# ANNUAL PROGRESS REPORT
# 2019

**All India Coordinated Research Project on Rapeseed-Mustard**
**ICAR-Directorate of Rapeseed- Mustard Research**
**(Indian Council of Agricultural Research)**
**Bharatpur 321 303, Rajasthan**

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# *Annual Progress Report 2019*

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*(Indian Council of Agricultural Research)*

**Sewar, Bharatpur 321 303 (Rajasthan) India**

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# Acknowledgement

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My profound thanks to all the collaborators from 8 main, 13 sub and 24 voluntary centres under the umbrella of AICRP-RM programme during 2018-19. I extend my sincere appreciation to the monitoring team leaders and members for giving valuable suggestions for further improvement of the programme and express my gratitude to all the Vice-Chancellors and Directors of Research of the concerned SAUs, Directors of ICAR/other institutes, Directors of State Department of Agriculture for their valuable and timely cooperation in the successful implementation of the envisaged research and development activities.

The overall seasonal weather conditions during crop season of 2018-19, across the rapeseed-mustard production zones were quite normal and favourable for crop growth and development. Performance of 158 strains including 10 of toria, 05 of yellow sarson and 132 of Indian mustard, 10 of gobhi sarson and 01 of taramira was tested in thirty five performance evaluation trials at 46 locations across the 6 agro-climatic zones of the country. 256.32q breeder seed of 61 rapeseed-mustard varieties was produced, indicating a surplus availability of 171.61q.

In 8th year of long term fertility experiment under different cropping systems and locations, Crop responded up to 50% higher dose of NPK in Zone I & V and balanced fertilizer application with supplementary use of S/ Zn/ B and FYM in zone II, III and IV. On an average, raised bed technique recorded 17.2 & 26.9% higher seed yield of mustard over conventional and zero till practice, respectively. Application of hydrogel 5.0 kg/ha + Foliar spray of salicylic acid 200ppm at flowering and siliqua formation stage recorded 18.6, 42.6, 37.7, 72.6 & 133% higher seed yield in Zone I, II, III, IV and V control. Reaction to different diseases was observed in integrated disease management practices and farmer's practices to standardise the best integrated disease management module. Module included seed treatment with *Trichoderma harzianum* @10g/ kg seed, soil application of *Trichoderma* (1 kg/ 50 kg FYM), basal application of zince sulphate @ 15 kg/ h + S (dose as per location recommendation) + boron (10 kg borax/ ha), line sowing 45 x 20 cm spacing, no irrigation during 25$^{th}$ to 15$^{th}$ Jan, expressed significant increase in yield by using IDM module over farmer's practices.

My sincere thanks and appreciation to all the principal investigators, associated scientists and other colleagues at the ICAR-DRMR especially Drs. K. H. Singh, O. P. Premi, A. K. Sharma, Vinod Kumar, Bhagirathram, Ram Swarup Jat, Pankaj Sharma, Anubhuti Sharma, Archana Anokhe of ICAR-DRMR and Drs. Sarvan Kumar and Pushp Sharma of PAU Ludhiana for their painstaking efforts in compiling the data and timely brining out the report in the present form.

Last but not the least, help rendered by the technical, administrative and supporting staff of DRMR, particularly by Dr. R. C. Sachan, Mr. Sanjay Kumar, Mr. R. C. Meena, Mrs. Veena Sharma, Mr Krishnakant Singh and Mr. Lala Ram is thankfully acknowledged.

(P. K. Rai)
**Director**

July 18, 2019
ICAR-DRMR, Bharatpur

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# सारांश

# सारांश

## मौसम

वर्श 2018–19 में सरसों फसल के लिये मौसम अनुकूल रहा। मानसून के दौरान सितम्बर माह में अच्छी बारि ा दे ा के लगभग सभी केन्द्रों में हुई। जिसके कारण प्रति हेक्टेयर पैदावार 14 क्विंटल से अधिक हुई क्रम ाः दिसम्बर एवं जनवरी माह में न्यूनतम तापमान –1.5 डिग्री सेल्सियस एवं 0.8 डिग्री सेल्सियस हिमाचल के बाजौरा केन्द्र में दर्ज किया गया। इस वर्श कीड़ों एवं बीमारियों का प्रकोप भी बहुत कम रहा, जिसके कारण फसल की पैदावार अच्छी हुई।

## आनुवांि ाकी एवं पादप प्रजनन

### किस्मों का सुधार/विकास

अखिल भारतीय राई सरसों समन्वित परियोजना के अन्तर्गत दे ा के 11 राज्यों के 14 विभिन्न अनुसंधान केन्द्रों पर राई–सरसों की उन्नत किस्मों के विकास हेतु कार्यक्रम कृषि पारिस्थितिकी तंत्र की आव यकताओं के अनुरूप किया गया। 158 किस्मों का मूल्यांकन 46 केन्द्रों जिसमें 24 स्वैच्छिक एवं निजी केन्द्र सम्मिलित है, पर 35 समन्वित परीक्षणों में किया गया।

### जननद्रव्य संसाधन प्रबंधन

कुल 6605 प्रारूपों जिनमें तोरिया (547), लाहा (4822), पीली सरसों (617), गोभी सरसों (116), भूरी सरसों (105), करन राई (235), तारामीरा (70), *ब्रेसिका टोरनफोरटाई* (04), *ब्रेसिका काऊडेटस* (01), *ब्रेसिका नाइग्रा* (10), *ब्रेसिका रूगोसा (10), ब्रेसिका टॉर्नेफोर्टाई (04), रेफेनस काऊडेटस* (01) एवं अन्य वन प्रजाति (67) के प्रारूपों को उचित संकरण विधि द्वारा सुरक्षित रखा गया। लाहा (22) एवं तारामीरा (10) एवं तोरिया (12) के कुल 44 नये प्रारूप को एकत्र किया गया एवं लाहा (438), तोरिया (84), पीली सरसों (174), भूरी सरसों (41), करन राई (06) और तारामीरा (30) के 773 प्रारूपों का मूल्यांकन किया गया। मूल्यांकन के आधार पर विभिन्न गुणों के लिए उपयोगी जननद्रव्यों की पहचान की गई।

### संकरण एवं चयन

अधिक उपज, भीघ्र पकने वाली, बीज–आकार, कीट–रोग प्रतिरोधकता, उच्चताप सहन ीलता, गुणवत्ता एवं अधिक तेल मात्रा के आधार पर तोरिया (80), पीली सरसों (36), लाहा (946) के 1062 नए कॉसेस नवगांव, चट्ठा, भा कृ अं सं नई दिल्ली कानपुर, पंतनगर, मुरेना, हिसार, श्रीगंगानगर, लुधियाना, वाराणसी एवं एस.के. नगर में बनाए गए। तोरिया में समंष्टि (पॉपुले ान) सुधार कार्यक्रम, कम्पोजिट बनाकर एवं चयन प चात् समष्टि बनाकर किया गया। पीली सरसों के लिये पंतनगर एवं कानपुर में संकरण तथा 389 एकल पौधे पृथक्करणीय पीढियों में चयन किया गया। लाहा के 7081 एकल पौधे एवं 793 पुंज (बल्क) पृथक्करणीय एवं अग्रिम पीढ़ियों में से चयन किये गये।

### अग्रिम प्रजनन स्तर का मूल्याकंन

तोरिया के 107 प्रभेदों का कानपुर, हिसार,चट्ठा एवं ढोली में मूल्याकंन किया गया। कानपुर में मानक तपे वरी की तुलना में 38.3 प्रति ात पैदावार वृद्वि दर्ज की गई। पीली सरसों के कुल 47 प्रभेदों को कानपुर, एवं ढोली में जॉचा गया और कानपुर में पीताम्बरी की तुलना में 22.5 प्रति ात अधिक उपज वृद्वि हुई। लाहा के 660 प्रभेदों को 07 केन्द्रो पर 43 परीक्षणों में जॉचा गया। वाराणसी में एनआरसीएचबी 101 की तुलना में 68.7 प्रति ात उपज में वृद्धि पाई गई। गोभी संरसो के कुल 22 प्रभेदों का हिसार एवं चट्ठा में मूल्यांकन किया गया। करन–राई की 11 किस्मों का मूल्यांकन पैदावार वृद्धि और तेल के लिए सिंचित अवस्था में लुधियाना में किया गया।

### संकर/ गुणवत्ता/ मानचित्रीय समष्टि विकास

लाहा में अधिकतम तापमान एवं सूखा अवरोधिता के लिए भारतीय कृषि अनुसंधान संस्थान, नई दिल्ली में मानचित्रीय समष्टियॉ बनाई गई। संकर विकास के लिए सी.एम.एस. एवं पुर्नसंग्रहण (रीस्टोरर) रूपान्तरण

कार्यक्रम भा.कृ.अनु.सं., नई दिल्ली, हिसार, पंतनगर एवं एस.के.नगर में अग्रिम पीढ़ी के लिए संकरण किया गया। 36 प्रायोगिक संकर प्रभेदों का मूल्यांकन दो परीक्षणों में किया गया। भीघ्र पकने वाले समूह में एक संकर प्रभेद आर.एच.एच. 1803 की उपज मानक किस्म एन.आर.सी.एच.बी. 101 की तुलना में 6.7 प्रति ात अधिक थी। दो संकर किस्म एच.जे. 518 और एच.जे. 1117 की उपज मानक किस्म डी.एम.एच. 1 की तुलना में क्रम ाः 5.5 प्रति ात एवं 4.7 प्रति ात अधिक थी। आई.ए.आर.आई में जी.ई.आर. 1 एवं जी.ई.आर. 5 के लिए एस टी एस मार्कर को इनसिलकों एवं रिस्क्युसिंग के द्वारा उत्पन्न किया गया। भा.कृ.अ.सं. नई दिल्ली में 2306 कम इरूसिक अम्ल (< 2 प्रति ात) एवं 906 कम ग्लाईकोसिनोलेट (< 30 पी पी एम) मात्रा वाले एकल पौधों/समूहों का चयन किया गया।

## प्रजनक बीज उत्पादन

कृषि मंत्रालय, भारत सरकार द्वारा वर्ष 2018–19 के लिए प्रस्तावित 61 अनुमोदित किस्मों का प्रजनक बीज विभिन्न केन्द्रों पर आवंटित किया गया। 84.76 क्विंटल प्रजनक बीज की मांग की तुलना में 256.32 क्विंटल (जिसमें पिछले वर्ष का बीज सम्मिलित है) प्रजनक बीज तैयार किया गया।

## समन्वित परीक्षण

तोरिया (10), पीली सरसों (05), लाहा (132), तारामीरा (01) एवं गोभी सरसों (10) के 158 उन्नत प्रभेदों को दे ा के 6 कृषि जलवायु क्षेत्रों में 35 उपज परीक्षणों हेतु 46 स्थानों पर जॉचा गया। जिसके आधार पर कुल 32 जिसमें तोरिया (01), गोबी सरसों (07) एवं लाहा (24) सम्मिलित है, को अग्रिम स्तर की जाँच के लिए प्रोन्नत किया गया।

**सर्वोत्तम जॉच किस्म की तुलना में 10 प्रति ात अधिक उपज एवं तेल मात्रा वाले राई सरसों के उत्कृष्ट प्रभेद**

| जोन 01 | जोन 02 | जोन 03 | जोन 04 | जोन 05 |
|---|---|---|---|---|
| **तोरिया, ऐ.वी.टी. (सिंचित/असिंचित)** | | | | |
| | | | | टीएस 38 (1426,16.7) |
| **सरसों, आई.वी.टी., समय से पहले बुवाई (सिंचित)** | | | | |
| – | | डीआरएमआर सीआई 96 (2203,10.6) आरएमएम 10–1–1 (2187, 9.8) | | – |
| **सरसों आई एच टी (संकर) भीघ्र परिपक्वता** | | | | |
| | | डीआरएमआर एचजे 2403'' (2458, 9.3) | | |
| **सरसों, आई.वी.टी., समय पर बुवाई (सिंचित)** | | | | |
| आरजीएन 443 (1226, 21.6) एसकेएम 1626 (1210, 20.1) पीबीआर 385 (1187, 17.7) पीआर 2016–4 (1144, 13.5) पीआर 2016–8 (1134, 12.5) डीआरएमआर 17–16 | आरएच 1676 (2944, 11.2) | आरएच 1584 (2992, 10.8) एसकेएम 1626 (2991, 10.8) | | |

| | | | | |
|---|---|---|---|---|
| (1115, 10.6)<br>आरएच 1676<br>(1112, 10.3) | | | | |
| सरसों, असिंचित, आई वी टी | | | | |
| | आरएच 1424''<br>(2794, 7.4) | | | |
| सरसों, देरी से बुवाई, ए वी टी I | | | | |
| | डीआरएमआर<br>2017–15<br>(1847, 19.9)<br>डीआरएमआर<br>आईसी 16–38<br>(1716, 11.3) | | | |
| सरसों, संकर, समय पर बुवाई, (आई एच टी) | | | | |
| | 8 आईजे1004<br>(3169, 13.9)<br>एसबीएच 108''<br>(3047, 9.5) | | | |
| **सरसों आई बी टी (गुणवत्ता) सरसों असिंचित देरी से बुवाई** | | | | |
| – | आरएच (ओई) 1706<br>(2872, 4.7)<br>पीडीजेड 12रु<br>(2800, 2.1)<br>आरएच (ओई) 1705<br>(2738, ८ ) | आरएच (ओई) 1706<br>(2405, 3.2)<br>पीडीजेड 11रु<br>(2335, ८ ) | | |
| सरसों ए वी टी **I गुणवत्ता संकर देरी से बुवाई** | | | | |
| | एलईएस 54<br>(2711, ८ ) | | | |
| **गोभी सरसों आई वी टी** | | | | |
| एकेजीएस 8217<br>(1573, 26.0)<br>जीएसएच 1707<br>(1561, 25.0)<br>एकेजीएस 8146<br>(1561, 25.0)<br>जीएसएच 1717<br>(1406, 13.0)<br>जीएसएच 1699<br>(1386, 11.0)<br>एचएनएस 1102<br>(1373, 10.0) | | | | |
| गोभी **सरसों ए वी टी I** | | | | |
| एकेएमएस 8141<br>(1821, 15.9) | | | | |

कोष्ठक के अन्दर द ार्यी संख्या क्रम ाः उत्पादन किलोग्राम/हैक्टेयर एवं उपज वृद्धि है।
'' तेल की उपज के आधार पर उन्नति।

# ास्य विज्ञान

वर्ष 2018–2019 में 23 केन्द्रों पर राई–सरसों फसल उत्पादन की छः विधाओ पर परीक्षण किये गये।

## दीर्घकालीन उर्वरता परीक्षण

परीक्षण के सातवें वर्ष, जोन–1 व 5 में 50 प्रतिशत एन.पी.के बढाने से राई–सरसों की पैदावार में बढोतरी अंकित की गई। लेकिन जोन – II, III व IV में अनुमोदित 100 प्रतिशत एन.पी.के तथा जिंक/वोरोन/गोबर की खाद का अतिरिक्त प्रयोग करने से उत्पादकन में वृद्वि पाई गई।

## राई– सरसों के खरपतवार

देश के 14 जिलों में राई–सरसों के खरपतवारों का सर्वेक्षण किया गया। गुडिया, जंगली राइस, बथुआ, प्याजी, सफेद सैंजी, दूब, पित्त पापडा, हिरणखुरी, मोकोय, मरवारी व जॉय वीड,, सत्यानाशी खरपतवार अधिक स्थानों पर पाये गये।

## उपयोगी जनन द्रव्यों का मूल्यांकन

लवणीय परिस्थिति में किये गये परिक्षणों में केवल करनाल में ही सी. एस. – 508–1 पी 2 की औसतन पैदावार सर्वोत्तम चेक की तुलना से 6.9 प्रति ात अधिक प्राप्त रही।

## वर्तमान और भावी जलवायु के अंर्तगत उत्पादन में वृद्वि के लिए संसाधन प्रयोग कार्यकुशल एवं लचीली राई–सरसों आधारित फसल प्रणाली का विकास

चट्ठा, पंतनगर व मुरैना में मूंग– सरसों फसल प्रणाली अपनाने से सरसों की अधिक पैदावार प्राप्त हुई। सरसों को उभरी क्यारी पर बोने से पारंपरिक व जुताई रहित विधि के मुकावले क्रमशः 17.2 व 26.9 प्रतिशत पैदावर में बढोतरी पाई गई।

## सघन सरसों प्रणाली

सरसों कि विभिन्न प्रजातियों का 60 X 60 से. मी. पर रोपण करने से पैदावर में 10.2 प्रतिशत नई दिल्ली में, 45.8 प्रतिशत नागपुर में एवं 27.2 प्रतिशत वनारस में वृद्वि अर्जित की गई।

## बारानी परिस्थिति में जल प्रयोग की क्षमता को बढाना

फूल व फलियॉ बनने की अवस्था पर हाईड्रोजैल 5.0 कि.ग्रा. है. और सैलिसिलिक एसिड 200 पी. पी. एम. के छिडकाव से जोन – I, II, III व IV V में हाईड्रोजैल 5.0 कि.ग्रा. है और कन्ट्रोल के मुकावले पैदावार में क्रमशः 5.3, 9.6, 20.4, 31.3 व 6.9 एव 18.6, 42.6, 37.7, 72.6, व 133.0 प्रतिशत की वृद्वि अर्जित की गई।

# पादप रोग विज्ञान

2018–19 के दौरान श्रीगंगानगर, धौली, पंतनगर, लुधियाना, झांसी, हिसार, नई दिल्ली, वाराणसी एवं ि ालोंगनी में काला धब्बा रोग का प्रकोप औसत से तीव्र पाया गया। भरतपुर व श्रीगंगानगर में इसका प्रकोप सामान्य से मध्यम पाया गया। नई दिल्ली एवं मुरैना में सफेद रोली का प्रकोप औसत से तीव्र रहा। झांसी व पंतनगर में मृदुरोमिल आसिता का प्रकोप प्रांकुर अवस्था में औसत से सामान्य पाया गया जबकि पंतनगर, श्रीगंगानगर, नई दिल्ली एवं भरतपुर में कम से मध्यम रहा। चूर्णिल आसिता रोग का प्रकोप मुरैना, झांसी और एस.के. नगर में औसत से तीव्र रहा और जगदलपुर व भरतपुर में कम रहा। पंतनगर, नई दिल्ली, मुरैना, श्रीगंगानगर, लुधियाना व वाराणसी में तना गलन रोग का प्रकोप औसत से सामान्य पाया गया।

### राई–सरसों जनन द्रव्य की विभिन्न रोगों के प्रति प्रतिक्रिया

पंतनगर, लुधियाना, और हिसार में 71जे0002, आरएलसी–2, आरसीएच–1 एवं आरएलसी–7 पर सफेद रतुआ रोग का प्रकोप नहीं पाया गया।

### बीमारी की नर्सरी

सरसों के जनन द्रव्य पीडीजेड–2, पीडीजेड–3, पीडीजेड–5, पीडीजेड–7, डीआरएमआरआईजे 12–26, डीआरएमआर 12–28, डीआरएमआरआईजे 12–37, डीआरएमआरआईजे 12–39, डीआरएमआरआईजे 12–44, डीआरएमआर 2018–37, डीआरएमआर 2018–41, डीआरएमआरएसजे–1, डीआरएमआरएसजे–18, डीआरएमआरएसजे–21, डीआरएमआरएसजे–22, डीआरएमआरएसजे–26 एवं डीआरएमआरएसजे–34 सफेद रतुआ के प्रति प्रतिरोधी पाये गये। सरसों का डीआरएमआर 2018–44 जनन द्रव्य तना गलन रोग के प्रति प्रतिरोधी पाया गया।

### राष्ट्रीय रोग नर्सरी

सरसों के डीआरएमआर 2018–37, डीआरएमआर 2018–41, डीआरएमआरएसजे–18, डीआरएमआरएसजे–21, डीआरएमआरएसजे–22, डीआरएमआरएसजे–25, डीआरएमआरएसजे–26, डीआरएमआरएसजे–34 एवं डीआरएमआर–5206 जनन द्रव्य सफेद रतुआ के प्रति प्रतिरोधी पाये गये।

### एल्ब्यूगो कैन्डिडा रोग हेतु विभिन्न परपो ी का प्रमाणीकरण

ब्रैंसिका प्रजाति के 11 जनन द्रव्यों पर एल्ब्यूगो कैन्डिडा के 4 पृथ्थक्कृत जीवों की रोगजनन प्रतिक्रिया का अध्ययन पंतनगर, भरतपुर व हिसार में किया गया। पंतनगर, हिसार व भरतपुर जननद्रव्य डीआरएमआर 12–40 एल्ब्यूगो कैन्डिडा के सभी 4 पृथ्थकृत जीवों के प्रति सहन ील पाया गया। जबकि जननद्रव्य ईसी 399301, आरएच 30 व डीआरएमआरएबी 753 सभी पृथ्थकृतों के प्रति सुग्राही प्रतिक्रिया द र्ायी।

### काला धब्बा, सफेद रतुआ, चूर्णिल आसिता व मृदुरोमिल आसिता रोगों की महामारी का अध्ययन

ि लांगनी में काला धब्बा को सर्वप्रथम 66 दिन की अवस्था में 8 अक्टूबर को बोयी गयी फसल में देखा गया व रोग की तीव्रता (40.6 प्रतिशत) 12 नवम्बर को बोई फसल में 100 दिनों तक रही । मुरैना में सफेद रोली की तीव्रता (43.6 प्रतिशत) 19 नवम्बर को बोई रोहिणी में 90 दिन पर रही व 12 नवम्बर को बोई फसल में 68 दिन बाद कालाधब्बा बीमारी दिखाई दी। धौली में काला धब्बा 19 नवम्बर को बोई वरूणा व राजेन्द्र सुफलाम किस्मों में 38 दिन बाद दिखाई दिया। एस.के.नगर में चूर्णिल आसिता 19 नवम्बर को बोई वरूणा में 83 दिन पर दिखाई दी जिसकी 117 दिनों तक तीव्रता रही। पंतनगर में मृदुरोमिल आसिता 15 अक्टूबर व 22 अक्टूबर को बोई फसल में 10 दिन पर प्रथम बार प्रांकुर पर दिखाई दी। जबकि सफेद रोली 21 नवम्बर को बोई फसल में 45 दिन पर दिखाई दी व 122 दिनों तक तीव्र रही। काला धब्बा प्रथम बार 53 दिन पर दिखाई दिया।

## कीट विज्ञान

इस वर्श 2018–19 में कीटों के विकास के लिए मध्यम से उच्चतम तक मौसम उपयुक्त रहा । प्रभेद डीआरएमआर 2017–26, केएमआर(ई)18–2, आरएच 1699–5, केएमआर(ई)18–1, आरएमएम. 10–1–1, क्रांति (एनसी), बुलट, 8आईजे 4002, 8आईजे 0117, पूसा एमएच–7.(हाईब्रिड), एनपीजे–224, आरजीएन(चैक), एसकेएन 1626, एकेएमएस–1002, अनमोल, आरएच 1584, पीबीआर 385, एनपीजे–223, एचयूजेएम17–6, डीआरएमआरसीआई 107, एनपीजे–226, डीआरएमआर 150–35(चैक), 8आई जे0117, आरबी 100, डीआरएमआरसीआई 114, आरएच 1424,जेएम 11–9, पूसा बोल्ड(चैक), केएमआर(एल) 18–6, आरएचएच. 1801, आरसीएच. 2, डीआरएमआरएचजे 517,आरएलसी. 9, आरजीएन 394, आरजीएन 73(चैक), डीआरएमआर 2017–15, एनआरसीएचबी 101(चैक), जीएसएच 1754, आरटीएम 1624 और आरटीएम 314(चैक) में चैंपा का आक्रमण 2.0 से कम पाया गया।

राई–सरसों की उपज में कीटों के द्वारा अधिकतम हानि वी.एस.एच. 1(भूरी सरसों) कानपुर में (60.9 प्रति ात), पीएम 31 एस.के.नगर में (60.7 प्रति ात), ढ़ोली में (35.4 प्रति ात), हिसार में (29.4 प्रति ात), मुंरैना में प्रभेद आरएच 725 (22.7 प्रति ात), लुधियाना में पीएम 31(18.7 प्रति ात) जबकि नई दिल्ली और पंतनगर में आरएच 725 (14.8 प्रति ात) एवं वरूणा (12.6 प्रति ात ) की उपज में कीटों द्वारा अधिकतम हानि पायी गयी।

ज्यादातर केन्द्रों पर मध्यम से अधिकतम 2वें से 13वें सप्ताह तक सार्थक संख्या में चैंपा दिखाई दिया जो कि 7 से 11 वें सप्ताह में अधिकतम बिन्दु पर पाया गया। **लुधियाना** में दोनों बुवाई में समय से बुवाई और पछेती बुवाई के अन्तर्गत पत्ता गोभी की सूंडी बहुत कम संख्या में पायी गयी। यह डीआरएमआरआईजे 31 में 6 वें सप्ताह में समय से बुवाई की अवस्था में पुनः 8 वें सप्ताह तक में सक्रिय पाया गया। जबकि पछेती बुवाई की अबस्था में 9 वें से 12 वें सप्ताह तक पुनः सक्रिय पाया गया। चितकबरा कीट **एस.के.नगर** में कम से मध्यम संख्या में 44 वें से 47 वें सप्ताह तक पाया गया, पहले 47 वें से 49 वें सप्ताह तक और दूसरा 8 वें से 11 वें सप्ताह तक दिखाई दिया। चितकबरा कीट की कुछ सक्रियता 47वें से 51वें सप्ताह तक भी पायी गई। **मुरैना** में 1 वें से 10 वें सप्ताह तक मधुमक्खिों की संख्या सक्रियता रही। परभक्षी कॉक्सीनेला की सक्रियता मध्यम से अधिकतम 6 वें से 12 वें सप्ताह तक रही। **ि ालोंगनी** में आरामक्खी 50 वें से 5 वें सप्ताह तक, फ्ली बीटिल 49 वें से 13 वें सप्ताह तक और परभक्षी कॉक्सीनेला 50 वें से 14 वें सप्ताह तक पायी गई।

पंखदार चैंपा की संख्या का अवलोकन सात केन्द्रों द्वारा किया गया। **लुधियाना** में पंखदार चैंपा पहले 43 वें सप्ताह में दिखाई दिया। अधिकतर केन्द्रों पर 51 वें –1 वें सप्ताह से बढ़ना भारू हुआ और 8वें 11वें सप्ताह में बहुत अधिक संख्या में पंखदार चैंपा दिखाई दिया। **एस.के नगर** में (5696.2 चैंपा/ट्रेप ) 8 वें सप्ताह में बहुत अधिक संख्या में पंखदार चैंपा दिखाई दिया। अधिकतर केन्द्रों पर 11वें सप्ताह से कमी भारू हो गई तथा 13 वें सप्ताह के बाद पंखदार चैंपा विलुप्त हो गया।

जैव एकीकृत ना ीजीव प्रबंधन के मॉड्यूल के विभिन्न उपचारों के अन्तर्गत डाईमैथोएट 30 ई.सी./2 मिली/लीटर की दर से छिड़काव के उपरान्त इस के दूसरे उपचार जो 10 दिनों के बाद किया गया वह अधिकां ा केन्द्रों जैसे कानपुर, लुधियाना, एस.के नगर, ढ़ोली और मुंरैना के साथ वृद्धि ील लाभ लागत अनुपात क्रम ाः 56.6, 37.6, 23.7, 8.9 और 4.9 का अधिक प्रभाव ाली पाया गया। जबकि दूसरा मुख्य उपचार एजाडाईरिक्टन 3000 पीपीएम 5 एमएल प्रति लीटर की दर से छिड़काव के उपरान्त इस के दूसरे उपचार जो 10 दिनों के बाद हिसार, मुरैना, ि ालोंगनी और लुधियाना केन्द्रों में प्रयोग किया गया था, अधिक प्रभाव ाली पाया गया। नए कीटना ी परिक्षणों के प्रयोगों में, इमिडाक्लोप्रिड 17.8 एस.एल. 0.25 मि. ली. प्रति लीटर की दर से अधिकतर केन्द्रों पर जैसे कानपुर, एस.के नगर, हिसार, पंतनगर, लुधियाना और ि ालोंगनी के साथ वृद्धि ील लाभ लागत अनुपात क्रम ाः 72.5, 29.9, 20.2, 14.6 और 0.8 अधिक प्रभाव ाली पाया गया।

एस.के. नगर, कानपुर, लुधियाना और ि ालोंगनी में कीटों का सर्वेक्षण किया गया जिसमें सरसों का चैंपा, चितकबरा कीट, आरा मक्खी, फ्ली बीटिल एवं परभक्षी कॉक्सीनेला पाये गये।

## पादप कार्यिकी

वर्षा आधारित स्थिति के अन्तर्गत पीजीआर की दक्षता का परीक्षण करने के लिये विभिन्न कृशि–जलवायु क्षेत्रों से सरसों के जीनोटाइप्स का मूल्यांकन करने के लिये पाँच प्रयोग तीन स्थान पर किए गए थे, अकुंर अवस्था पर भारतीय सरसों (बी. जुन्सिंया) के 37 प्रभेदों का उच्च तापमान सहिश्णुता के लिये क्षेत्र और प्रयोग ाला परिस्थितियों में परीक्षण किया गया। अंकुरण अवस्था मृत्यु दर $\leq$ 20 प्रति ात और डीडब्ल्यू/10 अंकुरण 40 प्रति ात से अधिक जीनोटाइप्स नियत्रिंत परिस्थितियों ने सहिश्णु है। पाँच जीनोटाइप्स यथा डीआरएमआर 2059, पीएम 25 (एनसी), पीएम 29 (एलआर) बुलेट और आरएच 749 (जेडसी) कानपुर एवं लुधियाना में, पीएम 25 (एनसी) और बुलेट हिसार, कानपुर एवं लुधियाना में, जबकि डीआरएमआर 2059 तीन प्रक्षेत्रों (मुम्बई, कानपुर और लुधियाना) में ताप सहिश्णु पाये गये। क्षेत्रों में बोये गये परीक्षण में डीआरएमआर 2059, पीएम 25 (एनसी), पीएम 29 (एलआर), केएमआर (ई) 18–2 एवं आरएच 1699–5 कानपुर और लुधियाना में अधिक सहन ील पाये गये, आरएच 1658 धौली एवं लुधियाना में अकुंरण अवस्था मृत्युदर $\leq$ 20 प्रति ात एवं शुश्क पदार्थ प्रति दर 10 अकुरित अवस्था $\geq$ 4.0gm. पाये गये, केवल डीआरएमआर 2300 अधिक सहिश्णु और डीआरएमआर 2059 मध्यम सहिश्णु धौली, कानपुर एवं लुधियाना में पाये गये। जेडी 6 (जेडसी) कानुपर एवं लुधियाना नियत्रिंत परिस्थितियों में मध्यम सहिश्णु में पाया गया। पीएम 25 (एनसी) एवं पीएम 29 (एलआर) ने प्रयोगशाला और क्षेत्र के स्थिति के अन्तर्गत अकुंर स्तर पर उच्च तापमान के प्रति सहिश्णुता पाई गई। प्रका ा तनाव के कारण उच्च छायांकन के लिये 30 दिनों के लिये क्षति भाारीरिक और उपज के लिये जीनोटाइप्स का तीन स्थानों पर परीक्षण किया गया। कम शारीरिक तनाव और बीज की उपज में कमी ($\leq$ 20 प्रति ात) ने हिसार और कानपुर में आरएच 749 एवं एनआरसीएचबी 101 की पहचान की गई। जबकि हिसार और लुधियाना में डीआरएमआर 541–44 एवं क्रांन्ति कम प्रका ा तनाव के अन्तर्गत अच्छी पाई गई। पैतीस एवं पैंसठ दिन सिंचाई नही करने पर नमी की कमी के कारण चार केन्द्रों पर जीनोटाइप प्रभेदों का प्रर्द ान महत्वपूर्ण रूप से प्रभावित हुआ।

टीएम 179, एलईएस 54, एनपीजे 210, आरजीएन 444 एवं आरएच 1584 धौली और लुधियाना में, आरबी 100 एवं एनपीजे 226 धौली और हिसार में केवल एक जीनोटाइप एनपीजे 216 कानपुर और लुधियाना में एनपीजे 214, आरएच 1555, एनपीजे 225, आरजीएन 73(जेडसी), आरबी 102, पीएम 29, पीएम 30 और डीआरएमआर 114 नमी प्रतिबल के प्रति सहिश्णु, धौली, हिसार एवं लुधियाना में पायी गई। केवल जीनोटाइप प्रभेदों डीआरएमआर 170 चारों प्रक्षेत्रों (धौली, हिसार, कानुपर और लुधियाना) पर सूखे के प्रति अधिक सहिश्णु पाया गया नमी की कमी के प्रति सहिश्णु होने से आरडब्ल्यूसी, स्पैड संख्या अधिक पायी गई मुख्य शाखा पर फलीयों की संख्या दाना प्रति फली और बीज भार में कम गिरावट के साथ–साथ डीएसआई $\leq$ 1.2 से कम पाई गई। बीज उपज में गिरावट $\leq$ 30 प्रति ात के लिये जीनोटाइप आरएच 749 (जेडसी) तीन प्रक्षेत्रों (धौली, हिसार व लुधियाना) पर मध्यम सूखा सहिश्णु पाया गया। तीस प्रभेदों में से दो प्रभेद (आरएच 749 एवं डीआरएमआर आईसी 1638) धौली, हिसार और लुधियाना में आरएच 919 धौली, हिसार, कानपुर में जबकि डीआरएमआर 2059 चार प्रक्षेत्रों पर (धौली, हिसार, कानपुर एवं लुधियाना) में 20 प्रति ात उपज में कमी एवं गर्मी स्थिरता सूचकांक $>$ 0.6 पाया गया और ये अवसान गर्मी के साथ–साथ झिल्ली स्थिरता में कम अन्तर, बीज भार एवं दाना प्रति फली के प्रति अधिक सहिश्णु पाया गया। बीज अकुंरण प्रतिशत में कम गिरावट पौध की लम्बाई और अधिक शुश्क भार के आरएच 1607 को कानपुर और लुधियाना में पहचान की गई, जबकि सीएस 58 को कानपुर और लुधियाना के अन्तर्गत अधिक सहिश्णु के रूप में पहचाना गया। तीन प्रक्षेत्रों हिसार, कानपुर एवं लुधियाना पर ब्रेसीनालाइड/20 पीपीएम साइकलिक अम्ल/200 पीपीएम का पर्णीय छिड़काव करने से वर्शा आधारित के अन्तर्गत बीज उपज में वृद्धि पायी गयी।

## जैव रसायन

22 जीनोटाइप का आईवीटी/एवीटी गुणवत्ता परीक्षण भरतपुर, कानपुर, कांगडा, पंतनगर, हिसार और लुधियाना में किया गया। तेल की मात्रा का अनुपातिक वि ले ाण इन पॉच केन्द्रों पर किया गया। जिसमें अधिकतम 40.88 प्रति ात डी.आर.एम.आर.क्यू 1–16–27 में और कम से कम 35.73 प्रति ात एलइएस–59 में प्राप्त हुआ। तेल स्थिरता सूचकांक एमयूएफए : पीयूएफए के अनुपात का रेंज आरएच–749 में 0.65 से 1.31 आरएलसी–7 में प्राप्त हुआ। आरएलसी 8, आरसीएच 3, एलईएस 59, एलईएस 58, आरएलसी 7, डीआरएमआरक्यू 4–7–23, एलईएस 57, एलईएस 54, पीडीजैड 11, पीडीजैड 12 और आरएलसी 9 में इरूसिक अम्ल 2 प्रति ात से कम पाया गया। पाल्मिटिक अम्ल की रेंज 2.89 प्रति ात (आरएच–749) से 4.61 प्रति ात (पीडीजैड–11), स्टेरिक अम्ल 0.83 प्रति ात (क्रांति) से 1.52 (एलईएस–59), ओलिक अम्ल 9.88 प्रति ात (आरएच–749) से 42.25 प्रति ात (पीडीजैड–1) तक, लिनोलिक अम्ल 15.33 प्रति ात (आरएच–749) से 40.86 प्रति ात (पीडीजैड–11) तक, लिनोलेनिक अम्ल 10.25 प्रति ात (एलईएस–58) से 16.82 प्रति ात (आरएलसी–3) तक, इकोसोनोइक अम्ल 4.37 प्रति ात (आरसीएच–3) से 8.35 प्रति ात (आरएच–749) तक प्राप्त हुआ। ओमेगा 6 : ओमेगा 3 का अनुपात 0.98 प्रति ात (आरएच–749) से 3.78 (एलईएस–58) तथा एसएफए:एमयूएफए:पीयूएफए का अनुपात 1:7:10 (पीडीजैड–11) से 1:24:13 (आरएच––749) के बीच पाया गया। कुल प्रोटीन 35.59 प्रति ात (71जे0002) से 35.92 प्रति ात (एलईएस–58), मेथोनिन 1.34 (एलईएस–57) से 1.68 (एलईएस–59) प्रति 100 ग्राम प्रोटीन तक प्राप्त हुआ। ट्रिप्टोफेन 1.15 (आरएलसी–3) से 1.40 (आरएच–749) प्रति 100 ग्राम प्रोटीन तक मिला है। कुल एन्टीओक्सीडेन्ट क्षमता 16:14 (एलईएस–59) से 24:81 (आरएच(ओई) 1706) mg/g एएई तक प्राप्त हुआ। कुल फिनोल की मात्रा 3.47 प्रति ात (पीएम–29) से 5.16 प्रति ात (डीआरएमआरक्यू 1–16–27) तक मिली। आरएलसी–8, आरसीएच–3, आरएलसी–10, आरएलसी–7, आरसीएच–1, डीआरएमआरक्यू 4–7–23, पीडीजैड–11, पीडीजैड–12, डीआरएमआरक्यू 1–16–27, पीडीजैड–1, 71जे0002, आरएलसी–3 और आरएलसी–9 जीनोटाइप्स. में ग्लूकोसिनोलेट की मात्रा 3 $\mu$ मोल/ग्राम से कम प्राप्त हुई है। 2 प्रति ात फाइटिक एसिड से कम मात्रा आरसीएच–3, पीएम–29, आरसीएच–1, डीआरएमआरक्यू 1–16–27 में प्राप्त हुई। $\beta$.केरोटिन $>$ 5 पीपीएम आरएलसी–10, आरएच(ओई)1705, पीएम–29, क्रांति, 71जे0002 में प्राप्त हुआ है। टोकोफेरॉल >160मि.ग्रा. 100ग्रा./बीज 71जे0002, पीडीजैड–1, क्रांति, डीआरएमक्यू 1–16–27 और डीआरएमआरक्यू 4–7–23 में पाया गया।

# अग्रिम पंक्तिप्रद ान 2017–18

- व ा 2018–19 में तिलहनों के अग्रिम पंक्ति प्रद ान और अन्य संबंधित गतिविधियों की योजना के तहत 27 अखिल भारतीय राई–सरसों समन्वित अनुसंधान परियोजना के केन्द्रों/भारतीय कृशि अनुसंधान परि ाद और कृशि वि वविद्यालय द्वारा 14 राज्यों के 63 जिलों में सिंचित एवं बारानी अवस्था में राई सरसों के 2080, जिसमें राजस्थान में सर्वाधिक 533 एवं मणीपुर, आसाम, उत्तरप्रदे ा, तथा मध्य प्रदे ा में क्रम ाः 450, 320, 236, एवं 129 अग्रिम पंक्ति प्रद ानो का आयोजन किया गया। इसमें 1671 राई समूह के फसलों पर तथा 409 सरसों समूह की फसलों पर थे। इस वर्श सभी प्रद ान सम्पूर्ण तकनीकी पर आधारित थे, जिन्हें सिंचित (1129) एवं बारानी (951) अवस्था में लगाया गया था।
- सिंचित अवस्था में राई–सरसों की अधिकतम औसत पैदावार 2,754 किलोग्राम प्रति हैक्टेयर हरियाणा में प्राप्त हुई। इसके बाद राजस्थान, पंजाब, गुजरात एवं मध्य प्रदे ा में क्रम ाः 2,443; 2,093; 1,999 एवं 1,858 किलोग्राम प्रति हैक्टेयर औसत पैदावार दर्ज की गई। सम्पूर्ण तकनीकी प्रदर्शनों से उपज में अधिकतम बढोत्तरी 62.7, 60.3, 60.0, 37.8, 18.8 एवं 17.8 प्रति ात क्रम ाः जम्मू एवं क मीर, उडीसा, हिमाचल प्रदे ा, उत्तरप्रदे ा, मध्य प्रदे ा तथा महाराश्ट्र, में प्राप्त हुई। अधिकतम अतिरिक्त भाुद्व लाभ 22,544; 16,503; 15,343; 13,532; एवं 12,457 रूपये प्रति हैक्टेयर क्रम ाः जम्मू एवं क मीर, हिमाचल प्रदे ा, उत्तरप्रदे ा, हरियाणा एवं राजस्थान में प्राप्त हुआ। सिंचित अवस्था में राई–सरसों की उत्पादन लागत सबसे कम 13,273 रूपये प्रति हैक्टेयर महाराश्ट्र में तथा अधिकतम 34,462 रूपये प्रति हैक्टेयर हरियाणा में आई।
- बारानी अवस्था में राई–सरसों की अधिकतम औसत पैदावार 1,590 किलोग्राम प्रति हैक्टेयर राजस्थान में प्राप्त हुई। इसके बाद, आसाम, जम्मू एवं क मीर, झारखण्ड, हिमाचल प्रदे ा, उत्तराखण्ड एवं मणीपुर में क्रम ाः 1,167; 1,128; 1,047; 1,037; 1,016 एवं 1,007 किलोग्राम प्रति हैक्टेयर औसत पैदावार दर्ज की गई। अधिकतम 47.7 प्रति ात तक उपज में बढोत्तरी झारखण्ड में प्राप्त हुई। आसाम, हिमाचल प्रदे ा, मणीपुर, उत्तराखण्ड, जम्मू एवं क मीर, तथा राजस्थान में क्रम ाः 46.2, 39.2, 28.1,21.8,18.2 तथा 16.3 प्रति ात तक उपज में बढोत्तरी दर्ज की गई। अधिकतम अतिरिक्त औसत भाुद्व लाभ 11,803; 9,687; 9,056; 8,207; 7,998; 6,197 एवं 5,524 रूपये प्रति हैक्टेयर, आसाम, झारखण्ड हिमाचल प्रदे ा, राजस्थान, मणीपुर, जम्मू एवं क मीर एवं उत्तराखण्ड में प्राप्त हुई। असिंचित अवस्था में राई–सरसों की उत्पादन लागत सबसे कम 11,072 रूपये प्रति हैक्टेयर राजस्थान में तथा अधिकतम 26,152 रूपये प्रति हैक्टेयर जम्मू एवं क मीर में आई।
- सम्पूर्ण तकनीकी प्रद ानों में भारतीय राई की 20, पीली सरसों की 3, तोरिया की 2 तथा गोभी सरसों की एक उन्नत प्रजातियों को 11 राज्यों में सिंचित अवस्था में प्रयोग किया गया। भारतीय राई के प्रद ानों में हरियाणा में सिंचित अवस्था में 30 प्रथम पंक्ति प्रद ानों में आर. एच. 725 प्रजाति का प्रयोग था जिससे 16.3 प्रति ात उपज बढोत्तरी के साथ अधिकतम उपज 2,790 किलोग्राम प्रति हैक्टेयर प्राप्त हुई। इसके बाद राजस्थान में 10 प्रद ानों में प्रद ित डी.आर.एम.आर. 1165–40 प्रजाति की औसत पैदावार 2,650 किलो प्रति हैक्टेयर तथा 13.7 प्रति ात उपज में बढोत्तरी दर्ज की गई। राजस्थान में 19 प्रद ानों में प्रदर्शित आर. एच. 406 प्रजाति से न्यूनतम 4.4 प्रति ात उपज बढोत्तरी दर्ज की गई जबकि न्यूनतम औसत पैदावार 933 किलोग्राम प्रति हैक्टेयर उडीसा मे 15 प्रदर्शनों में प्रद ित एन. आर. सी. एच. बी. 101 प्रजाति में दर्ज की गई। हालांकि जम्मू एवं क मीर में एन. आर. सी. एच. बी. 101 किस्म से सिंचित अवस्था मे किसान की स्थानीय प्रजाति की तुलना में सर्वाधिक 66.1 प्रति ात तक उपज बढोत्तरी के साथ औसत पैदावार 1,709 किलोग्राम प्रति हैक्टेयर दर्ज की गई।
- भारतीय राई के असिंचित अवस्था में राजस्थान में प्रदर्शित आर. जी. एन. 229 प्रजाति से अधिकतम औसत पैदावार 2,080 किलोग्राम प्रति हैक्टेयर के साथ 12.4 प्रति ात तक उपज में बढोत्तरी दर्ज की गई। मणीपुर में 123 प्रद ानों में प्रद ित डी.आर.एम.आर. 150–35 प्रजाति से न्यूनतम औसत पैदावार 994 किलोग्राम प्रति हैक्टेयर के साथ 27.3 प्रति ात तक उपज में बढोत्तरी प्राप्त हुई। हालांकि झारखण्ड में शिवानी किस्म से असिंचित अवस्था मे किसान की स्थानीय प्रजाति की तुलना में सर्वाधिक 55.9 प्रति ात तक उपज बढोत्तरी के साथ औसत पैदावार 1,034 किलोग्राम प्रति हैक्टेयर दर्ज की गई।

# Summary

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## Seasonal Conditions

Weather was favorable for the mustard crop during the crop season 2018-19. Good rains were received during monsoon in the month of September almost all the centers. The extremely low temperature -1.5$^0$c and 0.8$^0$c was reported of Bajaura center in the month of December & January 2018-19 respectively. Incidence of diseases and pest was very low then resulted high productivity (More than 14 qtl/ha).

## Genetics and Plant Breeding

*Varietal Improvement*

Fourteen centers spread over 11 states carried out the varietal development activities in accordance to approved technical programme in toria (*Brassica rapa* var toria), yellow sarson (*B. rapa* var yellow sarson), Indian mustard (*B. juncea*), karan rai (*B. carinata*), gobhi sarson (*B. napus*) and taramira (*Eruca sativa*). Thirty five Performance evaluation trials were conducted at 46 centres including 24 volunteer centres/private organizations.

## Genetic Resource Management

A total of 6,605 accessions comprising toria (547), Indian mustard (4,822), yellow sarson (617), gobhi sarson (116), brown sarson (105), karan rai (235), taramira (70), *B. caudatus* (01), *R. caudatus* (01), *B. rugosa* (10), *B. nigra* (10) *B. tournefortii* (04), and other wild species (67) were maintained through appropriate mating system at Dholi, Hisar, Pantnagar, Ludhiana, Kanpur, Sriganganagar, IARI, New Delhi, Jobner, Morena, Chatha-Jammu and SK Nagar.In addition, 44 new accessions comprising Indian mustard (22), taramira (10) and toria (12) were collected. Further, 773 accessions consisting of 438 Indian mustard, 84 toria, 174 yellow sarson, 41 brown sarson, 06 Karan rai, and 30 taramira were evaluated. On the basis of germplasm evaluation, promising accessions were identified for seed yield, earliness, yield components, thermo-tolerance (early and terminal stages), rresistance/tolerance to diseases/pests and quality traits.

## Creation of genetic variability through hybridization/ mutagenesis and selection

Creation of variability is the essence and backbone of the breeding programme. To cater the need of diverse agro-climatic conditions of the country, 80 crosses were attempted in toria, 36 in yellow sarson at Pantnagar and Kanpur and946 in Indian mustard at Chatha, Hisar, IARI New Delhi, Ludhiana, Kanpur, Pantnagar, SK Nagar, Morena, Sriganganagar and Varanasi to improve seed yield, earliness, seed size, component traits, disease/pest resistance, heat tolerance, drought tolerance, “0” and “00” quality characters and high oil content. Selection of superior plants/bulks at different centres was practised intoria, yellow sarson and Indian mustard. In toria, development of composites population after the selection was the main objective. In yellow sarson, hybridization and selection from segregating generations were attempted at Kanpur and Pantnagar and 389 single plants were selected.In Indian mustard, 7081 single plants and about 793 bulks were selected from segregating and advanced generations.

## Evaluation of advanced breeding lines

The advanced breeding lines evaluated under different station/state /preliminary yield trials at various centres have been presented. 107 strains of toria were tested at Kanpur, Chatha, Hisar, Dholi. The yield superiority in toria was up to 38.3 % over the check (Tapeshwari) at Kanpur. In yellow

sarson, 47 strains were tested at Kanpur and Dholi. The yield superiority up to 22.5 % over the check Pitambari was recorded at Kanpur. In Indian mustard, 662 strains were evaluated at 07 centres; Chatha, Hisar, Ludhiana, Kanpur, Dholi, Sriganganagar and Varanasi in 43 trials. Seed yield superiority up to 68.7 % over the check NRCHB-101 was recorded at Varanasi.Ten strains at Hisar, and 12 strains at Chatha of gobhi sarson were evaluated for seed yield and its component characters. In addition, 11 strains of Karan rai were also evalauted at Ludhiana for Seed yield and oil content under irrigated condition.

## Hybrid/ Mapping Populations' Development/Quality Improvement

Efforts for hybrid development continued under "Consortia Research Platform on Hybrids", at four centres including ICAR-DRMR Bharatpur, ICAR-IARI New Delhi, PAU Ludhiana and CCS HAU Hisar. A total of thirty six experimental hybrids including 10 each from DRMR and IARI, 11 from PAU Ludhiana and 05 from Hisar were evaluated in two multilocation trials; early maturity group and medium to late maturity group, conducted at each of four centres.Under early maturity trial (MLT 1), 15 early maturing hybrids were tested against three checks. All experimental hybrids were late in maturity than earliest maturing check Keshri but matured at par with NRCHB 101, hence, these were compared with NRCHB 101 for seed yield. Only One hybrid RHH 1803 (2913 kg/h) out yielded the best check NRCHB 101 (2731 kg/h) by a margin of 6.7%. Twenty experimental hybrids were evaluated under timely sown normal maturity group against four checks. Two hybrids namely HJ 518 (2959 kg/h) and HJ 1117 (2935 kg/h) out yielded the best check DMH 1 (2804kg/h) by a margin of 5.5% and 4.7 %, respectively.

At IARI, *STS markers* for GER1 and GER 5 were developed by *in-silco* analysis and re-sequencing the genes from RLC3 and Pusa Jagannath. These *STS* markers were validated with the previous reported markers and no recombination frequency was observed. Two mapping populations for mapping genes/ QTLs for drought/heat tolerance (Pusa Bahar x BEC 144) and oil content EJ-17 x BEC144 were advanced for developing RILs which are in $F_7$ stage at IARI.For low erucic acid, 2453 single plants/bulks were analysed of which 2306 were having <2% erucic acid. Single plants/bulks, 2326 in number, from double low quality material/progenies were also analyzed for total glucosinolates content of which 906 plants/bulks were possessing <30ppm glucosinolates.

## Breeder seed production

Against the indent of84.76 q, 256.32 q breeder seed of 61 varieties was produced, indicating a surplus availability of 171.61 q.

## Coordinated Trials

Performance of 158 strains including 10 of toria, 05 of yellow sarson and 132 of Indian mustard, 10 of gobhi sarson and 01 of taramira was tested in thirty five performance evaluation trials consisting of toria (03), yellow sarson (02), gobhi sarson (02), taramira (01) and Indian mustard (27) at 46 locations across the 6 agro-climatic zones of the country. On the basis of superiority for seed/oil yield/ earliness/quality over the best check, 32 strains comprising toria (01), gobhi sarson (07) and Indian mustard (24) were promoted for advanced stage evaluation.

## Rapeseed-Mustard strains promoted for advance stage testing on the basis of higher seed/oil yield/quality (2018-19)

| Zone I | Zone II | Zone III | Zone IV | Zone V |
|---|---|---|---|---|
| **Toria AVT I (Irrigated/Rainfed)** | | | | |
| | | | | TS 38 (1426, 16.7) |
| **Early Mustard, IVT, Irrigated** | | | | |
| | | DRMRCI 96 (2203, 10.6)<br>RMM 10-1-1 (2187, 9.8) | | |

| | | | | |
|---|---|---|---|---|
| **Early Mustard Hybrid, IHT** | | | | |
| | | DRMRHJ 2403**<br>(2458, 9.3) | | |
| **Mustard, Timely Sown, Irrigated, IVT** | | | | |
| RGN 443<br>(1226,21.6)<br>SKM 1626<br>(1210, 20.1)<br>PBR 385<br>(1187,17.7)<br>PR 2016-4<br>(1144, 13.5)<br>PR 2016-8<br>(1134,12.5)<br>DRMR 17-16<br>(1115, 10.6)<br>RH 1676<br>(1112, 10.3) | RH 1676<br>(2944, 11.2) | RH 1584<br>(2992, 10.8)<br>SKM 1626<br>(2991, 10.8) | | |
| **Mustard, Rainfed, IVT** | | | | |
| | RH 1424**<br>(2794, 7.4) | | | |
| **Mustard, Late Sown AVT I** | | | | |
| | DRMR2017-15<br>(1847, 19.9)<br>DRMRIC 16-38<br>(1716, 11.3) | | | |
| **Mustard, Hybrid Timely Sown, IHT** | | | | |
| | 8IJ1004<br>(3169, 13.9)<br>SVJH 108**<br>(3047, 9.5) | | | |
| **Mustard, Quality, IVT** | | | | |
| | RH (OE) 1706<br>(2872, 4.7)<br>PDZ 12#<br>(2800, 2.1)<br>RH (OE) 1705<br>(2738, ≈ ) | RH (OE) 1706<br>(2405, 3.2)<br>PDZ 11#<br>(2335, ≈) | | |
| **Mustard, Quality, AVT I** | | | | |
| | LES 54 (2711, ≈) | | | |
| **Gobhi Sarson IVT** | | | | |
| AKGS 8217 (1573, 26.0)<br>GSH 1707 (1561, 25.0)<br>AKGS- 8146 (1561, 25.0)<br>GSH 1717 (1406, 13)<br>GSH 1699 (1386, 11)<br>HNS 1102 (1373, 10) | | | | |
| **Gobhi Sarson AVT I** | | | | |
| AKMS 8141 (1821, 15.9) | | | | |

Figures in parenthesis indicate seed yield (Kg/ha), percent superiority over best check
** promoted on te basis of oil yield; # double low strain.

### Breeder seed production

Against the indent of 84.76 q, 256.32 q breeder seed of 61 varieties was produced, indicating a surplus availability of 171.61 q.

## Crop Production

Six experiments on various crop production aspects of rapeseed-mustard were conducted at 23 cooperating centres across the 5 zones.

### Long term fertility experiments

It was 8th year of experiment; Crop responded up to 50% higher dose of NPK in Zone I & V and balanced fertilizer application with supplementary use of S/ Zn/ B and FYM in zone II, III and IV.

### Weed flora in rapeseed-mustard crop

*Orobanche aegyptica, Echinochloa colonum, Chenopodium album/murale, Aspodelus tenuifolius, Melilotus alba/indica, Cynodon dactylon, Fumeria parviflora, Convolvulus arvensis, Solanum nigrum, Medicago denticulate, Vicia sp., Alternanthera sessile*

### Agronomic evaluation of promising rapeseed-mustard entries

Under saline/alkaline conditions entry CS 508-1P2 produced 6.9% higher seed yield than the best check at Karnal centre only.

### Developing resource efficient and resilient rapeseed- mustard based cropping systems under current and future climates.

Among different cropping systems green gram-mustard system gave higher seed yield of mustard at Chatha, Pantnagar and Morena. On an average, raised bed technique recorded 17.2 & 26.9% higher seed yield of mustard over conventional and zero till practice, respectively.

### System of mustard intensification (SMI) in rapeseed-mustard through transplanting

Transplanting of *Brassica* sp. at 60x60cm increased the seed yield by 10.2, 45.8 and 27.2% at IARI, Nagpur and Varanasi, respectively.

### Enhancing water use efficiency in rapeseed-mustard under rainfed

Application of hydrogel 5.0 kg/ha + Foliar spray of salicylic acid 200ppm at flowering and siliqua formation stage recorded 5.3, 9.6, 20.4, 31.3 & 6.9 % and 18.6, 42.6, 37.7, 72.6 & 133% higher seed yield in Zone I, II, III, IV and V, over 5.0 kg/ha hydrogel alone and control, respectively.

## Plant Pathology

### Disease Scenario

During 2018-19, moderate to the severe incidence of Alternaria blight was recorded at SHL, DOL, LDH, JHS, HSR, NDH, VAR and PNT. However, low to the medium incidence of Alternaria blight was recorded from BPR and SGN. White rust appeared in moderate to severely at MOR and NDH while low to moderate at PNT, SGN, LDH and BPR. Low to medium incidence of DM was observed at the cotyledonary stage at JHS and PNT. Powdery mildew severity was moderate to severe at JHS, SKN, MOR and low at JAG and BPR. Low to moderate incidence of Sclerotinia rot was observed at NDH, MOR, PNT, SGN, LDH and VAR.

## Screening of *Brassica* germplasm and breeding materials

Under natural condition, 71J0002 (Bj), AKMS 8141, GSH 1754 (Bn), and RTM 1624 (*E. sativa*) were found resistant at all six locations. Entries including RAUDT 14-09, TS-38 of *B. rapa* var Toria escaped WR infection at most of the locations.

Under artificial condition GSH 1754, AKMS 1841 (Bn) and 71J0002, RLC 3, RCH 1, RLC 7 of *B. juncea* were found resistant to WR at HSR, PNT and LDH.

## Uniform Disease Nursery for major diseases

PDZ 2, PDZ 3, DRMRIJ-12-39, DRMR 2018-41, DRMRIJ-12-26, DRMRIJ-12-28, DRMRIJ-12-37, DRMRIJ-12-44, DRMRSJ-22, DRMRSJ-18, DRMRSJ-26, PDZ 7, PDZ 5, PRD 14-16, DRMRSJ-1, DRMRSJ-34, DRMR-2018-37 and DRMRSJ-21 of *B. juncea* showed resistance reaction to WR under natural conditions. Under natural condition, DRMR 2018-44 of *B. juncea* was found tolerant to SR at 5 locations.

## National Disease Nursery (NDN) for Alternaria blight

DRMR-2018-37, DRMRSJ-22, DRMRSJ-18, DRMRSJ-21, DRMRSJ-34, DRMRSJ-26, DRMRSJ-25, DRMR 5206, and DRMR-2018-41 of *B. juncea* showed resistant reaction to WR except PNT centre.

## National Disease Nursery (NDN) for white rust

DRMRJA 35, DRMRIJ 12-26, DRMRIJ 12-39, PDZ-3 strains of *B. juncea* showed immune reaction to WR at three locations. Some of the promising strains sowing resistance to WR were DRMRIJ 12-21, DRMRSJ-25, DRMR-5206, RH 1400, RH 1700 and DRMRIJ 12-48.

DRMRIJ 12-26, DRMRIJ 12-39, and DRMRMJA-35 were found promising for resistant to WR during 2014-15, 2015-16, 2016-17 and 2017-18 consistently.

## National Disease Nursery (NDN) for Sclerotinia rot

DRMRSJ-25 and DRMRSJ-22 (*B. juncea*) showed a resistant reaction to WR at PNT, HSR and LDH. DRMRSJ-22 and DRMR 5206 showed tolerance to SR with small lesion size and <50% incidence under artificial conditions.

## Screening of IVT entries of Brassica against different diseases

Nine entries were found resistant to WR at three locations, JGS-12-3, HNS 1102, GSH-1717, PYS-2016-8, AKGS-8217, YSKM 18-1, GSH-1699, GSH-1707 and AKGS-8146. Almost all the entries of *B. rapa* var. *toria*and *B. rapa* var *yellow sarsonB. napus* escaped WR infection.

AKGS-8217, GSH-1699, AKGS-8146 and GSH-1707 showed tolerance to PM.

## Standardization of differential hosts for identification of races in *A. candida*

Genotype DRMRIJ 12-40 gave resistant reaction against 4 isolate at PNT, HSR and BPR. While, genotypes EC 399301, RH-30 and DRMRAB-753 were found susceptible reaction against all 4 isolates of *A. candida* at 3 locations.

## Epidemiology of Alternaria blight, white rust, powdery and downy mildew

Experiments on the epidemiology of foliar diseases of rapeseed-mustard were laid out using cv. Varuna and Kranti. The experiment was sown on eight different dates at the weekly interval starting from October 1 to November 19 without adopting any protection measures against pest and diseases.

At PNT, Downy mildew disease first appeared 10 DAS on Oct 12, Oct 22 and Nov 12 sown crop whereas, on Oct 01 sown crop the disease appeared 19 DAS on both the cultivars. The white rust disease first appeared 30 DAS on Nov 21 sown crop during 2017-18 while 45 DAS on Oct 1, Oct 22, Oct 29 and continued up to 54 DAS on Nov 19 sown crop during 2018-19.

Alternaria blight disease was first noticed 53 DAS on Oct 15, Oct 29 and Nov 19 instead of 44 DAS on leaves on Nov 07 sown crop on both the cultivars last year. While, on Oct 01 sown crop, the disease appeared very late i.e. 67 DAS same as last year. The Alternaria blight on pods first appeared 88 DAS on late (Nov 19) sown crop. On early (Oct 08) sown crop, the symptoms on pod appeared late after 120 days of sowing.

At SHL, The crop was sown with 7 dates of sowing started from Oct 08 to Nov. 19 at weekly intervals with cv. Varuna and TM 2. AB was first observed at 66 DAS in Oct 08 seeded crop while it was appeared in 39 DAS in Nov 19 sown crop. Maximum disease severity was at 100 DAS (40.6%) in Nov 19 on cv TM 2 (Table 4.8). Maximum yield was recorded in Oct 19 sown cv Varuna (16.7 q/ha) while in TM 2 it was 12.5 q/ha (Oct 29).

At SKN, experiments were laid out with cv. Varuna and GM 2 sown on 8 dates of sowing started from Oct 01 to Nov. 19 at weekly intervals. Powdery mildew disease appeared at 83 DAS instead of 76 DAS last year first on Nov 19 sown crop of Varuna and 88 DAS in Nov 19 sown GM 2 continued to progress up to 114 DAS. The maximum disease severity was observed 98% in Nov 19 followed 95% in Nov 12 sown Varuna. The maximum reduction in seed yield was observed in late sown crop.

At MOR, experiments on the epidemiology of foliar diseases of rapeseed-mustard were laid out with cv. Varuna and Rohini. The crop was sown with 8 dates of sowing started from Oct 01 to Nov. 19 at weekly intervals. Alternaria blight appeared 68 DAS in Nov 12 and Nov 19 sown Rohini while appeared 100 DAS in Oct 01 sown both cultivars.

WR severity was appeared first on 48 DAS in Nov 19 and appeared till 90 DAS in Oct 01 sown crop. WR disease severity was maximum upto 43.6% in Nov 19 sown crop both in Varuna and Rohini.

PM was observed first 83 DAS and was maximum 47.1 % reported in cv Rohini at 130 DAS in Nov 19, sown crop. SR incidence appeared between 80-102 DAS first in late sown and delayed in optimum sowing dates.

At DOL,Experiment was laid out with cv. Varuna and Rajendra Suflam. The crop was sown with 8 dates of sowing started from Oct 01 to Nov 19 at weekly intervals. AB was first observed at 38 DAS in Nov 19 sown both Varuna and Rajendra Suflam, while appeared late in early sown Oct 01 sown crop (89 DAS). The disease continued to progress up to 140 DAS on leaves on both the cultivars.

## Testing of IDM module for major rapeseed-mustard diseases

AB, WR, DM, PM, SR diseases were observed in integrated disease management practices and farmer's practices to standardise the best integrated disease management module. Module includes seed treatment with *Trichoderma harzianum* @10g/ kg seed, soil application of *Trichoderma* (1 kg/ 50 kg FYM), basal application of zince sulphate @ 15 kg/ h + S (dose as per location recommendation) + boron (10 kg borax/ ha), line sowing 45 x 20 cm spacing, no irrigation during 25$^{th}$ to 15$^{th}$ Jan. AB severity recorded from 1.8% at BPR to 26.7% at PNT in module while in farmers practices severity ranged from minimum 1.8% at BPR to highest at PNT (33.3%). Similarly, WR severity was recorded minimum 2.1 % at LDH and maximum 44.0 % at MOR in farmer's practices while low at BPR (0.6%) and maximum at 29.6% at SGN in module. SR disease was also reduced from 26.9% in farmer's practices to 1.5% in module at SGN likewise 51.7% in farmer's practices to 10.0% in module at MOR. As per results, we found the significant increase in yield by using IDM module over farmer's practices.

## Entomology

### Summary Entomology 2019

The 2018-19 crop season witnessed moderate to high population development of mustard aphid on different Brassica species. Strain DRMR 2017-26, KMR (E) 18-2, RH 1699-5, KMR (E) 18-1, RMM 10 -1- 1, Kranti (NC), Bullet, 8IJ4002, 8IJ0117, Pusa MH-7 (Hybrid), NPJ-224, RGN 73 (Check), SKM 1626, AKMS- 1002, Anmol, RH 1584, PBR 385, NPJ-223, HUJM 17-6, DRMRCI 107, NPJ-226, DRMR 150-35 (Check), 8IJ0117, RB-100, DRMRCI 114, RH 1424, JM-11-9, Pusa Bold (Check), KMR (L) 18-6, RHH 1801, RCH 2, DRMRHJ 517, RLC 9, RGN 394, RGN 73 (Check), DRMR 2017-15, NRCHB 101 (Check), GSH 1754, RTM 1624 and RTM 314 (Check) were found promising since these recorded AAII $\leq$ 2.

The highest yield loss was observed in strain BSH-1 at **KPR**(60.9%)**,** PM31 at **SKN** (60.7%), **DOL** (35.4%), **HSR** (29.4%), in strain RH-725 (22.7%) at **MOR,** in PM 31at **LDH** (18.7%) whereas**, NDH** and **PNT** higher yield loss was recorded in strain, RH-725 (14.8%) and Varuna (12.6%) respectively.

The Moderate to high population of mustard aphid was reported at most of the centers from 2$^{nd}$ to 13$^{th}$ standard week with peak during 7$^{th}$ and 11$^{th}$ standard week. Very low activity of cabbage caterpillar was recorded both under timely and late sown conditions at **LDH** . It appeared on 6$^{th}$ std. week on DRMR IJ 31 under timely sown conditions and remained active till 8$^{th}$ std. week, while under late sown conditions it remained active from 9$^{th}$ to 12$^{th}$ std week. Low to moderate population of painted bug was observed from 44$^{th}$ – 47$^{th}$ std. week at **SKN**. Some activity of painted bug was also recorded from 47$^{th}$ to 51$^{st}$std week whereas activity of honeybees was recorded from 1$^{st}$ to 10$^{th}$ std. week at **MOR**. The activity of coccinellid predators was moderate to high during 6$^{th}$ and 12$^{th}$ std. week. At **SHL,**sawfly observed during 50$^{th}$ to 5$^{th}$ std. week, flea beetle from 49$^{th}$ to 13$^{th}$ std. week and coccinellid predators during 50$^{th}$ and 14$^{th}$ std. week.

The alate aphid population was recorded by seven centres. Alate aphid appeared as early as 43$^{rd}$ std. week at **LDH.** It started increasing at most of the centers from 51$^{st}$ – 1$^{st}$std. week and reached its peak from 8$^{th}$ – 11$^{th}$ std. week. The highest peak (5696.2 aphids/ trap) was recorded from **SKN** during 8$^{th}$std. week. After 11$^{th}$ std. week at general trend of decline in alate aphid population was observed which disappeared from most of centers after 13$^{rd}$ standard week.

Among bio-intensive IPM module treatments, treatment with Dimethoate 30 EC@2 ml/l followed by its second application after 10 days was found effective at most of the centers *i.e* **KPR, LDH, SKN, DOL** and **MOR,** with IBCR 56.6, 37.6, 23.7,8.9 and 4.9, respectively. The second best treatment was the spray of Azadirachtin 3000 ppm @ 5 ml/l followed by second spray after 10 days at HSR, MOR, SHIL and LDH. Among newer insecticide tested Imidacloprid 17.8 SL @ 0.25 ml/l was found effective in most of the centers with the IBCR 72.5, 29.9, 20.2, 15.6, 14.6 and 0.8 in **KPR, SKN, HSR, PNT, LDH** and **SHL** respectively.

Survey and surveillance of insect-pests was conducted at **SKN, KPR, LDH** and **SHL** Mustard aphid, painted bug, sawfly, flea beetle and coccinellid predators were reported from fields with moderate to low activity.

## Plant Physiology

Five experiments were conducted to evaluate mustard genotypes from different agro-climatic zones to abiotic stresses while sixth experiment was conducted at three locations to test the efficacy of PGR's under rainfed conditions. Thirty seven genotypes of Indianmustard (*B.juncea*)were tested for high temperature tolerance at seedling stage both under laboratory and field conditions.Seedling mortality

≤20% and DW/10 seedlings ≥ 40mg rated genotypes tolerant under controlled conditions. Five genotypes namely DRMR2059, PM 25(NC), PM29 (LR), Bullet and RH749 (ZC) at Kanpur and Ludhiana, PM 25(NC) and Bullet at Hisar, Kanpur and Ludhiana while DRMR 2059 at 3 locations (Mumbai, Kanpur and Ludhiana) showed thermo tolerance. In the field sown trial, DRMR2059, PM 25(NC), PM 29(LR), KMR (E) 18-2 and RH1699-5 were rated tolerant at Kanpur and Ludhiana, RH1658 at Dholi and Ludhiana with seedling mortality ≤20% and dry matter per 10 seedlings ≥4.0g. Only DRMR2300 was highly tolerant and DRMR 2059 moderately tolerant at Dholi, Kanpur and Ludhiana. JD-6(ZC) was moderately tolerant at Kanpur and Ludhiana under controlled condition. PM 25(NC) and PM29 (LR) showed tolerance to high temperature at seedling stage both under laboratory and field conditions. Light stress due to shading for 30 days impaired physiological and yield traits to variable extent within the genotypes and also at three locations. Lesser reduction in the physiological traits and seed yield (≤20%) identified RH749 and NRCHB 101 at Hisar and Kanpur while DRMR541-44 and Kranti at Hisar and Ludhiana as promising genotypes under low light stress. Moisture stress imposed by withholding irrigations at 35 and 65 DAS significantly affected the performance of genotypes at 4 locations.TM179, LES54, NPJ210, RGN444 and RH1584 at Dholi and Ludhiana, RB100 and NPJ226 at Dholi and Hisar, only one genotype NPJ216 at Kanpur and Ludhiana, NPJ214, RH1555, NPJ225, RGN73 (ZC), RB102, PM29, PM30 and DRMRCI114 at Dholi, Hisar and Ludhiana were tolerant to moisture stress. Only one genotype DRMRCI70 was rated highly tolerant to drought at 4 locations (Dholi, Hisar, Kanpur and Ludhiana). Tolerance to moisture deficit in these genotypes was attributed to higher RWC, SPAD values and also lesser decline in siliqua on main shoot, seeds per siliqua and seed weight with DSI≤1.2. Genotype RH749 (ZC) showed seed yield reduction ≤30% and was rated moderately drought tolerant at 3 locations (Dholi, Hisar and Ludhiana).Out of thirty mustard genotypes only two genotypes (RH749 and DRMRIC16-38) at Dholi, Hisar and Ludhiana, RH919 at Dholi, Hisar and Kanpur while DRMR2059 at 4 locations (Dholi, Hisar, Kanpur and Ludhiana) showed yield reduction≤20% and HSI≥0.6 and were considered highly tolerant to terminal heat stress with relatively lesser depression in membrane stability, seed weight and seeds/siliqua. Lesser decrease in germination percent, seedling length and higher dry matter identified RH1607 at Hisar and Kanpur while CS58 at Kanpur and Ludhiana as salinity tolerant. Foliar spray of brassinolide @ 20ppm and salicylic acid @ 200ppm at 3 locations (Hisar, Kanpur and Ludhiana) improved seed yield under rainfed conditions.

## Biochemistry

IVT/AVT quality trials were evaluated at Bharatpur, Kanpur, Kangra, Pantnagar, Hisar and Ludhiana. Among the 22 genotypes analysed, mean values of oil content for five centres (Bharatpur, Pantnagar, Ludhiana, Hisar and Kangra) showed maximum oil content (40.88%) in DRMRQ1-16-27 and minimum oil content (35.73%) in LES-59. Oil stability index which is the ratio of MUFA: PUFA ranged from 0.65 in RH-749 to 1.31 in RLC-7. RLC-8, RCH-3, LES-59, LES-58, RLC-7, DRMRQ4-7-23, LES-57, LES-54, PDZ-11, PDZ-12 and RLC-9 had < 2 % erucic acid content. Palmitic acid ranged from 2.89% (RH-749) to 4.61 % (PDZ-11). Stearic acid: 0.83 % (Kranti) to 1.52% (LES-59). Oleic acid: 9.88 % (RH-749) to 42.25 % (PDZ-1). Linoleic acid: 15.33 % (RH-749) to 40.86 % (PDZ-11). Linolenic acid: 10.25 % (LES-58) to 16.82 % (RLC-3). Eicosanoic acid: 4.37 % (RCH-3) to 8.35 % (RH-749). ω6:ω3 ratio ranged from 0.98 (RH-749) to 3.78 (LES-58). The SFA: MUFA: PUFA ratio ranged between 1:07:10 (PDZ-11) to 1:24:13 (RH-749). Total Protein ranged from 32.59 (7IJ0002) to 35.92% (LES-58). Methionine: 1.34 (LES-57) to 1.68 (LES-59) g/100g protein. Tryptophan: 1.15 (RLC-3) to 1.40 (RH-749) g/100g protein. Total antioxidant capacity ranged from 16.14 (LES-59) to 24.81 (RH (OE) 1706) mg/g AAE. Total phenol content ranged from 3..47% (PM-29) to 5.16% (DRMRQ1-16-27). Total Glucosinolate mean values were <30 µmol/g in RLC-8, RCH-3, RLC-10, RLC-7, RCH-1, DRMRQ4-7-23, PDZ-11, PDZ-12, DRMRQ1-16-27, PDZ-1, 7IJ0002, RLC-3and RLC-9 genotypes. Less than 2% phytic acid content was in RCH-3, PM-29, RCH-1, DRMRQ1-16-27 (Table 17-18). β-carotene content were recorded > 5 ppm RLC-10, RH(OE)1705,,

PM-29, Kranti, 7IJ0002. Tocopherol content were >160 mg/100 g seed in 7IJ0002, PDZ-1, Kranti, DRMRQ1-16-27and DRMRQ4-7-23.

## Frontline Demonstrations

Under the scheme "Frontline demonstrations and other related activities of Oilseeds" 27 cooperating centres of AICRPRM/ ICAR institutes/ Ag. Universities conducted 2080 frontline demonstrations (FLDs) on rapeseed-mustard in 67 districts across 14 states during 2018-19. Rajasthan had maximum (533) followed by Manipur (450), Assam (320), Uttar Pradesh (236) and Madhya Pradesh (129) FLDs.

Four hundred nine FLDs were conducted on rapeseed and 1671 on mustard. All the demonstrations were conducted under whole package demonstrations in two different situations viz., irrigated (1129) and rainfed (951).

The maximum average yield of 2,754 kg/ha from the IP under irrigated conditions was in Haryana followed by 2,443 kg/ha in Rajasthan; 2,093 kg/ha in Punjab; 1,999 kg/ha in Gujarat and 1,858 kg/ha in Madhya Pradesh. The maximum yield gap of 62.7% was recorded in Jammu and Kashmir followed by 60.3% in Odisha; 60.0% in Himachal Pradesh; 37.8% in Uttar Pradesh; 18.8% in Madhya Pradesh and 17.8% in Maharashtra. The maximum ANMR/ha were Rs 22,544; Rs 16,503; Rs 15,343;, Rs 13,532; and Rs. 12,457 in Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Haryana and Rajasthan, respectively. The cost of cultivation ranged from Rs. 13,273/ha in Maharashtra to Rs. 34,462 /ha in Haryana in IP under irrigated Whole package demonstrations.

The maximum average yield of 1,590 kg/ha from the WP under rainfed conditions was in Rajasthan followed by 1,167 kg/ha in Assam; 1,128 kg/ha in Jammu & Kashmir; 1,047 kg/ha in Jharkhand; 1,037 kg/ha in Himachal Pradesh; 1,016 kg/ha in Uttarakhand and 1,007 kg/ha in Manipur. The maximum yield gap of 47.7% was recorded in Jharkhand followed by 46.2% in Assam, 39.2% in Himachal Pradesh; 28.1% in Manipur, 21.8% in Uttarakhand, 18.2% in Jammu & Kashmir and 16.3% in Rajasthan. The maximum ANMR/ha were Rs 11,803; Rs 9,687; Rs 9,056; Rs 8,207; Rs. 7,998; Rs 6197 and Rs 5,524 in Assam, Jharkhand, Himachal Pradesh, Rajasthan, Manipur, Jammu & Kashmir and Uttarakhand, respectively. The cost of cultivation ranged from Rs. 11,072/ha in Rajasthan to Rs. 26,152/ha in Jammu & Kashmir in IP under rainfed Whole package demonstrations.

A total of 20 improved varieties of Indian mustard, 3 of yellow sarson, 2 of toria and one of gobhi sarson were used in WP covering eleven states under irrigated condition. Under irrigated condition, improved variety RH 725 of Indian mustard demonstrated in 30 FLDs in Haryana recorded highest average yield of 2,790 kg/ha with a yield improvement of 16.3% over local (FP) followed by DRMR 1165-40 demonstrated in 10 FLDs in Rajasthan with average seed yield of 2,650 kg/ha with yield improvement 13.7%. The minimum yield improvement of 4.4% was reported from RH 406 variety from 19 FLDs in Rajasthan, while minimum average seed yield of 933 kg/ha was reported from NRCHB 101 variety from 15 FLDs in Odisha. However, the variety NRCHB 101 in Jammu & Kashmir under irrigated condition recorded highest yield improvement of 66.1% with average seed yield of 1,709 kg/ha.

Under rainfed condition, the demonstrations with RGN 229 recorded a highest average seed yield of 2080 kg/ha with yield improvement of 12.4% in Rajasthan under rainfed situation. In Manipur, 123 demonstrations with DRMR 150-30 recorded lowest average seed yield of 994kg/ha with yield improvement of 27.3% over FP. However, the variety Shivani in Jharkhand under rainfed condition recorded highest yield improvement of 55.9% with average seed yield of 1,034 kg/ha.

# Monitoring Team Report

# Monitoring Report

Sixteams comprising scientists from ICAR-DRMR and other AICRP-R&M Centres visited 31centres across the five zones during (February - March,2018)to monitor the conduct of different coordinated trials, breeder seed production and front line demonstrations.

| Zone | Team | Centres | Duration |
|---|---|---|---|
| **I +II** | **Team Leader**<br>Dr. Virendra Sardana, Sr. Scientist (Agronomy),PAU, Ludhiana<br>**Team Members**<br>Dr. Bhagirath Ram, Pr. Scientist (GPB),ICAR-DRMR-Bharatpur<br>Dr. Pushpa Sharma, Sr. Scientist, PAU, Ludhiana<br>Dr. A.K. Tiwari, SRO. Pathology, GBPUA&T, Pantnagar | Kangra, Bajaura, Dhaulakuan, Una<br>Chatha<br>Ludhiana | 20-22 February 2019 |
| **II** | **Team Leader**<br>Dr. Mahak Singh, Breeder (R&M), CSAUA&T, Kanpur<br>**Team Members**<br>Dr. P.D. Meena, Pr. Scientsit, (Pl. Pathology),ICAR-DRMR-Bharatpur<br>Dr. Harvir Singh, Scientist, (Agronomy), ICAR-DRMR, Bharatpur<br>Dr. M.K. Dhillon, Sr. Scientist (Ento), IARI, New Delhi | New Delhi<br>Mahendragarh<br>Hisar<br>Bawal<br>Sriganganagar<br>Karnal<br>Sohna(Gurugram) | 12-15 February 2019 |
| **III** | **Team Leader**<br>Dr. K.H. Singh, Pr. Scientist (GPB), ICAR-DRMR, Bharatpur<br>**Team Members**<br>Dr. Kartikey Srivastava, Prof. (PB), BHU, Varanasi<br>Dr. Bikram Singh, Prof. (Agronomy), CCSHAU, Bawal<br>Dr. G.P. Gangwar, Astt. Professor (Pl.Pathology), SDAU, SK Nagar | Kanpur<br>Varanasi<br>Banda<br>Jhansi | 25 February-01 March 2019 |
| **III** | **Team Leader**<br>Dr. V.V. Singh, Pr. Scientist, (Plant Breeding), DRMR, Bharatpur<br>**Team Members**<br>Dr. R.S. Jat, Pr. Scientist, (Agronomy), DRMR Bharatpur<br>Dr. J.C.Gupta, (Plant Pathologist), ZARS, Morena | Morena<br>Bichpuri (Agra)<br>Bharatpur<br>Pantnagar | 13-15 February 2019 |
| **III+IV** | **Team Leader**<br>Dr. H.S. Meena, Sr. Scientist (GPB), ICAR-DRMR, Bharatpur<br>**Team Members**<br>Dr. B.L. Meena, Scientist (GPB), ICAR-DRMR, Bharatpur<br>Dr. R.L. Choudhary, Scientist (Agronomy), ICAR-DRMR, Bharatpur<br>Dr. K.N. Meena, Sr. Technical Officer, ICAR-DRMR, Bharatpur | Jobner<br>Mandore<br>S.K. Nagar<br>Deesa<br>Kota | 11-14 February 2019 |
| **III+V** | **Team Leader**<br>Dr. Pankaj Sharma, Pr. Scientist (Pl.Pathology), ICAR-DRMR, Bharatpur<br>**Team Members**<br>Dr. S.S. Rathore, Pr. Scientist (Agronomy). IARI, New Delhi<br>Dr. H.K. Sharma, Scientist (GPB). ICAR-DRMR, Bharatpur<br>Dr. R.R. Bhanwar, Scientist (Pl. Pathology), RRS, IGKV, Jagdalpur, Bastar | Shillongani<br>Kalyani<br>Dholi<br>Kanke<br>Jagdalpur | 16-22 February 2019 |

## Centre wise salient observations

### Zone I

#### KNG

Three breeding trials were allotted toKangra centre,all were conducted properly. The expected yield 10-15 q/ha in gobhi sarson and 12-15 q/ha timely sown crop was reported.

**BJR**

Only gobhi sarson trials (IVT & AVT-I) were allotted to Bajaura centre. These were conducted as per technical programme.

**DLK**

One IVT (Timely Sown) mustard trial and two gobhi sarson trials were conducted as per technical programme. Plant stand and growth was good.

**UNA**

Only one trial IVT mustard timely sown was allotted to Una centre. The plant growth and expression was poor.

## ZoneII

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**LDH**

Twelve breeding trials were allotted to Ludhiana centre,all were conducted. Expected yield reported was 14-16 q/ha, 22-26 q/ha of early and IVT timely sown trials respectively. Segregation was observed in entry MH 18-1 of IHT.

**NDH**

The experiments were conducted as per the technical programme.All the trials conducted nicely and plant population and growth was good.The top three entries of IVT timely sown trial were MCN 18-9, MCN 18-24, MCN 18-27.

**BAW**

Alloted trials were conducted properly. The plant stand & growth were proper and good. 20 FLDswere also conducted.

**KAR**

AVT- I alkaline/saline trial was allotted. The trial was conducted properly. The top three entries reported were CSCN 18-2,5&7.

**MDG (Shaktivardhak)**

Only IVT hybrid trial was allotted. The yield performance was very poor. The segregation was observed in entry number MH 18-10, 17 & 3.

**PAL**

Two breeding trials IHT early and IHT timely sown were allotted to Bayer Bio science at Palwal (Sohna) centre. The monitoring team observed that IHT early trial was not conducted properly.

**HSR**

All allotted trials were conducted as per technical programme. The incidence of white rust and stag head was observed up to 5-10 %. Over all crop condition was good and expected yield reported was16-18 q/ha.

**SGN**

Four breeding trials were allotted to Sriganganagar centre. All were conducted as per technical programme. Appearance of white rust disease in some of entries. Twenty FLDs (Front Line Demonstrations) were conducted under full package component.

## Zone III

**PNT**

All the experiments were conducted as per technical programme. The monitoring team observed segregation in some of entries MH (E) 18-3, MH (E) 18-6, MH (E) 18-7 and IHT (TS) MH 18-13, MH 18-7 and AVT-I (Q) QM 18-27. The expected yield of 18-20 q/ha in timely sown breeding trial was reported.

**BPR**

Five breeding trialswere conducted at DRMR Bharatpur. The monitoring team has been observed segregation in some of entries in IHT (TS) MH 18-13, MH 18-7. Expected yield 22-25 q/ha in timely sown trial was reported. 350 FLDs were also conducted properly.

**AGR (Bichpuri)**

Only one saline/alkaline trial was allotted to Bichpuri (Agra) centre.Trial was not worth considering according to monitoring team.

**MOR**

28 trials allotted in different disciplines, plant breeding, agronomical, pathology and entomology. Segregation was observed by monitoring team in different trials IHT timely sown MH 18-7, IVT (Q) QM 18-12 and QM 18-15 and AVT-I (Q) QM 18-27.

**BND**

Only one breeding trial was allotted to Banda centre, which was conducted properly. The expected yield was reported 20-25 q/ha. The top three entries were MCN 18-14, MCN 18-19 and MCN 18-20.

**VAR**

Plant stand, growth and expression were proper and excellent. The segregation was observed in AVT-I QM 18-27, IVT timely sown MCN 18-24, IHT MH 18-7 & MH 18-16. The expected yield 20-25 q/hain plant breeding irrigated trial was reported. 100 FLDs were conducted properly.

**KPR**

Aphid infestation was very high in all the trials. Plant stand was satisfactorily and expression of crop was good. Segregation was observed in some of entries IHT early number MH (E) 7, QM 18-2. The expected yield was reported 15-20 q/ha in breeding trials.

**JHS**

Two breeding, one agronomy and one pathology trials were allotted to Jhansi centre. They conducted all the trials in good manners. The expected yield of plant breeding was observed 20-25 q/ha and 18-20 q/ha in agronomy trial. They also conducted 75 FLDs of different varieties.

**DOL**

Eight plant breeding trials were allotted to Dholi centre. Plant stand was proper and growth of crop was good. Infestation of disease alternaria blight and powdery mildew were observed moderate.

**KOT**

Only two breeding trials were allotted to Kota centre. All were conducted properly but in some of entries MCN 18-4, MCN 18-7 and MCN 18-25, plant population waspoor in IVT timely sown trial.

**ZONE IV**

**SKN**

Three breeding trails were conducted as per technical programme. Over all crop condition was good in all the trials. 30 FLDs were conducted properly.

**JOB**

One breeding trial was allotted to Jobner centre. Over all crop condition was good. 20 FLDs were conducted properly. Aphid infestation occurred in few plants.

**MDR**

Three breeding trials were allotted to ARS Mandore centre. Over all crop condition was good. 20 FLDs conducted properly.Aphid infestation occurred in few plants. Segregation was observed in some of entries MCN 18-1, MCN 18-2, MCN 18-18 and MCN 18-4 of IVT timely sown. Expected yield was reported 25-35 q/ha and 25-32 q/ha in IVT and AVT-I TS trials, respectively.

**DSA**

One hybrid trial was conducted at Deesa centre.Over all crop condition was very good and it was free from disease and pest. The segregation was observed by the monitoring team in some of entries MH 18-7, MH 18-17, MH 18-16 and MH 18-13.

**ZONE V**

**KNK**

Six breeding and 3 Agronomy trials were allotted to Kanke centre. They conducted all the trails as per technical program.All trials were conducted properly. 26 FLDs were allotted and all were conducted.Over all FLDs condition was good. Expected yield was reported10-12 q/ha of IVT Early, 15 q/ha IVT timely sown (RF).

**SHL**

All allotted breeding, agronomy, pathology and entomology trials were conducted properly and 20 FLD's were conducted nicely. Infestation of alterneria blight on pod was observed moderate to heavy (5-7 scale).

**KLN**

Total five trials allotted to Kalyani centre. Three trials of plant breeding and two agronomy trials were conducted. Alterneria blight was observed (5-7 Scale). Expected yield of toria 10 q/ha and yellow sarson 12-14 q/ha.

**JAG**

Six breeding and four pathology trials were allotted to Jagdalpur centre. Expected yield was reported of IVT early mustard trial 14-15 q/ha, IVT mustard rain fed 15-18 q/ha, IHT early mustard 15-18 q/ha and AVT-I+II repeat 18-20 q/ha. The top three entries were observed of IVT early mustard trial MCNE 18-3, MCNE 18-13, MCNE 18-4 and IVT mustard rain fed TS MCNR 18-11, MCNR 18-14, MCNR 18-18 and IHT Early MH (E) 18-9, MH(E) 18-10, MH(E) 18-1.

# Seasonal Conditions

# 1. Seasonal Conditions

Weather was favorable for the mustard crop during the crop season 2018-19. Good rains were received during monsoon in the month of September almost all the centers. The extremely low temperature -1.5$^0$c and 0.8$^0$c was reported of Bajaura center in the month of December & January 2018-19 respectively. Incidence of diseases and pest was very low then resulted high productivity (More than 14 qtl/ha).

**Zone I**

Only two centers reported the weather data namely Kangra and Bajaura. The extremely low temperature -1.5 & 0.8$^0$c was reported at Bajaura centre in the month of December, 2018 & January 2019, respectively. Good rains were received in the month of October to April 2018-19 at both the centers.

Table: 1.1 Weather conditions during crop season in Zone I

| Centre | Sep. 18 | Oct. 18 | Nov. 18 | Dec. 18 | Jan. 19 | Feb. 19 | Mar. 19 | Apr. 19 |
|---|---|---|---|---|---|---|---|---|
| **Max. Temp. (°C)** | | | | | | | | |
| KNG | - | 30.2 | 25.6 | 25.6 | 16.7 | 18.4 | 24.2 | 32.7 |
| BJR | - | 26.5 | 25.0 | 18.3 | 14.0 | 15.1 | 20.5 | 27.5 |
| **Min. Temp. (°C)** | | | | | | | | |
| KNG | - | 11.6 | 8.6 | 8.6 | 1.4 | 3.4 | 6.4 | 17.8 |
| BJR | - | 5.9 | 2.8 | -1.5 | 0.8 | 3.4 | 5.4 | 10.1 |
| **Rainfall (mm) (rainy days)** | | | | | | | | |
| KNG | - | 8.6 | 21.0 | 21.0 | 95.4 | 187.2 | 36.6 | 36.5 |
| BJR | - | 8.8 | 65.3 | 3.6 | 91.0 | 179.4 | 76.8 | 41.4 |
| **Max. R.H. (%)** | | | | | | | | |
| KNG | - | 77.3 | 79.8 | 79.8 | 85.4 | 85.8 | 79.1 | 71.9 |
| BJR | - | 90.0 | 91.0 | 91.0 | 91.0 | 92.0 | 89.0 | 91.0 |
| **Min. R.H. (%)** | | | | | | | | |
| KNG | - | 61.9 | 63.0 | 63.0 | 69.5 | 68.8 | 66.2 | 57.5 |
| BJR | - | 33.0 | 46.0 | 32.0 | 51.0 | 54.0 | 41.0 | 46.0 |

**Zone II**

The mean maximum temperature ranged from 17.4$^0$c at Chatha in January, 2019 to 37.6$^0$c at Sriganganagar in the month of September 2018. The minimum temperature 4.4$^0$c reported by Chatha centre during December 2018.Good rains were received during crop season at all the centers. The mean minimum and maximum humidity ranged from 32% to 89.3% at Sriganganagar and high humidity at Chatha 95% in the month of December, 2018.

Table: 1.2 Weather conditions during crop season in Zone II

| Centre | Sep. 18 | Oct. 18 | Nov. 18 | Dec. 18 | Jan. 19 | Feb. 19 | Mar. 19 | Apr. 19 |
|---|---|---|---|---|---|---|---|---|
| **Max. Temp. (°C)** | | | | | | | | |
| BAW | - | 35.0 | 28.2 | 21.4 | 19.3 | 20.6 | 31.0 | - |
| SGN | 37.6 | 34.7 | 28.3 | 18.6 | 19.3 | 22.1 | 28.6 | 36.9 |
| CHT | 32.2 | 29.4 | 25.6 | 20.3 | 17.4 | 19.3 | 24.4 | 33.5 |
| NDH | 31.6 | 32.6 | 27.4 | 21.8 | 20.0 | 21.3 | 27.0 | - |
| **Min. Temp. (°C)** | | | | | | | | |
| BAW | - | 16.6 | 11.1 | 4.6 | 5.6 | 8.3 | 12.9 | - |
| SGN | 25.5 | 19.5 | 12.2 | 7.7 | 7.4 | 9.5 | 15.0 | 22.2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CHT | 22.9 | 13.3 | 10.1 | 4.4 | 5.2 | 8.1 | 10.6 | 17.1 |
| NDH | 22.3 | 14.9 | 11.8 | 5.0 | 6.4 | 10.0 | 12.4 | - |
| **Rainfall (mm) (rainy days)** | | | | | | | | |
| BAW | NIL | NIL | NIL | 1.0 | 12.5 | 14.0 | 6.8 | - |
| SGN | 5.5 | 1.5 | 0.3 | 0.2 | 2.1 | 3.0 | 9.2 | 13.5 |
| CHT | 202.4 | 3.6 | 14.8 | 11.8 | 64.2 | 155.4 | 36.2 | 42.4 |
| NDH | 244.5 | 0.0 | 4.0 | 0.2 | 52.0 | 72.2 | 0.3 | - |
| **Max. R.H. (%)** | | | | | | | | |
| BAW | - | 84.3 | 87.2 | 92.0 | 91.5 | 90.6 | 77.4 | - |
| SGN | 73.7 | 74.5 | 77.9 | 89.3 | 89.0 | 87.3 | 72.0 | 60.5 |
| CHT | 87.0 | 85.0 | 93.0 | 95.0 | 93.0 | 91.0 | 91.0 | 74.0 |
| NDH | 88.8 | 89.3 | 88.9 | 94.7 | 90.3 | 95.0 | 89.3 | - |
| **Min. R.H. (%)** | | | | | | | | |
| BAW | - | 35.0 | 36.2 | 36.8 | 47.5 | 53.2 | 23.4 | - |
| SGN | 50.9 | 44.5 | 51.2 | 57.4 | 57.2 | 55.9 | 37.5 | 32.0 |
| CHT | 63.0 | 40.0 | 44.0 | 44.0 | 55.0 | 58.0 | 50.0 | 35.0 |
| NDH | 69.6 | 49.2 | 57.6 | 63.8 | 70.7 | 74.6 | 57.5 | - |
| **Sunshine (hours/day)** | | | | | | | | |
| BAW | - | 7.6 | 6.4 | 6.1 | 4.9 | 4.8 | 7.1 | - |
| SGN | 7.2 | 7.3 | 6.3 | 6.9 | 4.9 | 5.8 | 8.0 | 8.5 |
| CHT | 6.5 | 8.0 | 5.8 | 5.9 | 3.9 | 4.8 | 5.6 | 8.0 |
| NDH | 5.2 | 6.8 | 4.7 | 4.4 | 3.8 | 3.6 | 7.3 | - |

**Zone III**

Five centres reported weather data. Meager rains were received during crop season in all the centers. Maximum temperature ranged from $19.6^0$c at Banda in January 2019 to $37.9^0$c at Kanpur in April 2019. Maximum humidity 99.8% was reported by Dholi centre during the January, 2019. Good sunshine hours reported by Kanpur centers during crop season.

Table: 1.3 Weather conditions during crop season in Zone III

| Centre | Sep. 18 | Oct. 18 | Nov. 18 | Dec. 18 | Jan. 19 | Feb. 19 | Mar. 19 | Apr. 19 |
|---|---|---|---|---|---|---|---|---|
| **Max. Temp. (°C)** | | | | | | | | |
| PNT | 31.6 | 30.9 | 27.2 | 24.0 | 21.3 | 22.4 | 27.4 | 34.5 |
| KPR | 32.4 | 34.3 | 28.3 | 23.0 | 21.6 | 23.4 | 29.4 | 37.9 |
| KOT | - | 34.8 | 29.9 | 23.8 | 23.6 | 26.3 | 32.8 | - |
| DOL | 33.4 | 33.0 | 29.2 | 24.2 | 22.6 | 24.8 | 29.7 | 34.1 |
| BND | 31.5 | 31.5 | 25.3 | 19.7 | 19.6 | 22.0 | 25.9 | 30.0 |
| **Min. Temp. (°C)** | | | | | | | | |
| PNT | 23.9 | 15.5 | 11.7 | 6.1 | 6.5 | 9.8 | 10.8 | 18.3 |
| KPR | 23.5 | 17.2 | 12.1 | 6.9 | 7.9 | 10.9 | 13.7 | 21.4 |
| KOT | - | 15.5 | 10.5 | 5.0 | 5.3 | 10.9 | 14.1 | - |
| DOL | 25.5 | 19.8 | 13.5 | 8.2 | 7.7 | 11.0 | 13.5 | 21.6 |
| BND | 26.0 | 20.0 | 14.0 | 8.6 | 9.2 | 13.8 | 15.2 | 17.0 |
| **Rainfall (mm) (rainydays)** | | | | | | | | |
| PNT | 224.6 | 2.6 | 4.2 | 0.8 | 14.2 | 33.4 | 6.2 | 14.1 |
| KPR | 143.8 | 0.0 | 0.0 | 0.0 | 13.5 | 17.5 | 4.0 | 2.8 |
| KOT | - | - | - | - | - | - | - | - |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| DOL | 126.8 | 11.0 | 0.0 | 0.0 | 0.0 | 30.4 | 0.0 | 0.0 |
| BND | 31.0 | 0.0 | 0.0 | 0.0 | 2.7 | 3.4 | 0.0 | 0.0 |
| **Max. R.H. (%)** | | | | | | | | |
| PNT | 91.0 | 87.0 | 93.0 | 95.0 | 92.0 | 93.0 | 88.0 | 71.0 |
| KPR | 84.2 | 74.0 | 84.0 | 89.0 | 85.0 | 88.0 | 76.7 | 65.5 |
| KOT | - | 58.0 | 63.8 | 65.7 | 70.7 | 70.0 | 49.5 | - |
| DOL | 98.8 | 99.1 | 99.5 | 99.7 | 99.8 | 99.0 | 96.0 | 90.9 |
| BND | 76.5 | 63.0 | 61.3 | 64.3 | 70.4 | 67.8 | 55.5 | 40.0 |
| **Min. R.H. (%)** | | | | | | | | |
| PNT | 74.0 | 58.0 | 57.0 | 56.0 | 56.0 | 65.0 | 50.0 | 35.0 |
| KPR | 64.0 | 35.0 | 40.0 | 38.0 | 47.0 | 53.0 | 41.3 | 35.2 |
| KOT | - | - | - | - | - | - | - | - |
| DOL | 75.0 | 76.7 | 84.4 | 88.7 | 88.2 | 85.6 | 76.8 | 64.1 |
| BND | - | - | - | - | - | - | - | - |
| **Sunshine (hours/day)** | | | | | | | | |
| PNT | 5.6 | 3.9 | 2.4 | 1.9 | 2.8 | 2.8 | 1.6 | 4.9 |
| KPR | 6.3 | 9.8 | 7.6 | 6.3 | 5.6 | 5.4 | 8.9 | 7.7 |
| KOT | - | - | - | - | - | - | - | - |
| DOL | - | - | - | - | - | - | - | - |
| BND | - | - | - | - | - | - | - | - |

**Zone IV**

The minimum and maximum temperature ranged from $2.7^0$c in the month of December at Jobner and $37.0^0$c in month of March 2019 at Nagpur. No rain occurred during crop season except month of November and January 2018-19. The maximum humidity 84.8% was reported by Jobner during the month of September, 2018. Bright sunshine hours received during crop season.

Table: 1.4 Weather conditions during crop season in Zone IV

| Centre | Sep. 18 | Oct. 18 | Nov. 18 | Dec. 18 | Jan. 19 | Feb. 19 | Mar. 19 |
|---|---|---|---|---|---|---|---|
| **Max. Temp. (°C)** | | | | | | | |
| JAL | 33.2 | 36.4 | 31.9 | 29.4 | 29.7 | 33.2 | 37.5 |
| SKN | 31.9 | 33.8 | 38.1 | 32.9 | 27.0 | 26.0 | 26.9 |
| NGP | 32.6 | 33.7 | 32.1 | 26.5 | 27.8 | 31.9 | 37.0 |
| JOB | 31.9 | 35.4 | 30.6 | 24.5 | 23.0 | 24.1 | 29.6 |
| AND | - | 36.0 | 33.5 | 24.5 | 27.5 | 30.5 | - |
| **Min. Temp. (°C)** | | | | | | | |
| JAL | 22.4 | 19.3 | 13.6 | 10.6 | 9.8 | 15.0 | 18.1 |
| SKN | 24.9 | 22.5 | 18.0 | 12.4 | 8.2 | 8.1 | 9.9 |
| NGP | 23.1 | 22.3 | 18.1 | 13.6 | 11.4 | 16.3 | 21.8 |
| JOB | 20.8 | 15.4 | 9.2 | 2.7 | 3.1 | 6.4 | 10.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| AND | - | 16.5 | 14.8 | 10.2 | 10.0 | 13.0 | - |
| **Rainfall (mm) (rainy days)** | | | | | | | |
| JAL | 23.3 | 0.0 | 6.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| SKN | 91.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| NGP | - | - | - | - | - | - | - |
| JOB | 54.4 | 0.0 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 |
| AND | - | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | - |
| **Max. R.H. (%)** | | | | | | | |
| JAL | 83.5 | 62.6 | 58.0 | 63.3 | 62.4 | 57.0 | 57.3 |
| SKN | 81.7 | 75.8 | 61.9 | 55.6 | 48.1 | 49.9 | 59.9 |
| NGP | 76.3 | 68.8 | 69.8 | 75.8 | 74.0 | 67.0 | 41.0 |
| JOB | 84.8 | 68.5 | 72.2 | 81.0 | 81.0 | 81.0 | 67.4 |
| AND | - | 56.9 | 61.1 | 58.5 | 60.1 | 58.7 | - |
| **Min. R.H. (%)** | | | | | | | |
| JAL | 56.5 | 32.8 | 32.5 | 38.3 | 32.8 | 26.3 | 28.3 |
| SKN | 74.1 | 52.2 | 30.5 | 36.1 | 40.5 | 37.4 | 43.9 |
| NGP | 63.3 | 43.4 | 40.5 | 61.3 | 54.0 | 53.3 | 29.0 |
| JOB | 56.3 | 23.3 | 30.4 | 29.0 | 36.3 | 33.5 | 26.4 |
| AND | - | - | - | - | - | - | - |
| **Sunshine (hours/day)** | | | | | | | |
| JAL | 6.9 | 9.0 | 7.9 | 6.9 | 8.1 | 9.1 | 8.7 |
| SKN | 0.1 | 6.7 | 9.5 | 8.6 | 9.1 | 9.3 | 8.8 |
| NGP | - | - | - | - | - | - | - |
| JOB | 5.3 | 8.8 | 8.8 | 8.4 | 7.5 | 8.1 | 8.2 |
| AND | - | - | - | - | - | - | - |

**Zone V**

Only Two centers have reported weather data. Good rains in the whole cropping season except month of November, 2018. The maximum temperature ranged from $22.4^0$c in the month of December and $36.8^0$c in month of March, 2019 at Kanke. Bright sunshine hours have been received during crop season. Minimum and maximum humidity were ranged from 36.6% to 91.8% at Imphal in the month of January, 2019.

Table: 1.5 Weather conditions during crop season in Zone V

| Centre | Sep. 18 | Oct. 18 | Nov. 18 | Dec. 18 | Jan. 19 | Feb. 19 | Mar. 19 | Apr. 19 |
|---|---|---|---|---|---|---|---|---|
| **Max. Temp. (°C)** | | | | | | | | |
| KNK | 28.8 | 26.9 | 26.3 | 22.4 | 28.1 | 35.9 | 36.8 | 36.2 |
| IMP | 30.3 | 27.4 | 25.7 | 22.9 | 23.7 | 24.7 | 26.6 | - |
| **Min. Temp. (°C)** | | | | | | | | |
| KNK | 19.4 | 16.7 | 12.4 | 5.0 | 14.1 | 20.7 | 22.0 | 21.7 |
| IMP | 20.9 | 16.5 | 9.4 | 7.4 | 4.6 | 7.7 | 11.2 | - |
| **Rainfall (mm) (rainy days)** | | | | | | | | |
| KNK | 62.4 | 2.0 | 0.0 | 13.5 | 15.0 | 11.9 | 31.8 | 18.5 |
| IMP | 27.9 | 119.1 | 0.4 | 24.3 | 3.4 | 20.3 | 36.0 | - |
| **Max. R.H. (%)** | | | | | | | | |
| KNK | 85.2 | 85.9 | 84.4 | 85.2 | 85.1 | 85.8 | 84.4 | 85.6 |
| IMP | 90.0 | 89.5 | 86.4 | 89.5 | 91.8 | 87.6 | 83.6 | - |
| **Min. R.H. (%)** | | | | | | | | |
| KNK | 68.3 | 68.5 | 68.6 | 68.9 | 68.1 | 69.5 | 86.3 | 68.4 |
| IMP | 65.9 | 59.3 | 59.3 | 47.8 | 36.6 | 41.2 | 40.9 | - |
| **Sunshine (hours/day)** | | | | | | | | |
| KNK | 6.8 | 8.0 | 8.6 | 7.4 | 6.7 | 8.3 | 7.9 | 8.3 |
| IMP | 5.6 | 6.3 | 8.6 | 7.2 | 8.7 | 6.9 | 7.1 | - |

# Genetics & Plant Breeding

# 2. Genetics & Plant Breeding

## 2.1 Varietal Improvement

Fourteencentres spread over 11 states carried out the varietal development activities as per the approved technical programme. The salient achievements during the year 2018-19 in toria (*Brassica rapa* var toria), yellow sarson (*B. rapa* var yellow sarson), gobhi sarson (*B. napus*), Indian mustard (*B. juncea*), karan rai (*B. carinata*) and taramira (*Eruca sativa*) are discussed below:

### 2.1.1 Genetic Resource Management

A total of 6,605accessions comprising toria (547), Indian mustard (4,822), yellow sarson (617), gobhi sarson (116), brown sarson (105), karan rai (235), taramira (70), *B. caudatus* (01), *R. caudatus* (01), *B. rugosa*(10), *B. nigra* (10) *B. tournefortii*(04),and other wild species (67)were maintained through appropriate mating system at Dholi, Hisar, Pantnagar, Ludhiana,Kanpur, Sriganganagar, IARI, New Delhi, Jobner, Morena,Pannagar, Chatha-Jammu and SK Nagar (Table 2.1.1).In addition, 44 new accessions comprising Indian mustard (22), taramira (10) and toria (12)were collected. Further, 773 accessions consisting of 438 Indian mustard, 84toria, 174 yellow sarson, 41 brown sarson,06 Karan rai, and 30taramira accessions were evaluated. On the basis of germplasm evaluation, promising accessions were identified for seed yield, earliness, yield components, thermo-tolerant(early and terminal stages), resistance/tolerance to diseases/pestsand quality traits in toria at Dholi and Chatha-Jammu.

### 2.1.2 Creation of genetic variability through hybridization/ mutagenesis and selection

Creation of variability is the essence and backbone of the breeding programme. To cater the need of diverse agro-climatic conditions of the country, 80 crosses were attempted in toria, 36 in yellow sarson at Pantnagar and Kanpur and946 in Indian mustard at Chatha, Hisar, IARI New Delhi, Ludhiana,Kanpur, Pantanagar, SK Nagar,Morena, SriganganagarandVaranasito improve seed yield, earliness, seed size, component traits, disease/pest resistance,heat tolerance suitable for late sown condition, drought tolerance, “0” and “00” quality characters and high oil content (Table 2.1.2). Selection of superior plants/bulks at different centres was practised intoria, yellow sarson and Indian mustard. In toria, development of composites population after theselection was the main objective. In yellow sarson, hybridization and selection from segregating generations were attempted at Kanpur and Pantnagar and 7126 single plants were selected at Kanpur and Pantnagar.In Indian mustard, 7081single plants and about 793bulks were selected from segregating and advanced generations.

### 2.1.3 Evaluation of advanced breeding lines

The advanced breeding lines evaluated under different station/state /preliminary yield trials at various centres have been presented in Table 2.1.3. 107 strains of toria were tested at Kanpur, Chatha,Hisar, Dholi. The yield superiority in toria was up to 38.27 % over the check (Tapeshwari) at Kanpur. In yellow sarson, 47 strains were tested at Kanpurand Dholi. The yield superiority up to 22.53 % over the check Pitambariwas recorded at Kanpur. In Indian mustard, 662 strainswere evaluated at 07 centres; Chatha, Hisar, Ludhiana, Kanpur, Dholi, Sriganganagar and Varanasi in 43 trials. Seed yield superiority up to 68.7 % over the check NRCHB-101was recorded at Varanasi.Ten strains at Hisar, and 12 strains atChathaof gobhi sarson were evaluated for seed yield and its component characters. In addition, 11 strains of Karanrai were also evalauted at Ludhiana for Seed yield and oil content under irrigated condition.

**Development of STS marker for glucosinolates:**

Several molecular markers linked with total glucosinolates content in *Brassica*have been reported in earlier studies. Markers contributing major phenotypic variation, reported earlier are; GER1, GER5, At5g101, At5gAJ30, At5g41, At5g67, Myb28A9, My28B1 and CYP79F1. Out of these earlier reported five markers *viz.*, GER1, GER5 Myb28A9, My28B1 and CYP79F1 were found to be controlling maximum phenotypic variance of total glucosinolates trait. The primers for these markers were developed using the orthologs from *Arabidopsis*. These primers either amplified multiple alleles or at times failed to amplify the desired allele in the individuals. To overcome this limitation, efforts were made to develop STS marker for these earlier reported genes. At IARI, First they developed their own *STS markers* for GER1 and GER 5 by *in-silco* analysis and re-sequencing the genes from RLC3 and Pusa Jagannath. These *STS* markers were validated with the previous reported markers and no recombination frequency was observed.

**2.1.4Hybrid/ Mapping population development/ quality improvement**

***Hybrid Evaluation***

Under CRP on hybrid technology, a total of thirty six experimental hybrids including 10 each from DRMR and IARI, 11 from PAU Ludhiana and 05 from Hisar were evaluated in two multilocation trials; early maturity group and medium to late maturity group, conducted at each of four centres.Under early maturity trial (MLT 1), 15 early maturing hybrids were tested against three checks. All experimental hybrids were late in maturity than earliest maturing check Keshri but matured at par with NRCHB 101, hence, these were compared with NRCHB 101 for seed yield. Only One hybrid RHH 1803 (2913 kg/h) out yielded the best check NRCHB 101 (2731 kg/h) by a margin of 6.7%. Twenty experimental hybrids were evaluated under timely sown normal maturity group against four checks. Two hybrids namely HJ 518 (2959 kg/h) and HJ 1117 (2935 kg/h) out yielded the best check DMH 1 (2804kg/h) by a margin of 5.5% and 4.7 %, respectively. Two hundred fifteen experimental hybrids including 12, 20, 19 and 164 at DRMR, IARI, PAU and CCSHAU, respectively, were evaluated by each centre at their own place and identified promising hybrids performing better for seed yield than the best check. On the basis of seed yield experimental hybrids; OEH 7, OEH 6, OEH 4, from CCS HAU and Pusa MH 61 from IARI and PHR 1309, PHR 1293 from PAU were found promising. 15 experimental hybrids comprising 4 of early maturity group and 11 of timely sown normal maturity group have been inducted to initial hybrid trials under AICRPRM. 64 $F_1$s contributed by all four centres were evaluated against two checks in augmented block design. On the basis of seed yield, ten crosses exhibited more than 10% heterosis, out of ten, top three crosses were; RH 1758 x IC 597920 (31.1 %), RH 1624 x IC 347947 (26.4%) and PM 28 x RH 725 (23%) over the best check Pioneer 45S46.

254 $F_1$ crosses (103 at DRMR, 64 at PAU 102 at CCSHAU and 49 at IARI were evaluated by each centre in their own station trial and identified $F_1$ crosses with > 10 percent heterosis. 33, 65, 30, 67 backcrosses for advancing the generation of CMS line and 22, 11, 5 and 44 backcrosses for advancing the generation of R line were attempted at DRMR, HAU, PAU and IARI, respectively. 180, 220, 75 and 201 $F_1$ crosses were attempted at DRMR, HAU, PAU and IARI, respectively. Efforts continued to develop new inbred lines as well as to improve parental lines for white rust resistance, canola quality and for yield components at all four centres. Eigy nine germplasm/inbred lines along with two checks i.e. Giriraj and Pusa Mustard 25 were evaluated at all four centres to evaluate their agronomic performance. Genotyping of 96 germplasm/inbred lines carried out at all four centres with different set of SSR markers has been completed. Seed of 30, 32 and 25 new experimental hybrids was produced at DRMR, CCSHAU and IARI, respectively. Review meeting of the CRP on Hybrid Technology- Mustard was held at ICAR-IARI, New Delhi on 1st September 2018 for planning the experiments for the crop season 2018-19.

Development of mapping populations (RILs)at IARI:Two mapping populations for mapping genes/ QTLs for drought/heat tolerance (Pusa Bahar x BEC 144) and oil content EJ-17 x BEC144 were advanced for developing RILs which are in $F_7$ stage.

**J. Mutation breeding:**

To create novel genetic variationin the elite genotypes, single plant progenies were raised for selection as per the following details:

| Genotype mutated | Mutagen | Generation/ progenies grown | Progenies/SPS selected | Objective |
|---|---|---|---|---|
| PM30 | EMS | M-6 (23) | 20 | Fatty acid profile, productivity |
| Heera | γ irradiated | M-3 (21) | 18 | Bold seed, Earliness |
| Heera | EMS | M-5 (17) | 23 | Bold seed & earliness |
| **Total** | | | **61** | |

**Phenotyping for identification of '0' and '00' genotypes:**

For identifying low erucic acid and double low genotypes in segregating generations and maintenance of double/ single low varieties and advance lines, a large number of single plants and bulks were phenotyped through biochemical analysis. For low erucic acid, 2453 single plants/bulks were analysed of which 2306 were having <2% erucic acid. Single plants/bulks, 2326 in number, from double lowquality material/progenies were also analyzed for total glucosinolates content of which 906 plants/bulks were possessing <30ppm glucosinolates.

**2.2 Breeder seed production**

Indents of 84.76 q breeder seed of 61 rapeseed-mustard varieties were received from Department of Agriculture and Cooperation (DAC), Ministry of Agriculture, Govt. of India for production during 2018-19. The allocation was made to 15 centres for the production of **84.76**q breeder seed of 61 varieties during the 25$^{th}$annual group meeting held at BHU, Varanasi (UP). Against the indent of 84.76 q, 256.32q breeder seed was produced, indicating a surplus availability of 171.61 q. Breeder seed of 02 varieties including)Panchali (TWC-3) of Toria and Jhumka (YSBNC-1) of yellow sarson could not be produced .Further, less quantity of TS 36 and Sushree of toria; Jawahar mustard -3 of Indian mustard and RTM-1355 (Jwala Tara) of Taramira was produced. In addition, 77.58q breeder seed of 17 varieties was also reported from different centres. The centre and variety-wise details of breeder seed production are reported in Table 2.2.

**Table 2.1.1 Genetic Resource Management activities**

| Crop | Centre | No. of accessions procured/ collected | No. of lines maintained | No. of lines Evaluated | Promising accessions identified | Traits for which identified |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **Toria** | Dholi | -- | 84 | 84 | IGT-2, IGT-64 , IGT-91, RAUDT-62, RAUDT-15, RAUDT-7 ,RAUDT-67, RAUDT-36,RAUDT-16,RAUDT-74, RAUDT-79,RAUDT-7,DC9401 , TH-9802,Dwarf Toria, Satha local | Yield , Earliness , Yield components, Thermo-tolerant(Early and Terminal stages) ; Resistance/Tolerance to Diseases – Pests,and Quality traits likeOil Content. |
| | Kanpur | - | 255 | - | - | - |
| | Pantnagar | 12 | | | - | - |
| | Chatha-Jammu | - | **38** | | - | Earliness , high seed yield, resistance/tolerance to diseases-pests and quality |
| | Morena | | 31 | | | |
| | S K Nagar | | 18 | | | |
| **Total** | | **12** | **426** | **84** | **-** | - |
| **Indian mustard** | Chatha-Jammu | | 71 | 48 | - | - |
| | Dholi | | 390 | 390 | MDOC-8; MDOC-53;MDOC-27; TPM-1, RK-8401, NDRE -4; IC -401574; IC-399788; TM-12, BIO94, Domo, Jatai Local, , EC 339000, EC 338997 , EC-399301, PAB 9511, PAB 9534 , IC401574, IC 399788, RAURDA 09-32, RAURDA 09-34, RAURDA 09-78, RAURDA 09-153, RAURDA 09-170, RAURDA 09-172, RAURDA 09-212, RAURDA 09-214 | Yield , Earliness , Yield components ,Thermo-tolerant(Early and Terminal stages) ; Resistance/Tolerance to Diseases – Pests,and Quality traits likeOil Content. |
| | Hisar | - | 296 | - | - | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| | IARI, New Delhi | | 280 | | | |
| | Kanpur | - | 1465 | | - | - |
| | Pantnagar | - | 83 | | - | - |
| | Sri Ganganagar | 22 | 716 | - | - | Yield, disease |
| | S.K.Nagar | - | 400 | - | - | - |
| | Morena | | 161 | | | |
| | Ludhiana | | 500 | | | |
| **Total** | | **22** | **4362** | **438** | | |
| **Yellow sarson** | Dholi | - | 174 | 174 | RAUDYS-89-111, RAUDYS-9701; RAUDYS-9702 ; RS-1; Pendent Local | Yield , Earliness , Yield components ,Thermo-tolerant(Early and Terminal stages) ; Resistance/Tolerance to Diseases – Pests,and Quality traits likeOil Content. |
| | Hisar | - | 12 | - | - | - |
| | Pantnagar | - | 33 | - | - | - |
| | S K Nagar | | 69 | | | |
| | Kanpur | - | 155 | - | - | - |
| **Total** | | - | **443** | **174** | | |
| **Gobhi sarson** | Dholi | - | 17 | 17 | Tower, HNS 0004 and HYOLA 401 | - |
| | Hisar | - | 39 | - | - | - |
| | IARI, New Delhi | - | 15 | - | - | - |
| | S K Nagar | | 14 | | | |
| | Chatha-Jammu | - | **30** | **15** | - | - |
| **Total** | | - | **115** | **17** | | |
| **Brown Sarson** | Dholi | - | 41 | 41 | BSH-1 | - |
| | S K Nagar | | 23 | | | - |
| **Total** | | - | **64** | **41** | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Karan rai** | Dholi | - | 06 | 06 | Kiran, PBN-2001, PBN-2002, PBN9501, PBC9221 | - |
| | Hisar | - | 10 | - | - | - |
| | IARI, New Delhi | - | 170 | - | - | - |
| | S K Nagar | - | 03 | | | |
| | Pantnagar | | 40 | | | |
| **Total** | | - | **229** | **06** | - | |
| ***B rapa*** | IARI, New Delhi | - | 25 | - | - | - |
| **Total** | | **-** | **25** | **-** | | |
| **Taramira** | Jobner | 10 | 30 | 30 | | Seed yield |
| | S K Nagar | - | 02 | | | |
| | IARI, New Delhi | | 03 | | | |
| **Total** | | **10** | **63** | **--** | | |
| *S. alba* | IARI, New Delhi | - | | - | - | - |
| **Total** | | **-** | **00** | **-** | | |
| *B. caudatus* | IARI, New Delhi | - | 01 | - | - | - |
| | | - | | - | - | - |
| **Total** | | **-** | **01** | **-** | | |
| *R. caudatus* | IARI, New Delhi | - | 01 | - | - | - |
| **Total** | | **-** | **01** | **-** | | |
| *B. nigra* | IARI, New Delhi | - | 08 | - | - | - |
| *B. nigra* | Pantnagar | | 2 | | | |
| **Total** | | - | **10** | - | | |
| *B. rugosa* | Pantnagar | - | 26 | | - | - |
| **Total** | | | 26 | | | |
| *B. tournefortii* | IARI, New Delhi | | 04 | | | |
| **Total** | | | 04 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***R. sativa*** | IARI, New Delhi | | 04 | | | |
| **Total** | | | **04** | | | |
| ***Crambe sp*** | IARI, New Delhi | | 01 | | | |
| **Total** | | | **01** | | | |
| ***Lapidium sp*** | IARI, New Delhi | | 02 | | | |
| **Total** | | | **02** | | | |
| *Total* | | | 02 | | | |
| *Other wild species* | S K Nagar | | 05 | | | |
| *Quality* | S K Nagar | - | 39 | | | |
| *Total* | | | 44 | | | |
| ***Grand Total*** | | **44** | **5788** | **773** | | |

**Table 2.1.2: Number of crosses, their generation and number of selections practiced.**

| Centre | Objective (s) | Generation | Pedigree | No. of crosses/ lines | Selection | |
|---|---|---|---|---|---|---|
| | | | | | No. of single plants | No. of bulks |
| **1** | **2** | **3** | **4** | 5 | **6** | **7** |
| **Crop: Toria** | | | | | | |
| Chatha-Jammu. | Early and high yield | Fresh cross | PT-2013-5,PT-2013-8,TS-38,TRS-79,TKM-16-1 With Bhawani, PT-303 &Tapeswari | 15 | | |
| | | $F_3$ | Open pollination ( Early and late populations ) | 07 | | |
| | | $F_4$ | RSPT-1, RSPT-2, RSPT- 6 cross with PT-303, PTC-2009-3, RAUDT-10 , TL15 ,TL-21 lines. | 11 | | |
| Dholi | To develop early and high yielding strains of toria | 9 advanced generation Station Materials (bulks) evaluated in Advanced Varietal Station Trials | Derived by hybridization between Varieties, namely RAUTS-17, PT-303 and $T_9$ (three) with sources of earliness (four) namely Satha local, IGT-2, IGT-64 and IGT-91. | CSVT(TORIA) | 09 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | To develop yellow seeded high seed and oil yield in toria | 4 advanced generation Station Materials (bulks) evaluated in Advanced Varietal Station Trials | Derived by hybridization between RAUTS-17 / 89-115, PT 303 / 89-115, $T_9$ / 89-115 | CSVT (TORIA) | 04 | |
| | Development of high yielding Strains of Toria | 13 advanced generation Station Materials (bulks) evaluated in Advanced Varietal Station Trials | Derived by hybridization ( Details already given above) | CSVT (TORIA) | Total:16 (13+3 Checks) | |
| Hisar | Early, high seed yield | Fresh crosses | RH-1657, RH-1658, RH (OE) 1615 and JD 6 as agronomically superior backgrounds and MCN(E)18-6, MCN(E)18-15, RH-1599-44, RH-1638, RH-1699-5 and RH-1699-7 as donor sources for earliness | 24 | | |
| | | $F_2$ | Three $F_2$ populations were grown in larger plots and desirable single plants have been selected from each $F_2$. | 3 | ✓ | |
| | | | $BC_1$ was attempted in 25 $F_1$ crosses; besides, $F_2$ seed of these crosses was also harvested. | | | |
| | | $BC_3$ and $BC_2$ | $BC_3$ and $BC_2$ were attempted in 60 and 55crosses, respectively | 60 and 55 | | |
| | | Intermating | First cycle of intermating was attempted in 14 $BC_3$ crosses | | | |
| | | Intermating | Third and second cycle of intermating was attempted in 8 and 15 $BC_3$ crosses, respectively and their seeds have been harvested. | 8 and 15 | | |
| | | Intermating | Third intermate progenies were selfed and seed was multiple | 15 | | |
| | Early and late populations | | The early and late populations of toria were grown in isolation and open pollination was allowed. The early and late maturing plants have been selected | | ✓ | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Component traits | | Progenies of early raya were evaluated in One Progeny Row Trial (ER) against two check varieties viz., NPJ 112 and JD 6 for seed yield and component traits. Single plants possessing desirable traits have been selected. | 42 | ✓ | |
| Kanpur | Early, high yielding | Population Improvement | **Population – 1 :** TK 01-1, TK 01-2, PT-303, TK 02-1, TK 9901, PT-507, $T_9$, Bhawani, ORM (M) 21-1, ORM (M) 7-1, Parbati, Anuradha and ORT-11. | 3 | | ✓ |
| | | | **Population- 2 :** TK 9902, PT-303, TK-9801, TK-9802, PT-507, $T_9$, Bhawani, ORM (M) 21-1, ORM (M) 7-1, Parbati, Anuradha and ORT-11. | | | ✓ |
| | | | **Population- 3 :** TK-950, TK-9302, PT-303, TK-9702, PT-507, $T_9$, Bhawani, ORM (M) 21-1, ORM (M) 7-1**,** Parbati, Anuradha and ORT-11. | | | ✓ |
| | | Fresh crosses | Six single crosses using parents TKM 14-1 x T-9, TKM 15-1 x Tapeshwari, TKM 16-1 x Bhawani, TKM 17-1 x PT-303, TKM 18-1 x PT-507 and TKM 18-2 x Azad chetna were attempted $F_0$ seed of six crosses were procured which will be grown in coming next season to raise $F_1^s$ populations | 6 | | |
| | | $F_3$ | PT-303 x T9, PT-303 x Bhwani , PT-303 x Tapeswari , PT-303 x ORT-11, PT-303 x PT507, PT-303 x Anuradha , T9 x Bhwani , T9 x Tapeswari , T9 x ORT-11, T9 x PT507, T9 x Anuradha , Bhwani x tapeswari , Bhwani x ORT-11, Bhwani x PT507, Bhwani x Anuradha , Tapeswari x ORT-11, Tapeswari x PT507, Tapeswari x Anuradha , ORT-11 x PT507, ORT-11 x Anuradha, and PT-507 x Anuradha | 501 | | |
| Morena | Earliness, high seed yield bold seed and quality | $F_1$ | JT-1 x (BAUT-08-01, RMT-15-2, TKM 17-1, TH 1603, RAUDT-14-9, Tapeswari, RAUDT—14-09, PT-2015-03, TKM 17-2, JT-11-9, PT-2015-11, Th 1602), (BAUT-08-01, RMT-15-2, TKM 17-1, TH 1603, RAUDT-14-9, Tapeswari, Bhawani, | 26 | 50 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | RAUDT—14-09, PT-2015-03, PT-303, TKM 17-2, JT-11-9, PT-2015-11, Th 1602) x JT-1 | | | |
| | | $F_2$ | JT-1 x TS-36, JT-1 x TRL-79 (ASR), JT-1 x PT-303, JT-1 x RMT-10-9-1, JT-1 x TH-1502, JT-1 x TH-1402, PT-303 x JT-1, TKM-16-2 x JT-1, TH-1502 x JT-1, PT-2013-8 x JT-1, RAUDT-10-33 x JT-1 | 11 | 45 | |
| | | $F_3$ | JT-1 x TKM-15-2, JT-1 x PT-303, JT-1 x PT-303, JT-1 x RAUDT-10-33, TKM-15-1 x JT-1, TH-1402 x JT-1, RAUDT-10-33 x JT-1, PTC-2012-2 x JT-1, Tapeswari x JT-1 | 7 | 30 | |
| | | $F_5$ | RMT-10-11 x JT-1, RMT-10-9 x RMT-02-6, RMT-10-13 x JT-1, RMT-10-13 x B-85, JM-3 x JT-1 | 5 | 40 | |
| | | $F_6$ | JMT-02-6 x JMT-04-5, JT-1 x JD-6 | 2 | | |
| | | $F_7$ | RMT-08-6 x JM-1, JM-2 x RMT-10-10, JM-3 x JT-1 | 3 | 5 | |
| | | $F_8$ | RMT-02 x JT-1, RMT-0-2-6 x RMT-10-6, RMT-0-2-6 x JD-6, RMT-0-16 x RMT-10-6, RMT-0-4-1 x RMT-10-10, RMT-10-11x JT-1, RMT-10-2 x RMT-10-10 | 7 | 8 | |
| | | $F_9$ | JT-1 x PT-303, NDT-5-3 x JT-1, Bastar Toria-4 x JT-1, RMT-10-9 x TL -2013, RMT-10-9 x RMT-10-7, RMT-10-11 x RMT-10-13, RMT-10-13 x RMT-10-9, RMT-10-2 x RMT-04-1 | 8 | 25 | |
| | | $F_{11}$ | PT-2004-3 x TH-0302, Bhawani x TL-2013, Bhawani x RMT-016, JT-1 x TL-2013 | 4 | | |
| | | $F_{12}$ | RMT-02-6 x TH-0302, MRNT-20 x TK-06-2 | 2 | | |
| | | $BC_2F_{14}$ | {NDT-03-1 x JT-1} x ORT [M] 5-2, {JT-1 x NDT-03-1} x PT-303, {JT-1 x RH-0258 } x PT-303, {TKG-03-2 x JT-1} x PT-303, {Parkland x JT-1} x PT-303 | 5 | 10 | |
| | | $BC_2F_{15}$ | {JT-1 x SCRT-1-1-2} x {ORT[M]-5-2 x ORT[M]-5-2, {Candle x T 9} x {ORT[M]-5-2 x ORT[M]-5-2, {Parklnd x Candle} x {ORT[M]-5-2 x ORT[M]-5-2, {JT-1 x PT-2002-26} x {PT-303 x RMT-02 | 4 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Identification of good combiners for seed yield and quality | Fresh crosses | 60 fresh crosses were made during rabi 2018-19 | | | |
| Pantnagar | Breeding for early maturing & high yielding varieties | Fresh crosses | PT-15-3×PT-16-6, PT-15-3×TKM-17-1, PT-15-3×PT-16-9,TCN-18-2×PT-16-6,TCN-18-2×TKM-17-1,TCN-18-2×PT-16-9,TCN-18-2×PT-17-3,PT-17-2× PT-16-6,PT-17-2× TKM-17-1,PT-17-2× PT-16-9, PT-17-2× PT-17-3,PT-12-5×PT-16-6,PT-12-5× TKM-17-1,PT-12-5× PT-16-9, and PT-12-5× PT-17-3 | 15 | | |
| | | $F_1$ to $F_2$ | TL-15×Uttara,TL-15×PT-30,PT-15-7 × PT-15-27,PT 15-6 × PT-17-25, 1 × PT-16-4,PT-15-4×PT-16-6,PT 15-4 × PT-303,PT-16-11 × PT-16-3,PT-15-10 ×PT-16-10,PT-15-4×Tapeswari,PT-15-7×PT-16-2,PT-15-6×PT-17-24,PT-15-10×PT-17-3,Tapeswari×PT-30,PT-145×Tapeswari,PT-145×TL-15,(KBS – 49 × Uttara) × PT-141,(KBS-49 × PHT-1) × PT-30,(KBS-49 × Uttara) × PT-30,(KBS 49×PHT-1×Uttara,(TH-2014×PT-30)×TL-15, and (TH-2014-2×PT-30)×PT-141 | 23 | 17 | |
| | | **$F_2$ to $F_3$** | Bhawani × PT-141,PRT-1 × PT-145,RSPT-2 × PT-141,RSPT-2 × Bhawani,Uttara × PT-508,Uttara × PHT-1,PT-2013-8 × RAUDT-10-3,KBS-49 × PHT-1,Tapeswari × PT-15-3, and PHTC-2010-1 × KBS-48 | 10 | 8 | |
| | | $F_3$ to $F_4$ | PT-2015-4 PT-508,PT-2015-6 × PT-2012-5,PT-2015-9 × PT-508, PT-2012-5 × PTC-2010-2,PT-2015-3 × (PT-30 × PT-141), PT-2015-4 × (TH-1102 × PT-141),PT-2015-6 × (PT-30 × PT-141), and (PT-2006-4 × TKM-16-1) × PT-2012-5 | 8 | 6 | |
| | | $F_4$ to $F_5$ | PTE-2008-2 × PT-141, PT-2006-4 × PT-30, TKM-16-1 × PT-2010-5, PT-2008-2 × RAUDT-10-33, and PT-2006-4 × TKM-16-1 | 5 | 5 | |
| | | Composite | PTC-2017-1, PTC-2017-2, PTC-2017-3, PTC-2017-4 | 4 | 4 | |
| **Crop: Yellow Sarson** | | | | | | |
| Kanpur | Early and high yield | Fresh crosses | Six single crosses using parents YSKM 15-2 x YSH - 401, YSKM 16-2 x Benoy, YSKM 17-2 x Pitambari, YSKM 18-1 x Benoy and YSKM 18-2 | 06 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | xPitambari were attempted $F_0$ seed of six crosses were harvested. | | | |
| | | $F_3$ | YSC-63 x NRCYS-05-02, YSC-63 x YSH-401, YSC-63 x Benoy, YSC-63 x Pitambari, YSC-41 x NRCYS-05-02, YSC-41x YSH-401, YSC-41x Benoy, YSC-41x Pitambari, YSC-09x NRCYS-05-02, YSC-09x YSH-401, YSC-09x Benoy, YSC-09x Pitambari, YSC-71x NRCYS-05-02, YSC-71x YSH-401, YSC-71x Benoy, YSC-71x Pitambari, YSKM11-02x NRCYS-05-02, YSKM11-02x YSH-401, YSKM11-02 x Benoy, YSKM11-02 x Pitambari, YSC-76x NRCYS-05-02, YSC-76x YSH-401, YSC-76x Benoy, YSC-76x Pitambari, YSKM-10-1x NRCYS-05-02, YSC -10-1x YSH-401, YSKM-10-1x Benoy, YSKM-10-1x Pitambari, YSKM-11-1x NRCYS-05-02, YSKM-11-1x YSH-401, YSKM-11-1x Benoy, YSKM-11-1x Pitambari , YSC-75x NRCYS-05-02, YSC-75x YSH-401, YSC-75x Benoy, YSC-75x Pitambari, YSKM-10-2x NRCYS-05-02, YSKM-10-2x YSH-401, YSKM-10-2x Benoy , YSKM-10-2x Pitambari , YSK9-01x NRCYS-05-02, YSK9-01x YSH-401, YSK9-01x Benoy, YSK9-01x Pitambari, YSC-80x NRCYS-05-02, YSC-80x YSH-401, YSC-80x Benoy, YSC-80x Pitambari, K88x NRCYS-05-02, K88x YSH-401, K88x Benoy, K88x Pitambari, YSC-15x NRCYS-05-02, YSC-15x YSH-401, YSC-15x Benoy, YSC-15x Pitambari, T42x NRCYS-05-02, T42x YSH-401, T42x Benoy, T42x Pitambari, YSC-18x NRCYS-05-02, YSC-18x YSH-401, YSC-18x Benoy, YSC-18x Pitambari, YSK-03x NRCYS-05-02, YSK-03x YSH-401, YSK-03x Benoy, YSK-03x Pitambari , YSC-21x NRCYS-05-02, YSC-21x YSH-401, YSC-21x Benoy, YSC-21x Pitambari, YSC-92x NRCYS-05-02, YSC-92x YSH-401, YSC-92x Benoy, YSC-92x Pitambari, YSC-45x | 1952 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | NRCYS-05-02, YSC-45x YSH-401, YSC-45x Benoy, YSC-45x Pitambari, YSC-30x NRCYS-05-02, YSC-30x YSH-401, YSC-30x Benoy, YSC-30x Pitambari, YSC-95x NRCYS-05-02, YSC-95x YSH-401, YSC-95x Benoy, YSC-95x Pitambari, YSC-40x NRCYS-05-02, YSC-40x YSH-401, YSC-40x Benoy, YSC-40x Pitambari, YSC-46x NRCYS-05-02, YSC-46x YSH-401, YSC-46x Benoy, YSC-46x Pitambari, YSC-84x NRCYS-05-02, YSC-84 x YSH-401, YSC-84 x Benoy, and YSC-84 x Pitambari | | | |
| | | **$F_4$** | YST-151 x T-44, YST-151 x K88, YST-151 x T-3, YST-151 x T-4, YST-151 x B-9, YST-151 x YSK-1, T-44x K88, T-44x T-3, T-44x T-4, T-44x B-9, T-44x YSK-1, K-88x T-3, K-88x T-4, K-88x B-9, K-88x YSK-1, T-3x T-4, T-3x B-9, T-3x YSK-1, T-4x B-9, T-4x YSK-1, and B-9x YSK-1 | 456 | | |
| | | **$F_5$** | YST-151 x YSK-3, YST-151 x YSK-24, YST-151 x YSK-28, YST-151 x YSK-42, YST-151 x K88, YST-151 x YSK-2, YST-151 x YSK-4, YSK-3x YSK-2, YSK-3x YSK-28, YSK-3x YSK-42, YSK-3 x K88, YSK-3x YSK-2, YSK-3x YSK-4, YSK-24x YSK-28, YSK-24x YSK-42, YSK-24x K88, YSK-24x YSK-2, YSK-24x YSK-4, YSK-28x YSK-42, YSK-28x K88, YSK-28x YSK-2, YSK-28x YSK-4, YSK-42x K88, YSK-42x YSK-2, YSK-42x YSK-4, K88x YSK-2, K88x YSK-4, and YSK-2x YSK-4 | 608 | | |
| Pantnagar | Breeding for high yield | Fresh crosses | YS-89-7×PYS-16-7,YS-89-7×NDYS-107,YS-89-7×NDYS-2018,YS-89-7×NDYS-123,YS-89-7×YSCN-18-1,Pitambari × PYS-16-7,Pitambari × NDYS-107,Pitambari × NDYS-2018,Pitambari × NDYS-123,Pitambari × YSCN-18-1,NDYS-842× PYS-16-7NDYS-842× NDYS-107,NDYS-842× NDYS-2018,NDYS-842× NDYS-123, NDYS-842× YSCN-18-1,PYS-17-6× PYS-16-7, PYS-17-6× NDYS-107,PYS-17-6× NDYS-2018,PYS-17-6× NDYS-123,PYS-17-6× YSCN-18-1, PYS-17- | 30 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 11× PYS-16-7,PYS-17-11× NDYS-107, PYS-17-11× NDYS-2018,PYS-17-11× NDYS-123, PYS-17-11× YSCN-18-1,PYS-17-13× PYS-16-7, PYS-17-13× NDYS-107,PYS-17-13× NDYS-2018, PYS-17-13× NDYS-123, and PYS-17-13× YSCN-18-1, | | | |
| | | $F_1$ to $F_2$ | PYSC-68-6 × NDYS-115, PYSC-98-1×NDYS-137, PYSC-14-3 × YS-897, PYSC-98-1 × NDYS-107, PYS-58-13 × NRCYS-05-02,PYSC-21-6 × YS-897, PYSC-21-6×NDYS-115, PYSC-41-3 × NDYS-123, PYSC-40-4 × PYS-842, PYSC-58-13 ×PYS-16-10, PYSC-441-3 × NRCYS-05-02, PYSC-40-4 ×B-9, PYSC-40-4 × RAUDYS-14-9, PYSC 67-6 ×PYS-6, PYSC-68-6 × PYS-842, NDYS-115 × Ragini, PYS-6 × Ragini, NDYS-115 × YS-897, PYS-842 × NRCYS-05-02, PYS-64-5 × RAUDYS-14-9, PYSC-53-5 × RAUDYS-14-9, PYS-6 × RAUDYS-14-9, PYS-842 × NDYS-115, PYS-841 × NDYS-115, PYS-841 × RAUDYS-14-9, PYSC-53-5 × Ragini, (PYS-2016-6 x PYS-6) × B-9, (IC-317444x IC-444231)×RAUDYS-14-9, (PYS-2016-6 x PYS-6) × NDYS-115, (PYS-2016-6 x B-9) × YS-897, {(IC-317444x IC-444231) × PYS-2012-6 } x YS-897, and (PYS-2016-8 x B-9) × (PYS-6 x NDYS-137) | 32 | 20 | |
| | | $F_2$ to $F_3$ | PYS-6 × NDYS-137, PYS-6 × NDYS-123 PYS-6 × NDYS-115, NDYS-137 × PYS-2010-3NDYS-137 × PYS-2015-3,PYS-2008-5 × NDYS-137, PYS-2016-8 × B-9, DRMRYS-2016-42 × YSH-842, PYS-2016-9 × PYSC-11-4, PYS-2008-5 × PYS-2012-4, PYS-2016-9 × PYS-2011-43PYS-2016-6 × PYS-6, PYS-2011-43 × NDYS-137 PYS-2011-43 × PYS-2012-4, PYS—6 (ML) × NDYS-115, PYS-2012-6 × YSH-0401,PYS-2012-6 × PYS-841,PYS-2012-6 × NDYS-107, (PYSC-2011-43 × YSH-0401) × Ragini,(IC-262105 × B-9) × PYS-6, (IC-262105 × B-9) × B-9, (IC-262105 × B-9) × NDYS-137, and (IC-338742 ×IC-444231) × PYS-2012-4 (IC-317444 ×IC-316158) × PYS-2012-4, (IC- | 26 | 154 | 10 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 317444 ×IC-316158) × PYS-2012-6, and (IC-338742 ×IC-444231) × PYS-2012-4, | | | |
| | | $F_3$ to $F_4$ | NDYS-2010 × YSH-401, NDYS-115 × PYS-2015-5, NDYS-137 × NRCYS-0502, NDYS-117 × B-9, PYSC-11-43 × YSH-401, Apealus × YSH-0401, Apetalus × PYS-2012-1, IC-262105 × Pant Sweta, NDYS-123× Pant Sweta, NDYS-123× PPS-1 | 10 | 117 | **9** |
| | | $F_4$ to $F_5$ | PYS-841 x PYSC-11-47, PYS-6 x PYSC-11-47, NRCYS-502 x PYSC-11-47, NRCYS-502 x PYSC-11-43, and PYSC-11-31 x PYSC-11-43, | 5 | 39 | 5 |
| | | $F_5$ to $F_6$ | PYSC-11-43 x PYSC-13-12, YSWB-2010-8 x PYS-11-47, and PYS-7 x PYS-11-1 | 3 | 32 | 2 |
| | | $F_6$ to $F_7$ | PYSC-11-20 x B-9, PYSC-11-20 x YSWB-2014-3-12, and PYS-2011-16 x PYSC-2011-12 | 3 | 27 | 3 |
| **Crop: Indian mustard** | | | | | | |
| Chatha-Jammu. | High seed yield &quality | Fresh cross (for rainfed condition) | RSPR-69,RSPR-5,RSPR-1,RSPR-3,RH-1209,RH-0923,SKJM-5,SKJM-3 With NRCHB-101,RH-406& RH-749 | 24 | | |
| | | $F_1$ | RGN-400,DRMRIJ-16-1,PRE-2013-10,DRMRCI-55,NRCHB-101,RH-1207 WITH RH-406,PM-25&RH-1573 | 18 | | |
| | | $F_2$ | RSPR-01, RH-30, RSPR-03, RH-749,RSPR-69 & RB-24 with RH-406,RB-50, RH-819 & DRMR 541-44 | 21 | | |
| | | $F_3$ | NRCDR-2, NRCHB-101, NPJ-112, DRMRIJ-31, PUSA BOLD, RB-50, RH-749 with RSPR-69 , RSPR-01& RSPR-03 | 15 | | |
| | | $F_4$ | Early and late populations | 05 | | |
| | | $F_5$ | RH-30, PusaAgrani , PusaMahak , RB-24 with RSPR-01, RSPR-03 & RSPR-69 | 09 | | |
| | | $F_6$ | PusaKarishma x RSPR-01, PM-21 x RSPR-03 , PM24 x RSPR-01 , PM24 x RSPR-69 . | 03 | | |
| | | $F_7$ | Kranti x RSPR-01, RSPR-03 x Urvashi , RSPR-03xPusa Bold , RSPR-03xPusa Tarak , , RSPR-69 x Pusa Bold . | 05 | | |
| Dholi | To develop high | $F_5$ to $F_6$ | Pusa Mustard-25 X TPM-1; RH-30 X | 42 | Nil | 27 |

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| | temperature tolerant mustard strains for early sown condition with high yield and early / medium maturity | 122(63+59) SPS ($F_{5s}$) grown in plant to row progenies to make bulk selections in$F_6$ generation. | TPM-1;<br>Rajendra Sufalam X TPM-1; Rajendra Sufalam X NDRE-4;<br>TPM-1 X Pusa Mustard-25; PM -1X RH-30;<br>TPM-1 X Rajendra Sufalam; TPM-1 X Varuna;<br>NRCDR -2 X TPM -1;<br>RAURD-78 X Rajendra Sufalam; | | | |
| | To develop high temperature tolerant mustard strains for Early & Late sown condition through induced mutagenesis | $M_5$s<br>Grown under early and also under Late sown condition.<br>D/Sowing<br>(ES) 27-09-2018<br>(LS) 20-11-2018 | Parent : Rajendra Sufalam<br>(i) Dosages of Gamma Rays: 05<br>80Kr;90Kr; 100Kr;110Kr 120 Kr<br>(ii) Dosages of Gamma Rays +EMS: 04<br>90Kr +0.2%EMS ;90 Kr+0.3% EMS;<br>100Kr +0.2%EMS ;100 Kr+0.3% EMS | 09 | 1. Individual plants from each Single plant progeny row selected for target traits.<br>2. These single plant selections were also under evaluation under laboratory conditions. (using Seed Germinator ) | |
| | EF& EM Plant type mutants (EF,EM, Basal branching, Hight of first siliqua ctc.) | $M_5$ | -do- | -do- | √ | 54 |
| | Earliness in flowering and maturity mutants | $M_5$ | -do- | -do- | √ | 36 |
| | Medium and tall plant type mutants | $M_5$ | -do- | -do- | √ | 36 |
| | Bold-Very bold siliqua mutants | $M_5$ | -do- | -do- | √ | 8 |
| | Bold-very bold seeded mutants | $M_5$ | -do- | -do- | √ | 5 |
| | Long siliqua mutants | $M_5$ | -do- | -do- | √ | 9 |

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| | Long siliqua with bold seeded mutants | $M_5$ | -do- | -do- | √ | 4 |
| | Appressed , Early flowering - maturity mutants | $M_5$ | -do- | -do- | √ | 45 |
| | Mutagenic variation in other component traits (PB,SB,LPMA ,SMA etc) | $M_5$ | -do- | -do- | √ | 81 |
| | Resistance/ tolerance to diseases high yield and other attributes | 18 advanced generation Station Materials (bulks) evaluated in Advanced Varietal Station Trials. | Derived by Interspecific hybridization involving Kranti, Pusa Bold, Varuna, & RAURDL 02-1 of *B. juncea* and PBC9221 (*B. carinata*), EC 339000, EC 338997, ONK-1, HNS 0004 and HYOLA 401 (*B. napus*) | CSVT (INDIAN MUSTARD) | Total:22<br><br>(18+4 Checks) | |
| Hisar | Breeding for component characters | Fresh crosses | New crosses were attempted using agronomically superior genotypes viz., RH 725, RH 406, Giriraj, RH 1222-28, RH 8812, RH 1899-40, RH 1550 and RH 1799-19 as base population and Sel-1, RH 1633, RH 1638, MCNR 18-16, & RC-1658 as donor sources in one set. In another set, new crosses were also attempted using RH 725, RH 749 and RH 8812 agronomically superior genotypes as base population and EC-61-67-1 as donor source. | | | |
| | | $F_2$ | $F_2$ populations were grown in larger plots and desirable single plants have been selected from each $F_2$. | 16 | | |
| | | Generation advancement; $BC_{1s}$ | $F_{1s}$ were grown for generation advancement; $BC_{1s}$ were attempted in these crosses and $F_2$ seed of these crosses was also harvested and threshed. | 62 | | |
| | | $BC_3$ and $BC_2$ | $BC_3$ and $BC_2$ were attempted in 98 and 126 crosses, respectively. | 98 and 126 | | |
| | | inter mating | Third, second and first cycle of inter mating was attempted in 10, 18 and 46 $BC_3$ progenies, respectively | 10, 18 and 46 | | ✓ |

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| | | $BC_3$ | Thirty six $BC_3$ progenies were selfed and multiplied in Third inter mate. | | | ✓ |
| | | PRTs | Seven Progeny Row Trials comprising 42 progenies each were evaluated against two check varieties viz., RH 30 and RH 0749 for seed yield and component traits. Single plants possessing desirable traits have been selected. | 42 | | ✓ |
| | Breeding for disease resistance | Fresh crosses | Attempted using agronomically superior genotypes viz., RH 725, RH 406, Giriraj, RH 1222-28, RH 8812, RH 1899-40, RH 1550 and RH 1799-19 as base population and DRMR 2-11 as donor source for white rust resistance. | -- | | |
| | | $F_2$ | Populations were grown in larger plots and desirable single plants have been selected from each $F_2$ | 4 | | |
| | | $BC_1$ $F_1$ | $F_{1s}$ were grown and $BC_1$ was attempted in these crosses. Besides, $F_2$ seed of these crosses have also been harvested. | 16 | | |
| | | $BC_3$ and $BC_2$ | $BC_3$ and $BC_2$ were attempted in 18 and 20 crosses, respectively | 18 and 20 | | |
| | | Inter mating | Third, second and first cycle of inter mating was attempted in 5, 17 and 10 $BC_3$ crosses, respectively and their seeds were harvested. | 5, 17 and 10 | | |
| | | PRTs | Forty two progenies were evaluated against two checks (RH 8113 and RH 0749) in one Progeny Row Trial for seed yield and disease tolerance. Single plants possessing desirable traits have been selected. | 42 | | |
| | Breeding for aphid tolerant | Fresh crosses | Attempted RH 725, RH 406, Giriraj, RH 1222-28, RH 8812, RH 1899-40, RH 1550 and RH 1799-19 agronomically superior genotypes as base population and RH 7846 as donor source for aphid tolerance. | | | |
| | | $BC_1F_1$ | $F_{1s}$ were grown and $BC_1$ was attempted in these crosses. Besides, $F_2$ seed of these crosses have also been harvested | 16 | | |
| | | $F_2$ | $F_2$ populations were grown in larger plots and desirable single plants have been selected from | 3 | | |

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| | | | each population | | | |
| | | $BC_3$ and $BC_2$ | $BC_3$ and $BC_2$ were attempted in 24 and 4 crosses, respectively | 24 and 4 | | |
| | | Intermating | Third, second and first cycle of intermating was attempted in 3, 13 & 19 $BC_3$ crosses, respectively. | 3, 13 & 19 | | |
| | | Intermate | Progenies after third intermate were selfed and seed was multiplied | 5 | | |
| | | PRTs | Forty two progenies were evaluated against two checks in one Progeny Row Trial for seed yield and aphid tolerance. Single plants possessing desirable traits have been selected. | 42 | | |
| | Breeding for '0' and '00' varieties | Fresh crosses | Attempted RH 725, RH 406, Giriraj, RH 1222-28, RH 8812, RH 1899-40, RH 1550 and RH 1799-19 agronomically superior genotypes as base population and PDZ-5 as donor source for '00' traits. | | | |
| | | $F_3$ | Populations were grown in larger plots and desirable single plants have been selected and these will be subjected to fatty acid analysis. | 3 | | |
| | | $BC_1$ $F_1$ | Sixteen $F_{1s}$ were grown and $BC_1$ was attempted in these crosses. Besides, $F_2$ seed of these crosses have also been harvested. | 16 | | |
| | | $BC_3$ and $BC_2$ | $BC_3$ and $BC_2$ were attempted in 12 and 9 crosses, respectively | 12 and 9 | | |
| | | Inter mate | Second and first inter mate was attempted in 2 and 5 low erucic acid $BC_3$ progenies respectively and seed was multiplied. | 2 and 5 | | |
| | | LST/SST | One Large Scale and one Small Scale Trial having 10 and 9 strains for low erucic acid, respectively were conducted and results are being compiled. | 10 and 9 | | |
| | Development of hybrids in Indian mustard | $F_1$ | 150 and 70 new $F_1$ hybrids based upon *Ogura* and *Mori* CMS systems, respectively were developed for evaluation. | 150 and 70 | | |
| | | Diversification of A and R lines | 22 and 11 new agronomical superior genotypes were used for diversification of A and R lines, respectively in *Ogura* CMS system. | 22 and 11 | | |
| | | | Generationswere advancedfor incorporation/diversification of *Ogura* CMS | 46 | | |

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| | | | system into 46 different genetic backgrounds | | | |
| | | A and R line Maintenance | 35 R lines of *Mori* CMS and 80 R lines for *Ogura* CMS system were maintained. | 35 | | |
| | | | 13 A lines of *Mori* and 14 A lines of *Ogura* CMS system were maintained | 13 | | |
| | | Evaluation of hybrids | 104 new test hybrids based upon *Ogura* CMS system and 48 hybrids based upon *Mori* CMS system were evaluated against three checks. The data analysis is in progress. | 104 | | |
| | | SST | One Small Scale Trial comprising nine experimental hybrids was conducted and results are being compiled. | 9 | | |
| IARI, new Delhi | Yield and yield contributing traits | Fresh crosses | Improved genotypes/varieties | 143 | | |
| | White rust resistance | Fresh crosses | Donskaja | 1 | | |
| | Powdery mildew resistance | Fresh crosses | PMW 18 | 5 | | |
| | Earliness, Yield and yield contributing traits | Fresh crosses | Improved breeding lines/varieties | 30 | | |
| | Terminal heat tolerance, yield and yield contributing traits | Fresh crosses | Improved breeding lines/varieties | 18 | | |
| | Improved oil and seed meal quality with high yield | Fresh crosses | Improved oil and seed meal quality with high yield | 78 | | |
| | Breeding high yielding genotypes for early, timely and late sown maturity groups | $F_1$ | | 104 | 97 | |
| | | $F_2$ | | 127 | 372 | |
| | | $F_3$ | | 126 | 133 | |

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| | | $F_4/MCF_3$ | | 133 | 160 | |
| | | $F_5$ | | 201 | 97 | |
| | | $F_6$ | | 106 | 70 | 40 |
| | | $F_7$ | | 113 | 20 | 64 |
| | Breeding Low erucic acid (0)/ Double low (00) genotypes | $F_1$ | | 55 | 55 | |
| | | $F_2$ | | 2 | 73 | |
| | | $F_3$ | | 8 | 83 | |
| | | $F_4$ | | 22 | 151 | |
| | | $F_5$ | | 4 | 155 | |
| | | $F_6$ | | 4 | 33 | 13 |
| | | $F_7$ | | 1 | | 4 |
| | **Pre-breeding for development of superior genotypes with improved stress tolerance** | $F_1$ | NRCPBrapa8 *&B. nigra* | 6 | | |
| | | $F_1$<br>$F_2$<br>$BC_1$ | NRCPBrapa8 , *B. rapa* var. *toria* acc.2*& B nigra* acc. 9 | 2<br>2<br>4 | | |
| | | $F_2$ | *D. erucoides/ B. rapa* ($D^eD^eAA$) *//B. juncea///B. juncea* | 56 | | |
| | | $MCF_1$ | *D. erucoides/ B. rapa* ($D^eD^eAA$) *//B. juncea///B. juncea* | 53 | | |
| | | $BC_2F_3$ | *B. juncea*//Turnip/*B. juncea*///*B. juncea* | 3 | | |
| Ludhiana | Seed yield component traits and oil content. | New F1 Developed | *Brassica juncea*: 115; *Brassica napus*: 16; Backcrosses: 33 | 164 | | |
| | | Interspecific hybridization | A large number of crosses were attempted between *Brassica fruticlosa* and *Brassica rapa, Brassica juncea* (RLC-2 and RLC-7) *and Brassica* | | | |

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| | | | *napus* (GSC-6). | | | |
| | Moisture stress | Fresh crosses | RB-50 X PBR-357, CM-2 X PBR-97, RH-725 X MCNR-18-16, RH-725 X RLMCP-626, RK-06-1 X PBR-97, RK-06-1 X PBR-357, TM-106-1 X PBR-97, RRN-624 X PBR-357, RRN-624 X PBR-97, RRN-608 X MCNR-18-16, RLMCP-626 X MCNR-18-16, PTJ-3-102 X PBR-97, PTJ-3-100 X PBR-97 | 13 | | |
| | | $F_4$ | | | | |
| | Breeding heat tolerance | Fresh crosses | Promising ones viz.DRMR-1153-2, DRMR 1187-55, DRMR 1191-2, DRMR 15-5 and DRMR-CZ-59 were involved in hybridization programme to initiate commercial breeding for heat tolerance. These lines were also crossed with early mustard determinate lines. | | | |
| | | Diverse set of lines | A diverse panel of 96 genotypes (selected from 500 Indian mustard fixed diversity stock through late planting at RRS Abohar during 2015-16 and 2016-17 for terminal heat stress, were sown under controlled condition (Poly–tunnels) with normal sown field crop as check. Five indentified terminal donor lines PTJ-3-69, RLMCP-626 (introgression lines), Divya-55, ELM-38 and GLM-3 were crossed with elite breeding lines viz., RL-1698, RL-1673, RL-1676, RL-1690 and RL-1693. | 96 | | |
| | | Identification of putative heat tolerant donors | Pusa bold DT, RRN-624, JWMR 941, MSC-5, DAR-1, DAR -5, BJN-1, DJ-149, CRL 1359, PTJ-3-102, PTJ -3-79 and MCP-12-211 | 96 | | |
| | Oil content under terminal heat stress | Genome wide association study | SNPs obtained through genotype-by-sequencing (GBS) were filtered for <20% missing data and minor allele frequency (MAF) >0.05. BLUPs from all environments along with filtered SNPs were used for GWAS using FarmCPU (Fixed and random model Circulating Probability Unification)model implemented through | 96 | | |

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| | | | FarmCPU package in R statistical software. | | | |
| | Seed yield | Fresh Crosses | Seventy six crosses were developed during 2018-19 at PAU, Ludhiana and are being raised at Keylong for further advancement. Thirty three back crosses were developed during 2018-19 at PAU, Ludhiana. The BC2 seeds are being raised at Keylong. | 72 | | |
| | Alternaria blight-Multiparent crosses | Fresh Crosses | Eight parents viz., PBR-857, PBR-357, PBR-97, GLM-3, CM-2, PTJ-3-102, RH-725 and RLMCP-626 with differential reaction to alternaria blight was crossed during 2018-19 at PAU, Ludhiana in four combinations. Four F1s generations will be crossed at Keylong. | -- | | |
| | Development of determinate Indian mustard | Fresh Crosses | Eight crosses were made among determinate and indeterminate genotypes | 8 | | |
| | | | | | | |
| Kanpur | Early maturing, high yielding, bold/medium, brown/yellow seeded varieties | Fresh crosses | **Set – I:** Twenty one crosses ( 7 Parental diallel excluding reciprocals) using Urvashi, PM-27 Pusa agrani, RH-749, KMR15-2, Pusa bahar and Durgamani were attempted $F_0$ seeds of 21 crosses were procured which will be grown in coming next season to raise $F_{1s}$ populations. | 21 | | |
| | | | **Set – II:** Twenty one crosses (7 Parental diallel excluding reciprocals) using Maya, Basanti, PM-28, PM-29, PM-30, Rohini and Kanti were attempted $F_0$ seeds of 21 crosses were procured which will be grown in coming next season to raise $F_{1s}$ populations. | 21 | | |
| | | **$F_2$** | **$F_2$ Population (Set I):** Varuna x Maya , Varuna x NDR-8501, Varuna x RH-30 , Varuna x Durgamani, Varuna x Lotani Gota , Varuna x PR-15, Maya x NDR-8501, Maya x RH-30, Maya x Durgamani, Maya x Lotani Gota , Maya x PR-15 , NDR-8501 x RH-30, NDR-8501 x | | **531** | |

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| | | | Durgamani, NDR-8501 x Lotani Gota, NDR-8501 x PR-15, RH-30 x Durgamani , RH-30 x Lotani Gota, RH-30 x PR-15, Durgamani x Lotani Gota, Durgamani x PR-15, Lotani Gota x PR-15 . | | | |
| | | **$F_3$** | **Set I:** Kranti x NDR8501, Kranti x Maya, Kranti x Sej-2, Kranti x Pusa Agarni , Kranti x Varuna , Kranti x Pusa Bold, Kranti x JM-2 , Kranti x JM-3, Kranti x J.M-4 , NDR8501 x Maya , NDR8501 x Sej-2, NDR8501 x Pusa Agarni, NDR8501 x Varuna, NDR8501 x Pusa Bold , NDR8501 x JM-2, NDR8501 x JM-3, NDR8501 x JM-4, Maya x Sej-2, Maya x Pusa Agarni, Maya x Varuna, Maya x Pusa Bold, Maya x JM-2, Maya x JM-3, Maya x JM-4, Sej-2 x Pusa Agarni, Sej-2 x Varuna , Sej-2 x Pusa Bold, Sej-2 x JM-2, Sej-2 x JM-3, Sej-2 x JM4, Pusa Agrani xVaruna , Pusa Agrani x Pusa Bold, Pusa Agrani x JM-2, Pusa Agrani x JM-3, Pusa Agarani x JM-4, Varuna x Pusa Bold, Varuna x JM-2, Varuna x JM-3, Varuna x JM-4, Pusa Bold x JM-2, Pusa Bold x JM-3, Pusa Bold x JM-4 , JM-2 x JM-3, JM-2 x JM-4 and JM-2 x JM-4. | | **782** | |
| | | | **Set II:** NRCDR-2 x Pusa jai kisan, NRCDR-2 x JM-2, NRCDR-2 x Geeta , NRCDR-2 x Urvashi , NRCDR-2 x RGN-73, NRCDR-2 x Maya , NRCDR-2 x CS-52 , Pusa jai kisan x JM-2, Pusa jai kisan x Geeta, Pusa jai kisan x Urvashi , Pusa jai kisan x RGN-73, Pusa jai kisan x Maya , Pusa jai kisan x CS-52 , JM-2 x Geeta , JM-2 x Urvashi , JM-2 x RGN-73 , JM-2 x Maya , JM-2 x CS-52 , Geeta x Urvashi , Geeta x RGN-73, Geeta x Maya , Geeta x CS-52 , Urvashi x RGN-73, Urvashi x Maya , Urvashi x CS-52 , RGN-73x Maya , RGN-73x CS-52 and Maya x CS-52 | | **516** | |

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| | | $F_4$ | **Set I:** Varuna x Kanti, Varuna x sej-2 , Varuna x NDRE-4, Varuna x M rai, Maya x Kanti, Maya x sej-2, Maya x NDRE-4, Maya x M rai , NDR8501 x Kanti, NDR8501 x sej-2, NDR8501 x NDRE-4, NDR8501 x M rai, Kranti x Kanti, Kranti x sej-2, Kranti x NDRE-4, Kranti x M rai, RLM-198 x Kanti, RLM-198 x sej-2, RLM-198 x NDRE-4, RLM-198 x M rai, RH-30 x Kanti, RH-30 x sej-2, RH-30 x NDRE-4, RH-30 x M rai, Pusa Bold x Kanti, Pusa Bold x sej-2, Pusa Bold x NDRE-4, Pusa Bold x M rai, Urvashi x Kanti , Uvashi x sej-2, Urvashi x NDRE-4, Urvashi x M rai, Pusa jaganath x Kanti , Pusa jaganath x sej-2, Pusa jaganath x NDRE-4, Pusa jaganath x M rai, Pusa bahar x Kanti, Pusa bahar x sej-2,<br>Pusa bahar x NDRE-4, Pusa bahar x M rai, Arawali x Kanti, Arawali x sej-2, Arawali x NDRE-4, Arawali x M rai, RK-9808 x Kanti, RK-9808 x sej-2, RK-9808 x NDRE-4, RK-9808 x M rai, RK-9903 x sej-2, RK-9903 x NDRE-4, RK-9903 x M rai , RK2000-1 x Kanti, RK2000-1 x sej-2, RK2000-1 x NDRE-4, RK2000-1 x M rai, RK2000-2 x Kanti, RK2000-2 x sej-2, RK2000-2 x NDRE-4, RK2000-2 x M rai, RK-2005-1 x Kanti, RK-2005-1 x sej-2, RK2006-1 x NDRE-4, RK2006-1 x M rai , RK2006-1 x Kanti, RK2006-2 x sej-2, RK2006-2 x NDRE-4, RK2006-2 x M rai, RK2007-2 x Kanti , RK2007-1 x sej-2, RK2007-1 x NDRE-4, and RK2007-1 x M rai | | 1715 | |
| | | | **Set II:** Varuna x Pusa bold, Varuna x RLM 198, Varuna x Rajat, Kranti x Rajat, Pusa bold x RLM 198, Pusa bold x Maya, Vardan x Pusa bold, Vardan x NDR-8501, Vardan x Laha-101, Vaibhav x Pusa bahar, Vaibhav x Pusa bold, Vaibhav x Laha-101, Pusa bahar x Pusa bold, Pusa bahar x NDR-8501, Pusa bahar x Laha-101, Pusa bold x NDR-8501, Pusa bold x Laha- | | 423 | |

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| | | | 101, and NDR-8501 x Laha -101 | | | |
| | | $F_5$ | **Set I:** Varuna x Kranti, Varuna x Krishna, Varuna x Pusa basant, Varuna x RLM-198, Varuna x Ashirwad, Varuna x Sej-2, Kranti x Krishna, Kranti x Pusa basant, Kranti x RLM-198, Kranti x Sej-2, Pusa basant x RLM-198, Pusa basant x Ashirwad, Pusa basant x Sej-2, RLM-198 x Sej-2, Krishna x RLM-198, Krishna x Pusa basant, and Ashirwad x Sej-2 | | 483 | |
| | | | **Set II:**Varuna x Pusa bold, Varuna x RC-781, Varuna x RH-198, Varuna x Pusa Jagannath, Varuna x Jawahar mustard-1, NUDH x Pusa bold, NUDH x RC-781, NUDH x RH-198, NUDH x Pusa Jagannath, and NUDH x Jawahar mustard-1 | | 238 | |
| | | $F_6$ | **Set I:** Varuna x Pusa Jai kisan, Kranti x Pusa jai kisan, Urvashi x Pusa jai kisan, NDR-8501 x Pusa jai kisan, Rohini x Pusa jai kisan, Varuna x Sej-2, Kranti x Sej-2, Urvashi x Sej-2, NDR-8501 x Sej-2, Rohini x Sej-2, Basanti x Sej-2, Pusa bold x Sej-2, Maya x Kranti, Ashirwad x Kranti, Urvashi x Kranti, Vaibhav x Kranti, Vardan x Kranti, Basanti x Kranti, RH-30 x Kranti, Pusa bold x Kranti | | **485** | |
| | | | **Set II:** Varuna x Urvashi, Varuna x Maya, Varuna x Kranti, Varuna x NDR-8501, Varuna x Pusa bold, Varuna x Aravali, Urvashi x Maya, Urvashi x Kranti, Urvashi x NDR-8501, Urvashi x Pusa bold, Urvashi x RH-30, Maya x Kranti, Maya x NDR-8501, Maya x Pusa bold, Maya x RH-30, Kranti x NDR-8501 | | **391** | |
| | | $F_7$ | Kranti x Pusa bold, Seeta x Varuna, Seeta x Pusa bold, Seeta x Aravali Seeta x Sej-2, Pusa bold x Sej-2, Pusa bold x Durgamani , Pusa bold x Aravali , Ashirwad x Varuna , Ashirwad x Maya , Ashirwad x Kanti , Ashirwad x Jawahar-1, Ashirwad x Vaibhav , Rohini x Vardan , Rohini x Basanti , Rohini x Maya, Rohini x Pusa bold , and Rohini x Pusa basant. | **60** | **479** | |

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| | | $F_8$ | Varuna x Rohini, Varuna x NDR 8501, Varuna x RH-30, Varuna x RLM -198, Varuna x KR-5610, Varuna x CSR-1017, Varuna x Pusa basant, , Rohini x B-85, Rohini x Mathura Rai, Rohini x NDR-8501, Rohini x RH-30, Rohini x RLM-198, Rohini x KR-5610, Rohini x CSR-1017, Maya x Urvashi, Maya x Basanti, Maya x RC-781, Pusa bold x Urvashi, Vardan x Maya, Vardan x Basanti, Vardan x Kranti, Pusa basant x Kranti, Pusa basant x NDR-8501, Vaibhav x Jawahar mustard-1, and Vaibhav x Basanti | 70 | 525 | |
| | Breeding for late sown situation | Fresh crosses | Twenty one crosses (7 parental diallel excluding reciprocals) using Varuna, Pusa bold, RH-30, RLM-198, PR-15, Urvashi and B-85 were attempted $F_0$ seeds of 21 crosses were procured which will be grown in coming next season to raise $F_1^s$ populations. | 21 | | |
| | | $F_4$ | RK03-01 x Varuna, RK-9903 x Vardan, Kranti xVardan, Rohini x Varuna, Varuna x Vardan, and RK9807xVardan | 138 | | |
| | | $F_5$ | Urvashi X RH-30, Urvashi x Pusa Bold, Urvashi x Pusa Basant, Urvashi x Rohini, Urvashi x R K 9803, Urvashi x Vardan, Urvashi x R L M 198, Urvashi x Seeta, Urvashi x Varuna, RH-30 x Pusa Bold, RH-30 x Pusa Basant , RH-30 x Rohini, RH-30 x RK9803, RH-30 x Vardan, RH-30 x RLM-198, RH-30 x Seeta, RH-30 x Varuna, Pusa Bold x Pusa Basant, Pusa Bold x Rohini, Pusa Bold x RK9803, Pusa Bold x Vardan, Pusa Bold x RLM-198, Pusa Bold x Seeta, Pusa Bold x Vardan, Pusa Basant x Rohini, Pusa Basant x RK9803, Pusa Basant X Vardan, Pusa Basant x RLM-198, Pusa Basant x Seeta, Pusa Basant31 x Varuna, Rohini x RK9803, Rohini X Vardan, Rohini x RLM-198, Rohini X Seeta, Rohini x Varuna, RK-9803 x Vardan, RK-9803 x RLM-198, RK-9803 X Seeta, RK-9803 x Varuna, Vardan x RLM-198, Vardan x Seeta, Vardan x Varuna, RLM-198 x | 955 | | |

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| | | | Seeta, RLM-198 x Varuna and Seeta x Varuna | | | |
| | | $F_6$ | MK(L)13-301 x MK(L)13-308, MK(L)13-301 x MK(L)13-303, MK(L)13-301 x MK(L)13-305, MK(L)13-301 x MK(L)13-310, MK(L)13-301 x Ashirvad, MK(L)13-301 x Vardan, MK(L)13-301 x MK(L)13-303, MK(L)13-301 x MK(L)13-305, MK(L)13-301 x MK(L)13-310, MK(L)13-301 x Ashirvad, MK(L)13-301 x Vardan, MK(L)13-303 x MK(L)13-305, MK(L)13-303 x MK(L)13-310, MK(L)13-303 x Ashirvad, MK(L)13-303 x Vardan, MK(L)13-305 x MK(L)13-310, MK(L)13-305 x Ashirvad, MK(L)13-305 x Vardan, MK(L)13-310 x Ashirvad, MK(L)13-310 x Vardan, and Vardan x Ashirvad. | 394 | | |
| | | $F_7$ | MK(L)14-403 x MK(L)14-404, MK(L)14-403 x MK(L)14-405, MK(L)14-403 x MK(L)14-406, MK(L)14-403 x MK(L)14-407, MK(L)14-403 x Ashirvad, MK(L)14-403 x Vardan, MK(L)14-403 x MK(L)14-405, MK(L)14-403 x MK(L)14-406, MK(L)14-403 x MK(L)14-407, KM(L)14-404 x Ashirvad, KM(L)14-404 x Vardan, KM(L)14-405 x MK(L)14-406, KM(L)14-405 x MK(L)14-407, KM(L)14-405 x x Ashirvad, KM(L)14-405 x Vardan, KM(L)14-406 x MK(L)14-407, KM(L)14-406 x Ashirvad, KM(L)14-406 x Vardan, KM(L)14-407 x Ashirvad, KM(L)14-407 x Vardan and Vardan x Ashirvad | 388 | | |
| | | $F_8$ | **Set-I:** Pusa bold x Pusa Jagannath, Pusa bold x Pusa jai kisan, Pusa bold x Pusa bahar, Pusa bold x Krishna, Pusa bold x Urvashi, , Pusa basant x Jawahar mustard -1, Pusa basant x Vaibhav, Pusa bold x Rohini, Pusa bold x Varuna, Pusa bold x Vardan, Pusa bold x Maya,<br>Varuna x Durgamani, and Pusa basant x Durgamani | 41 | 259 | |
| | | $F_8$ | **Set-II:** Varuna x RK 9808, Varuna x RK 9807, Varuna x RK 9803, Varuna x VSL-5, Varuna x | 63 | 411 | |

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|---|---|---|---|---|---|---|
| | | | RH-30, Varuna x RK 9801, Varuna x RK 9802, Varuna x RK 9803, Varuna x RK 9804, Varuna x Mathura rai , Urvashi x RK 9807, Urvashi x RK 9803, Urvashi x RK 9808, Urvashi x Durgamani, Urvashi x RK 9801, Pusa bahar x RK 9901 , Pusa bahar x RK 9807, Pusa bahar x RK 9808, Pusa bahar x Durgamani, and Pusa bahar x Mathura rai. | | | |
| | Breeding mustard varieties for quality | $F_7/F_8$ | Developed through single crosses using parents *viz;* Varuna x EC287711, Varuna x EC322090, Rohini x EC287711, Rohini x EC322090, Kanti x EC287711, Kanti x EC322090, Varuna x NUDH YJ-3, Rohini x NUDHYJ-3, Basanti x NUDHJ-3, Maya x NUDH YJ-3, Vardan x NUDHYS-3, Basanti x EC287711, Basanti x EC322090, Maya x EC287711 and Maya x EC322090 were grown and seed were collected for growing them in $F_8$ generation | 15 | | |
| Morena | High seed yield and quality | $F_1$ | RGN-73 x (JM-1, JM-2, JM-3, RVM-1, RVM-2, RVM-3, Kranti, RH-749, L-4), Kranti x (JM-1, JM-2, JM-3, RVM-1, RVM-2, RVM-3, RGN-73, RH-749, L-4), L-4 x (JM-3, RVM-1, RVM-2, RVM-3, Kranti), RH-749 x (JM-1, JM-3, RVM-1, RVM-2, RVM-3, RGN-73, L-4, Kranti, JMM-927, JMM-09-1-1), JM-1 x (JM-2, JM-3, RVM-1, RVM-2, RVM-3, RGN-73, RH-749, L-4, Kranti, JMM-927, JMM-09-1-1), JM-2 x (JM-1, JM-3, RVM-1, RVM-2, RVM-3, RGN-73, RH-749, L-4, Kranti, JMM-927, JMM-09-1-1), JM-3 x (JM-1, JM-2, RVM-1, RVM-2, RVM-3, RGN-73, RH-749, Kranti, JMM-927), RVM-2x (JM-1, JM-3, RVM-1, RVM-3, RGN-73, L-4, Kranti, RH-749, JMM-927, JMM-09-1-1), RVM-1 x (JM-3, RGN-73, L-4, RH-749), RVM-3 x (JM-1, JM-2, JM-3, RVM-1, RVM-2, JMM-927, JMM-09-1-1), JMM-09-1-1x (JM-1, RVM-1, RVM-3, RGN-73, L-4, Kranti, RH-749,) | 91 | 110 | |
| | | $F_2$ | RVM-2 x RDZ-6, RVM-2 x DRMRIJ-15-85, JMM-927 x RGN-73, RDZ-6 x RVM-2, RDZ-6 x | 13 | 40 | |

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| | | | MRNJ-77, DRMRIJ-15-85 x JM-4, DRMRIJ-15-85 x MRNJ-77, RDZ-5 x JM-4, RMM-09-10 x RVM-2, RMM-09-10 x JMM-927, RH-1209 x MRNJ-77, RGN-73 x JM-4, Basanti x MRNJ-77 | | | |
| | | $F_3$ | 44 S 31 x Pusa Mustard- 25, 44 S 31 x Maya, 44 S 31 x Kranti, 44 S 31 x DMH-1, 44 S 31 x RGN-73, PM-28 x Pusa Mustard- 25, RH-1134 x Pusa Mustard- 25, RH-1134 x RGN-73, KM-108 x DMH-1, KM-108 x NRC-HB-506, RH-3601 x Kranti, RH-3601 x NRC-HB-506, RVM-2x DMH-1, Pusa Mustard- 25 x PM-28, Pusa Mustard- 25 x RH-3601, Pusa Mustard- 25 x RVM-2 | 16 | 80 | |
| | | $F_4$ | MRNJ-70 x JM-2, MRNJ-71 x JM-4, MRNJ-73 x RVM-1, MRNJ-73 x RVM-2, MRNJ-77 x JM-2, MRNJ-78 x JM-1, MRNJ-83 x JM-1, MRNJ-83 x JM-2, MRNJ-84 x RVM-1, MRNJ-85 x JM-1, MRNJ-87 x JM-3, MRNJ-90 x JM-3, MRNJ-90 x RVM-1, MRNJ-91 x JM-2, MRNJ-92 x JM-2, MRNJ-95 x JM-4, MRNJ-96 x JM-3, MRNJ-96 x JM-4, MRNJ-96 x RVM-1, MRNJ-97 x JM-3, MRNJ-98 x JM-1, MRNJ-98 x JM-4, MRNJ-98 x RVM-1, MRNJ-99 x JM-1, MRNJ-99 x JM-2, MRNJ-100 x JM-3, MRNJ-70 x JM-1, MRNJ-73 x JM-4 | 28 | 280 | |
| | | $F_5$ | JM-1 x MRNJ-1, JM-1 x MRNJ-101, JM-1 x PusaBold, JM-2 x MRNJ-1, JM-2 x MRNJ-137, JM-2 x MRNJ-131, JM-3 x MRNJ-101, JM-3 x MRNJ-84, JM-3 x PusaBold, JM-4 x MRNJ-101, JM-4 x MRNJ-137, JM-4 x Rohini, RVM-1 x MRNJ-101, RVM-1 x MRNJ-137, RVM-2 x MRNJ-101, RVM-2 x MRNJ-84, RVM-2 x PusaBold, RMM-09-3 x MRNJ-1, RMM-09-3 x MRNJ-137, RMM-09-3 x MRNJ-84, RMM-09-3 x MRNJ-131, JMWR-945-2-2,75 kr. x MRNJ-84, JMWR-945-2-2,75 kr.x PusaBold | 23 | 65 | |

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| | | $F_6$ | PussaBold x Rohini, PussaBold x Varuna, JM-1 x Sej-2, RVM-2 x B-85, JM-4 x Divya-33, JM-4 x JD-6, RMM-09-2 x L-4, RMM-09-2 x L-6, RMM-09-2 x B-85, RMM-09-2 x Sej-2, RMM-09-3 x Rohini, RMM-09-3 x L-4, RMM-09-3 x Kranti, RMM-09-3 x B-85, JMWR-945-2-2,75 kr. x Rohini, JMWR-945-2-2,75 kr. x L-4, JMWR-945-2-2,75 kr. x L-6, JMWR-945-2-2,75 kr. x B-85, JM-2 x Rohini | 19 | 19 | |
| | | $F_7$ | JM-1 x JMM-927, JM-1 x L-4, JM-1 x L-6, JM-1 x Rohini, JM-2 x JMM-927, JM-2 x B-85, JM-2 x NRC-HB-101, JM-3 x L-4, JM-3 x MRNJ-137, JM-4 x JMM-927, JM-4 x MRNJ-101, JMM-05-6 x L-6, RMM-09-1 x PusaBold, RVM-2 x MRNJ-1, RVM-2 x MRNJ-84, RVM-2 x MRNJ-131, DJ-28 x PBR-210 x RVM-2 | 17 | | |
| | | $F_8$ | JM-4 x Kranti, JM-4 x B-85, JM-4 x NDRE-4, RVM-2 x NDRE-4 | 4 | | |
| | | $F_9$ | RH-7846 x PusaBold, EJ-17 x PusaBold, EJ-17 x Rohini, EJ-17 x JM-3, EJ-17 x RVM-1, ELM-134 x Rohini, ELM-134 x JM-2, ELM-169 x RVM-1, PRQ-2005-31 x PusaBold, PRQ-2005-31 x RVM-1, RH [OE]-0204 x Varuna, RH [OE]-0204 x JM-2, RVM-1 x RH-7846, RVM-1 x PRQ-2005-31 | 14 | | |
| | | $F_{10}$ | MJA-3 x JMM-927, MJA-3 x HUJM-0201, Swarnjyoti x MJA-3 | 3 | 40 | |
| | | $F_{11}$ | Rohini x RH-7846, Varuna x ELM-134, Varuna x RH [OE]-0204, Kranti x HUJM-04-01, Kranti x NDR-06-3, JM-2 x RK-06-05, HUJM-04-06 x JM-2, PusaKarishma x Rohini | 8 | 90 | |
| | | $BC_2F_6$ | {MJA-3 x Varuna} x {Varuna x NRC-HB-101}, {MJA-3 x JM-2} x {JM-2 x NRC-HB-101}, {MJR x JMM-927} x {JMM-927 x JMM-927}, {MJR x JM-4} x {JM-4 x NRC-HB-101}, {MJR x Kranti} x {Kranti x Kranti} | 5 | | |
| | | $BC_2F_7$ | {RH-7846 x Varuna } x Varuna, {RH-7846 x Rohini } x Rohini, {EJ-17 x RVM-1 } x RVM-1, {ELM-134 x Rohini } x Rohini, {ELM-169 x PusaBold } x PusaBold, {ELM-169 x Rohini } x | 11 | | |

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| | | | Rohini, {LET-16 x JM-4 } x JM-4, {PRQ-2005-31 x JM-2 } x JM-2, {PRQ-2005-31 x JM-3 } x JM-3, {RH [OE]-0204 x JM-2 } x JM-2, {RVM-1xPRQ-2005-31} x PRQ-2005-31 | | | |
| | | $BC_2F_{10}$ | {PusaBold x RH [OE]-0204} x RH [OE]-0204, {PusaBold x KLM-134} x KLM-134, {PusaBold x RL-2047} x RL-2047, {Rohini x HUJM-04-06} x HUJM-04-06, {Varuna x RH [OE]-0204} x RH [OE]-0204, {Varuna x HUJM-04-06} x HUJM-04-06, {Kranti x LET-16} x LET-16, {Kranti x PR-2004-14} x PR-2004-14, {JM-2 x LET-16} x LET-16, {JM-2 x KLM-134} x KLM-134, {JM-3 x RK-06-05} x RK-06-05, {JM-4 x RH [OE]-0204} x RH [OE]-0204, {JM-4 x PR-2004-14} x PR-2004-14, {JMM-927 x RH [OE]-0204} x RH [OE]-0204, {JMM-927 x HUJM-04-06} x HUJM-04-06, {JMM-927 x KLM-134} x KLM-134, {JMM-927 x NDR-06-3} x NDR-06-3, {JMM-927 x NRCDR-2} x NRCDR-2, {JMM-927 x PusaKarishma} x PusaKarishma, {PusaKarishma x Varuna} x Varuna, {PusaKarishma x Rohini} x Rohini, {PBR-97 x JM-4} x JM-4, {HUJM-04-06 x JM-2} x JM-2 | 25 | 260 | |
| | Identification of good combiners for seed yield and WRR quality | Fresh crosses | 98 fresh crosses were made during Rabi 2018-19 | | | |
| | | | | | | |
| Pantnagar | Early Sowing | Fresh crosses<br>Single cross | NDRE-4×DRMR-IJ-16-51,NDRE-4×DRMR-IJ-16-56,PM-28×DRMR-IJ-16-51,PM-28×DRMR-IJ-16-56,,DRMR-IJ-16-51×PR-19,DRMR-IJ-16-51×PM-25,DRMR-IJ-16-51×NDRE-4,RH-1656×PR-19,RH-1656×PM-25,RH-1656×NDRE-4,PRE-16-2×DRMR-IJ-16-51,PRE-16-2×RH-16-56,PRE-16-2×PM-27,PRE-2017-2×DRMR-IJ-16-51,PRE-2017-2×PM-25,PRE-2017-2×RH-16-56,PRE-2017-8×PR-19,PRE-2017-8×NDRE-4,PRE-2017-8×NPJ-112,PRE-2017-7×NPJ-112,PRE-2017-7×PR-19,PRE-2017-7×PR-20,(RH-1209×GP1-8)×NPJ-112,(RH-1209×GP-1-8)×PR- | 53 | | |

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| | | | 20,(RH-1209×GP-1-14)×NDRE-4,(RH-1209×GP-1-4)×PR-19,(RH-1209×GP-1-7)×NPJ-112, (PR-2015-1×CRP-3)×PR-19,(PR-2015-1×CRP-3)×PR-20,(PR-2015-1×CRP-3)×Albeli (RH-1209×CRP-3)×(RH-1209×PR-20),(RH-1209×CRP-3) ×(RH-1209×Albeli),(Giriraj×GP-I-123)×Albeli,(Giriraj×GP-I-123)×PR-20,(Giriraj×GP-I-123)×RH-749, (PRHC-13-7×CRP-1)×Albeli,(PRHC-13-7×CRP-1)×PR-20,(NPJ-203×GP-I-7)×Albeli, (PRE-10-7×CRP-1)×PR-20,(PRE-10-7×CRP-1)×RH-749,(PRE-10-7×CRP-1)×NPJ-112, (PRE-13-13×PR-20)×NDRE-4,(PRE-13-13×PR-20)×NPJ-112,(PRHC-13-7×PRE-10-7)×PR-20,(PRHC-13-7×PRE-10-7)×NPJ-112,(PRE-12-4×GP-I-3)×NDRE-4,(PRE-12-4×GP-I-3)×NPJ-112,(PR-2012-4×CRP-3)×JD-6,(PR-2012-4×CRP-3)×PR-20,(PR-19×CRP-1)×Albeli, (PR-19×CRP-1)×JD-6,(PR-19×CRP-1)×PR-20, (PR-19×CRP-1)×Albeli | | | |
| | | $F_1$ to $F_2$ | PR-15-1 × GP-1-3, RH-1209 × GP-1-3,Giriraj × GP-1-12,RH-1209 × GP-1-23,<br>RH-1209 × GP-1-8,RH-1209 × GP-1-14, Giriraj × GP-I-22,Giriraj × GP-I-7,<br>Giriraj × GP-I-14,Giriraj × GP-I-5,Giriraj × GP-I-8,PR-21 × GP-I-7,RH-1209 × CRP-3,RH-1209 × GP-I-22,Giriraj × GP-I-3,Giriraj × GP-I-23,RH-1209 × GP-I-12,RH-1209 × GP-I-5,JD-6 × GP-I-3,JD-6 × GP-I-5,NPJ-203 × GP-I-7,<br>PRE-10-7 × CRP-1,JD-6 × GP-I-8, JD-6 × GP-I-23, PR-21 × GP-I-5, NPJ-203 × CRP-3 PR -21 × GP-I-23, PRE-12-4 × GP-I-14, PR -21 × GP-I-22, RH-406 × PRE-13-13,JD-6 × GP-1-22, PRE-12-4 × GP-I-23, PRE-13-7 × PRE-10-7, PR-15-1 × GP-I-22, PR-15-1 × GP-I-23, PR-15-1 × GP-I-14, PR-13-7 × CRP-3, PR-2012-4 × GP-I-7, PR-2012-4 × GP-I-8, PR-2012-4× PRHC-13-7, NPJ-203 × GP-1-8, PR-2012-4 × GP-I-22, PR-21 × GP-I-12, PR-15-1 × GP-I-12, RH-406 × EJ-17, JD-6 × GP-1-8, (PRB-13-10 x Divya-88) x EJ-17, (PRE-13-10 x | 54 | | 45 |

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| | | | Krishna ) x CRP-1-14, (PRE-13-10 x Diyva-88 ) x CRP-1-14, (PRE-13-10 x Krishna ) x PR-19, Rohini × PRHC-13-7-10, PR-2013-2 × PRHC-14-10, and PR-2013-2 × PRHC-13-7-10, | | | |
| | | $F_2$ to $F_3$ | PRE-13-19 × PBML-2, PRE-13-10 × Krishna, PRE-13-19 × Divya-88m, PR-2016-5 × IC-427689, PRHC-13-7 (MH) × PRHC-13-7(DH), PRHC-13-7 (MH) × PRHC-13-7(DH), EEC-3 × IC-570302, EEC-1 × IC-689427, PRHC-13-7 (MH) × PRHC-13-7(DH), PRE-10-7 × PRHC-13-7, PRHC-13-7 (MH) × PRHC-13-7(DH), PRHC-13-7 (MH) × PRHC-13-7(DH), (CAN-83 × PR-21) × PR-20, (PRE-12-1 × Albeli) × (PR-21×NDRE-4), and Griraj × HC 13-7 | 15 | 10 | |
| | | $F_3$ to $F_4$ | Albeli × NPJ-112, PR-21 × NDRE-4, PRE-11-6 × Albeli, PRE-12-11 × Albeli , and PRE-11-6 × Raj Vijay | 5 | 5 | |
| | | $F_4$ to F5 | PRE-2011-15 x RRN-778, PRE-2011-15 x Maya, Divya 55 x NPJ-112, DRMR-675-39 x NPJ-112, RB-57 x NPJ-112, and Maya x NPJ-112 | 6 | | |
| | | $F_5$ to $F_6$ | (PRE-2010-19×EJ-17)×Maya, (PRE-2010-19×NDRE-4)×Maya, (PRE-2010-19×EJ-17)×Albeli, NPJ-112 xPRE-2010-15, PRE-2010-19 x PRE-2010-15, NDRE-4 x(PRE-2010-15× RGN-73), PRB-08-5xPRE-2010-15, and Albeli xPRE-2010-15 | 8 | 115 | 8 |
| | | $F_6$ to $F_7$ | PRE-2010-15 × NDRE-4, PRE-2010-19 × PR-19, PRE-2009-9 x Kranti, Vardan × PR-19, Bhagirathi x PRE-2007-6, PRB-2008-5 x PRE-2007-6, RGN-145 x NDYR-8, and Divya Sel, | 8 | 33 | |
| | | $F_7$ to $F_8$ | RH-919 x NPJ-112, NDR-08-16 x NPJ-112, and DRMR-2011-1 x NPJ-112 | 4 | 12 | 4 |

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| | Timely sowing | Fresh crosses | Rohini ×PRHC-13-7-10×PR-20, Rohini ×PRHC-13-7-10×Albeli, Rohini ×PRHC-13-7-10×RH-749, PR-2013-2×PRHC-13-7-10×PR-20, PR-2013-2×PRHC-13-7-10×Albeli, PR-2013-2×PRHC-13-7-10×RH-749, RGN-394×PRHC-13-7-1×RH-1585, RGN-394×PRHC-13-7-1×Giriraj, RGN-394×PRHC-13-7-1×Albeli, PR-2013-7×PRHC-14-10×PR-20, PR-2013-7×PRHC-14-10×Giriraj, PR-2013-7×PRHC-14-10×RH-1585, RGN-73 × Kranti, KMR-17-3× Kranti, RH-1585× Kranti, PR-15-7× Kranti, PR-15-7× PR-19, RH-749× PR-20, RH-749× PR-12-4, RB-57× PR-12-4, RH-749× PR-17-2, PR-17-5× RH-749, and PR-17-8× Albeli | 23 | | |
| | | $F_1$ to $F_2$ | NPJ-208 x NPJ-113, PR-13-2 × PRHC-14-9, PR-2015-5 × EJ-17, Rohini× PRHC-14-10, Krishna× NPJ-113, PR-2015-5×Divya-22, PR-15-1 × IC-264133,<br>RGN-394 × PRHC-14-7-1, PR-2013-7 × PRHC-13-7-10, PR-2013-7 × PRHC-14-10, PR-20 × RRN-732, (PR-15-5 x Divya ) x PRHC-14-9 | 12 | 9 | |
| | | $F_2$ to $F_3$ | PRE-2013-19 x PBML-1, PRE-2013-10 x PR-2012-12, PRE-2013-10 x RH-749, PRE-2013-19 x Maya, Albeli x NPJ-112, PRE-2013-10 x PBML-2,<br>PR-2016-5 × Giriraj, PR-2015-1 × Maya, PR-2016-4 × Maya, PR-2016-4 × RGN-73, PR-2015-1 × RGN-73, PR-2016-4 × Giriraj, PR-2016-6 × Maya, PR-2016-3 × RGN-73, PR-2016-1 × Giriraj, PR-2016-5 × RGN-73, PR-2016-3 × Giriraj, PR-2015-1 × Giriraj, PR-2016-5 × Maya, PR-2012-12 x PBML-1,PR-2016-6 × Giriraj, PR-2016-1 × RGN-73, PR-2016-1 × Maya, PR-21 x IC-355934, PR-12-12 x IC-355934, PR-2016-6× IC 520478, PR-20 x IC-355931,RRN-9-11x RH-749, $F_1$ x PR-2012-12, PR-16-3 x IC-597950,<br>Three way cross<br>(PRE-2011-6 x Rajvijay) x RH-1209, (PR -21 x NDRE-4) x RH-749, (PR -21 x NDRE-4) x | 36 | | 25 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | Divya-88, (KMR-2013-14 × Albeli) × Krishna, (TM-1061 × CAN-83) × PR-2012-12, (Albeli × NPJ-112) × PR-2012-12, | | | |
| | | $F_3$ to $F_4$ | ACN-83 × PR-21, ACN-83 × PR-20, Divya 55 × Kranti, KMR-13-14 × Albeli, RH-1019 × Raj Vijay, NPJ-191 × Albeli, NPJ-191 × Raj Vijay, (RMM-09-4 × NPJ-112) × Albeli, (DRMR-675-3 × PRE-11-15) × Albeli, (NRCHB-101× Maya) × Albeli | 10 | | 8 |
| | | $F_4$ to $F_5$ | NRCHB-101 × Divya-55, Divya-55 × RRN-778, Divya-55 × RB-57, RRN-778 × Maya,PR-2009-6 × RGN-73, PR-2009-6 × Albeli, (PR-2009-6 × Albeli) × Albeli, (PR-2009-6 × RGN-73) × PR-2009-6, (PR-2009-6 × Albeli) × PR-2009-6, (KMR-13-3 × PR-20) × KMR-13-3 | 10 | | 8 |
| | | $F_5$ to $F_6$ | PR-2009-6 × PR-20, PBR-423 × Albeli, PR-2009-6 × NDYR-8, RH-0923 × Albeli, PR-2009-6 × RGN-73, PBR-423 × RGN-73, PR-2009-6 × Albeli | 7 | 156 | 7 |
| | | $F_6$ to $F_7$ | RGN-291 x Urvashi, PRE-2010-15 × RGN-73, PRB-2006-5 x Bhagirathi, PRB-2006-5 x RGN-74, and (PRKS-28 x PRHC-11-15) x PRKS-28 | 5 | 43 | |
| | | $F_7$ to $F_8$ | Krishna × NRCH-101, Urvashi × PRB-2006-5, PRKS-28 × EC-399299, PRB-2004-3-4 × EC-399301 | 4 | | |
| | Late sowing | Fresh crosses | PRL-13-9×DRMR-17-5, PRL-16-6×DRMR-17-5, PRL-16-5×DRMR-17-5, RL-18-5×PRL-18-19, PRL-18-4×PRL-18-19, PRL-16-5×PRL-18-19, PRL-16-5×PRL-18-9, PRL-17-1×PRL-18-5, PRL-17-1× NRCHB-101, PRL-17-2×PRL-18-14, PRL-17-2× NRCHB-101 | 11 | | |
| | | $F_1$ to $F_2$ | PR-20 × NRCHB-101, PR-20 × NPJ-113, Krishna × NPJ-113, KMRL-15-5 × NPJ-113, KMRL-15-5 × Ashriwad, PR-20 × Ashriwad, PRE-13-13 × NRCHB-101, RH-1599 × NRCHB-101, NPJ-201 × DIVYA-55, PRB-417 × NPJ-113, RH-1599 × PRL-13-15, PBR-417 × NRCHB-101, NPJ-208 × RH-1599-7, PBR-417× Ashriwad, PRL-2013-17 × Ashirwad, PRHC-2035 × NRCHB-101, DRMR- | 30 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 2035 × NRCHB-101, KMRL-15-5 × NRCHB-101, DRMR-2035 × Ashirwad, PRL-13-15 × NPJ-113, PR-19 × NRCHB-101, RB-57 × NPJ-113, PRL-13-15 × NRCHB-101, RB-57 × Ashirwad, DRMR-2035 × NPJ-113, Vardan × NRCHB-101, NPJ-208 × NRCHB-101, RB-57× NRCHB-101, PRL-13-15 × Ashirwad, NPJ -208 x PRL-13-15, | | | |
| | | $F_2$ to $F_3$ | PRD-2013-6 × NRCHB-101, PRD-2013-6 × NPJ-113, NPJ-113 × NRCHB-101,<br>PR-2016-3 x PAB-9511, PR-2016-5 x PWR-2013-8, PR-2015-1 x PWR-2013-8,<br>Three way cross,<br>(NRCHB-101x Vardan) × NRCHB-101, (PRD-13-9 × Albeli) × NPJ-113, (PRD-13-9 × Ashirwad) × NRCHB-101, (Albeli × NPJ-112) × NRCHB-101, (NRCHB-101x Vardan) × NPJ-113 | 11 | | |
| | | $F_3$ to $F_4$ | NRCHB-101 × Ashirwad, NRCHB-101 × Vardan, PRL-10-8 × NRCHB-101,PRD-13-2 × NRCHB-101, PRD-13-9 × Ashirwad,PRD-13-9 × Vardan,PRD-13-9 × NRCHB-101, PRL-12-13 × Raj Vijay | 8 | | |
| | | $F_4$ to $F_5$ | PRB-2013-7 × NRCHB-101, PRL-2012-6 × Raj Vijay, FS-13-8 × KMRL-14-6,<br>FS-13-8 × Kranti, PRL-12-13 × RMM-09-4, PRL-12-13 ×NRCHB-101, PRL-12-13 ×Divya 55, NRCHB-101 × Maya, NRCHB-101 × DRMR-675-39, DRMR-675-39 × RRN-778, RB-57 × RRM-09-4 | **11** | | |
| | | $F_6$ to $F_7$ | NPJ-170× RGN-73, KMRL-12-1 × Ashirvad, NRCHB-101× Ashirvad, NRCHB-101× RGN-73, Kranti × RGN-73 | 5 | 101 | 5 |
| | Yellow seeded | $F_2$ to $F_3$ | (NDYS-12-5 × NDYR-8) × DRMR-101, (NDYR-10 × PRY-2009-8) × PR-2012-12, (PYR-2012-5 × NDYR-8) × PR-2012-12, (Navgold × NDYR-8) × CS-56, (PYR-2012-5 × NDYR-8) × NPJ-112, (NDYS-8 × PYS-2009-5) × PR-19,and Griraj x NDYR-8, | 9 | | |
| | | $F_3$ to $F_4$ | NDYR-8 × PYR-2009-5, PYR-2012-5 × NDYR-8, Navgold × NDYR-8, (PRE-11-6 x Raj Vijay) x | 4 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | RH-1209 | | | |
| | | $F_5$ to $F_6$ | RH-0923 × NDYR-8, and PR-2009-6 × NDYR-8 | 2 | | |
| | | $F_6$ Advanced to $F_7$ | PYR-2009-8 × NDYR-8, PYR-2009-13 × NDYR-8, PYR-2009-13 × NDYR-10, and PR-2009-6 × Navgold | 4 | 62 | |
| | | $F_7$Advanced to $F_8$ | NDYR-8 × PYR-2009-3, and NDYR-8 × PYR-2009-4 | 2 | 10 | |
| | Disease resistance | Fresh crosses | Alternaria Blight (48) & White rust/Downy Mildew (36) | 84 | | |
| | | $F_1$ | Alternaria Blight (10) & White rust/Downy Mildew (19) | 29 | | |
| | | $F_2$ | Alternaria Blight (08) & White rust/Downy Mildew (12) | 20 | | |
| | | $F_3$ | Alternaria Blight (15) & White rust /Downy Mildew (15) | 30 | | |
| | | $F_7$ | Alternaria Blight (25) | 25 | | |
| | | Advanced lines | Alternaria Blight (47) & White rust/Downy Mildew (19) | 66 | | |
| | CMS conversion | Fresh crosses | | 20 | | |
| | | $BC_1$ | | 17 | | |
| | | $BC_2$ | | 34 | | |
| | | $BC_3$ | | 32 | | |
| | | $BC_4$ | | 41 | | |
| | | $BC_5$ | | 10 | | |
| | | $BC_6$ | | 06 | | |
| | | $BC_7$ | | 12 | | |
| | Conversion of restorers | Fresh crosses | | 20 | | |
| | | $BC_1$ | | 12 | | |
| | | $BC_2$ | | 11 | | |
| | | $BC_3$ | | 12 | | |
| | | $BC_4$ | | 14 | | |
| | | $BC_5$ | | 02 | | |
| | | $BC_6$ | | 02 | | |
| | | $BC_7$ | | 08 | | |
| | Advanced line under | Toria | Station trial(20), State varietal trial(09) | 29 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | testing | Yellow sarson | Station trial(17), State varietal trial(07) | 24 | | |
| | | Mustard | Station trial (Early-36), Station trial (Timely sown-28), Station trial (Late sown-30) and State varietal trial-09 | 103 | | |
| | | | | | | |
| S.K.Nagar | Seed yield, boldness, earliness and heat tolerance suitable for late sown conditions | Fresh crosses | KM 126, DRMR IJ 16-66, NPJ 203, ANDM 14-9, MCN 18-10, SKM 1746, GM 1, and GDM 4 | 56 | | |
| | | | | | | |
| | High Yield | $F_2$ to $F_7$ | | | 130+230 | 84+43 |
| | High Yield & Bold seed | $F_{4\ to}\ F_7$ | | | 48+57 | 44+30 |
| | High Seed Yield and Quality | $F_{5\ to}\ F_6$ | | | 116 | 06+47 |
| | Early and Temp. tolerance | $F_{2to}\ F_6$ | | | 208+160 | 65 |
| | Interspecific | $F_{2to}\ F_3$ | | | 26+14 | |
| | CMS conversion | $BC_{12}F_1$ | | | 05 | |
| | | $BC_{11}F_1$ | | | 20 | |
| | Conversion of restorers | $BC_{10}F_1$ | | | 16 | |
| | | $BC_9F_1$ | | | 09 | |
| | | $BC_4F_1$ | | | 03 | |
| | | $BC_3F_1$ | | | 13 | |
| | Restorer study | $F_1$ | | | 66 | |
| | Promising Entry | | | 43 | | |
| Varanasi | White rust tolerance | Fresh crosses | Crosses were made in Line X Tester Fashion | 20 | | |
| | Heat and drought | $F_1$ | | 314 | | |
| | Heat and drought tolerance and testing combing ability | $F_2$ | | 37 | | |
| | | $F_3$ | | 27 | | |
| | | BCs | | 20 | | |
| Sriganganagar | High yield, white rust and alternaria blight resistance, high oil | Fresh crosses | | 172 | | |
| | | $F_1$ | | 194 | | 193 |
| | | $F_2$ | | 70 | 94 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | content, quality improvements, earliness and salt tolerance | $F_3$ | | 170 | 134 | |
| | | $F_4$ | | 174 | 124 | |
| | | $F_5$ | | 110 | 81 | |
| | | $F_6$ | | 91 | - | 24 |
| **Crop: Gobhi sarson** | | | | | | |
| Chatha-Jammu. | High seed yield | Fresh crosses | Advanced fixed genotypes with GSC-6,GSL-1&RSPN-25 | 18 | | |
| | | $F_1$ | CNH-11-1,RSPN-28,CNH-11-13,HNS0901,RSPN-25 With GSC-6,GSL-1&DGS-1 | 15 | | |
| | | $F_6$ | GSL-1 xRSPN-28, GSL-1xRSPN-29 , DGS-1 x GSC-101, , RSPN-25 xRSPN-28 ,RSPN-25 x GSC-101. | 05 | | |
| Ludhiana | Seed yield | Fresh crosses | Fourteen crosses were made | 14 | | |
| | | Evaluation | Few entries with promising seed and oil yield viz. ACN-3, EC-609308, EC-609310, OCN-6 and RR-009 was observed with higher yield than check variety GSC-7 were selected for further evaluation. | 200 | | |
| **Crop: Karan rai** | | | | | | |
| Ludhiana | Seed yield | Fresh crosses | Single plant selections of desired carinata types viz., PDC-4-2, PDC-59-1, PDC-8-1, PDC-81-1 and PDC-91-2 were crossed with PC-6 | 12 | | |

**Table 2.1.3 Evaluation of advanced breeding lines at different centres.**

| Centre | Name of trials | No. of trials | No. of strains tested | Name of best strain excelling the check | Yield (kg/ha) | Check | Superiority over the check (%) | Specific objective |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Crop: Toria** | | | | | | | | |
| Kanpur | PYT (set I) | 01 | 15 | TKM 17-104 | 1540 | Tapeshwari (1309 Kg/ha). | | High seed yield |
| | | | | TKM 17-113 | 1463 | | | |
| | | | | TKM 17-105 | 1425 | | | |
| | | | | TKM 17-106 | 1425 | | | |
| | PYT (set II) | 01 | 15 | TKM 18-109 | 1810 | Tapeshwari (1309 Kg/ha) | | High seed yield |
| | | | | TKM 18-102 | 1733 | | | |
| | | | | TKM 18-103 | 1733 | | | |
| | SVT | 01 | 10 | TKM 15-1 | 1656 | Tapeshwhwari (1309 Kg/ha). | | High seed yield |
| | | | | TKM 17-1 | 1540 | | | |
| Chatha | Station trial | 01 | 7 | | | | | -- |
| Ludhiana | MLT | 01 | 05 | ST-2 andd ST-3 | | TL-17 | | Seed yield |
| Dholi | CSVT | 01 | 07 | RAUDT-14-09 | | Tapeshwari,PT-303,Bhawani,RAUTS-17 | | Toria –Irrigated |
| | | | | RAUDT-14-04 | | | | Toria –Irrigated |
| **Crop: Yellow Sarson** | | | | | | | | |
| Dholi | CSVT | 01 | 7 | RAUDYS-14-09 | | Pitambari, YSH-0401, NRCYS -05-02 & Swarna | | Yellow Sarson – Irrigated |
| | | | | RAUDYS-14-15 | | | | Yellow Sarson – Irrigated |
| Kanpur | PYT (Set I) | 01 | 15 | YSKM 17-106 | 1848 | Pitambari (1540 Kg/ha) | | Early maturity, high seed yield |
| | | | | YSKM 17-104 | 1810 | | | |
| | | | | YSKM 17-103 | 1733 | | | |
| | PYT (Set II) | 01 | 15 | YSKM 18-113 | 1810 | Pitambri (1540 Kg/ha) | | Early maturity, high seed yield |
| | | | | YSKM 18-102, | 1771 | | | |
| | SVT | 01 | 10 | YSKM 18-1 | 1887 | Pitambari (1540 Kg/ha) | | Early maturity, hig seed yield |
| | | | | YSKM 15-2 | 1810 | | | |

| **Crop: Indian Mustard** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Chatha | Station trial | 01 | 27 | | | | | |
| Hisar | FYT | 01 | 232 | | | RH 0749, RH 30, PM 26 and RVM 2 | | Seed yield and its component characters |
| | LST | 04 | | | | | | |
| | SST | 9 | | | | | | |
| Ludhiana | FYT-1 | 2 | 50 | RL-1637, RL-1486, RL-1626, RL-1627, RL-1442 | | PBR-97, RH-725, PBR-357, Giriraj | | Seed yield and oil content |
| | FYT-2 | 01 | 05 | PBR-235 and PBR-231 | | Giriraj | | Seed yield and oil content |
| | MLT | 03 | 10 | Giriraj and PBR-357 | | PHR-3328, PHR-126 , PBR-385 | | Timely sown |
| | MLT | 3 | 6 | RLM-619 | | PBR 422 and PBR 385 | -- | Late sown |
| | MLT | 02 | 6 | RH-725 | | PBR-450, PBR-561, PBR-385 and PBR-552 | | Rainfed |
| | | | | | | | | |
| Kanpur | PYT (Set I) | 01 | 15 | KMR (E) 17-110 | 1848 | Kanti (1540 kg/ha) | | Extra Early Sown |
| | | | | KMR (E) 17-113 | 1810 | | | |
| | | | | KMR (E) 17-101 | 1771 | | | |
| | PYT (Set II) | 01 | 15 | KMR (E) 18-101 | 1810 | Kanti (1540 kg/ha) | | Extra early sown |
| | | | | KMR (E) 18-110 | 1810 | | | |
| | | | | KMR (E) 18-102 | 1771 | | | |
| | | | | KMR (E) 18-107 | 1640 | | | |
| | SVT | 01 | 10 | KMR (E) 18-1, | 1810 | Kanti (1540 kg/ha) | | Extra early sown |
| | | | | KMR (E) 17-1 | 177 | | | |
| | | | | KMR (E) 15-2 | 1733 | | | |
| | PYT (Set I) | 01 | 13 | KMR 17-405 | 2772 | Maya (2387 | | Normal sown |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | KMR 17-404 | 2567 | kg/ha) | | |
| | | | | KMR 17-408 | 2541 | | | |
| | | | | KMR 17-402 | 2515 | | | |
| | PYT (Set II) | 01 | 13 | KMR 18-403 | 2669 | Maya (2387 kg/ha) | | Normal sown |
| | | | | KMR 18-401 | 2567 | | | |
| | | | | KMR 18-404 | 2567 | | | |
| | | | | KMR 18-406 | 2567 | | | |
| | SVT | 01 | 09 | KMR 16-3 | 2764 | Maya (2387 Kg/ha) | | Normal sown |
| | | | | KMR 18-3 | 2592 | | | |
| | | | | KMR 18-4 16-1 | 2567 | | | |
| | PYT (Set I) | 01 | 12 | KMR (LS) 17-404 , | 1951 | Vardan (1591 Kg/ha) | | Late sown |
| | | | | KMR (LS) 17-401 | 1925 | | | |
| | | | | KMR (LS) 17-406 | 1925 | | | |
| | | | | KMR (LS) 17-402 | 1892 | | | |
| | PYT (Set II) | 01 | 12 | KMR(LS) 18-309 | 1810 | Vardan (1591 Kg/ha). | | Late sown |
| | | | | | | | | |
| | | | | KMR (LS) 18-303 | 1744 | | | |
| | | | | KMR (LS) 18-308 | 1719 | | | |
| | SVT | 01 | 8 | KMR (LS) 15-5 | 2002 | Vardan (1591 Kg/ha) | | Late sown |
| | | | | , KMR (LS) 15-6 | 1976 | | | |
| | | | | KMR (LS) 15-6 | 1976 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | KMR (LS) 16-5 | 1925 | | | |
| Dholi | CSVT | 01 | 7 | RAURD-214 | | PM-25, Pusa Mahak, Kranti, | | Indian mustard-Irrigated |
| | | | | RAURD-14-18 | | Varuna & RGN-73 | | Indian mustard-Irrigated |
| Varanasi | Station Trail I | 1 | 24 | HUJM-18 – 7 | 2546.94 | Giriraj and RH-749 | 14.02%, | Timely Sown |
| | | | | HUJM-18 - 9 | 2512.54 | | 12.48% | |
| | | | | HUJM-18 – 8 | 2382.81 | | 6.67% | |
| | Station Trail II | 1 | 24 | HUJM-18 - 9 | 2377.03 | RH-749 and NRCHB-101 | 44.25%, | Late Sown |
| | | | | HUJM-18 – 7 | 2360.32 | | 43.23% | |
| | | | | HUJM-18 – 18 | 2135.23 | | 17.21% | |
| | PVT-I | I | 31 | Kranti x RH-406 | 3748.54 | NRCHB-101, Giriraj, RH-406 and RH-749 | 190.8% | Seed yield |
| | | | | Kranti x PM-30 | 3165.81 | | 29.6% | |
| | | | | Kranti x Sej-2 | 3165.76 | | 68.7% | |
| | PVT-II | I | 56 | Maya x Jatai Rai | 3875.00 | RH-749, Giriraj, RH-406 and NRCHB-101 | | Seed yield |
| | | | | Ashirwad x NDRE-4 | 3629.63 | | | |
| | | | | Maya x RH-781 | 6360.36 | | | |
| | PVT-III | I | 41 | NPJ-112 x RH-8813 | 2603.70 | RH-749, Giriraj, RH-406 and NRCHB-101 | | Seed yield |
| | | | | Sej-2 x HUJM-9903 | 2175.93 | | | |
| | | | | NDRE-4 x Kranti | 2035.22 | | | |
| | PVT-IV | I | 18 | NPJ-112 X LP | 2454.11 | RH-749, Giriraj, RH-406 and NRCHB-101 | | Seed yield |
| | | | | MCN-10-11 X HUJM-9903 | 2192.59 | | | |
| | | | | NPJ-112 X Kranti | 2095.24 | | | |
| | PVT-V | I | 18 | NRCH-803-1-2-1 | 2517.21 | RH-749, Giriraj, RH-406 and NRCHB-101 | | |
| | | | | HUJM-08-18-1-1-1 | 1829.87 | | | |
| | | | | HUJM-08-16-1-1 | 1760.35 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sriganganagar | Station trial | 03 | 22 | RGN-462, RGN-470 and RGN-474,and RGN-746 | | | | Timely sown irrigated |
| | | | | RGN-464 and RGN-4472 | | | | Timely sown rainfed |
| | | | | RGN-464 and RGN-472 | | | | late sown irrigated |
| **Crop: Gobhi sarson** | | | | | | | | |
| Hisar | LST | 01 | 10 | | | | | Seed yield and its component characters |
| Chatha | Station trial | 01 | 12 | | | | | -- |
| Ludhiana | | | | | | | | |
| **Crop: Karan rai** | | | | | | | | |
| Ludhiana | Advanced Yield Trial | 01 | 11 | MCB-1-2-3-2-4 and MCB 1-1-5-1 | | PC-6 | | Seed yield and oil content |
| | | | | | | | | |

**Table 2.2. Breeder Seed Production of indented Rapeseed-mustard varieties during 2018-19**

| S. No | State | Producing centre | Crop | Name of variety | Year of notification | DAC indent (q) | Actual allocation as per BSP-1 target(q) | Actual Production (q) | Production surplus(+)/Deficit (-) over BSB-1 Target |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Assam | AAU, Shillongani | Toria | M -27 | 1978 | 0.50 | 0.50 | 2.00 | 1.50 |
| 2 | Assam | AAU, Shillongani | Toria | TS-36 | | 7.00 | 7.00 | 2.35 | -4.65 |
| 3 | Chhattisgarh | IGKVV Jagdalpur | Indian mustard | Chhattisgarh Sarson | 2010 | 5.00 | 5.00 | 5.10 | 0.10 |
| 4 | H.P. | Kangra | Gobhi sarson | HPN-1 (Sheetal) | 1995 | 0.05 | 0.05 | 0.05 | 0.00 |
| 5 | H.P. | Kangra | Indian mustard | RCC - 4 | 2001 | 0.05 | 0.05 | 0.05 | 0.00 |
| 6 | Haryana | CCS HAU Bawal | Indian mustard | RB-50 | 2009 | 0.05 | 0.05 | 1.00 | 0.95 |
| 7 | Haryana | CCS HAU Hisar | Indian mustard | RH 30 | 1983 | 2.52 | 2.52 | 10.20 | 7.68 |
| 8 | Haryana | CCS HAU Hisar | Indian mustard | Laxmi (RH-8812) | 1996 | 2.13 | 2.13 | 9.98 | 7.85 |
| 9 | Haryana | CCS HAU Hisar | Indian mustard | RH 406 | 2013 | 1.60 | 1.60 | 6.83 | 5.23 |
| 10 | Haryana | CCS HAU Hisar | Indian mustard | RH 0749 | 2013 | 1.76 | 1.76 | 4.89 | 3.13 |
| 11 | Haryana | CCS HAU Hisar | Yellow Sarson | YSH 0401 | 2009 | 0.85 | 0.85 | 1.77 | 0.92 |
| 12 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Double Zero Mustard-31 (PDZ-1) | 2016 | 0.65 | 0.65 | 2.00 | 1.35 |
| 13 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Bold | 1984 | 2.56 | 2.56 | 5.10 | 2.54 |
| 14 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Jaikisan (Bio-902) | 1993 | 0.79 | 0.79 | 2.00 | 1.21 |
| 15 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Mustard-24 (LET-18) | 2009 | 2.00 | 2.00 | 3.15 | 1.15 |
| 16 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Mustard-25 (NPJ112) | 2010 | 2.65 | 2.65 | 3.60 | 0.95 |
| 17 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Mustard-26 (NPJ113) | 2011 | 1.60 | 1.60 | 5.40 | 3.80 |
| 18 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Mustard-27 (EJ17) | 2011 | 3.95 | 3.95 | 4.00 | 0.05 |
| 19 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Mustard 28 (NPJ124) | 2012 | 2.45 | 2.45 | 4.00 | 1.55 |
| 20 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Mustard-30 (LES-43) | 2013 | 6.40 | 6.40 | 6.40 | 0.00 |
| 21 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Mahak (JD-6) | 2004 | 3.05 | 3.05 | 3.15 | 0.10 |
| 22 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Vijay (NPJ 93) | 2008 | 2.20 | 2.20 | 2.25 | 0.05 |
| 23 | Haryana | IARI, RS, Karnal | Indian mustard | Pusa Agrani (SEJ-2) | 1998 | 0.30 | 0.30 | 1.16 | 0.86 |
| 24 | Madhya Pradesh | ZARS, Morena | Indian mustard | Jawahar Mustard-3 (JMM-915) | 2005 | 2.00 | 2.00 | 1.08 | -0.92 |
| 25 | Madhya Pradesh | ZARS, Morena | Indian mustard | Raj Vijay Mustard-2 (JMWR08-3) (RVM2) | 2013 | 0.55 | 0.55 | 5.40 | 4.85 |
| 26 | Orissa | OUAT Bhubaneswar | Toria | Anuradha (ORT-M6-2) | 2002 | 0.50 | 0.50 | 0.53 | 0.03 |
| 27 | Orissa | OUAT Bhubaneswar | Toria | Sushree | 2015 | 2.00 | 2.00 | 1.52 | -0.48 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 28 | Punjab | PAU, Ludhiana | Indian mustard | PBR- 357 | 2013 | 0.05 | 0.05 | 0.40 | 0.35 |
| 29 | Punjab | PAU, Ludhiana | Indian mustard | RLC-3 | 2016 | 0.05 | 0.05 | 0.50 | 0.45 |
| 30 | Punjab | PAU, Ludhiana | Indian mustard | PBR-91 | 1996 | 0.05 | 0.05 | 0.50 | 0.45 |
| 31 | Punjab | PAU, Ludhiana | Indian mustard | RLM-619 | 1985 | 0.02 | 0.02 | 1.00 | 0.98 |
| 32 | Punjab | PAU, Ludhiana | Toria | TL-17 | 2016 | 0.03 | 0.03 | 1.00 | 0.97 |
| 33 | Punjab | PAU, Ludhiana | Toria | TL-15 | 1982 | 0.05 | 0.05 | 1.00 | 0.95 |
| 34 | Punjab | PAU, Ludhiana | Gobhi sarson | GSC-6 | | 0.05 | 0.05 | 1.00 | 0.95 |
| 35 | Punjab | PAU, Ludhiana | Gobhi sarson | GSC-7 | | 0.05 | 0.05 | 1.00 | 0.95 |
| 36 | Rajasthan | DRMR, Bharatpur | Indian mustard | Giriraj (DRMRIJ 31) | 2013 | 5.80 | 5.80 | 17.14 | 11.34 |
| 37 | Rajasthan | DRMR, Bharatpur | Indian mustard | NRCDR 2 | 2007 | 0.02 | 0.02 | 1.27 | 1.25 |
| 38 | Rajasthan | DRMR, Bharatpur | Indian mustard | NRCHB 101 | 2009 | 3.40 | 3.40 | 5.61 | 2.21 |
| 39 | Rajasthan | DRMR, Bharatpur | Yellow sarson | NRCYS 05-02 | 2009 | 0.20 | 0.20 | 0.60 | 0.40 |
| 40 | Rajasthan | SK RAU, Sriganganagar | Indian mustard | RGN 48 | 2006 | 0.04 | 0.04 | 0.52 | 0.48 |
| 41 | Rajasthan | SK RAU, Sriganganagar | Indian mustard | RGN-229 | 2013 | 0.02 | 0.02 | 1.76 | 1.74 |
| 42 | Rajasthan | SK RAU, Sriganganagar | Indian mustard | RGN-298 | 2014 | 0.50 | 0.50 | 1.45 | 0.95 |
| 43 | Rajasthan | SK NAU, Jobner | Taramira | RTM-1351 | 2018 | 0.04 | 0.04 | 0.30 | 0.26 |
| 44 | Rajasthan | SK NAU, Jobner | Taramira | RTM-1355 (Jwala Tara) | 2017 | 1.04 | 1.04 | 0.80 | -0.24 |
| 45 | Uttar Pradesh | CSAUA&T Kanpur | Indian mustard | Rohini | 1986 | 1.24 | 1.24 | 8.94 | 7.70 |
| 46 | Uttar Pradesh | CSAUA&T Kanpur | Indian mustard | Varuna | 1975 | 1.77 | 1.77 | 17.40 | 15.63 |
| 47 | Uttar Pradesh | CSAUA&T Kanpur | Toria | Bhawani | 1986 | 0.55 | 0.55 | 1.28 | 0.73 |
| 48 | Uttar Pradesh | CSAUA&T Kanpur | Toria | TYPE-9 | 1978 | 0.02 | 0.02 | 4.94 | 4.92 |
| 49 | Uttar Pradesh | CSAUA&T Kanpur | Toria | Tapeshvari TK 06-1 | 2014 | 0.20 | 0.20 | 2.25 | 2.05 |
| 50 | Uttar Pradesh | CSAUA&T Kanpur | Yellow sarson | Pitambari (RYSK-05-02) | 2010 | 1.42 | 1.42 | 16.15 | 14.73 |
| 51 | Uttarakhand | GBPUAT, Pantnagar | Indian mustard | Kranti (PR-15) | 1983 | 0.11 | 0.11 | 3.00 | 2.89 |
| 52 | Uttarakhand | GBPUAT, Pantnagar | Indian mustard | Pant Rai-19 | 2012 | 0.20 | 0.20 | 5.00 | 4.80 |
| 53 | Uttarakhand | GBPUAT, Pantnagar | Toria | PT-303 | 1985 | 0.39 | 0.39 | 13.00 | 12.61 |
| 54 | Uttarakhand | GBPUAT, Pantnagar | Yellow sarson | Pant Pili Sarson -1 | 2010 | 1.82 | 1.82 | 33.50 | 31.68 |
| 55 | Uttarakhand | GBPUAT, Pantnagar | Yellow sarson | Pant Sweta (PYS 2007-10) | 2017 | 0.05 | 0.05 | 3.85 | 3.80 |
| 56 | Uttarakhand | GBPUAT, Pantnagar | Toria | Uttara (PT-2002-25) | 2010 | 5.22 | 5.22 | 10.00 | 4.78 |
| 57 | West Bengal | PORS, Berhampore | Toria | Agrani (B-54) | 1982 | 0.82 | 0.82 | 0.90 | 0.08 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 58 | West Bengal | PORS, Berhampore | Toria | Panchali (TWC-3) | 1988 | 0.11 | 0.11 | 0.00 | -0.11 |
| 59 | West Bengal | PORS, Berhampore | Yellow sarson | Jhumka (YSBNC-1) | 1992 | 0.15 | 0.15 | 0.00 | -0.15 |
| 60 | West Bengal | PORS, Berhampore | Yellow sarson | Benoy (B 9) | 1980 | 4.07 | 4.07 | 4.60 | 0.53 |
| 61 | Jharkhand | BAU, Kanke, Ranchi | Indian mustard | BAUR 9502 (SHIVANI) | 2005 | 0.05 | 0.05 | 0.70 | 0.65 |
| | **Total** | | | | | **84.76** | **84.76** | **256.32** | **171.61** |

*Not reported

## Additional Breeder Seed Produced

| S. No. | State | Crop | Name of variety | Actual Production (q) |
|---|---|---|---|---|
| | **Gujarat** | | | |
| 1. | SDAU SK Nagar | Indian mustard | GM 1 | 0.50 |
| 2. | | | GM 2 | 0.60 |
| 3. | | | GM 3 | 0.60 |
| 4. | | | GDM 4 | 1.00 |
| 5. | | | GDM 5 | 0.50 |
| | **New Delhi** | | | |
| 6. | IARI, New Delhi | | Pusa Tarak | 2.00 |
| | **Uttar Pradesh** | | | |
| 7. | CSAUA&T Kanpur | Indian mustard | Vardan | 17.40 |
| 8. | | | Vaibhav | 1.81 |
| 9. | | | Urvashi | 6.20 |
| 10. | | | Basanti | 5.84 |
| 11 | | | Maya | 8.50 |
| 12. | | | Kanti | 16.70 |
| 13. | | | Ashirwad | 3.80 |
| | | | | |
| | **M.P.** | | | |
| 14. | ZARS, Morena | Indian mustard | RVM-1 | 3.40 |
| 15. | | Toria | RVT-1 | 5.48 |
| | **Rajasthan** | | | |
| | | | | |
| 16. | ZRS, Shri Ganganagar | Indian mustard | RGN-73 | 0.88 |
| 17. | | | RGN-236 | 2.37 |
| | **Total** | | | **77.58** |

**Coordinated Trials**

Performance of 158 strains including 10 of toria, 05 of yellow sarson and 132 of Indian mustard, 10 of gobhi sarson and 01 of taramira was tested in thirty five performance evaluation trials consisting of toria (03), yellow sarson (02), gobhi sarson (02), taramira (01) and Indian mustard (27) at 46 locations across the 6 agro-climatic zones of the country. On the basis of superiority for seed/oil yield/ earliness/quality over the best check, 32 strains comprising toria (01), gobhi sarson (07) and Indian mustard (24) were promoted for advanced stage evaluation.

| Trial | NC | ZC | LR |
|---|---|---|---|
| **Toria** | PT 303 | Bhawani, Panchali, Gulchin | Tapeswari |
| **Yellow sarson** | YSH 401 | NRCYS 05-2 | Pitambari |
| **Indian mustard** | | | |
| Early mustard | Pusa Mustard 25 | JD 6, PM 27, NRCHB 101 | Pusa Mustard 27, Pusa Mustard 28, NRCHB 101 |
| Hybrid early sown | Pusa Mustard 25 | JD 6, PRO5111 | PM 28, PM 27, NRCHB 101 |
| Timely sown irrigated | Kranti | RL 1359, Maya, BIO 902, RCC 4, RH 749 | RH 0749, RGN 73, GDM 4, Giriraj |
| Rainfed | Kranti | RGN 229, Pusa Bold, RGN 48 | DRMR 150-35, NRCHB 101, RH 725 |
| Late sown | Kranti | Pusa Bold, PM 26, NRCHB 101 | JD 6, Raj Vijay Mustard 2, CS 56 |
| Hybrid | Kranti | RGN 73, RH 749 | DMH 1, NRCHB 506 |
| Quality | Kranti | RGN 73, RH 749 | Pusa Mustard 29, Pusa Mustard 30, RLC 2, PM 31 |
| Salinity | Kranti | RH 749 | CS 54, Giriraj, CS 58, CS 60 |
| Gobhi Sarson | Kranti | GSL 1 | GSC 6 |
| Taramira | T 27 | RTM 314 | RTM 1351 |

## Table 2.3.1a. Performance of toria strains in IVT Zone-III

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | Plant Stand | | | | Days to Maturity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | DOL | Mean | MOR | PNT | KPR | DOL | MOR | PNT | KPR | DOL |
| | | | 1 | 2 | 3 | 4 | (1-4) | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1 | TCN-18-1 | PT- 303 (NC) | 2247 | 1772 | 1466 | 1315 | **1700** | 173 | 136 | 125 | 160 | 118 | 97 | 94 | 87 |
| 2 | TCN-18-2 | TKM 18-2 | 2531 | 1379 | 1312 | 1858 | **1770** | 174 | 150 | 119 | 163 | 117 | 97 | 95 | 94 |
| 3 | TCN-18-3 | RMT 10-15 | 2735 | 1536 | 1350 | 1654 | **1819** | 171 | 122 | 122 | 160 | 122 | 97 | 93 | 97 |
| 4 | TCN-18-4 | JT- 90-1 | 1908 | 1327 | 1273 | 753 | **1315** | 174 | 112 | 118 | 160 | 123 | 95 | 92 | 89 |
| 5 | TCN-18-5 | CAU- Toria 1 | 2389 | 1278 | 1273 | 1290 | **1557** | 166 | 138 | 116 | 156 | 114 | 94 | 95 | 96 |
| 6 | TCN-18-6 | TKM 18-1 | 2587 | 1686 | 1312 | 1759 | **1836** | 173 | 122 | 119 | 163 | 119 | 95 | 95 | 93 |
| 7 | TCN-18-7 | Bhawani (ZC) | 1772 | 1333 | 1350 | 1235 | **1422** | 174 | 124 | 123 | 160 | 114 | 84 | 91 | 87 |
| **8** | **TCN-18-8** | **Tapeswari (LR)** | **2519** | **1609** | **1389** | **1481** | **1750** | **173** | **146** | **124** | **160** | **116** | **96** | **92** | **96** |
| 9 | TCN-18-9 | PT- 2015-10 | 2568 | 1526 | 1273 | 1704 | **1768** | 172 | 130 | 113 | 160 | 119 | 96 | 97 | 95 |
| 10 | TCN-18-10 | PT- 2013-7 | 2327 | 1683 | 1041 | 1287 | **1585** | 174 | 128 | 113 | 158 | 121 | 96 | 96 | 94 |
| | | GM | 2358 | 1513 | 1304 | 1434 | | | | | | | | | |
| | | CD (5 %) | 382 | 189 | 80 | 211 | | | | | | | | | |
| | | CV (%) | 9.7 | 7.5 | 8.5 | 8.8 | | | | | | | | | |
| | | DOS | 08.10.2018 | 5.10.2018 | 30.9.2018 | 26.9.2018 | | | | | | | | | |

## Table 2.3.1b. Performance of toria strains in IVT Zone-III

| S.No. | Code | Strain | 1000-Seed Wt. (g) | | | | Oil Content (%) | | | | Mean | Oil Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | DOL | MOR | PNT | KPR | DOL | | |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-4) | (1-4) |
| 1 | TCN-18-1 | PT- 303 (NC) | 3.9 | 2.5 | 4.3 | 3.1 | 43.4 | 42.1 | 43.4 | 42.2 | **42.8** | **727** |
| 2 | TCN-18-2 | TKM 18-2 | 3.7 | 2.5 | 4.3 | 3.0 | 43.2 | 42.0 | 43.5 | 42.2 | **42.7** | **756** |
| 3 | TCN-18-3 | RMT 10-15 | 4.1 | 2.5 | 4.4 | 3.3 | 43.0 | 42.4 | 43.7 | 42.4 | **42.8** | **779** |
| 4 | TCN-18-4 | JT- 90-1 | 3.7 | 2.4 | 4.3 | 2.8 | 43.4 | 41.7 | 42.7 | 42.8 | **42.6** | **561** |
| 5 | TCN-18-5 | CAU- Toria 1 | 4.5 | 2.7 | 4.0 | 3.7 | 43.0 | 42.1 | 43.2 | 42.3 | **42.6** | **664** |
| **6** | TCN-18-6 | TKM 18-1 | 4.0 | 2.4 | 3.8 | 2.9 | 42.3 | 42.3 | 43.2 | 42.4 | **42.6** | **781** |
| 7 | TCN-18-7 | Bhawani (ZC) | 3.7 | 2.5 | 4.2 | 2.8 | 43.4 | 41.7 | 42.0 | 42.0 | **42.3** | **601** |
| **8** | **TCN-18-8** | **Tapeswari (LR)** | **4.0** | **2.6** | **4.0** | **3.3** | **43.4** | **42.6** | **43.1** | **42.0** | **42.8** | **748** |
| 9 | TCN-18-9 | PT- 2015-10 | 4.3 | 2.8 | 3.8 | 3.4 | 43.2 | 42.5 | 43.4 | 41.2 | **42.6** | **752** |
| 10 | TCN-18-10 | PT- 2013-7 | 4.2 | 2.6 | 3.8 | 3.0 | 43.6 | 41.2 | 43.5 | 40.8 | **42.3** | **670** |

## Table 2.3.2a. Performance of toria strains in IVT Zone-V

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | | | Plant Stand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BHU | JAG | IMP | SHL | KNK | KLN | Mean | BHU | JAG | IMP | SHL | KNK | KLN |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | (2-5) | 1 | 2 | 3 | 4 | 5 | 6 |
| **1** | **TCN-18-1** | **PT- 303 (NC)** | **730** | **702** | **2962** | **639** | **1047** | **1326** | **1338** | **124** | **125** | **171** | **189** | **193** | **135** |
| 2 | TCN-18-2 | TKM 18-2 | 672 | 664 | 2186 | 694 | 1007 | 1341 | **1138** | 121 | 162 | 186 | 184 | 201 | 143 |
| 3 | TCN-18-3 | RMT 10-15 | 679 | 1108 | 1529 | 711 | 930 | 1133 | **1069** | 128 | 136 | 174 | 179 | 207 | 134 |
| 4 | TCN-18-4 | JT- 90-1 | 464 | 648 | 2915 | 700 | 875 | 1244 | **1284** | 120 | 120 | 179 | 197 | 187 | 131 |
| 5 | TCN-18-5 | CAU- Toria 1 | 669 | 649 | 2985 | 944 | 729 | 1496 | **1327** | 121 | 122 | 181 | 198 | 192 | 142 |
| 6 | TCN-18-6 | TKM 18-1 | 672 | 710 | 1999 | 672 | 981 | 1394 | **1090** | 124 | 113 | 177 | 185 | 200 | 136 |
| 7 | TCN-18-7 | Bhawani (ZC) | 431 | 710 | 2304 | 433 | 775 | 1041 | **1055** | 124 | 114 | 172 | 180 | 194 | 133 |
| **8** | TCN-18-8 | Tapeswari (LR) | 746 | 591 | 1803 | 617 | 1051 | 1341 | **1015** | 125 | 130 | 171 | 189 | 194 | 134 |
| 9 | TCN-18-9 | PT- 2015-10 | 661 | 922 | 2127 | 833 | 1114 | 1267 | **1249** | 123 | 143 | 184 | 187 | 204 | 138 |
| **10** | TCN-18-10 | PT- 2013-7 | 472 | 1023 | 2486 | 706 | 1077 | 1373 | **1323** | 127 | 133 | 176 | 185 | 196 | 141 |
| | | GM | 620 | 773 | 2330 | 695 | 958 | 1296 | | | | | | | |
| | | CD 5% | 123 | 186 | 403 | 112 | 167 | 242 | | | | | | | |
| | | CV (%) | 12.2 | 14.4 | 10.8 | 9.6 | 10.1 | 11.2 | | | | | | | |
| | | DOS | 25.11.2018 | 24.10.2018 | 29.10.2018 | 24.10.2018 | 28.9.2018 | 2.11.2018 | | | | | | | |

# data of BHU and KLN excluded from computation of mean due to inappropriate date of sowing

## Table 2.3.2b. Performance of toria strains in IVT, Zone-V

| S.No. | Code | Strain | Days to Maturity | | | | | | 1000-Seed Wt. (g.) | | | | | | Oil Content % | | | Oil Yield (kg/ha.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BHU | JAG | IMP | SHL | KNK | KLN | BHU | JAG | IMP | SHL | KNK | KLN | IMP | KNK | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | 3 | 5 | (3,5) | (2-5) |
| 1 | TCN-18-1 | PT- 303 (NC) | 81 | 106 | 114 | 84 | 86 | 103 | 3.9 | 4.1 | 3.5 | 4.1 | 2.8 | 2.4 | 40.9 | 42.6 | **41.7** | **558** |
| 2 | TCN-18-2 | TKM 18-2 | 83 | 105 | 113 | 86 | 90 | 102 | 4.1 | 2.9 | 3.5 | 4.1 | 3.1 | 2.7 | 40.6 | 42.4 | **41.5** | **472** |
| 3 | TCN-18-3 | RMT 10-15 | 86 | 102 | 114 | 86 | 92 | 102 | 3.5 | 2.9 | 4.7 | 2.9 | 3.2 | 2.2 | 40.9 | 42.5 | **41.7** | **446** |
| 4 | TCN-18-4 | JT- 90-1 | 80 | 106 | 112 | 85 | 86 | 105 | 3.1 | 3.1 | 3.2 | 3.1 | 2.9 | 2.8 | 41.2 | 41.3 | **41.2** | **529** |
| 5 | TCN-18-5 | CAU- Toria 1 | 85 | 105 | 111 | 89 | 86 | 105 | 4.0 | 2.4 | 3.9 | 5.2 | 3.4 | 2.7 | 41.3 | 42.7 | **42.0** | **557** |
| 6 | TCN-18-6 | TKM 18-1 | 84 | 107 | 112 | 88 | 88 | 103 | 3.8 | 4.2 | 3.5 | 3.5 | 3.3 | 2.4 | 40.4 | 42.2 | **41.3** | **450** |
| 7 | TCN-18-7 | Bhawani (ZC) | 80 | 101 | 112 | 86 | 83 | 102 | 3.4 | 3.1 | 3.4 | 2.3 | 3.5 | 2.5 | 41.3 | 41.5 | **41.4** | **437** |
| 8 | TCN-18-8 | Tapeswari (LR) | 81 | 103 | 112 | 89 | 87 | 105 | 4.2 | 4.2 | 4.0 | 5.0 | 3.3 | 2.7 | 40.8 | 42.0 | **41.4** | **420** |
| 9 | TCN-18-9 | PT- 2015-10 | 83 | 107 | 112 | 85 | 89 | 105 | 3.5 | 3.7 | 3.9 | 4.5 | 3.2 | 2.3 | 39.7 | 41.9 | **40.8** | **509** |
| 10 | TCN-18-10 | PT- 2013-7 | 80 | 99 | 112 | 85 | 87 | 102 | 3.1 | 3.5 | 3.9 | 4.7 | 3.2 | 2.6 | 40.8 | 41.2 | **41.0** | **542** |

## Table 2.3.3a. Performance of toria strains in AVT-I Zone-V (rainfed)

| S. No. | Code | Strain | Seed Yield (kg/ha) | | | | | | | | Plant Stand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SHL$ | IMP | JAG | BHU# | KLN# | KNK | Mean | | SHL | IMP | JAG | BHU | KLN | KNK |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | (2-3,6) | | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | TCN 18-11 | Tapeswari | 431 | 1671 | 800 | 748 | 1361 | 1031 | **1168** | | 174 | 331 | 269 | 122 | 300 | 364 |
| 2 | TCN 18-12 | Filler 1 (PT- 303) | 396 | 1764 | 702 | 799 | 1343 | 706 | **1057** | | 189 | 337 | 287 | 122 | 306 | 363 |
| 3 | TCN 18-13 | RAUDT 14-09 | 502 | 1642 | 1032 | 844 | 1182 | 833 | **1169** | | 201 | 325 | 287 | 124 | 302 | 384 |
| **4** | **TCN 18-14** | **PT- 303 (NC)** | **506** | **2104** | **731** | **772** | **1216** | **830** | **1222** | | **198** | **329** | **244** | **118** | **313** | **371** |
| 5 | TCN 18-15 | Bhawani (ZC) | 356 | 1660 | 784 | 739 | 1164 | 717 | **1054** | | 175 | 342 | 292 | 116 | 302 | 370 |
| **6** | **TCN 18-16** | **TS- 38*** | **881** | **2614** | **812** | **735** | **1083** | **853** | **1426** | * | **190** | **336** | **251** | **121** | **315** | **376** |
| 7 | TCN 18-17 | Tapeswari (LR) | 729 | 1743 | 1019 | 646 | 1063 | 956 | **1239** | | 193 | 325 | 292 | 120 | 309 | 399 |
| | | GM | 543 | 1885 | 840 | 755 | 1202 | 847 | | | | | | | | |
| | | CD 5% | 133 | 287 | 97 | 88 | 210 | 181 | | | | | | | | |
| | | CV (%) | 16.8 | 11.0 | 7.9 | 8.6 | 12.0 | 14.4 | | | | | | | | |
| | | DOS | 28.10.2018 | 29.10.2018 | 24.10.2018 | 25.11.2018 | 2.11.2018 | 29.9.2018 | | | | | | | | |

* Repeat entry

$ data of SHL excluded from computation of mean due to low general mean than the state average

# data of BHU and KLN excluded from computation of mean due to inappropriate date of sowing

* Strain outyielding the best check by margin of > 10 % seed and oil yield

## Table 2.3.3b. Performance of toria strains in AVT-I Zone-V (rainfed)

| S.No. | Code | Strain | Days to Maturity | | | | | | 1000-Seed Wt. (g) | | | | | | | Oil Content (%) | | | Oil yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SHL | IMP | JAG | BHU | KLN | KNK | SHL | | IMP | JAG | BHU | KLN | KNK | IMP | KNK | Mean | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 1 | | 2 | 3 | 4 | 5 | 6 | 2 | 6 | (2,6) | (2-3,6) |
| 1 | TCN 18-11 | Tapeswari | 92 | 118 | 102 | 81 | 105 | 91 | 3.7 | | 3.7 | 4.8 | 3.9 | 3.1 | 3.6 | 41.0 | 42.3 | **41.6** | **486** |
| 2 | TCN 18-12 | Filler 1 (PT- 303) | 91 | 117 | 103 | 80 | 104 | 88 | 3.1 | | 3.5 | 4.0 | 4.1 | 3.6 | 3.1 | 41.1 | 41.8 | **41.4** | **438** |
| **3** | TCN 18-13 | RAUDT 14-09 | 94 | 117 | 107 | 84 | 104 | 91 | 2.7 | | 3.6 | 4.1 | 4.3 | 2.8 | 3.2 | 41.1 | 42.8 | **42.0** | **491** |
| **4** | **TCN 18-14** | **PT- 303 (NC)** | **95** | **116** | **110** | **80** | **106** | **89** | **3.5** | | **3.8** | **4.1** | **3.6** | **2.6** | **3.4** | **42.5** | **42.3** | **42.4** | **518** |
| 5 | TCN 18-15 | Bhawani (ZC) | 93 | 114 | 99 | 80 | 106 | 85 | 3.5 | | 3.8 | 4.2 | 3.4 | 3.3 | 3.5 | 41.1 | 42.3 | **41.7** | **440** |
| **6** | **TCN 18-16** | **TS- 38#** | **95** | **114** | **97** | **80** | **105** | **88** | **4.3** | | **3.5** | **4.3** | **3.7** | **3.3** | **3.3** | **42.7** | **42.4** | **42.6** | **607** |
| 7 | TCN 18-17 | Tapeswari (LR) | 95 | 117 | 101 | 83 | 104 | 89 | 3.5 | | 3.5 | 4.0 | 3.2 | 2.3 | 3.4 | 41.0 | 42.0 | **41.5** | **515** |

## Table 2.3.4a. Performance of yellow sarson strains in IVT Zone-III

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | Plant Stand | | | | Days to Maturity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | DOL | Mean | MOR | PNT | KPR | DOL | MOR | PNT | KPR | DOL |
| | | | 1 | 2 | 3 | 4 | (1-4) | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1 | YSCN-18-1 | PYS- 2016-15 | 3043 | 2069 | 1813 | 1444 | **2092** | 172 | 131 | 126 | 160 | 133 | 108 | 123 | 110 |
| 2 | YSCN-18-2 | YSKM 18-1 | 2747 | 1397 | 1428 | 1407 | **1745** | 170 | 118 | 121 | 159 | 134 | 100 | 120 | 105 |
| **3** | YSCN-18-3 | NYM- 283 | 3525 | 1922 | 1659 | 1426 | **2133** | 170 | 128 | 120 | 159 | 135 | 105 | 123 | 112 |
| **4** | **YSCN-18-4** | **NRCYS 05-02 (ZC)_** | **3432** | **2026** | **1698** | **2142** | **2325** | **167** | **134** | **121** | **160** | **134** | **102** | **122** | **111** |
| 5 | YSCN-18-5 | PYS- 2016-8 | 3124 | 2147 | 1736 | 2179 | **2296** | 167 | 123 | 121 | 162 | 135 | 106 | 120 | 113 |
| 6 | YSCN-18-6 | Pitambari (LR) | 3432 | 1714 | 1698 | 1488 | **2083** | 172 | 126 | 122 | 161 | 135 | 111 | 125 | 112 |
| 7 | YSCN-18-7 | YSKM 18-2 | 3408 | 1609 | 1621 | 1562 | **2050** | 171 | 134 | 121 | 163 | 135 | 109 | 118 | 114 |
| 8 | YSCN-18-8 | YSH- 0401 (NC) | 3815 | 1486 | 1891 | 1426 | **2155** | 171 | 117 | 130 | 159 | 136 | 110 | 120 | 112 |
| | | GM | 3316 | 1796 | 1693 | 1634 | | | | | | | | | |
| | | CD (5%) | 527 | 323 | 82 | 258 | | | | | | | | | |
| | | CV (%) | 9.4 | 10.6 | 6.7 | 9.3 | | | | | | | | | |
| | | DOS | 9.10.2018 | 18.10.2018 | 30.9.2018 | 26.9.2018 | | | | | | | | | |

## Table 2.3.4b. Performance of yellow sarson strains in IVT Zone-III

| S.No. | Code | Strain | 1000-Seed Wt. (g) | | | | Oil Content (%) | | | | | Oil yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | DOL | MOR | PNT | KPR | DOL | Mean | |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-4) | (1-4) |
| 1 | YSCN-18-1 | PYS- 2016-15 | 4.9 | 3.5 | 5.0 | 4.3 | 43.9 | 44.8 | 44.1 | 43.5 | **44.1** | **922** |
| 2 | YSCN-18-2 | YSKM 18-1 | 3.4 | 3.5 | 3.5 | 2.6 | 43.0 | 44.6 | 44.8 | 43.9 | **44.1** | **769** |
| **3** | YSCN-18-3 | NYM- 283 | 5.0 | 3.9 | 5.2 | 4.4 | 43.7 | 45.8 | 45.3 | 43.4 | **44.5** | **950** |
| **4** | **YSCN-18-4** | **NRCYS 05-02 (ZC)** | **5.0** | **3.9** | **4.2** | **3.3** | **45.2** | **45.0** | **45.2** | **43.9** | **44.8** | **1043** |
| 5 | YSCN-18-5 | PYS- 2016-8 | 4.9 | 3.7 | 5.1 | 4.0 | 44.9 | 45.1 | 45.3 | 43.1 | **44.6** | **1024** |
| 6 | YSCN-18-6 | Pitambari (LR) | 5.2 | 3.7 | 5.2 | 3.9 | 45.7 | 44.6 | 45.5 | 42.9 | **44.7** | **930** |
| 7 | YSCN-18-7 | YSKM 18-2 | 5.2 | 4.0 | 4.5 | 4.8 | 45.6 | 46.0 | 44.4 | 43.1 | **44.8** | **918** |
| 8 | YSCN-18-8 | YSH- 0401 (NC) | 5.4 | 3.9 | 4.7 | 4.3 | 45.2 | 44.6 | 45.3 | 43.0 | **44.5** | **969** |

## Table 2.3.5a. Performance of yellow sarson strains in IVT Zone -V

| S.No. | Code | Strain | Seed Yield (Kg/ ha) | | | | | | Plant Stand | | | | | Days to Maturity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IMP | KNK | KLN$ | BHU$ | SHL | Mean | IMP | KNK | KLN | BHU | SHL | IMP | KNK | KLN | BHU | SHL |
| | | | 1 | 2 | 3 | 4 | 5 | (1-2,5) | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| 1 | YSCN-18-1 | PYS- 2016-15 | 2918 | 677 | 1541 | 624 | 639 | **1411** | 165 | 194 | 121 | 125 | 184 | 118.7 | 110 | 101 | 88 | 105 |
| 2 | YSCN-18-2 | YSKM 18-1 | 2309 | 831 | 1674 | 521 | 1011 | **1384** | 165 | 196 | 115 | 115 | 179 | 112.3 | 108 | 98 | 89 | 105 |
| **3** | YSCN-18-3 | NYM- 283 | 2244 | 776 | 1737 | 615 | 750 | **1257** | 164 | 201 | 131 | 128 | 197 | 118.7 | 109 | 104 | 86 | 105 |
| 4 | YSCN-18-4 | NRCYS 05-02 (ZC) | 2185 | 653 | 1859 | 527 | 744 | **1194** | 179 | 190 | 128 | 118 | 198 | 115.7 | 105 | 104 | 88 | 108 |
| 5 | YSCN-18-5 | PYS- 2016-8 | 3298 | 866 | 1974 | 606 | 789 | **1651** | 172 | 205 | 130 | 122 | 185 | 118 | 112 | 107 | 85 | 108 |
| **6** | **YSCN-18-6** | **Pitambari (LR)** | **3376** | **762** | **1915** | **616** | **772** | **1637** | **165** | **202** | **126** | **127** | **180** | **119.7** | **107** | **106** | **88** | **108** |
| 7 | YSCN-18-7 | YSKM 18-2 | 3263 | 748 | 1989 | 701 | 839 | **1617** | 179 | 197 | 133 | 124 | 189 | 119.7 | 106 | 105 | 87 | 110 |
| 8 | YSCN-18-8 | YSH- 0401 (NC) | 3053 | 736 | 1537 | 698 | 911 | **1567** | 181 | 192 | 122 | 125 | 187 | 118.3 | 105 | 108 | 88 | 110 |
| | | GM | 2831 | 756 | 1778 | 614 | 807 | | | | | | | | | | | |
| | | CD (5%) | 551 | 121 | 275 | 94 | 136 | | | | | | | | | | | |
| | | CV (%) | 11.6 | 9.7 | 9.1 | 9.1 | 10.0 | | | | | | | | | | | |
| | | DOS | 29.10.2018 | 10.10.2018 | 7.11.2018 | 28.11.2018 | 28.10.2018 | | | | | | | | | | | |

$ data of KLN and BHU excluded from computation of mean due to inappropriate date of sowing

## Table 2.3.5b. Performance of yellow sarson strains in IVT Zone -V

| S.No. | Code | Strain | 1000 Seed Wt. (g) | | | | | Oil Content (%) | | | Oil Yield (kg/ha.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IMP | KNK | KLN | BHU | SHL | IMP | KNK | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | (1-2) | (1-2,5) |
| 1 | YSCN-18-1 | PYS- 2016-15 | 3.5 | 3.1 | 3.9 | 3.3 | 4.0 | 43.5 | 32.3 | **37.9** | **535** |
| 2 | YSCN-18-2 | YSKM 18-1 | 3.3 | 3.5 | 3.7 | 3.2 | 3.5 | 45.8 | 39.2 | **42.5** | **588** |
| **3** | YSCN-18-3 | NYM- 283 | 3.6 | 3.3 | 4.3 | 3.1 | 4.1 | 45.2 | **35.8** | **40.5** | **509** |
| 4 | YSCN-18-4 | NRCYS 05-02 (ZC) | 3.9 | 2.9 | 3.6 | 3.1 | 4.3 | 43.8 | 39.6 | **41.7** | **498** |
| 5 | YSCN-18-5 | PYS- 2016-8 | 4.1 | 3.6 | 3.6 | 3.4 | 3.7 | 43.3 | 39.4 | **41.3** | **682** |
| **6** | **YSCN-18-6** | **Pitambari (LR)** | **3.5** | **3.4** | **3.7** | **3.4** | **4.3** | **43.9** | **36.7** | **40.3** | **660** |
| 7 | YSCN-18-7 | YSKM 18-2 | 4.0 | 3.3 | 4.0 | 3.8 | 4.9 | 43.2 | 34.1 | **38.6** | **624** |
| 8 | YSCN-18-8 | YSH- 0401 (NC) | 4.0 | 3.1 | 3.8 | 3.6 | 4.4 | 44.6 | 32.7 | **38.6** | **605** |

# Table 2.3.6a. Performance of early Indian mustard strains in IVT Zone-II

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | Plant Stand | | | | Days to Maturity | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LDH | NDH | HSR | CHT | Mean | LDH | NDH | HSR | CHT | LDH | NDH | HSR | CHT | |
| | | | 1 | 2 | 3 | 4 | (1-4) | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-4) |
| 1 | MCN (E) -18-1 | DRMRCI 96 | 2235 | 2294 | 2323 | 2067 | **2229** | 133 | 130 | 117 | 129 | 120 | 114 | 125 | 122 | 120 |
| 2 | MCN (E) -18-2 | PRE 2016-2 | 1638 | 1861 | 2553 | 2151 | **2051** | 126 | 133 | 114 | 131 | 119 | 109 | 126 | 120 | 118 |
| 3 | MCN (E) -18-3 | RMM 10-1-1 | 2177 | 1622 | 2595 | 1446 | **1960** | 137 | 127 | 115 | 140 | 123 | 131 | 135 | 129 | 130 |
| **4** | **MCN (E) -18-4** | **PM 28 (LR)** | **2111** | **2094** | **2630** | **2067** | **2225** | **127** | **137** | **111** | **138** | **124** | **102** | **115** | **128** | **117** |
| 5 | MCN (E) -18-5 | DRMRIS 17-7 | 1840 | 2144 | 2134 | 2154 | **2068** | 132 | 143 | 112 | 141 | 123 | 123 | 132 | 127 | 126 |
| 6 | MCN (E) -18-6 | NPJ- 221 | 1568 | 2117 | 2317 | 1868 | **1967** | 128 | 137 | 119 | 146 | 122 | 98 | 115 | 120 | 114 |
| 7 | MCN (E) -18-7 | DTM- 184 | 1790 | 928 | 2027 | 1732 | **1619** | 131 | 130 | 112 | 149 | 124 | 131 | 125 | 128 | 127 |
| 8 | MCN (E) -18-8 | KMR (E) 18-2 | 1601 | 967 | 2742 | 1702 | **1753** | 123 | 138 | 122 | 151 | 124 | 131 | 136 | 126 | 129 |
| 9 | MCN (E) -18-9 | RH 1699-5 | 1774 | 2022 | 2311 | 2101 | **2052** | 127 | 136 | 121 | 153 | 122 | 130 | 135 | 124 | 128 |
| 10 | MCN (E) -18-10 | KMR (E) 18-1 | 1370 | 2106 | 2600 | 2258 | **2084** | 129 | 144 | 119 | 129 | 121 | 118 | 127 | 125 | 123 |
| 11 | MCN (E) -18-11 | NPJ- 222 | 1222 | 2150 | 2553 | 1566 | **1873** | 127 | 154 | 122 | 138 | 120 | 102 | 120 | 124 | 117 |
| 12 | MCN (E) -18-12 | DRMR 2017-26 | 1761 | 2139 | 2553 | 2078 | **2133** | 141 | 142 | 118 | 136 | 121 | 116 | 125 | 126 | 122 |
| 13 | MCN (E) -18-13 | RH 1658 | 1284 | 2239 | 2612 | 1879 | **2004** | 147 | 166 | 117 | 131 | 120 | 102 | 115 | 123 | 115 |
| 14 | MCN (E) -18-14 | Bullet | 1313 | 1939 | 2364 | 2128 | **1936** | 136 | 138 | 113 | 139 | 122 | 102 | 115 | 126 | 116 |
| 15 | MCN (E) -18-15 | DRMRHT 13-13-5-4 | 1305 | 2394 | 2630 | 1797 | **2031** | 135 | 160 | 118 | 135 | 124 | 103 | 116 | 121 | 116 |
| 16 | MCN (E) -18-16 | JD- 6 (ZC) | 1449 | 1656 | 2535 | 1813 | **1863** | 132 | 146 | 110 | 131 | 124 | 126 | 135 | 127 | 128 |
| 17 | MCN (E) -18-17 | PRE 2016-5 | 1428 | 1683 | 2098 | 2021 | **1808** | 128 | 126 | 115 | 136 | 122 | 108 | 124 | 124 | 119 |
| 18 | MCN (E) -18-18 | Pusa Mustard 25 (NC) | 1284 | 2294 | 2547 | 1795 | **1980** | 124 | 148 | 113 | 130 | 122 | 99 | 113 | 125 | 115 |
| | | GM | 1619 | 1925 | 2451 | 1923 | | | | | | | | | | |
| | | CD (5 %) | 210 | 290 | 372 | 406 | | | | | | | | | | |
| | | CV (%) | 8.1 | 9.4 | 9.5 | 13.2 | | | | | | | | | | |
| | | DOS | 28.9.2018 | 14.9.2018 | 30.9.2018 | 18.9.2018 | | | | | | | | | | |

## Table 2.3.6b. Performance of early Indian mustard strains in IVT Zone-II

| S.No. | Code | Strain | 1000-Seed Wt. (g) | | | | Oil Content (%) | | | | | Oil Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LDH | NDH | HSR | CHT | LDH | NDH | HSR | CHT | Mean | |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-4) | (1-4) |
| 1 | MCN (E) -18-1 | DRMRCI 96 | 5.3 | 4.36 | 4.8 | 4.2 | 41.1 | 40.0 | 38.7 | 39.9 | **39.9** | **890** |
| 2 | MCN (E) -18-2 | PRE 2016-2 | 4.8 | 3.39 | 3.9 | 4.6 | 40.2 | 40.0 | 40.3 | 40.5 | **40.3** | **825** |
| 3 | MCN (E) -18-3 | RMM 10-1-1 | 4.3 | 4.2 | 4.4 | 3.9 | 39.0 | 40.2 | 38.9 | 40.4 | **39.6** | **777** |
| **4** | **MCN (E) -18-4** | **PM 28 (LR)** | **4.8** | **3.59** | **4.1** | **3.8** | **40.8** | **39.7** | **39.8** | **39.0** | **39.8** | **887** |
| 5 | MCN (E) -18-5 | DRMRIS 17-7 | 4.9 | 4.28 | 4.6 | 3.7 | 40.7 | 40.6 | 39.3 | 39.5 | **40.0** | **827** |
| 6 | MCN (E) -18-6 | NPJ- 221 | 4.0 | 3.84 | 4.0 | 3.8 | 40.4 | 40.1 | 38.6 | 40.0 | **39.8** | **782** |
| 7 | MCN (E) -18-7 | DTM- 184 | 4.9 | 4.78 | 4.7 | 3.6 | 38.5 | 38.1 | 37.1 | 38.3 | **38.0** | **615** |
| 8 | MCN (E) -18-8 | KMR (E) 18-2 | 4.3 | 3.46 | 4.0 | 3.9 | 40.7 | 39.1 | 38.6 | 39.0 | **39.4** | **690** |
| 9 | MCN (E) -18-9 | RH 1699-5 | 4.1 | 4.42 | 4.7 | 4.3 | 41.2 | 40.1 | 38.2 | 41.5 | **40.2** | **826** |
| 10 | MCN (E) -18-10 | KMR (E) 18-1 | 5.2 | 3.97 | 4.5 | 4.6 | 41.4 | 39.7 | 39.9 | 40.2 | **40.3** | **840** |
| 11 | MCN (E) -18-11 | NPJ- 222 | 4.9 | 3.9 | 4.2 | 3.8 | 40.6 | 39.7 | 40.1 | 41.0 | **40.3** | **755** |
| 12 | MCN (E) -18-12 | DRMR 2017-26 | 4.9 | 4.3 | 4.8 | 4.1 | 40.5 | 40.4 | 39.1 | 41.2 | **40.3** | **860** |
| 13 | MCN (E) -18-13 | RH 1658 | 6.6 | 6.02 | 5.7 | 4.6 | 39.4 | 39.8 | 38.3 | 40.9 | **39.6** | **793** |
| 14 | MCN (E) -18-14 | Bullet | 5.9 | 5.85 | 6.1 | 4.9 | 39.5 | 38.9 | 38.7 | 41.3 | **39.6** | **766** |
| 15 | MCN (E) -18-15 | DRMRHT 13-13-5-4 | 4.8 | 4.12 | 4.3 | 3.7 | 41.8 | 40.7 | 40.1 | 41.1 | **40.9** | **831** |
| 16 | MCN (E) -18-16 | JD- 6 (ZC) | 4.7 | 3.76 | 4.4 | 4.1 | 39.6 | 40.8 | 37.7 | 41.2 | **39.9** | **743** |
| 17 | MCN (E) -18-17 | PRE 2016-5 | 4.8 | 3.32 | 4.1 | 4.7 | 40.5 | 39.3 | 40.0 | 42.3 | **40.5** | **732** |
| 18 | MCN (E) -18-18 | Pusa Mustard 25 (NC) | 6.0 | 4.7 | 4.4 | 3.1 | 40.6 | 39.5 | 37.8 | 40.6 | **39.6** | **784** |

## Table 2.3.7a. Performance of early Indian mustard strains in IVT Zone-III

| S. No. | Code | Strain | Seed Yield (kg/ha) | | | | | | | | Plant Stand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | JHS# | KPR | BPR | DOL | Mean | | MOR | PNT | JHS | KPR | BPR | DOL |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | (1-2,4-6) | | 1 | 2 | 3 | 4 | 5 | 6 |
| **1** | **MCN (E) -18-1** | **DRMRCI 96** | **3395** | **2262** | **1173** | **1813** | **2001** | **1543** | **2203** | * | **176** | **110** | **253.3** | **120** | **101** | **158** |
| 2 | MCN (E) -18-2 | PRE 2016-2 | 2198 | 2134 | 1148 | 1543 | 2080 | 1216 | **1834** | | 171 | 118 | 239.3 | 114 | 114 | 163.7 |
| **3** | **MCN (E) -18-3** | **RMM 10-1-1** | **3772** | **2473** | **741** | **1505** | **1981** | **1204** | **2187** | * | **173** | **112** | **245.7** | **116** | **111** | **156.3** |
| **4** | **MCN (E) -18-4** | **PM 27 (LR)** | **3179** | **1819** | **1123** | **1466** | **2046** | **1451** | **1992** | | **172** | **111** | **232.3** | **115** | **100** | **165.3** |
| 5 | MCN (E) -18-5 | DRMRIS 17-7 | 2550 | 2382 | 753 | 1659 | 1671 | 1568 | **1966** | | 172 | 117 | 246.3 | 120 | 98 | 159.3 |
| 6 | MCN (E) -18-6 | NPJ- 221 | 1216 | 1990 | 846 | 1466 | 1772 | 1377 | **1564** | | 168 | 115 | 225 | 112 | 96 | 162.7 |
| 7 | MCN (E) -18-7 | DTM- 184 | 2327 | 1642 | 938 | 1428 | 2557 | 1364 | **1864** | | 177 | 113 | 202 | 112 | 116 | 159.3 |
| 8 | MCN (E) -18-8 | KMR (E) 18-2 | 2198 | 1611 | 840 | 1813 | 2052 | 1340 | **1803** | | 174 | 120 | 244 | 120 | 103 | 158.7 |
| 9 | MCN (E) -18-9 | RH 1699-5 | 2179 | 2001 | 1006 | 1505 | 1656 | 1648 | **1798** | | 175 | 125 | 205.7 | 114 | 84 | 163.7 |
| 10 | MCN (E) -18-10 | KMR (E) 18-1 | 2327 | 1769 | 1099 | 1736 | 1953 | 1562 | **1870** | | 173 | 136 | 289.3 | 120 | 100 | 163 |
| 11 | MCN (E) -18-11 | NPJ- 222 | 1691 | 1777 | 617 | 1505 | 1969 | 1401 | **1669** | | 169 | 153 | 234 | 114 | 90 | 157.3 |
| 12 | MCN (E) -18-12 | DRMR 2017-26 | 2988 | 1814 | 1414 | 1389 | 2298 | 1241 | **1946** | | 176 | 143 | 213 | 112 | 106 | 162.3 |
| 13 | MCN (E) -18-13 | RH 1658 | 2469 | 1512 | 975 | 1659 | 2233 | 1735 | **1921** | | 177 | 110 | 207.7 | 117 | 106 | 159 |
| 14 | MCN (E) -18-14 | Bullet | 2642 | 1692 | 716 | 1466 | 1603 | 1228 | **1726** | | 174 | 115 | 180.7 | 115 | 94 | 158.3 |
| 15 | MCN (E) -18-15 | DRMRHT 13-13-5-4 | 2815 | 1653 | 926 | 1466 | 1878 | 1944 | **1951** | | 172 | 112 | 240 | 117 | 120 | 162.7 |
| 16 | MCN (E) -18-16 | JD- 6 (ZC) | 2599 | 1890 | 907 | 1582 | 1639 | 1568 | **1856** | | 174 | 132 | 259.7 | 114 | 100 | 166 |
| 17 | MCN (E) -18-17 | PRE 2016-5 | 2321 | 2152 | 957 | 1698 | 1692 | 1432 | **1859** | | 171 | 159 | 278 | 116 | 104 | 160 |
| 18 | MCN (E) -18-18 | Pusa Mustard 25 (NC) | 1778 | 2038 | 994 | 1389 | 2238 | 1660 | **1821** | | 171 | 145 | 257.3 | 111 | 110 | 159.3 |
| | | GM | 2480 | 1923 | 954 | 1560 | 1962 | 1471 | | | | | | | | |
| | | CD (5 %) | 524 | 233 | 351 | 94 | 382 | 230 | | | | | | | | |
| | | CV (%) | 13.2 | 7.6 | 23.0 | 8.7 | 12.2 | 9.4 | | | | | | | | |
| | | DOS | 9.10.2018 | 5.10.2018 | 6.10.2018 | 30.9.2018 | 28.9.2018 | 27.9.2018 | | | | | | | | |

# data of JHS excluded from computation of mean due to low general mean than the state average and high CV

* Strain(s) outyielding the best check by margin of > 10 % seed and oil yield

## Table 2.3.7b. Performance of early Indian mustard strains in IVT Zone-III

| S. No. | Code | Strain | Days to Maturity | | | | | | Mean | 1000-Seed wt. (g) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | JHS | KPR | BPR | DOL | | MOR | PNT | JHS | KPR | BPR | DOL |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | (1-2,4-6) | 1 | 2 | 3 | 4 | 5 | 6 |
| **1** | **MCN (E) -18-1** | **DRMRCI 96** | **138** | **110** | **129** | **120** | **112** | **124** | **121** | **5.2** | **3.6** | **5.9** | **5.2** | **5.2** | **5.5** |
| 2 | MCN (E) -18-2 | PRE 2016-2 | 137 | 106 | 141 | 118 | 111 | 123 | 119 | 4.4 | 3.0 | 4.7 | 4.7 | 4.4 | 4.3 |
| **3** | **MCN (E) -18-3** | **RMM 10-1-1** | **146** | **107** | **135** | **117** | **112** | **128** | **122** | **5.5** | **3.4** | **6.1** | **4.7** | **4.7** | **3.4** |
| **4** | **MCN (E) -18-4** | **PM 27 (LR)** | **142** | **111** | **137** | **119** | **112** | **123** | **121** | **7.1** | **3.0** | **4.7** | **4.1** | **5.5** | **3.9** |
| 5 | MCN (E) -18-5 | DRMRIS 17-7 | 140 | 112 | 135 | 116 | 120 | 124 | 122 | 5.2 | 3.6 | 5.1 | 5.6 | 5.2 | 4.2 |
| 6 | MCN (E) -18-6 | NPJ- 221 | 135 | 112 | 138 | 118 | 124 | 119 | 122 | 4.5 | 3.0 | 4.9 | 4.8 | 4.5 | 4.2 |
| 7 | MCN (E) -18-7 | DTM- 184 | 138 | 116 | 145 | 121 | 127 | 132 | 127 | 5.6 | 4.4 | 5.2 | 5.4 | 5.2 | 4.6 |
| 8 | MCN (E) -18-8 | KMR (E) 18-2 | 139 | 105 | 145 | 118 | 113 | 127 | 120 | 4.4 | 3.5 | 5.3 | 4.8 | 4.3 | 4.2 |
| 9 | MCN (E) -18-9 | RH 1699-5 | 138 | 107 | 147 | 119 | 113 | 127 | 121 | 5.3 | 4.0 | 5.0 | 5.7 | 5.1 | 4.6 |
| 10 | MCN (E) -18-10 | KMR (E) 18-1 | 138 | 108 | 143 | 122 | 123 | 120 | 122 | 5.5 | 3.5 | 5.1 | 5.5 | 4.3 | 4.3 |
| 11 | MCN (E) -18-11 | NPJ- 222 | 138 | 103 | 143 | 119 | 118 | 130 | 122 | 4.9 | 3.3 | 4.3 | 4.9 | 5.2 | 4.5 |
| 12 | MCN (E) -18-12 | DRMR 2017-26 | 138 | 101 | 128 | 120 | 113 | 127 | 120 | 5.4 | 3.9 | 5.0 | 5.7 | 4.6 | 5.1 |
| 13 | MCN (E) -18-13 | RH 1658 | 136 | 111 | 127 | 123 | 110 | 117 | 119 | 7.0 | 5.1 | 5.8 | 5.4 | 4.7 | 6.4 |
| 14 | MCN (E) -18-14 | Bullet | 138 | 104 | 128 | 121 | 121 | 120 | 121 | 7.7 | 4.6 | 6.1 | 5.2 | 5.1 | 6.6 |
| 15 | MCN (E) -18-15 | DRMRHT 13-13-5-4 | 138 | 114 | 135 | 125 | 120 | 122 | 124 | 5.0 | 3.0 | 5.0 | 5.4 | 5.0 | 5.0 |
| 16 | MCN (E) -18-16 | JD- 6 (ZC) | 139 | 111 | 135 | 122 | 131 | 127 | 126 | 5.2 | 3.4 | 4.5 | 5.0 | 5.2 | 4.2 |
| 17 | MCN (E) -18-17 | PRE 2016-5 | 130 | 107 | 128 | 119 | 115 | 118 | 118 | 3.8 | 2.5 | 4.7 | 4.6 | 4.5 | 4.1 |
| 18 | MCN (E) -18-18 | Pusa Mustard 25 (NC) | 131 | 104 | 128 | 120 | 116 | 116 | 117 | 5.1 | 3.3 | 4.8 | 4.9 | 5.0 | 4.5 |

## Table 2.3.7c. Performance of early Indian mustard strains in IVT Zone-III

| S. No. | Code | Strain | Oil Content (%) | | | | | | Mean | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | JHS | KPR | BPR | DOL | | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | (1-2,4-6) | (1-2,4-6) |
| **1** | **MCN (E) -18-1** | **DRMRCI 96** | **41.2** | **39.7** | **41.8** | **41.8** | **42.8** | **39.3** | **40.9** | **902** |
| 2 | MCN (E) -18-2 | PRE 2016-2 | 41.9 | 39.6 | 41.8 | 42.4 | 42.6 | 41.6 | **41.6** | **763** |
| **3** | **MCN (E) -18-3** | **RMM 10-1-1** | **41.2** | **39.5** | **41.3** | **41.8** | **42.7** | **39.1** | **40.9** | **894** |
| **4** | **MCN (E) -18-4** | **PM 27 (LR)** | **41.7** | **40.1** | **42.0** | **42.0** | **42.3** | **41.5** | **41.5** | **827** |
| 5 | MCN (E) -18-5 | DRMRIS 17-7 | 40.0 | 40.1 | 41.4 | 40.9 | 42.5 | 39.3 | **40.6** | **797** |
| 6 | MCN (E) -18-6 | NPJ- 221 | 41.3 | 38.8 | 40.9 | 41.5 | 42.8 | 41.6 | **41.2** | **644** |
| 7 | MCN (E) -18-7 | DTM- 184 | 39.6 | 38.9 | 40.3 | 40.3 | 42.8 | 38.9 | **40.1** | **747** |
| 8 | MCN (E) -18-8 | KMR (E) 18-2 | 40.7 | 39.9 | 41.3 | 41.1 | 43.2 | 38.9 | **40.7** | **734** |
| 9 | MCN (E) -18-9 | RH 1699-5 | 41.9 | 40.3 | 42.3 | 42.2 | 42.6 | 41.4 | **41.7** | **749** |
| 10 | MCN (E) -18-10 | KMR (E) 18-1 | 41.1 | 40.1 | 41.1 | 41.5 | 42.7 | 40.6 | **41.2** | **770** |
| 11 | MCN (E) -18-11 | NPJ- 222 | 43.0 | 40.9 | 42.7 | 42.5 | 42.3 | 41.8 | **42.1** | **702** |
| 12 | MCN (E) -18-12 | DRMR 2017-26 | 40.7 | 41.0 | 40.3 | 42.2 | 42.6 | 41.2 | **41.5** | **808** |
| 13 | MCN (E) -18-13 | RH 1658 | 41.0 | 40.6 | 40.6 | 40.8 | 42.3 | 40.8 | **41.1** | **790** |
| 14 | MCN (E) -18-14 | Bullet | 40.8 | 39.7 | 41.6 | 43.5 | 42.6 | 40.8 | **41.5** | **716** |
| 15 | MCN (E) -18-15 | DRMRHT 13-13-5-4 | 41.1 | 40.4 | 42.9 | 42.4 | 42.0 | 41.4 | **41.4** | **808** |
| 16 | MCN (E) -18-16 | JD- 6 (ZC) | 40.9 | 39.7 | 42.1 | 42.4 | 42.7 | 41.5 | **41.4** | **768** |
| 17 | MCN (E) -18-17 | PRE 2016-5 | 40.7 | 39.8 | 41.6 | 41.9 | 41.9 | 41.4 | **41.2** | **765** |
| 18 | MCN (E) -18-18 | Pusa Mustard 25 (NC) | 41.0 | 41.0 | 40.7 | 42.3 | 41.8 | 41.5 | **41.5** | **756** |

## Table 2.3.8a. Performance of early Indian mustard strains in IVT Zone-V

| S.No. | Code | Strain | Seed Yield (Kg/ha) | | | | | | Plant Stand | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IMP | SHL | BHU$ | JAG | KNK | Mean | IMP | SHL | BHU | JAG | KNK |
| | | | 1 | 2 | 3 | 4 | 5 | (1-2,4-5) | 1 | 2 | 3 | 4 | 5 |
| 1 | MCN (E) -18-1 | DRMRCI 96 | 1326 | 1528 | 919 | 1361 | 1646 | **1465** | 179 | 178 | 130 | 179 | 206 |
| 2 | MCN (E) -18-2 | PRE 2016-2 | 1277 | 1283 | 784 | 1628 | 1357 | **1386** | 162 | 176 | 126 | 181 | 207 |
| 3 | MCN (E) -18-3 | RMM 10-1-1 | 997 | 1311 | 1053 | 1267 | 1505 | **1270** | 160 | 197 | 135 | 174 | 211 |
| **4** | **MCN (E) -18-4** | **NRCHB 101 (LR)** | **1642** | **1528** | **962** | **1009** | **1814** | **1498** | **164** | **196** | **124** | **179** | **205** |
| 5 | MCN (E) -18-5 | DRMRIS 17-7 | 1207 | 1294 | 788 | 1329 | 1548 | **1345** | 170 | 176 | 123 | 209 | 205 |
| 6 | MCN (E) -18-6 | NPJ- 221 | 1468 | 1067 | 836 | 1426 | 1230 | **1298** | 163 | 179 | 120 | 190 | 203 |
| 7 | MCN (E) -18-7 | DTM- 184 | 1484 | 1206 | 823 | 1415 | 1302 | **1352** | 159 | 168 | 126 | 178 | 195 |
| 8 | MCN (E) -18-8 | KMR (E) 18-2 | 880 | 1439 | 782 | 1497 | 1343 | **1289** | 162 | 204 | 130 | 170 | 208 |
| 9 | MCN (E) -18-9 | RH 1699-5 | 1608 | 2200 | 935 | 988 | 1424 | **1555** | 169 | 222 | 134 | 205 | 200 |
| 10 | MCN (E) -18-10 | KMR (E) 18-1 | 1303 | 1333 | 725 | 1540 | 1536 | **1428** | 168 | 201 | 127 | 189 | 205 |
| 11 | MCN (E) -18-11 | NPJ- 222 | 1392 | 1194 | 813 | 977 | 1155 | **1179** | 178 | 193 | 125 | 205 | 211 |
| 12 | MCN (E) -18-12 | DRMR 2017-26 | 1673 | 1350 | 896 | 1641 | 1536 | **1550** | 177 | 187 | 131 | 202 | 210 |
| 13 | MCN (E) -18-13 | RH 1658 | 1372 | 1783 | 843 | 1051 | 1114 | **1330** | 178 | 205 | 134 | 239 | 203 |
| 14 | MCN (E) -18-14 | Bullet | 1711 | 1667 | 683 | 1583 | 1505 | **1616** | 173 | 199 | 128 | 159 | 198 |
| 15 | MCN (E) -18-15 | DRMRHT 13-13-5-4 | 1094 | 1694 | 975 | 1236 | 1201 | **1306** | 163 | 211 | 136 | 239 | 202 |
| 16 | MCN (E) -18-16 | JD- 6 (ZC) | 1193 | 1039 | 918 | 990 | 1519 | **1185** | 164 | 201 | 131 | 210 | 210 |
| 17 | MCN (E) -18-17 | PRE 2016-5 | 1838 | 1417 | 903 | 1471 | 1635 | **1590** | 163 | 178 | 126 | 220 | 207 |
| 18 | MCN (E) -18-18 | Pusa Mustard 25 (NC) | 1149 | 1644 | 838 | 1074 | 1279 | **1287** | 173 | 210 | 128 | 177 | 208 |
| | | GM | 1367 | 1443 | 860 | 1305 | 1425 | | | | | | |
| | | CD (5 %) | 318 | 334 | 115 | 179 | 179 | | | | | | |
| | | CV (%) | 14.5 | 14.5 | 8.3 | 8.6 | 7.9 | | | | | | |
| | | DOS | 5.11.2018 | 31.10.2018 | 26.11.2018 | 1.11.2018 | 18.10.2018 | | | | | | |

$ data of BHU excluded from computation of mean due to inappropriate date of sowing

## Table 2.3.8b. Performance of early Indian mustard strains in IVT Zone-V

| S.No. | Code | Strain | Days to Maturity | | | | | | 1000-Seed Wt.(g) | | | | | Oil Content (%) | | | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IMP | SHL | BHU | JAG | KNK | Mean | IMP | SHL | BHU | JAG | KNK | IMP | KNK | Mean | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 5 | (1-2.4-5) | 1 | 2 | 3 | 4 | 5 | 1 | 5 | (1,5) | (1-2,4-5) |
| 1 | MCN (E) -18-1 | DRMRCI 96 | 122 | 117 | 90 | 130 | 123 | 123 | 5.0 | 4.2 | 4.4 | 3.9 | 5.1 | 38.1 | 40.9 | **39.5** | **579** |
| 2 | MCN (E) -18-2 | PRE 2016-2 | 121 | 117 | 92 | 126 | 118 | 120 | 3.7 | 2.9 | 4.0 | 4.9 | 3.5 | 39.5 | 41.9 | **40.7** | **564** |
| 3 | MCN (E) -18-3 | RMM 10-1-1 | 123 | 121 | 102 | 130 | 123 | 124 | 5.0 | 4.6 | 4.5 | 5.3 | 4.8 | 35.6 | 41.4 | **38.5** | **489** |
| **4** | **MCN (E) -18-4** | **NRCHB 101 (LR)** | **122** | **121** | **96** | **126** | **121** | **123** | **5.7** | **2.9** | **4.4** | **5.4** | **6.3** | **35.2** | **41.8** | **38.5** | **577** |
| 5 | MCN (E) -18-5 | DRMRIS 17-7 | 123 | 117 | 96 | 130 | 121 | 123 | 5.4 | 3.5 | 4.1 | 4.9 | 4.2 | 36.3 | 41.7 | **39.0** | **525** |
| 6 | MCN (E) -18-6 | NPJ- 221 | 119 | 121 | 95 | 126 | 117 | 121 | 3.7 | 2.9 | 4.3 | 5.1 | 4.6 | 39.1 | 41.8 | **40.4** | **525** |
| 7 | MCN (E) -18-7 | DTM- 184 | 124 | 121 | 101 | 130 | 126 | 125 | 4.4 | 3.3 | 4.2 | 5.0 | 4.7 | 36.9 | 40.5 | **38.7** | **523** |
| 8 | MCN (E) -18-8 | KMR (E) 18-2 | 121 | 120 | 94 | 130 | 123 | 124 | 4.6 | 2.5 | 4.2 | 4.2 | 4.4 | 36.4 | 40.9 | **38.7** | **498** |
| 9 | MCN (E) -18-9 | RH 1699-5 | 123 | 121 | 100 | 126 | 122 | 123 | 4.9 | 3.6 | 4.3 | 4.4 | 5.3 | 37.1 | 40.1 | **38.6** | **600** |
| 10 | MCN (E) -18-10 | KMR (E) 18-1 | 121 | 117 | 93 | 126 | 122 | 121 | 4.3 | 4.5 | 4.0 | 3.9 | 4.3 | 38.7 | 42.1 | **40.4** | **577** |
| 11 | MCN (E) -18-11 | NPJ- 222 | 119 | 117 | 89 | 126 | 120 | 120 | 4.5 | 4.2 | 4.3 | 4.1 | 4.6 | 38.6 | 41.8 | **40.2** | **474** |
| 12 | MCN (E) -18-12 | DRMR 2017-26 | 121 | 117 | 94 | 126 | 122 | 122 | 4.9 | 4.0 | 4.4 | 4.6 | 3.9 | 38.6 | 42.1 | **40.4** | **626** |
| 13 | MCN (E) -18-13 | RH 1658 | 121 | 117 | 95 | 126 | 118 | 121 | 5.8 | 4.9 | 4.4 | 5.5 | 4.8 | 38.9 | 41.5 | **40.2** | **534** |
| 14 | MCN (E) -18-14 | Bullet | 121 | 120 | 91 | 126 | 121 | 122 | 6.1 | 6.5 | 4.1 | 6.8 | 5.6 | 38.2 | 39.9 | **39.0** | **631** |
| 15 | MCN (E) -18-15 | DRMRHT 13-13-5-4 | 122 | 117 | 92 | 126 | 120 | 121 | 4.5 | 3.4 | 4.5 | 4.0 | 4.3 | 39.3 | 41.1 | **40.2** | **526** |
| 16 | MCN (E) -18-16 | JD- 6 (ZC) | 123 | 121 | 101 | 126 | 123 | 123 | 4.3 | 3.0 | 4.4 | 4.0 | 4.7 | 38.1 | 43.0 | **40.6** | **481** |
| 17 | MCN (E) -18-17 | PRE 2016-5 | 120 | 117 | 96 | 126 | 124 | 122 | 3.6 | 3.0 | 4.2 | 4.2 | 4.8 | 38.4 | 42.3 | **40.3** | **642** |
| 18 | MCN (E) -18-18 | Pusa Mustard 25 (NC) | 120 | 117 | 91 | 130 | 121 | 122 | 4.9 | 3.1 | 4.1 | 4.8 | 4.5 | 38.5 | 41.3 | **39.9** | **514** |

## Table 2.3.9. Performance of early Indian mustard strains in IVT Zone-VI

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | |
|---|---|---|---|---|---|---|
| | | | RAI | DWD | HYD | Mean |
| | | | 1 | 2 | 3 | (1-3) |
| 1 | MCNE-18-1 | DRMRCI 96 | 683 | 1086 | 1554 | **1108** |
| 2 | MCNE-18-2 | PRE 2016-2 | 679 | 997 | 1875 | **1184** |
| 3 | MCNE-18-3 | RMM 10-1-1 | 654 | 931 | 1874 | **1153** |
| 4 | MCNE-18-4 | NRCHB 101(LR) | 636 | 741 | 1920 | **1099** |
| 5 | MCNE-18-5 | DRMRIS 17-7 | 632 | 931 | 1657 | **1073** |
| 6 | MCNE-18-6 | NPJ- 221 | 626 | 936 | 1696 | **1086** |
| 7 | MCNE-18-7 | DTM- 184 | 619 | 671 | 1599 | **963** |
| 8 | MCNE-18-8 | KMR (E) 18-2 | 617 | 929 | 1410 | **985** |
| 9 | MCNE-18-9 | RH 1699-5 | 595 | 988 | 1481 | **1021** |
| 10 | MCNE-18-10 | KMR (E) 18-1 | 593 | 982 | 1256 | **944** |
| 11 | MCNE-18-11 | NPJ- 222 | 582 | 1122 | 1722 | **1142** |
| 12 | MCNE-18-12 | DRMR 2017-26 | 580 | 1097 | 1613 | **1097** |
| 13 | MCNE-18-13 | RH 1658 | 562 | 1222 | 1833 | **1206** |
| 14 | MCNE-18-14 | Bullet | 510 | 986 | 1606 | **1034** |
| 15 | MCNE-18-15 | DRMRHT 13-13-5-4 | 494 | 982 | 1527 | **1001** |
| 16 | MCNE-18-16 | JD- 6 (ZC) | 486 | 734 | 1784 | **1001** |
| 17 | MCNE-18-17 | PRE 2016-5 | 465 | 1224 | 1576 | **1088** |
| 18 | MCNE-18-18 | Pusa Mustard 25 (NC) | 449 | 1511 | 1572 | **1177** |
| | | GM | 581 | 1004 | 1642 | |
| | | CD (5 %) | 95 | 318 | 347 | |
| | | CV (%) | 12.6 | 19.8 | 13.2 | |
| | | DOS | 20.10.2018 | | | |

## Table 2.3.10a. Performance of Indian mustard hybrids in IHT Early, Zone-II

| S. No | Code | Strain | Seed Yield (kg/ha) | | | | | | Plant Stand | | | | | Days to Maturity | | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | NDH | CHT | PAL# | Mean | HSR | LDH | NDH | CHT | PAL | HSR | LDH | NDH | CHT | PAL | |
| | | | 1 | 2 | 3 | 4 | 5 | (1-4) | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1-4) |
| 1 | MH(E)-18-1 | DRMRHJ 503 | 2076 | 2226 | 1756 | 2001 | 3941 | **2015** | 118 | 127 | 148 | 139 | 71 | 135 | 132 | 139 | 127 | 141 | **133** |
| 2 | MH(E)-18-2 | Pusa MH- 7 (Hybrid) | 2577 | 1206 | 2394 | 1485 | 1858 | **1915** | 104 | 130 | 118 | 128 | 0 | 135 | 134 | 110 | 124 | | **126** |
| 3 | MH(E)-18-3 | DRMRHJ 2403 | 3109 | 2412 | 2439 | 2144 | 4755 | **2526** | 119 | 115 | 148 | 141 | 120 | 127 | 130 | 122 | 128 | 126 | **127** |
| 4 | MH(E)-18-4 | JD- 6 (ZC) | 2707 | 1667 | 1889 | 2022 | 3939 | **2071** | 116 | 119 | 136 | 136 | 111 | 131 | 131 | 140 | 130 | 134 | **133** |
| 5 | MH(E)-18-5 | 8IJ4002 | 2589 | 1235 | 2333 | 2179 | 2891 | **2084** | 119 | 119 | 161 | 142 | 88 | 110 | 126 | 106 | 124 | 109 | **116** |
| 6 | MH(E)-18-6 | PRO 5111 (Hy Check) | 2904 | 1733 | 1833 | 2108 | 3919 | **2144** | 115 | 121 | 149 | 126 | 95 | 112 | 130 | 116 | 121 | 116 | **120** |
| 7 | MH(E)-18-7 | Pusa MH- 5 (Hybrid) | 2478 | 1909 | 2494 | 1501 | 3209 | **2096** | 114 | 119 | 146 | 123 | 84 | 123 | 131 | 110 | 122 | 125 | **122** |
| 8 | MH(E)-18-8 | Pusa Mustard 25 (NC) | 2340 | 1794 | 2011 | 1881 | 3344 | **2007** | 116 | 122 | 149 | 131 | 104 | 112 | 130 | 108 | 120 | 114 | **117** |
| 9 | MH(E)-18-9 | **PM (28 (LR)** | **2435** | **2144** | **2428** | **2064** | **3483** | **2268** | **112** | **125** | **143** | **138** | **90** | **113** | **130** | **110** | **124** | **116** | **119** |
| 10 | MH(E)-18-10 | 8IJ0117 | 2510 | 2025 | 2961 | 2226 | 3337 | **2430** | 114 | 128 | 145 | 136 | 79 | 116 | 131 | 118 | 123 | 126 | **122** |
| | | GM | 2572 | 1835 | 2254 | 1961 | 3468 | | | | | | | | | | | | |
| | | CD (5%) | 492 | 334 | 430 | 452 | 392 | | | | | | | | | | | | |
| | | CV (%) | 11.5 | 10.9 | 11.4 | 13.8 | 10.4 | | | | | | | | | | | | |
| | | DOS | 30.9.2018 | 28.9.2018 | 14.9.2018 | 18.9.2018 | 27.9.2018 | | | | | | | | | | | | |

# data of PAL excluded from computation of mean due to low plant stand

## Table 2.3.10b. Performance of Indian mustard hybrids in IHT, Zone-II

| S. No. | Code | Strain | 1000-Seed Wt.(g) | | | | | Oil Content (%) | | | | | | Oil Yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | NDH | CHT | PAL | HSR | LDH | NDH | CHT | PAL | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1-4) | (1-4) |
| 1 | MH(E)-18-1 | DRMRHJ 503 | 4.9 | 5.2 | 4.4 | 3.6 | 5.5 | 39.4 | 42.4 | 38.8 | 39.6 | 40.9 | **40.1** | **807** |
| 2 | MH(E)-18-2 | Pusa MH- 7 (Hybrid) | 4.1 | 2.7 | 4.1 | 4.4 | 4.0 | 39.2 | 42.6 | 41.0 | 40.0 | 41.1 | **40.7** | **780** |
| 3 | MH(E)-18-3 | DRMRHJ 2403 | 4.6 | 4.1 | 3.8 | 4.1 | 4.4 | 40.6 | 39.2 | 40.7 | 39.3 | 41.5 | **39.9** | **1009** |
| 4 | MH(E)-18-4 | JD- 6 (ZC) | 4.9 | 4.0 | 4.0 | 3.8 | 4.1 | 39.9 | 40.0 | 40.8 | 40.2 | 42.0 | **40.2** | **833** |
| 5 | MH(E)-18-5 | 8IJ4002 | 3.4 | 3.6 | 3.2 | 3.9 | 3.5 | 41.1 | 39.7 | 40.5 | 40.7 | 41.6 | **40.5** | **844** |
| 6 | MH(E)-18-6 | PRO 5111 (Hy Check) | 3.5 | 4.1 | 2.9 | 3.8 | 3.9 | 41.2 | 42.8 | 40.6 | 40.7 | 42.4 | **41.3** | **886** |
| 7 | MH(E)-18-7 | Pusa MH- 5 (Hybrid) | 5.0 | 5.6 | 4.8 | 3.2 | 5.3 | 40.5 | 41.1 | 40.4 | 39.6 | 41.9 | **40.4** | **847** |
| 8 | MH(E)-18-8 | Pusa Mustard 25 (NC) | 4.6 | 5.2 | 4.5 | 3.6 | 5.1 | 41.2 | 40.9 | 39.9 | 39.9 | 41.1 | **40.5** | **812** |
| **9** | **MH(E)-18-9** | **PM (28 (LR)** | **4.3** | **4.6** | **3.9** | **3.9** | **4.5** | **40.4** | **41.0** | **40.1** | **39.6** | **42.1** | **40.3** | **913** |
| 10 | MH(E)-18-10 | 8IJ0117 | 4.8 | 5.6 | 4.8 | 5.2 | 5.4 | 40.4 | 41.2 | 40.1 | 41.0 | 41.2 | **40.7** | **988** |

## Table 2.3.11a. Performance of Indian mustard hybrids in IHT Early, Zone-III

| S. No | Code | Strain | Seed Yield (kg/ha) | | | | | | | Plant Stand | | | | | Days to Maturity | | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | BPR$ | DOL$ | Mean | | MOR | PNT | KPR | BPR | DOL | MOR | PNT | KPR | BPR | DOL | |
| | | | 1 | 2 | 3 | 4 | 5 | (1-3) | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1-3) |
| 1 | MH(E)-18-1 | DRMRHJ 503 | 3820 | 1365 | 1775 | 2239 | 2107 | **2320** | | 114 | 122 | 122 | 84 | 92 | 128 | 120 | 140 | 125 | 123 | **129** |
| **2** | MH(E)-18-2 | Pusa MH- 7 (Hybrid) | 2537 | 1762 | 1621 | 1371 | 2091 | **1973** | | 116 | 114 | 118 | 29 | 92 | 126 | 117 | 131 | 118 | 121 | **125** |
| **3** | **MH(E)-18-3** | **DRMRHJ 2403** | **3451** | **2185** | **1736** | **2624** | **2519** | **2458** | * | **112** | **123** | **121** | **90** | **91** | **139** | **114** | **125** | **117** | **122** | **126** |
| 4 | MH(E)-18-4 | JD- 6 (ZC) | 3011 | 1753 | 1466 | 1695 | 2123 | **2077** | | 113 | 135 | 120 | 68 | 91 | 141 | 111 | 136 | 117 | 121 | **129** |
| **5** | MH(E)-18-5 | 8IJ4002 | 2336 | 1532 | 1543 | 1887 | 1361 | **1804** | | 116 | 125 | 117 | 91 | 89 | 141 | 102 | 108 | 91 | 114 | **117** |
| **6** | **MH(E)-18-6** | **PRO 5111 (Hy Check)** | **2944** | **2103** | **1698** | **1802** | **2299** | **2248** | | **115** | **116** | **118** | **52** | **94** | **142** | **103** | **119** | **107** | **119** | **121** |
| 7 | MH(E)-18-7 | Pusa MH- 5 (Hybrid) | 3078 | 1474 | 1582 | 1437 | 2217 | **2045** | | 113 | 114 | 116 | 73 | 93 | 141 | 111 | 125 | 105 | 115 | **126** |
| 8 | MH(E)-18-8 | Pusa Mustard 25 (NC) | 2739 | 1860 | 1543 | 1671 | 2041 | **2047** | | 114 | 122 | 115 | 95 | 92 | 138 | 109 | 110 | 96 | 120 | **119** |
| **9** | MH(E)-18-9 | PM 27 (LR) | 2806 | 2362 | 1428 | 1721 | 1460 | **2198** | | 117 | 167 | 114 | 86 | 91 | 134 | 110 | 115 | 107 | 123 | **120** |
| 10 | MH(E)-18-10 | 8IJ0117 | 3212 | 2278 | 1813 | 1708 | 2167 | **2435** | | 116 | 142 | 126 | 111 | 90 | 136 | 112 | 135 | 105 | 121 | **128** |
| | | GM | 2993 | 1867 | 1621 | 1816 | 2038 | | | | | | | | | | | | | |
| | | CD (5%) | 513 | 189 | 81 | 398 | 291 | | | | | | | | | | | | | |
| | | CV (%) | 11.9 | 6.0 | 7.0 | 12.8 | 8.5 | | | | | | | | | | | | | |
| | | DOS | 9.10.2018 | 5.10.2018 | 30.9.2018 | 28.9.2018 | 27.9.2018 | | | | | | | | | | | | | |

* Strain(s) outyielding the best check by a margin of > 10 percent oil yield

$ data of BPR and DOL excluded from computation of mean due to low plant stand

## Table 2.3.11b. Performance of Indian mustard hybrids in IHT Early, Zone-III

| S.No. | Code | Strain | 1000-Seed Wt.(g) | | | | | Oil Content (%) | | | | | | Oil Yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | BPR | DOL | MOR | PNT | KPR | BPR | DOL | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1-3) | (1-3) |
| 1 | MH(E)-18-1 | DRMRHJ 503 | 4.8 | 3.3 | 5.6 | 6.2 | 5.1 | 41.4 | 40.8 | 42.1 | 39.8 | 39.7 | **41.4** | **961** |
| **2** | MH(E)-18-2 | Pusa MH- 7 (Hybrid) | 4.5 | 3.1 | 4.72 | 4.6 | 4.7 | 41.9 | 41.2 | 42.0 | 40.2 | 41.3 | **41.7** | **823** |
| **3** | **MH(E)-18-3** | **DRMRHJ 2403** | **5.2** | **3.3** | **4.4** | **5.4** | **3.9** | **42.7** | **40.9** | **42.6** | **41.7** | **41.4** | **42.1** | **1034** |
| 4 | MH(E)-18-4 | JD- 6 (ZC) | 6.2 | 3.1 | 3.4 | 5 | 4.1 | 41.9 | 39.6 | 40.6 | 40.4 | 40.3 | **40.7** | **845** |
| **5** | MH(E)-18-5 | 8IJ4002 | 5.3 | 2.4 | 4.92 | 4.6 | 3.1 | 42.3 | 40.7 | 42.6 | 41.1 | 40.5 | **41.9** | **755** |
| **6** | **MH(E)-18-6** | **PRO 5111 (Hy Check)** | **4.8** | **2.8** | **3.6** | **3.5** | **3.9** | **41.7** | **40.5** | **43.0** | **41.4** | **41.7** | **41.7** | **938** |
| 7 | MH(E)-18-7 | Pusa MH- 5 (Hybrid) | 5.8 | 3.0 | 5.72 | 5.7 | 4.1 | 42.4 | 40.1 | 42.3 | 40.9 | 40.3 | **41.6** | **850** |
| 8 | MH(E)-18-8 | Pusa Mustard 25 (NC) | 4.3 | 2.5 | 5.44 | 5.2 | 4.1 | 41.6 | 39.9 | 41.8 | 40.6 | 40.2 | **41.1** | **841** |
| **9** | MH(E)-18-9 | PM 27 (LR) | 5.3 | 2.6 | 4.2 | 4.2 | 3.6 | 41.9 | 40.9 | 42.3 | 41.5 | 40.4 | **41.7** | **917** |
| 10 | MH(E)-18-10 | 8IJ0117 | 5.7 | 3.5 | 4.32 | 5.2 | 4.5 | 42.0 | 40.3 | 42.0 | 40.8 | 40.4 | **41.4** | **1009** |

## Table 2.3.12a. Performance of Indian mustard hybrids in IHT Early, Zone-V

| S. No | Code | Strain | Seed Yield (kg/ha) | | | | | | Plant Stand | | | | | | Days to Maturity | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BHU | IMP | JAG | KNK | SHL | Mean | BHU | IMP | JAG | KNK | SHL | | BHU | IMP | JAG | KNK | SHL | | |
| | | | 1 | 2 | 3 | 4 | 5 | (2,4-5) | 1 | 2 | 3 | 4 | 5 | | 1 | 2 | 3 | 4 | 5 | | (2,4-5) |
| 1 | MH(E)-18-1 | DRMRHJ 503 | 1004 | 1376 | 969 | 1416 | 1600 | **1464** | 125 | 109 | 223 | 159 | 215 | | 98 | 123 | 108 | 119 | 112 | | **118** |
| 2 | MH(E)-18-2 | Pusa MH- 7 (Hybrid) | 796 | 1435 | 541 | 1320 | 938 | **1231** | 123 | 108 | 210 | 146 | 179 | | 99 | 126 | 107 | 117 | 112 | | **118** |
| 3 | MH(E)-18-3 | DRMRHJ 2403 | 938 | 1387 | 947 | 1562 | 1180 | **1376** | 128 | 105 | 171 | 162 | 200 | | 101 | 122 | 105 | 118 | 114 | | **118** |
| 4 | MH(E)-18-4 | JD- 6 (ZC) | 760 | 1594 | 1117 | 1369 | 1575 | **1513** | 125 | 107 | 187 | 157 | 201 | | 100 | 121 | 98 | 115 | 114 | | **117** |
| 5 | MH(E)-18-5 | 8IJ4002 | 704 | 1778 | 1057 | 1151 | 1516 | **1482** | 122 | 102 | 203 | 159 | 205 | | 96 | 117 | 96 | 111 | 105 | | **111** |
| 6 | MH(E)-18-6 | PRO 5111 (Hy Check) | 716 | 1718 | 668 | 1143 | 1477 | **1446** | 120 | 106 | 197 | 142 | 201 | | 97 | 118 | 102 | 114 | 105 | | **112** |
| 7 | MH(E)-18-7 | Pusa MH- 5 (Hybrid) | 802 | 1400 | 1111 | 1207 | 1560 | **1389** | 124 | 105 | 229 | 152 | 210 | | 98 | 122 | 99 | 117 | 109 | | **116** |
| **8** | **MH(E)-18-8** | **Pusa Mustard 25 (NC)** | **768** | **1565** | **1185** | **1598** | **1565** | **1576** | **122** | **104** | **167** | **153** | **211** | | **96** | **119** | **104** | **111** | **114** | | **115** |
| 9 | MH(E)-18-9 | NRCHB 101 (LR) | 999 | 1335 | 1354 | 1434 | 1477 | **1415** | 130 | 103 | 216 | 156 | 200 | | 101 | 125 | 98 | 115 | 112 | | **117** |
| 10 | MH(E)-18-10 | 8IJ0117 | 947 | 1462 | 1214 | 1462 | 1936 | **1620** | 126 | 108 | 197 | 156 | 225 | | 100 | 125 | 98 | 116 | 112 | | **118** |
| | | GM | 843 | 1505 | 1016 | 1366 | 1482 | | | | | | | | | | | | | | |
| | | CD (5%) | 134 | 280 | 245 | 198 | 302 | | | | | | | | | | | | | | |
| | | CV (%) | 9.5 | 11.6 | 14.5 | 8.5 | 12.2 | | | | | | | | | | | | | | |
| | | DOS | 1.12.2018 | 3.11.2018 | 3.12.2018 | 25.10.2018 | 13.11.2018 | | | | | | | | | | | | | | |

## Table 2.3.12b. Performance of Indian mustard hybrids in IHT Early, Zone-III

| S. No. | Code | Strain | 1000-Seed Wt.(g) | | | | | | | | Oil Yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BHU | IMP | JAG | KNK | SHL | IMP | KNK | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 2 | 4 | (2,4) | (2,4-5) |
| 1 | MH(E)-18-1 | DRMRHJ 503 | 4.7 | 4.4 | 4.9 | 4.1 | 3.8 | 38.5 | 41.2 | **39.8** | **583** |
| **2** | MH(E)-18-2 | Pusa MH- 7 (Hybrid) | 4.1 | 3.8 | 3.3 | 3.2 | 3.9 | **38.5** | **41.7** | **40.1** | **493** |
| 3 | MH(E)-18-3 | DRMRHJ 2403 | 4.4 | 4.2 | 3.5 | 4.3 | 3.4 | 39.4 | 41.8 | **40.6** | **559** |
| 4 | MH(E)-18-4 | JD- 6 (ZC) | 4.0 | 4.4 | 3.4 | 3.8 | 3.5 | 39.1 | 41.7 | **40.4** | **611** |
| **5** | MH(E)-18-5 | 8IJ4002 | 4.1 | 3.4 | 3.2 | 3.0 | 2.8 | **39.8** | **40.7** | **40.2** | **596** |
| 6 | MH(E)-18-6 | PRO 5111 (Hy Check) | 4.0 | 3.7 | 3.4 | 3.5 | 3.6 | 39.3 | 41.8 | **40.6** | **587** |
| 7 | MH(E)-18-7 | Pusa MH- 5 (Hybrid) | 4.4 | 4.6 | 3.8 | 3.8 | 3.9 | 38.8 | 41.7 | **40.2** | **559** |
| **8** | **MH(E)-18-8** | **Pusa Mustard 25 (NC)** | **4.1** | **4.2** | **4.4** | **4.3** | **3.7** | **38.5** | **41.5** | **40.0** | **631** |
| **9** | MH(E)-18-9 | NRCHB 101 (LR) | 4.5 | 5.6 | 4.8 | 3.9 | 4.9 | 38.0 | 41.7 | **39.8** | **564** |
| 10 | MH(E)-18-10 | 8IJ0117 | 4.5 | 5.4 | 4.5 | 4.1 | 3.8 | 38.6 | 41.8 | **40.2** | **651** |

## Table 2.3.12c. Percent sterile plants in different entries of IHT

| S.No. | Code | Strain | Zone II | | | Zone III | | Mean |
|---|---|---|---|---|---|---|---|---|
| | | | LDH | NDH | PAL | PNT | BPR | |
| | | | 2 | 3 | 5 | 2 | 4 | |
| 1 | MH(E)-18-1 | DRMRHJ 503 | 0.0 | 19.4 | 30.3 | 0.0 | 5.0 | **11** |
| 2 | MH(E)-18-2 | Pusa MH- 7 (Hybrid) | 0.0 | 0.0 | 1.3 | 0.0 | 4.0 | **1** |
| 3 | MH(E)-18-3 | DRMRHJ 2403 | 0.0 | 12.8 | 25.4 | 15.6 | 5.0 | **12** |
| 4 | MH(E)-18-4 | JD- 6 (ZC) | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | **0** |
| 5 | MH(E)-18-5 | 8IJ4002 | 0.0 | 0.0 | 6.6 | 0.0 | 5.0 | **2** |
| 6 | MH(E)-18-6 | PRO 5111 (Hy Check) | 0.0 | 0.0 | 17.9 | 13.3 | 3.0 | **7** |
| 7 | MH(E)-18-7 | Pusa MH- 5 (Hybrid) | 0.0 | 0.0 | 26.9 | 0.0 | 3.0 | **6** |
| 8 | **MH(E)-18-8** | **Pusa Mustard 25 (NC)** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0** |
| 9 | MH(E)-18-9 | NRCHB 101 (LR) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0** |
| 10 | MH(E)-18-10 | 8IJ0117 | 0.0 | 0.0 | 0.0 | 0.0 | 3.]0 | **1** |

## Table-2.3.13a. Performance of Indian mustard strains in IVT timely sown (irrigated), Zone - I

| S.No | Code | Strain | Seed Yield (kg/ha) | | | | | | Plant Stand | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | KNG | DLK | UNA | BJR | Mean | | KNG | DLK | UNA | BJR |
| | | | 1 | 2 | 3 | 4 | (1-4) | | 1 | 2 | 3 | 4 |
| 1 | MCN-18-1 | AKMS- 1002 | 1130 | 1112 | 898 | 978 | **1029** | | 148 | 37 | 269 | 142 |
| 2 | MCN-18-2 | SKM 1512 | 1090 | 1091 | 808 | 1310 | **1075** | | 155 | 234 | 267 | 136 |
| **3** | **MCN-18-3** | **PBR 385** | **1387** | **1167** | **1054** | **1139** | **1187** | * | **155** | **242** | **268** | **123** |
| 4 | MCN-18-4 | Anmol | 964 | 891 | 677 | 1010 | **886** | | 152 | 243 | 269 | 136 |
| 5 | MCN-18-5 | ACN141 | 971 | 842 | 755 | 1244 | **953** | | 147 | 239 | 273 | 123 |
| **6** | **MCN-18-6** | **Giriraj (LR)** | **1180** | **1060** | **880** | **910** | **1008** | | **147** | **241** | **269** | **136** |
| **7** | **MCN-18-7** | **PR- 2016-8** | **1308** | **1171** | **981** | **1075** | **1134** | * | **144** | **245** | **271** | **136** |
| 8 | MCN-18-8 | KMR 18-3 | 1270 | 1082 | 909 | 959 | **1055** | | 160 | 243 | 266 | 135 |
| **9** | MCN-18-9 | RH 1584 | 1102 | 1026 | 924 | 1002 | **1014** | | 145 | 245 | 263 | 129 |
| 10 | MCN-18-10 | 8IJ0116 | 1135 | 1104 | 738 | 757 | **933** | | 147 | 244 | 266 | 127 |
| 11 | MCN-18-11 | RB- 101 | 1170 | 963 | 925 | 874 | **983** | | 147 | 243 | 266 | 127 |
| 12 | MCN-18-12 | DRMRCI 107 | 1155 | 1068 | 917 | 855 | **999** | | 155 | 244 | 273 | 128 |
| **13** | **MCN-18-13** | **RGN- 443** | **1485** | **1257** | **1158** | **1005** | **1226** | * | **146** | **243** | **267** | **134** |
| 14 | MCN-18-14 | DRMRIJ 1353 | 1061 | 1018 | 890 | 942 | **978** | | 148 | 243 | 266 | 119 |
| 15 | MCN-18-15 | KMR 18-4 | 969 | 925 | 767 | 996 | **914** | | 151 | 246 | 267 | 126 |
| 16 | MCN-18-16 | HUJM 17-6 | 1050 | 863 | 844 | 961 | **929** | | 145 | 242 | 265 | 137 |
| 17 | MCN-18-17 | Kranti (NC) | 973 | 915 | 786 | 737 | **853** | | 153 | 246 | 267 | 124 |
| 18 | MCN-18-18 | PHR- 3328 | 944 | 814 | 673 | 1145 | **894** | | 156 | 246 | 270 | 132 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **19** | **MCN-18-19** | **DRMR 2017-16** | **1229** | **1108** | **970** | **1151** | **1115** | * | **149** | **239** | **268** | **138** |
| **20** | **MCN-18-20** | **RH 1676** | **1219** | **1078** | **997** | **1153** | **1112** | * | **15** | **247** | **264** | **135** |
| **21** | **MCN-18-21** | **PR 2016-4** | **1293** | **1158** | **1020** | **1106** | **1144** | * | **152** | **242** | **268** | **127** |
| **22** | **MCN-18-22** | **SKM 1626** | **1373** | **1195** | **1088** | **1186** | **1210** | * | **148** | **242** | **273** | **135** |
| 23 | MCN-18-23 | JM- 13-5 | 905 | 1020 | 762 | 926 | **903** | | 151 | 245 | 269 | 120 |
| 24 | MCN-18-24 | NPJ- 223 | 1113 | 1045 | 847 | 942 | **987** | | 150 | 248 | 265 | 129 |
| 25 | MCN-18-25 | TM 217 | 937 | 940 | 826 | 1184 | **972** | | 151 | 244 | 271 | 136 |
| 26 | MCN-18-26 | RCC 4(ZC) | 958 | 978 | 700 | 905 | **885** | | 151 | 247 | 270 | 123 |
| 27 | MCN-18-27 | NPJ- 224 | 1070 | 1033 | 905 | 915 | **981** | | 151 | 245 | 268 | 117 |
| | | GM | 1128 | 1034 | 878 | 1014 | | | | | | |
| | | CD (5%) | 178.3 | 144.2 | 132 | 154 | | | | | | |
| | | CV(%) | 9.9 | 8.7 | 9.4 | 9.5 | | | | | | |
| | | DOS | 11.10.2018 | 30.10.2018 | 26.10.2018 | 18.10.2018 | | | | | | |

* Strain(s) outyielding the best check by a margin of > 10 percent seed yield

## Table-2.3.13b. Performance of Indian mustard strains in IVT timely sown (irrigated), Zone - I

| S.No | Code | Strain | Days to Maturity | | | | 1000 Seed Wt. (g) | | | | Oil Content(%) | | | | Mean | Oil yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | KNG | DLK | UNA | BJR | KNG | DLK | UNA | BJR | KNG | DLK | UNA | BJR | | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-4) | (1-4) |
| 1 | MCN-18-1 | AKMS- 1002 | 176 | 140 | 152 | 176 | 4.8 | 3.6 | 5.7 | 4 | 39.4 | 39.1 | 36.6 | 40.21 | **39** | **400** |
| 2 | MCN-18-2 | SKM 1512 | 173 | 145 | 155 | 173 | 4.4 | 3.5 | 5.2 | 2.8 | 40 | 39.6 | 37.6 | 38.2 | **39** | **418** |
| **3** | **MCN-18-3** | **PBR 385** | **175** | **147** | **153** | **175** | **4.3** | **4.1** | **5.8** | **3.6** | **39.5** | **39.2** | **36.4** | **39.1** | **39** | **457** |
| 4 | MCN-18-4 | Anmol | 168 | 139 | 147 | 172 | 4.7 | 5 | 5.9 | 4 | 38.4 | 40.6 | 38.5 | 38.83 | **39** | **346** |
| 5 | MCN-18-5 | ACN141 | 169 | 141 | 151 | 173 | 3.6 | 2.8 | 4.5 | 3.9 | 40.1 | 41.6 | 37.5 | 39.94 | **40** | **379** |
| **6** | **MCN-18-6** | **Giriraj (LR)** | **170** | **145** | **154** | **173** | **5.2** | **4.1** | **5.6** | **2.8** | **38.6** | **39.8** | **35.8** | **38.69** | **38** | **385** |
| **7** | **MCN-18-7** | **PR- 2016-8** | **169** | **143** | **145** | **172** | **4.5** | **3.9** | **5.4** | **5.1** | **40.2** | **41.1** | **36.6** | **39.33** | **39** | **446** |
| 8 | MCN-18-8 | KMR 18-3 | 174 | 144 | 154 | 174 | 5 | 3.4 | 4.8 | 5.5 | 39.3 | 41.3 | 36.5 | 38.79 | **39** | **411** |
| 9 | MCN-18-9 | RH 1584 | 175 | 144 | 154 | 174 | 4.1 | 3.5 | 4.5 | 2.5 | 37.7 | 39.3 | 38 | 37.04 | **38** | **385** |
| 10 | MCN-18-10 | 8IJ0116 | 167 | 145 | 140 | 170 | 4.3 | 2.7 | 4.7 | 3.7 | 39.4 | 40.8 | 37.4 | 39.32 | **39** | **366** |
| 11 | MCN-18-11 | RB- 101 | 174 | 143 | 153 | 174 | 4.2 | 3.3 | 4.4 | 3.2 | 38.2 | 41.3 | 37.3 | 40.24 | **39** | **386** |
| 12 | MCN-18-12 | DRMRCI 107 | 173 | 140 | 151 | 173 | 4.6 | 3.9 | 5.1 | 2.8 | 38.9 | 41.5 | 38.1 | 40.26 | **40** | **396** |
| **13** | **MCN-18-13** | **RGN- 443** | **177** | **140** | **155** | **176** | **4.8** | **3.5** | **5.1** | **3.1** | **39.4** | **41.3** | **39.9** | **39.77** | **40** | **492** |
| 14 | MCN-18-14 | DRMRIJ 1353 | 174 | 136 | 15 | 172 | 4.7 | 4.1 | 5.2 | 2.6 | 39.9 | 39.6 | 37.7 | 39.98 | **39** | **384** |
| 15 | MCN-18-15 | KMR 18-4 | 174 | 144 | 153 | 174 | 4.2 | 3.6 | 5.1 | 2 | 40 | 41.4 | 37.3 | 39.31 | **40** | **361** |
| 16 | MCN-18-16 | HUJM 17-6 | 169 | 139 | 146 | 173 | 4.6 | 3 | 4.4 | 4.5 | 38.6 | 40.2 | 36.3 | 39.61 | **39** | **359** |
| 17 | MCN-18-17 | Kranti (NC) | 168 | 140 | 148 | 174 | 3.8 | 4 | 4.5 | 4.5 | 38.7 | 40.3 | 38.8 | 39.55 | **39** | **335** |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | MCN-18-18 | PHR- 3328 | 174 | 146 | 145 | 173 | 3 | 2.8 | 4 | 2.6 | 40.6 | 41.5 | 36.4 | 39.9 | **40** | **354** |
| **19** | **MCN-18-19** | **DRMR 2017-16** | **178** | **145** | **157** | **176** | **4.5** | **4.1** | **4.4** | **5.7** | **39.8** | **39.9** | **40.2** | **40.33** | **40** | **446** |
| **20** | **MCN-18-20** | **RH 1676** | **175** | **141** | **154** | **173** | **4.7** | **3.5** | **4.4** | **4** | **39.4** | **40.6** | **38** | **40.76** | **40** | **441** |
| **21** | **MCN-18-21** | **PR 2016-4** | **175** | **140** | **153** | **175** | **4** | **3.6** | **4.9** | **5.8** | **39.6** | **40.7** | **37.3** | **39.16** | **39** | **448** |
| **22** | **MCN-18-22** | **SKM 1626** | **177** | **143** | **155** | **175** | **5.1** | **3.6** | **4.9** | **4.2** | **37.4** | **41.1** | **38.7** | **38.92** | **39** | **472** |
| 23 | MCN-18-23 | JM- 13-5 | 173 | 148 | 152 | 173 | 4.2 | 4.2 | 4 | 3.5 | 39.8 | 40.3 | 38.1 | 38.66 | **39** | **354** |
| 24 | MCN-18-24 | NPJ- 223 | 168 | 142 | 146 | 173 | 5.2 | 4.2 | 5.2 | 2.7 | 39 | 41 | 38.3 | 40.39 | **40** | **391** |
| 25 | MCN-18-25 | TM 217 | 177 | 151 | 156 | 176 | 4.7 | 4.4 | 4.9 | 3.2 | 39.4 | 40.5 | 38.5 | 40.89 | **40** | **387** |
| 26 | MCN-18-26 | RCC 4(ZC) | 174 | 146 | 152 | 174 | 2.6 | 2.7 | 3.5 | 4.5 | 40.2 | 41.8 | 40.4 | 39.14 | **40** | **358** |
| 27 | MCN-18-27 | NPJ- 224 | 170 | 140 | 152 | 174 | 4.3 | 3.9 | 4.9 | 5.8 | 40 | 38.8 | 36.5 | 40.05 | **39** | **381** |

## Table-2.3.14a. Performance of Indian mustard strains in IVT timely sown (irrigated), Zone - II

| S.No. | Code | Strain | Seed Yield Kg/ha | | | | | | | Plant Stand | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | NDH | CHT | SGN | Mean | | HSR | LDH | NDH | CHT | SGN |
| | | | 1 | 2 | 3 | 4 | 5 | (1-5) | | 1 | 2 | 3 | 4 | 5 |
| **1** | MCN-18-1 | AKMS- 1002 | 2826 | 2578 | 2150 | 2144 | 3002 | **2540** | | 123 | 127 | 156 | 134 | 173 |
| 2 | MCN-18-2 | SKM 1512 | 2642 | 2394 | 2515 | 1848 | 3432 | **2566** | | 121 | 138 | 124 | 122 | 160 |
| 3 | MCN-18-3 | PBR 385 | 3330 | 2246 | 2614 | 2290 | 3564 | **2809** | | 120 | 128 | 150 | 125 | 144 |
| 4 | MCN-18-4 | Anmol | 3443 | 2047 | 3017 | 1894 | 3221 | **2724** | | 119 | 119 | 120 | 128 | 180 |
| 5 | MCN-18-5 | ACN141 | 2517 | 2191 | 2319 | 2054 | 3198 | **2456** | | 121 | 133 | 139 | 129 | 160 |
| 6 | MCN-18-6 | Giriraj (LR) | 2646 | 2655 | 2712 | 1804 | 3312 | **2626** | | 122 | 128 | 149 | 125 | 163 |
| 7 | MCN-18-7 | PR- 2016-8 | 3555 | 2975 | 2661 | 2309 | 2925 | **2885** | | 118 | 137 | 151 | 124 | 179 |
| 8 | MCN-18-8 | KMR 18-3 | 2997 | 2281 | 2673 | 1916 | 3058 | **2585** | | 121 | 134 | 146 | 131 | 157 |
| 9 | MCN-18-9 | RH 1584 | 2605 | 2447 | 2803 | 2337 | 3551 | **2749** | | 123 | 134 | 132 | 128 | 169 |
| 10 | MCN-18-10 | 8IJ0116 | 3013 | 2405 | 3321 | 1472 | 3321 | **2707** | | 121 | 135 | 149 | 132 | 158 |
| 11 | MCN-18-11 | RB- 101 | 2564 | 2384 | 2093 | 2070 | 3620 | **2546** | | 125 | 127 | 120 | 138 | 154 |
| 12 | MCN-18-12 | DRMRCI 107 | 2331 | 2379 | 2130 | 1983 | 2979 | **2360** | | 121 | 130 | 142 | 130 | 168 |
| 13 | MCN-18-13 | RGN- 443 | 2527 | 2201 | 2020 | 2025 | 3601 | **2475** | | 118 | 126 | 134 | 127 | 166 |
| 14 | MCN-18-14 | DRMRIJ 1353 | 2654 | 2734 | 2532 | 1591 | 3387 | **2580** | | 119 | 141 | 143 | 128 | 163 |
| 15 | MCN-18-15 | KMR 18-4 | 2995 | 2126 | 2585 | 2370 | 3121 | **2640** | | 122 | 119 | 146 | 131 | 170 |
| 16 | MCN-18-16 | HUJM 17-6 | 2676 | 2296 | 2109 | 1998 | 3095 | **2435** | | 119 | 130 | 151 | 134 | 180 |
| 17 | MCN-18-17 | Kranti (NC) | 2544 | 2351 | 2436 | 2101 | 2937 | **2474** | | 121 | 126 | 145 | 131 | 169 |
| **18** | MCN-18-18 | PHR- 3328 | 2766 | 2414 | 2811 | 1997 | 3278 | **2653** | | 119 | 121 | 138 | 120 | 174 |
| 19 | MCN-18-19 | DRMR 2017-16 | 2667 | 2506 | 2327 | 1895 | 2899 | **2459** | | 120 | 126 | 131 | 131 | 179 |
| **20** | **MCN-18-20** | **RH 1676** | **3529** | **2808** | **2724** | **2358** | **3299** | **2944** | * | **120** | **145** | **146** | **135** | **183** |
| 21 | MCN-18-21 | PR 2016-4 | 3150 | 2102 | 2916 | 2297 | 3582 | **2809** | | 120 | 121 | 161 | 140 | 180 |
| 22 | MCN-18-22 | SKM 1626 | 2804 | 2451 | 3029 | 2194 | 3069 | **2709** | | 124 | 140 | 140 | 129 | 171 |
| 23 | MCN-18-23 | JM- 13-5 | 2465 | 2113 | 2548 | 2194 | 3602 | **2584** | | 118 | 130 | 135 | 134 | 174 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | MCN-18-24 | NPJ- 223 | 3265 | 2498 | 3319 | 1751 | 3251 | **2817** | | 122 | 139 | 150 | 122 | 166 |
| 25 | MCN-18-25 | TM 217 | 2128 | 2220 | 1901 | 1498 | 2837 | **2117** | | 118 | 126 | 133 | 131 | 174 |
| **26** | **MCN-18-26** | **RH 0749 (ZC)** | **2864** | **2221** | **2682** | **2035** | **3434** | **2647** | | **117** | **121** | **129** | **128** | **173** |
| 27 | MCN-18-27 | NPJ- 224 | 2868 | 2488 | 2857 | 1663 | 2963 | **2568** | | 121 | 137 | 139 | 136 | 156 |
| | | GM | 2829 | 2389 | 2585 | 2003 | 3242 | | | | | | | |
| | | CD (5%) | 499 | 390 | 302 | 332 | 494 | | | | | | | |
| | | CV(%) | 11.0 | 10.2 | 7.3 | 10.4 | 9.5 | | | | | | | |
| | | DOS | 8.10.2018 | 16.10.2018 | 13.10.2018 | 19.10.2018 | 26.10.2018 | | | | | | | |

* Strain(s) outyielding the best check by a margin of > 10 percent seed yield

## Table-2.3.14b. Performance of Indian mustard strains in IVT timely sown (irrigated), Zone - II

| S.No. | Code | Strain | Days to Maturity | | | | | 1000 Seed Weight (g) | | | | | Oil Content (%) | | | | | | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | NDH | CHT | SGN | HSR | LDH | NDH | CHT | SGN | HSR | LDH | NDH | CHT | SGN | Mean | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1-5) | (1-5) |
| 1 | MCN-18-1 | AKMS- 1002 | 149 | 143 | 158 | 149 | 149 | 5.0 | 5.0 | 4.1 | 5.2 | 5.6 | 42.0 | 41.5 | 38.7 | 39.8 | 38.8 | **40.1** | **1020** |
| 2 | MCN-18-2 | SKM 1512 | 144 | 143 | 153 | 141 | 153 | 5.2 | 4.7 | 4.8 | 3.7 | 5.4 | 40.5 | 41.4 | 39.4 | 39.9 | 41.5 | **40.5** | **1040** |
| 3 | MCN-18-3 | PBR 385 | 151 | 146 | 154 | 147 | 154 | 4.8 | 4.5 | 4.0 | 4.8 | 5.6 | 41.8 | 41.8 | 38.8 | 39.7 | 40.1 | **40.4** | **1136** |
| 4 | MCN-18-4 | Anmol | 144 | 135 | 152 | 142 | 150 | 5.9 | 5.6 | 6.3 | 3.6 | 6.0 | 37.6 | 39.6 | 39.4 | 39.5 | 41.0 | **39.4** | **1074** |
| 5 | MCN-18-5 | ACN141 | 148 | 141 | 155 | 148 | 147 | 4.7 | 4.3 | 3.8 | 3.8 | 5.0 | 40.5 | 41.7 | 39.5 | 39.3 | 40.3 | **40.2** | **988** |
| 6 | MCN-18-6 | Giriraj (LR) | 146 | 143 | 154 | 149 | 151 | 5.8 | 5.7 | 4.6 | 3.2 | 6.4 | 41.5 | 42.7 | 40.4 | 39.5 | 42.1 | **41.3** | **1084** |
| 7 | MCN-18-7 | PR- 2016-8 | 151 | 138 | 155 | 142 | 148 | 5.3 | 4.8 | 4.1 | 4.5 | 4.8 | 40.2 | 40.2 | 39.7 | 40.4 | 40.2 | **40.1** | **1158** |
| 8 | MCN-18-8 | KMR 18-3 | 147 | 137 | 153 | 140 | 155 | 4.7 | 5.2 | 4.7 | 3.4 | 5.0 | 39.9 | 41.8 | 39.9 | 39.2 | 38.7 | **39.9** | **1031** |
| 9 | MCN-18-9 | RH 1584 | 146 | 143 | 154 | 150 | 151 | 6.1 | 4.0 | 4.6 | 4.3 | 5.2 | 41.6 | 42.2 | 40.4 | 39.5 | 41.1 | **40.9** | **1125** |
| 10 | MCN-18-10 | 8IJ0116 | 133 | 130 | 132 | 141 | 148 | 4.7 | 5.0 | 4.6 | 3.8 | 4.2 | 41.6 | 42.1 | 40.3 | 37.3 | 38.5 | **40.0** | **1082** |
| 11 | MCN-18-11 | RB- 101 | 149 | 141 | 154 | 147 | 154 | 4.4 | 3.1 | 4.0 | 3.6 | 4.6 | 40.6 | 42.4 | 40.4 | 40.7 | 40.7 | **41.0** | **1043** |
| 12 | MCN-18-12 | DRMRCI 107 | 149 | 146 | 158 | 145 | 141 | 5.5 | 5.4 | 4.8 | 5.2 | 5.8 | 39.42 | 41.7 | 39.3 | 39.1 | 38.6 | **39.6** | **936** |
| 13 | MCN-18-13 | RGN- 443 | 150 | 144 | 156 | 148 | 147 | 4.7 | 4.9 | 4.0 | 4.2 | 5.6 | 40.2 | 41.0 | 40.1 | 39.8 | 39.2 | **40.1** | **991** |
| 14 | MCN-18-14 | DRMRIJ 1353 | 145 | 142 | 152 | 144 | 146 | 5.6 | 5.0 | 5.0 | 4.6 | 5.0 | 41.9 | 42.1 | 40.5 | 38.4 | 42.3 | **41.0** | **1059** |
| 15 | MCN-18-15 | KMR 18-4 | 146 | 141 | 154 | 150 | 151 | 4.8 | 4.9 | 3.7 | 4.1 | 5.0 | 41.6 | 41.7 | 40.1 | 39.6 | 41.2 | **40.8** | **1078** |
| 16 | MCN-18-16 | HUJM 17-6 | 147 | 137 | 155 | 146 | 150 | 4.6 | 4.5 | 3.8 | 3.7 | 5.8 | 40.5 | 41.3 | 39.0 | 38.8 | 39.6 | **39.8** | **970** |
| 17 | MCN-18-17 | Kranti (NC) | 151 | 140 | 150 | 144 | 147 | 4.1 | 4.0 | 3.9 | 3.6 | 4.6 | 42.3 | 40.7 | 40.6 | 39.7 | 41.1 | **40.9** | **1011** |
| 18 | MCN-18-18 | PHR- 3328 | 149 | 147 | 155 | 145 | 151 | 3.6 | 3.7 | 2.8 | 3.2 | 4.2 | 41.2 | 40.7 | 39.3 | 38.5 | 39.6 | **39.8** | **1057** |
| 19 | MCN-18-19 | DRMR 2017-16 | 148 | 142 | 156 | 149 | 144 | 5.1 | 5.6 | 3.8 | 3.9 | 5.4 | 40.6 | 42.5 | 40.5 | 40.5 | 40.9 | **41.0** | **1009** |
| **20** | **MCN-18-20** | **RH 1676** | **148** | **142** | **155** | **147** | **146** | **6.0** | **5.0** | **4.9** | **4.8** | **6.0** | **40.4** | **41.5** | **40.6** | **39.5** | **39.8** | **40.4** | **1188** |
| 21 | MCN-18-21 | PR 2016-4 | 150 | 143 | 155 | 148 | 147 | 5.4 | 4.9 | 4.6 | 4.4 | 5.2 | 40.6 | 41.0 | 40.0 | 39.4 | 41.1 | **40.4** | **1135** |
| 22 | MCN-18-22 | SKM 1626 | 150 | 146 | 153 | 149 | 149 | 5.0 | 5.7 | 5.5 | 4.5 | 6.6 | 41.6 | 40.7 | 40.0 | 39.9 | 41.2 | **40.7** | **1102** |
| 23 | MCN-18-23 | JM- 13-5 | 147 | 148 | 154 | 150 | 143 | 4.9 | 4.8 | 4.2 | 4.5 | 4.8 | 40.6 | 41.9 | 39.7 | 38.6 | 41.5 | **40.5** | **1046** |
| 24 | MCN-18-24 | NPJ- 223 | 144 | 144 | 149 | 140 | 160 | 5.9 | 5.4 | 4.6 | 3.5 | 5.8 | 40.5 | 41.8 | 39.2 | 35.7 | 38.5 | **39.2** | **1103** |
| 25 | MCN-18-25 | TM 217 | 150 | 146 | 155 | 151 | 149 | 5.56 | 5.6 | 4.9 | 4.4 | 6.2 | 39.6 | 38.9 | 37.3 | 40.7 | 38.3 | **39.0** | **825** |
| **26** | **MCN-18-26** | **RH 0749 (ZC)** | **151** | **141** | **154** | **147** | **153** | **6.15** | **5.2** | **4.7** | **4.6** | **5.4** | **40.5** | **41.9** | **39.0** | **40.1** | **40.9** | **40.5** | **1072** |
| 27 | MCN-18-27 | NPJ- 224 | 149 | 143 | 146 | 144 | 154 | 5.67 | 5.5 | 5.1 | 4.4 | 6.2 | 40.7 | 39.9 | 43.5 | 39.6 | 41.0 | **40.9** | **1051** |

# Table2.3.15a. Performance of Indian mustard strains in IVT timely sown (irrigated), Zone - III

| S. No | Code | Strain | Seed Yield (kg/ha) | | | | | | | | | Plant Stand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR# | VAR | KOT | BND | JHS$ | DOL$$ | Mean | MOR | PNT | KPR | VAR | KOT | BND | JHS | DOL |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | (1-2,4-6) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | MCN-18-1 | AKMS- 1002 | 3279 | 1676 | 2469 | 2238 | 3047 | 2610 | 1708 | 1238 | **2570** | 172 | 144 | 122 | 179 | 160 | 137 | 347 | 159 |
| 2 | MCN-18-2 | SKM 1512 | 3297 | 2844 | 2134 | 1976 | 2776 | 3005 | 2163 | 1111 | **2780** | 172 | 126 | 118 | 172 | 159 | 121 | 376 | 162 |
| 3 | MCN-18-3 | PBR 385 | 3265 | 1978 | 2264 | 2548 | 3277 | 3010 | 2135 | 1560 | **2816** | 172 | 169 | 119 | 182 | 167 | 144 | 329 | 160 |
| 4 | MCN-18-4 | Anmol | 1949 | 1850 | 2315 | 2920 | 3082 | 3052 | 1842 | 1394 | **2571** | 172 | 125 | 120 | 167 | 148 | 118 | 363 | 162 |
| 5 | MCN-18-5 | ACN141 | 3090 | 1366 | 2160 | 1919 | 3137 | 3178 | 1773 | 1721 | **2538** | 175 | 146 | 120 | 174 | 170 | 127 | 352 | 156 |
| 6 | MCN-18-6 | RGN 73 (LR) | 3554 | 1597 | 2443 | 2425 | 2756 | 2747 | 2076 | 1490 | **2616** | 175 | 129 | 122 | 179 | 165 | 121 | 316 | 165 |
| 7 | MCN-18-7 | PR- 2016-8 | 2772 | 1734 | 2186 | 2818 | 3255 | 3141 | 2147 | 1518 | **2744** | 172 | 145 | 118 | 178 | 166 | 147 | 339 | 157 |
| 8 | MCN-18-8 | KMR 18-3 | 3114 | 2104 | 2315 | 3295 | 2923 | 3281 | 2279 | 1400 | **2944** | 170 | 155 | 120 | 185 | 168 | 149 | 327 | 159 |
| **9** | **MCN-18-9** | **RH 1584** | **3818** | **2481** | **2520** | **2633** | **2648** | **3382** | **2215** | **1637** | **2992** | * | **171** | **149** | **123** | **184** | **163** | **128** | **286** | **160** |
| 10 | MCN-18-10 | 8IJ0116 | 3141 | 2140 | 2365 | 2125 | 2354 | 2812 | 2039 | 1260 | **2514** | 172 | 161 | 118 | 177 | 162 | 141 | 330 | 159 |
| 11 | MCN-18-11 | RB- 101 | 3454 | 1748 | 2392 | 2196 | 2635 | 2521 | 1934 | 1165 | **2511** | 174 | 166 | 121 | 175 | 160 | 152 | 277 | 158 |
| 12 | MCN-18-12 | DRMRCI 107 | 3425 | 1860 | 2237 | 2190 | 3012 | 3152 | 2002 | 1231 | **2728** | 170 | 159 | 118 | 172 | 169 | 137 | 320 | 155 |
| 13 | MCN-18-13 | RGN- 443 | 3649 | 1957 | 2418 | 2556 | 3268 | 2906 | 1795 | 1573 | **2867** | 166 | 133 | 120 | 171 | 167 | 134 | 275 | 159 |
| 14 | MCN-18-14 | DRMRIJ 1353 | 3300 | 2206 | 2186 | 2500 | 2836 | 2756 | 1860 | 1071 | **2720** | 175 | 144 | 119 | 173 | 168 | 137 | 325 | 162 |
| 15 | MCN-18-15 | KMR 18-4 | 3262 | 2525 | 2418 | 2558 | 2696 | 2876 | 1487 | 1306 | **2784** | 172 | 129 | 121 | 169 | 162 | 140 | 300 | 160 |
| 16 | MCN-18-16 | HUJM 17-6 | 3161 | 1490 | 2288 | 1821 | 2755 | 2470 | 1882 | 1042 | **2339** | 173 | 143 | 117 | 170 | 161 | 135 | 336 | 159 |
| **17** | **MCN-18-17** | **Kranti (NC)** | **3337** | **2451** | **2469** | **2301** | **2345** | **3065** | **1921** | **1411** | **2700** | **171** | **138** | **120** | **172** | **159** | **143** | **269** | **158** |
| 18 | MCN-18-18 | PHR- 3328 | 3040 | 2361 | 2520 | 1917 | 3109 | 3030 | 2154 | 1399 | **2691** | 175 | 161 | 121 | 178 | 163 | 148 | 290 | 161 |
| 19 | MCN-18-19 | DRMR 2017-16 | 3128 | 1797 | 2649 | 3318 | 2892 | 2913 | 1836 | 1326 | **2810** | 173 | 156 | 121 | 159 | 167 | 138 | 350 | 159 |
| 20 | MCN-18-20 | RH 1676 | 3454 | 1949 | 2211 | 2702 | 2422 | 3034 | 1894 | 1339 | **2712** | 170 | 166 | 120 | 167 | 163 | 142 | 338 | 161 |
| 21 | MCN-18-21 | PR 2016-4 | 3184 | 2141 | 2109 | 2606 | 2324 | 3138 | 1653 | 1447 | **2678** | 172 | 131 | 119 | 183 | 160 | 122 | 343 | 161 |
| # | **MCN-18-22** | **SKM 1626** | **3610** | **2110** | **2315** | **3166** | **3125** | **2942** | **2002** | **1302** | **2991** | * | **174** | **161** | **116** | **174** | **172** | **126** | **396** | **158** |
| 23 | MCN-18-23 | JM- 13-5 | 3386 | 1953 | 2186 | 1652 | 2848 | 3169 | 1847 | 1165 | **2602** | 174 | 173 | 115 | 176 | 165 | 137 | 339 | 159 |
| 24 | MCN-18-24 | NPJ- 223 | 2721 | 2282 | 2160 | 1270 | 2152 | 2750 | 1910 | 1076 | **2235** | 172 | 153 | 119 | 178 | 162 | 140 | 370 | 164 |
| 25 | MCN-18-25 | TM 217 | 2347 | 1436 | 2160 | 1358 | 2257 | 2388 | 1187 | 1110 | **1957** | 172 | 135 | 119 | 171 | 136 | 109 | 343 | 160 |
| 26 | MCN-18-26 | Maya (ZC) | 2626 | 1890 | 2315 | 2003 | 2910 | 2595 | 1816 | 1046 | **2405** | 175 | 160 | 118 | 171 | 168 | 158 | 281 | 162 |
| 27 | MCN-18-27 | NPJ- 224 | 2213 | 2053 | 2443 | 2434 | 2303 | 3433 | 2318 | 1523 | **2487** | 171 | 157 | 119 | 186 | 165 | 131 | 282 | 157 |
| | | GM | 3132 | 1999 | 2320 | 2350 | 2783 | 2939 | 1921 | 1328 | | | | | | | | | |
| | | C.D. (5%) | 612 | 187 | 316 | 571 | 477 | 699 | 667 | 356 | | | | | | | | | |
| | | CV (%) | 12.2 | 5.9 | 8.3 | 15.2 | 10.7 | 14.7 | 21.7 | 16.8 | | | | | | | | | |
| | | DOS | 8.10.2018 | 18.10.2018 | 26.10.2018 | 27.10.2018 | 25.10.2018 | 29.10.2018 | 26.11.2018 | 27.10.2018 | | | | | | | | | |

$ data of JHS excluded from computation of mean due to inappropriate date of sowing and high CV

$$ data of DOL excluded from computation of mean due to high CV

* Strain(s) outy ielding the best check by a margin of > 10 percent seed and oil yield

# data of KNP centre excluded from computation of mean due to conduct of trial in RBD instead of alpha lattice design

## Table2.3.15b. Performance of Indian mustard strains in IVT timely sown (irrigated ), Zone-III

| S. No. | Code | Strain | Days to Maturity | | | | | | | | 1000-Seed Wt. (g) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | VAR | KOT | BND | JHS | DOL | MOR | PNT | KPR | VAR | KOT | BND | JHS | DOL |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | MCN-18-1 | AKMS- 1002 | 151 | 128 | 132 | 139 | 135 | 134 | 114 | 134 | 5.1 | 4.2 | 4.9 | 4.3 | 4.4 | 4.4 | 4.6 | 3.6 |
| 2 | MCN-18-2 | SKM 1512 | 149 | 123 | 137 | 132 | 131 | 131 | 115 | 131 | 4.8 | 3.3 | 4.4 | 4.3 | 4.5 | 4.6 | 4.4 | 3.4 |
| 3 | MCN-18-3 | PBR 385 | 153 | 127 | 134 | 132 | 130 | 132 | 114 | 132 | 5.3 | 3.0 | 5.0 | 4.5 | 5.2 | 5.3 | 5.3 | 4.3 |
| 4 | MCN-18-4 | Anmol | 145 | 120 | 135 | 101 | 131 | 132 | 114 | 130 | 7.1 | 4.0 | 5.2 | 5.5 | 5.8 | 4.7 | 4.6 | 3.1 |
| 5 | MCN-18-5 | ACN141 | 152 | 130 | 133 | 101 | 127 | 135 | 114 | 130 | 5.1 | 3.9 | 3.9 | 4.2 | 3.4 | 4.7 | 4.5 | 2.6 |
| 6 | MCN-18-6 | RGN 73 (LR) | 153 | 131 | 132 | 134 | 132 | 134 | 114 | 131 | 5.1 | 3.4 | 5.0 | 4.1 | 3.7 | 5.0 | 4.2 | 2.6 |
| 7 | MCN-18-7 | PR- 2016-8 | 152 | 132 | 131 | 136 | 132 | 133 | 115 | 132 | 5.4 | 3.3 | 4.5 | 5.0 | 4.1 | 4.2 | 4.7 | 3.9 |
| 8 | MCN-18-8 | KMR 18-3 | 151 | 125 | 133 | 132 | 133 | 132 | 115 | 132 | 5.6 | 4.2 | 5.6 | 4.7 | 4.9 | 3.4 | 4.7 | 4.1 |
| **9** | **MCN-18-9** | **RH 1584** | **152** | **131** | **136** | **139** | **131** | **132** | **116** | **130** | **5.2** | **4.0** | **4.4** | **4.9** | **5.3** | **4.7** | **4.5** | **3.8** |
| 10 | MCN-18-10 | 8IJ0116 | 138 | 129 | 134 | 123 | 123 | 128 | 116 | 126 | 5.1 | 3.7 | 4.2 | 3.8 | 4.2 | 3.8 | 4.8 | 3.2 |
| 11 | MCN-18-11 | RB- 101 | 153 | 130 | 136 | 134 | 132 | 134 | 114 | 133 | 5.6 | 3.1 | 4.4 | 4.6 | 3.8 | 4.4 | 4.9 | 3.6 |
| 12 | MCN-18-12 | DRMRCI 107 | 153 | 125 | 135 | 139 | 132 | 134 | 116 | 134 | 6.1 | 3.8 | 5.2 | 4.9 | 5.2 | 4.2 | 4.5 | 3.2 |
| 13 | MCN-18-13 | RGN- 443 | 154 | 123 | 134 | 135 | 135 | 133 | 116 | 133 | 5.1 | 3.2 | 4.5 | 4.7 | 5.1 | 4.6 | 4.8 | 3.8 |
| 14 | MCN-18-14 | DRMRIJ 1353 | 151 | 127 | 132 | 101 | 127 | 129 | 115 | 128 | 6.8 | 3.3 | 4.6 | 4.5 | 4.5 | 4.3 | 4.4 | 3.1 |
| 15 | MCN-18-15 | KMR 18-4 | 152 | 133 | 130 | 134 | 129 | 130 | 116 | 132 | 3.8 | 3.5 | 4.6 | 4.8 | 3.8 | 3.4 | 4.3 | 3.4 |
| 16 | MCN-18-16 | HUJM 17-6 | 150 | 125 | 130 | 122 | 130 | 133 | 115 | 131 | 6.1 | 3.7 | 4.2 | 4.7 | 4.6 | 4.5 | 4.6 | 3.5 |
| 17 | **MCN-18-17** | **Kranti (NC)** | **152** | **134** | **133** | **136** | **126** | **127** | **113** | **134** | **4.6** | **3.0** | **4.3** | **3.9** | **3.5** | **5.6** | **4.3** | **2.5** |
| 18 | MCN-18-18 | PHR- 3328 | 153 | 132 | 134 | 132 | 134 | 133 | 114 | 129 | 3.7 | 3.5 | 4.2 | 3.1 | 3.2 | 5.8 | 3.8 | 2.5 |
| 19 | MCN-18-19 | DRMR 2017-16 | 152 | 135 | 131 | 136 | 132 | 137 | 114 | 131 | 5.9 | 3.2 | 5.2 | 4.6 | 4.6 | 4.4 | 4.7 | 3.7 |
| 20 | MCN-18-20 | RH 1676 | 140 | 131 | 133 | 134 | 134 | 133 | 116 | 128 | 5.4 | 3.4 | 4.4 | 4.9 | 5.2 | 4.1 | 5.0 | 3.6 |
| 21 | MCN-18-21 | PR 2016-4 | 151 | 134 | 135 | 134 | 131 | 133 | 115 | 132 | 5.8 | 3.6 | 4.8 | 4.9 | 5.3 | 5.0 | 5.0 | 4.7 |
| **22** | **MCN-18-22** | **SKM 1626** | **152** | **132** | **135** | **136** | **132** | **134** | **116** | **133** | **6.4** | **3.6** | **5.5** | **5.5** | **5.4** | **4.3** | **5.4** | **4.4** |
| 23 | MCN-18-23 | JM- 13-5 | 153 | 128 | 133 | 134 | 126 | 132 | 114 | 132 | 4.9 | 2.9 | 3.8 | 4.3 | 3.5 | 3.6 | 4.9 | 2.7 |
| 24 | MCN-18-24 | NPJ- 223 | 146 | 133 | 131 | 100 | 125 | 132 | 115 | 128 | 6.5 | 3.4 | 5.4 | 4.3 | 5.9 | 4.2 | 4.6 | 3.2 |
| 25 | MCN-18-25 | TM 217 | 152 | 131 | 132 | 101 | 130 | 132 | 113 | 129 | 6.5 | 4.0 | 5.6 | 5.6 | 4.9 | 5.7 | 5.1 | 4.1 |
| 26 | MCN-18-26 | Maya (ZC) | 148 | 133 | 135 | 100 | 129 | 119 | 114 | 128 | 5.7 | 3.7 | 4.6 | 6.2 | 5.0 | 5.1 | 4.1 | 3.2 |
| 27 | MCN-18-27 | NPJ- 224 | 137 | 134 | 132 | 100 | 127 | 128 | 114 | 128 | 6.2 | 3.4 | 5.4 | 4.8 | 4.9 | 5.1 | 5.2 | 4.2 |

## Table2.3.15c. Performance of Indian mustard strains in IVT timely sown (irrigated ), Zone-III

| S. No. | Code | Strain | Oil Content (%) | | | | | | | | Mean | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR$ | VAR | KOT | BND | JHS$ | DOL# | | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | (1-2,4-6) | (1-2,4-6) |
| 1 | MCN-18-1 | AKMS- 1002 | 39.59 | 40.05 | 39.23 | 36.77 | 39.55 | 40.57 | 39.52 | 39.76 | **39.3** | **1010** |
| 2 | MCN-18-2 | SKM 1512 | 41.87 | 36.22 | 39.89 | 40.22 | 40.66 | 41.61 | 39.51 | 40.05 | **40.1** | **1115** |
| 3 | MCN-18-3 | PBR 385 | 40.51 | 40.54 | 40.17 | 39.6 | 39.82 | 39.65 | 40.92 | 39.24 | **40.0** | **1127** |
| 4 | MCN-18-4 | Anmol | 40.78 | 39.05 | 39.81 | 39.87 | 38.11 | 39.92 | 39.94 | 39.85 | **39.5** | **1017** |
| 5 | MCN-18-5 | ACN141 | 40.5 | 40.53 | 39.95 | 38.91 | 39.65 | 40.22 | 39.4 | 39.2 | **40.0** | **1014** |
| 6 | MCN-18-6 | RGN 73 (LR) | 41.55 | 40.08 | 38.49 | 39.51 | 40.71 | 39.21 | 40.43 | 39.99 | **40.2** | **1052** |
| 7 | MCN-18-7 | PR- 2016-8 | 40.98 | 39.18 | 39.88 | 39.08 | 40.59 | 41.22 | 40.11 | 39.73 | **40.2** | **1103** |
| 8 | MCN-18-8 | KMR 18-3 | 42.06 | 39 | 39.95 | 39.76 | 42.13 | 38.78 | 40.85 | 40.03 | **40.3** | **1188** |
| **9** | **MCN-18-9** | **RH 1584** | **41.59** | **39.07** | **40.82** | **38.8** | **41** | **41.76** | **41.05** | **40.43** | **40.4** | **1210** |
| 10 | MCN-18-10 | 8IJ0116 | 40.59 | 40.5 | 39.27 | 39.32 | 39.72 | 41.3 | 40.44 | 40.34 | **40.3** | **1013** |
| 11 | MCN-18-11 | RB- 101 | 41.27 | 39.46 | 40.66 | 40.11 | 40.3 | 40.72 | 40.75 | 40.76 | **40.4** | **1014** |
| 12 | MCN-18-12 | DRMRCI 107 | 40.98 | 39.59 | 40.12 | 39.95 | 40.6 | 39.12 | 41.02 | 39.06 | **40.0** | **1092** |
| 13 | MCN-18-13 | RGN- 443 | 40.52 | 40.73 | 40.22 | 38.17 | 40.64 | 40.76 | 39.73 | 40 | **40.2** | **1152** |
| 14 | MCN-18-14 | DRMRIJ 1353 | 42.27 | 40.52 | 40.45 | 39.37 | 41.98 | 40.43 | 41.48 | 39.43 | **40.9** | **1113** |
| 15 | MCN-18-15 | KMR 18-4 | 40.69 | 40.33 | 40.1 | 39.85 | 40.12 | 41.51 | 40.66 | 39.51 | **40.5** | **1127** |
| 16 | MCN-18-16 | HUJM 17-6 | 41.23 | 40.32 | 40.32 | 39.02 | 41.02 | 41.27 | 39.62 | 40.96 | **40.6** | **949** |
| **17** | **MCN-18-17** | **Kranti (NC)** | **40.15** | **40.13** | **40.47** | **38.84** | **40.08** | **42.3** | **39.68** | **39.33** | **40.3** | **1088** |
| 18 | MCN-18-18 | PHR- 3328 | 41.96 | 39.5 | 40.56 | 38.67 | 40.84 | 41 | 40.49 | 38.74 | **40.4** | **1087** |
| 19 | MCN-18-19 | DRMR 2017-16 | 41.94 | 39.76 | 40.11 | 40.71 | 40.87 | 41.79 | 41.24 | 38.97 | **41.0** | **1152** |
| 20 | MCN-18-20 | RH 1676 | 40.91 | 40.54 | 40.55 | 38.77 | 40.14 | 40.86 | 39.52 | 39.4 | **40.2** | **1091** |
| 21 | MCN-18-21 | PR 2016-4 | 41.77 | 40.56 | 40.27 | 39.36 | 39.94 | 40.26 | 39.79 | 39.35 | **40.4** | **1082** |
| **22** | **MCN-18-22** | **SKM 1626** | **40.77** | **40.61** | **39.87** | **39.64** | **39.84** | **40.3** | **40.22** | **38.85** | **40.2** | **1203** |
| 23 | MCN-18-23 | JM- 13-5 | 40.95 | 40.29 | 40.13 | 39.75 | 39.4 | 41.02 | 40.62 | 38.87 | **40.3** | **1048** |
| 24 | MCN-18-24 | NPJ- 223 | 40.74 | 37.62 | 37.4 | 38.06 | 38.44 | 39.85 | 39.02 | 38.97 | **38.9** | **870** |
| 25 | MCN-18-25 | TM 217 | 39.92 | 37.71 | 37.58 | 37.1 | 41.1 | 40.68 | 38.21 | 39.37 | **39.3** | **769** |
| 26 | MCN-18-26 | Maya (ZC) | 40.14 | 38.92 | 39.33 | 38.51 | 40.13 | 41.74 | 39.83 | 38.84 | **39.9** | **959** |
| 27 | MCN-18-27 | NPJ- 224 | 42.13 | 40.58 | 38.87 | 38.52 | 39.8 | 41.69 | 40.42 | 39.85 | **40.5** | **1008** |

# Table2.3.16a. Performance of Indian mustard strains in IVT timely sown (irrigated), Zone - IV

| S. No. | Code | Strain | Seed Yield (Kg/ha) | | | | | | | Plant Stand | | | | | Days to Maturity | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SKN | NGP | JAL | MDR | WSM | AND | Mean | SKN | NGP | MDR | WSM | AND | SKN | NGP | JAL | MDR | WSM | AND |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | (1-6) | 1 | 2 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | MCN-18-1 | AKMS- 1002 | 3268 | 2035 | 1707 | 1361 | 1324 | 1794 | **1915** | 174 | 177 | 300 | 174 | 149 | 123 | 114 | 98 | 132 | 83 | 120 |
| 2 | MCN-18-2 | SKM 1512 | 3530 | 1989 | 1791 | 1730 | 1025 | 1602 | **1944** | 163 | 178 | 296 | 174 | 139 | 121 | 113 | 100 | 131 | 79 | 119 |
| 3 | MCN-18-3 | PBR 385 | 3408 | 1857 | 1578 | 1712 | 515 | 1560 | **1772** | 162 | 178 | 303 | 178 | 138 | 124 | 113 | 97 | 129 | 84 | 118 |
| 4 | MCN-18-4 | Anmol | 3845 | 1691 | 2177 | 1591 | 899 | 1711 | **1986** | 160 | 176 | 294 | 177 | 140 | 115 | 112 | 99 | 131 | 80 | 123 |
| 5 | MCN-18-5 | ACN141 | 3594 | 1913 | 1857 | 1382 | 1081 | 2103 | **1988** | 169 | 179 | 297 | 174 | 143 | 122 | 114 | 96 | 130 | 87 | 117 |
| **6** | **MCN-18-6** | **GDM 4(LR)** | **3966** | **1852** | **1719** | **1779** | **990** | **2346** | **2109** | **171** | **178** | **304** | **173** | **170** | **117** | **112** | **100** | **131** | **83** | **119** |
| 7 | MCN-18-7 | PR- 2016-8 | 3779 | 1993 | 2120 | 1696 | 756 | 1925 | **2045** | 152 | 179 | 305 | 175 | 143 | 120 | 114 | 95 | 131 | 84 | 121 |
| 8 | MCN-18-8 | KMR 18-3 | 3949 | 1940 | 1991 | 1615 | 672 | 1837 | **2001** | 163 | 176 | 294 | 178 | 146 | 119 | 113 | 98 | 133 | 82 | 121 |
| **9** | MCN-18-9 | RH 1584 | 3746 | 2152 | 2027 | 1720 | 1097 | 2203 | **2157** | 169 | 179 | 303 | 174 | 148 | 118 | 113 | 96 | 132 | 86 | 118 |
| 10 | MCN-18-10 | 8IJ0116 | 4192 | 1789 | 2515 | 1332 | 1226 | 2128 | **2197** | 170 | 175 | 292 | 176 | 145 | 110 | 111 | 97 | 128 | 85 | 117 |
| 11 | MCN-18-11 | RB- 101 | 2845 | 1822 | 2060 | 1451 | 550 | 1881 | **1768** | 167 | 177 | 296 | 174 | 139 | 122 | 113 | 98 | 132 | 86 | 116 |
| 12 | MCN-18-12 | DRMRCI 107 | 3545 | 1919 | 2077 | 1156 | 1008 | 2081 | **1965** | 156 | 175 | 300 | 175 | 140 | 123 | 112 | 99 | 134 | 83 | 119 |
| 13 | MCN-18-13 | RGN- 443 | 3800 | 2657 | 1394 | 1659 | 836 | 2193 | **2090** | 172 | 179 | 294 | 175 | 142 | 123 | 113 | 98 | 133 | 78 | 121 |
| 14 | MCN-18-14 | DRMRIJ 1353 | 3939 | 1842 | 1950 | 1784 | 1098 | 1811 | **2071** | 162 | 176 | 306 | 175 | 139 | 116 | 111 | 96 | 130 | 81 | 114 |
| 15 | MCN-18-15 | KMR 18-4 | 3415 | 2032 | 1932 | 1567 | 1276 | 1450 | **1945** | 161 | 180 | 292 | 177 | 140 | 122 | 113 | 97 | 132 | 84 | 116 |
| 16 | MCN-18-16 | HUJM 17-6 | 3198 | 1968 | 2229 | 1621 | 763 | 1938 | **1953** | 164 | 179 | 293 | 174 | 139 | 118 | 113 | 97 | 132 | 81 | 121 |
| 17 | MCN-18-17 | Kranti (NC) | 3377 | 1576 | 2044 | 1521 | 999 | 2033 | **1925** | 161 | 178 | 301 | 178 | 154 | 122 | 114 | 99 | 132 | 85 | 116 |
| 18 | MCN-18-18 | PHR- 3328 | 4100 | 2331 | 2290 | 1653 | 954 | 2344 | **2279** | 151 | 180 | 295 | 177 | 161 | 119 | 112 | 101 | 132 | 82 | 117 |
| 19 | MCN-18-19 | DRMR 2017-16 | 3376 | 2085 | 1405 | 1715 | 829 | 1898 | **1884** | 165 | 164 | 301 | 180 | 142 | 121 | 113 | 102 | 133 | 84 | 120 |
| 20 | MCN-18-20 | RH 1676 | 3854 | 2574 | 2067 | 1664 | 664 | 1942 | **2128** | 163 | 176 | 291 | 173 | 149 | 120 | 111 | 102 | 132 | 85 | 116 |
| 21 | MCN-18-21 | PR 2016-4 | 3517 | 1568 | 1891 | 1474 | 1168 | 2303 | **1987** | 174 | 180 | 295 | 174 | 165 | 122 | 114 | 98 | 133 | 87 | 119 |
| 22 | MCN-18-22 | SKM 1626 | 4039 | 2476 | 1996 | 1946 | 979 | 1745 | **2197** | 160 | 179 | 293 | 175 | 139 | 118 | 112 | 103 | 133 | 85 | 118 |
| 23 | MCN-18-23 | JM- 13-5 | 3055 | 1512 | 2328 | 1552 | 556 | 2134 | **1856** | 162 | 178 | 292 | 175 | 142 | 124 | 113 | 97 | 131 | 86 | 119 |
| 24 | MCN-18-24 | NPJ- 223 | 3719 | 1661 | 1974 | 1705 | 848 | 2208 | **2019** | 170 | 178 | 306 | 176 | 157 | 117 | 112 | 97 | 132 | 85 | 118 |
| 25 | MCN-18-25 | TM 217 | 3014 | 1769 | 1217 | 1147 | 532 | 1695 | **1562** | 157 | 180 | 300 | 175 | 140 | 122 | 113 | 97 | 133 | 81 | 116 |
| 26 | MCN-18-26 | BIO 902 (ZC) | 4017 | 2170 | 1966 | 1637 | 1004 | 1774 | **2095** | 162 | 151 | 295 | 176 | 135 | 122 | 113 | 98 | 132 | 83 | 120 |
| 27 | MCN-18-27 | NPJ- 224 | 3861 | 1858 | 2093 | 1741 | 1131 | 2105 | **2131** | 162 | 180 | 309 | 173 | 146 | 112 | 112 | 97 | 131 | 82 | 118 |
| | | GM | 3628 | 1964 | 1941 | 1589 | 918 | 1954 | | | | | | | | | | | | |
| | | CD (5%) | 541 | 370.8 | 301 | 195 | 213 | 352 | | | | | | | | | | | | |
| | | CV (%) | 9.3 | 11.8 | 9.7 | 7.7 | 14.5 | 11.3 | | | | | | | | | | | | |
| | | DOS | 23.10.2018 | 22.10.2018 | 27.10.2018 | 23.10.2018 | 23.10.2018 | 24.10.2018 | | | | | | | | | | | | |

# Table2.3.16b. Performance of Indian mustard strains in IVT timely sown (irrigated), Zone - IV

| S.No. | Code | Strain | 1000 Seed Weight | | | | | | Oil Content | | | | Oil Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SKN | NGP | JAL | MDR | WSM | AND | SKN | NGP | AND | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 6 | (1-2,6) | (1-6) |
| 1 | MCN-18-1 | AKMS- 1002 | 5.1 | 5.7 | 6.0 | 5.7 | 4.3 | 4.7 | 40.5 | 38.0 | 39.1 | **39.2** | **750** |
| 2 | MCN-18-2 | SKM 1512 | 5.0 | 4.7 | 5.4 | 5.2 | 4.3 | 4.2 | 41.6 | 39.1 | 40.2 | **40.3** | **783** |
| 3 | MCN-18-3 | PBR 385 | 4.6 | 4.3 | 6.1 | 5.0 | 3.7 | 4.4 | 41.0 | 37.5 | 38.1 | **38.9** | **689** |
| 4 | MCN-18-4 | Anmol | 6.1 | 6.0 | 6.2 | 6.8 | 4.7 | 5.2 | 40.5 | 37.0 | 37.9 | **38.5** | **764** |
| 5 | MCN-18-5 | ACN141 | 4.2 | 6.0 | 6.1 | 5.7 | 4.7 | 4.1 | 39.9 | 37.2 | 39.0 | **38.7** | **769** |
| **6** | **MCN-18-6** | **GDM 4(LR)** | **4.7** | **5.0** | **6.4** | **5.1** | **4.7** | **4.4** | **40.9** | **37.1** | **39.2** | **39.1** | **824** |
| 7 | MCN-18-7 | PR- 2016-8 | 5.1 | 5.0 | 5.3 | 5.5 | 4.0 | 4.4 | 41.6 | 36.1 | 40.1 | **39.3** | **803** |
| 8 | MCN-18-8 | KMR 18-3 | 5.1 | 5.3 | 6.1 | 6.4 | 5.3 | 4.4 | 41.4 | 38.5 | 39.5 | **39.8** | **797** |
| 9 | MCN-18-9 | RH 1584 | 4.8 | 5.7 | 6.2 | 6.0 | 3.7 | 4.1 | 41.6 | 36.4 | 38.2 | **38.7** | **836** |
| 10 | MCN-18-10 | 8IJ0116 | 5.4 | 5.0 | 5.8 | 5.6 | 4.3 | 4.4 | 41.0 | 35.9 | 39.7 | **38.9** | **854** |
| 11 | MCN-18-11 | RB- 101 | 4.5 | 6.0 | 6.0 | 5.3 | 4.3 | 4.4 | 41.4 | 34.2 | 39.1 | **38.2** | **676** |
| 12 | MCN-18-12 | DRMRCI 107 | 5.1 | 6.7 | 6.3 | 5.7 | 5.0 | 4.8 | 41.0 | 38.8 | 40.2 | **40.0** | **786** |
| 13 | MCN-18-13 | RGN- 443 | 4.8 | 3.7 | 6.4 | 5.7 | 3.7 | 4.4 | 39.7 | 35.2 | 38.8 | **37.9** | **792** |
| 14 | MCN-18-14 | DRMRIJ 1353 | 5.4 | 6.0 | 6.2 | 5.9 | 4.3 | 5.1 | 42.3 | 39.4 | 39.1 | **40.3** | **833** |
| 15 | MCN-18-15 | KMR 18-4 | 4.8 | 5.0 | 5.5 | 5.3 | 4.0 | 4.2 | 40.4 | 37.1 | 40.1 | **39.2** | **763** |
| 16 | MCN-18-16 | HUJM 17-6 | 5.0 | 5.3 | 5.9 | 5.7 | 4.0 | 4.7 | 40.8 | 37.5 | 39.2 | **39.2** | **765** |
| 17 | MCN-18-17 | Kranti (NC) | 4.3 | 4.3 | 6.4 | 4.6 | 3.7 | 3.9 | 41.0 | 38.9 | 38.9 | **39.6** | **763** |
| 18 | MCN-18-18 | PHR- 3328 | 4.1 | 4.7 | 6.4 | 5.3 | 4.3 | 4.0 | 40.4 | 37.4 | 39.4 | **39.0** | **889** |
| 19 | MCN-18-19 | DRMR 2017-16 | 4.9 | 6.0 | 5.7 | 6.3 | 4.0 | 4.4 | 41.2 | 39.2 | 39.4 | **39.9** | **752** |
| 20 | MCN-18-20 | RH 1676 | 5.4 | 4.3 | 6.2 | 6.2 | 4.0 | 4.4 | 41.0 | 38.7 | 38.6 | **39.4** | **839** |
| 21 | MCN-18-21 | PR 2016-4 | 4.9 | 6.0 | 6.3 | 6.2 | 4.0 | 4.6 | 40.4 | 37.9 | 40.2 | **39.5** | **784** |
| 22 | MCN-18-22 | SKM 1626 | 5.8 | 5.7 | 5.8 | 6.6 | 4.3 | 4.8 | 41.2 | 37.8 | 39.2 | **39.4** | **865** |
| 23 | MCN-18-23 | JM- 13-5 | 4.3 | 4.7 | 6.2 | 5.5 | 3.7 | 4.4 | 40.9 | 38.2 | 38.4 | **39.2** | **727** |
| 24 | MCN-18-24 | NPJ- 223 | 6.1 | 5.7 | 6.4 | 6.6 | 3.7 | 5.4 | 41.3 | 37.3 | 39.6 | **39.4** | **796** |
| 25 | MCN-18-25 | TM 217 | 5.9 | 5.7 | 6.3 | 6.6 | 4.3 | 5.4 | | 37.6 | 38.1 | **37.8** | **591** |
| 26 | MCN-18-26 | BIO 902 (ZC) | 5.5 | 5.7 | 5.8 | 6.5 | 4.3 | 4.9 | | 40.4 | 39.1 | **39.8** | **833** |
| 27 | MCN-18-27 | NPJ- 224 | 5.9 | 6.7 | 6.1 | 6.5 | 4.0 | 5.3 | 40.8 | 37.2 | 40.2 | **39.4** | **839** |

## Table 2.3.17a. Performance of Indian mustard strains in AVT-I+AHT 1 Timely sown (irrigated) Zone - II

| S. No. | Code | Strain | Seed yield (kg/ha) | | | | | | Plant stand | | | | | Days to maturity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LDH | HSR# | SGN | NDH$ | CTH | Mean | LDH | HSR | SGN | NDH | CTH | LDH | HSR | SGN | NDH | CTH |
| | | | 1 | 2 | 3 | 4 | 5 | (1,3,5) | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **1** | **MCN 18-28** | **Kranti (NC)** | **3133** | **2642** | **2945** | **2424** | **2149** | **2742** | **298** | **264** | **290** | **263** | **264** | **138** | **141** | **146** | **145** | **144** |
| 2 | MCN 18-29 | RH 749 (ZC) | 2716 | 2823 | 3212 | 2697 | 2138 | 2689 | 290 | 266 | 300 | 262 | 271 | 142 | 147 | 149 | 155 | 146 |
| 3 | MCN 18-30 | RH 1550 | 2670 | 3534 | 3309 | 2854 | 2041 | **2673** | 282 | 261 | 300 | 257 | 262 | 140 | 146 | 149 | 157 | 145 |
| 4 | MCN 18-31 | Giriraj (LR) | 2685 | 2646 | 3296 | 2567 | 1866 | **2616** | 297 | 262 | 280 | 283 | 260 | 139 | 143 | 144 | 152 | 149 |
| 5 | MCN 18-32 | 7IJ0003* | 2824 | 3617 | 3395 | 3439 | 2156 | **2792** | 294 | 263 | 274 | 264 | 273 | 134 | 136 | 142 | 141 | 147 |
| **6** | **MCN 18-33** | **DMH 1 (Hy Check)** | **2361** | **3343** | **3444** | **2614** | **2335** | **2713** | **279** | **260** | **265** | **277** | **269** | **130** | **134** | **149** | **144** | **146** |
| 7 | MCN 18-34 | Filler (Giriraj) | 2747 | 2727 | 3025 | 2513 | 2026 | **2599** | 287 | 261 | 270 | 273 | 274 | 139 | 144 | 147 | 154 | 145 |
| 8 | MCN 18-35 | NRCHB- 506 | 2392 | 2797 | 2878 | 2546 | 2003 | **2424** | 279 | 264 | 320 | 265 | 270 | 140 | 143 | 150 | 153 | 147 |
| | | GM | 2691 | 3016 | 3188 | 2706.8 | 2089 | | | | | | | | | | | |
| | | CD (5%) | 353 | 413 | 323 | 78 | 208 | | | | | | | | | | | |
| | | CV (%) | 9.5 | 8.1 | 7.3 | 2.1 | 7.2 | | | | | | | | | | | |
| | | DOS | 13.10.2018 | 8.10.2018 | 26.10.2018 | 13.10.2018 | 17.10.2018 | | | | | | | | | | | |

$ data of NDH excluded from computation of mean due to < 5.0 CV in field experimentation

# data of HSR excluded from computation of mean due to improper conduct of trial (less no. of reps)

*Hybrid

## Table2.3.17b. Performance of Indian mustard strains in AVT-I Timely sown irrigated Zone - II

| S.No. | Code | Strain | 1000 Seed Wt. (g) | | | | | Oil Content (%) | | | | | | Oil Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LDH | HSR | SGN | NDH | CTH | LDH | HSR# | SGN | NDH$ | CTH | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1,3,5) | (1-3,5) |
| **1** | **MCN 18-28** | **Kranti (NC)** | **4.3** | **4.1** | **4.6** | **2.96** | **3.2** | **40.5** | **41.3** | **40.0** | **39.4** | **39.7** | **40.1** | **1099** |
| 2 | MCN 18-29 | RH 749 (ZC) | 5.9 | 6.0 | 6.6 | 5.14 | 4.4 | 40.5 | 41.6 | 40.5 | 39.1 | 39.0 | **40.0** | **1076** |
| 3 | MCN 18-30 | RH 1550 | 6.4 | 6.4 | 6.4 | 5.73 | 5.2 | 41.6 | 41.0 | 40.4 | 40.8 | 40.1 | **40.7** | **1088** |
| 4 | MCN 18-31 | Giriraj (LR) | 5.7 | 6.0 | 6.6 | 5.12 | 3.9 | 42.4 | 41.9 | 41.7 | 40.9 | 39.4 | **41.1** | **1076** |
| **5** | MCN 18-32 | 7IJ0003# | 4.9 | 5.0 | 5.4 | 5.01 | 3.5 | 41.7 | 41.0 | 40.7 | 40.2 | **39.9** | **40.7** | **1137** |
| **6** | **MCN 18-33** | **DMH 1 (Hy Check)** | **3.6** | **3.7** | **4.0** | **3.45** | **3.4** | **41.2** | **40.9** | **39.9** | **39.6** | **40.2** | **40.4** | **1097** |
| 7 | MCN 18-34 | Filler (Giriraj) | 5.3 | 5.5 | 6.0 | 5.35 | 4.6 | 42.4 | 41.7 | 40.6 | 39.7 | 40 | **41.1** | **1068** |
| 8 | MCN 18-35 | NRCHB- 506 | 4.4 | 4.8 | 4.8 | 4.62 | 4.5 | 42.7 | 42.3 | 40.3 | 40.2 | 40 | **40.8** | **990** |

## Table 2. 3. 18a. Advance Varietal Trial Repeat (AVT-I irrigated, Repeat) on Mustard timely sown Zone -IV

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | | Plant Stand | | | | Days to Maturity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SKN | MDR | JAL | NGP | AND | Mean | SKN | MDR | NGP | AND | SKN | MDR | JAL | NGP | AND |
| | | | 1 | 2 | 3 | 4 | 5 | (1-5) | 1 | 2 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| 1 | MCN 18-36 | RGN 394 (WRR) | 3431 | 3616 | 2064 | 2016 | 1409 | **2507** | 308 | 298 | 360 | 309 | 124 | 131 | 101 | 111 | 115 |
| **2** | **MCN 18-37** | **BIO 902 (ZC)** | **3822** | **3210** | **2139** | **2183** | **1305** | **2532** | **324** | **302** | **359** | **291** | **120** | **131** | **101** | **110** | **115** |
| 3 | MCN 18-38 | RH 1326 | 4338 | 3689 | 2243 | 1929 | 1384 | **2717** | 316 | 305 | 360 | 301 | 121 | 130 | 100 | 114 | 117 |
| 4 | MCN 18-39 | Giriraj (Filler) | 3753 | 3479 | 2027 | 2392 | 1310 | **2592** | 310 | 303 | 359 | 288 | 122 | 131 | 99 | 114 | 116 |
| 5 | MCN 18-40 | RLMCP 626 (WRR) | 3663 | 3329 | 1861 | 1950 | 1499 | **2460** | 315 | 274 | 359 | 333 | 125 | 134 | 98 | 114 | 115 |
| 6 | MCN 18-41 | GM 2 (LR) | 3579 | 2713 | 1400 | 2156 | 1315 | **2233** | 305 | 302 | 360 | 293 | 124 | 134 | 100 | 112 | 119 |
| **7** | MCN 18-42 | NPJ 203 | 4117 | 3256 | 2103 | 1778 | 1729 | **2597** | 326 | 283 | 360 | 338 | 114 | 129 | 97 | 112 | 111 |
| 8 | MCN 18-43 | Kranti (NC) | 3661 | 2979 | 2271 | 1828 | 1475 | **2443** | 327 | 304 | 360 | 317 | 121 | 129 | 98 | 116 | 117 |
| | | GM | 3796 | 3284 | 2013 | 2029 | 1428 | | | | | | | | | | |
| | | CD (5%) | 439 | 295 | 244 | 337 | 176 | | | | | | | | | | |
| | | CV (%) | 8.4 | 6.0 | 8.7 | 12.0 | 8.9 | | | | | | | | | | |
| | | DOS | 23.10.2018 | 23.10.2018 | 27.10.2018 | 24.10.2018 | 24.10.2018 | | | | | | | | | | |

## Table 2. 3. 18b. Advance Varietal Trial Repeat (AVT-I irrigated, Repeat) on Mustard timely sown Zone -IV

| S.No. | Code | Strain | 1000-Seed Wt. (g) | | | | | Oil Content (%) | | | | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SKN | MDR | JAL | NGP | AND | SKN | NGP | AND | Mean | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 4 | 5 | (1, 4-5) | (1-5) |
| 1 | MCN 18-36 | RGN 394 (WRR) | 4.4 | 6.0 | 4.9 | 4.3 | 3.9 | 40.7 | 38.0 | 40.0 | 39.6 | 992 |
| **2** | **MCN 18-37** | **BIO 902 (ZC)** | **6.1** | **6.4** | **4.7** | **5.0** | **5.2** | **39.0** | **38.6** | **39.9** | **39.2** | **992** |
| 3 | MCN 18-38 | RH 1326 | 5.3 | 6.2 | 6.1 | 4.3 | 4.0 | 41.5 | 39.2 | 38.4 | 39.7 | 1078 |
| 4 | MCN 18-39 | Giriraj (Filler) | 5.7 | 5.9 | 6.6 | 4.3 | 4.8 | 40.3 | 38.9 | 40.7 | 39.9 | 1036 |
| 5 | MCN 18-40 | RLMCP 626 (WRR) | 4.7 | 5.4 | 5.1 | 4.0 | 4.2 | 40.2 | 37.4 | 40.2 | 39.2 | 965 |
| 6 | MCN 18-41 | GM 2 (LR) | 5.5 | 6.4 | 5.7 | 5.0 | 4.7 | 40.0 | 36.8 | 39.5 | 38.8 | 866 |
| **7** | MCN 18-42 | NPJ 203 | 5.3 | 6.0 | 5.5 | 5.0 | 4.6 | 40.2 | 39.4 | 39.1 | 39.6 | 1027 |
| 8 | MCN 18-43 | Kranti (NC) | 4.6 | 5.3 | 5.9 | 4.3 | 3.6 | 41.4 | 39.2 | 40.1 | 40.2 | 983 |

# Table-2.3.19a. Performance of Indian mustard strains in IVT timely sown (rainfed), Zone - II

| S.No. | Code | Strain | Seed Yield (Kg/ha) | | | | | | Plant Stand | | | | Days to maturity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | SGN | LDH | BAW | Mean | | HSR | SGN | LDH | BAW | HSR | SGN | LDH | BAW |
| | | | 1 | 2 | 3 | 4 | (1-4) | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1 | MCNR-18-1 | RH 1584 | 2963 | 3278 | 2333 | 2411 | **2746** | | 118 | 144 | 131 | 159 | 137 | 151 | 142 | 143 |
| 2 | MCNR-18-2 | RB- 102 | 2711 | 3037 | 1877 | 1877 | **2375** | | 120 | 166 | 128 | 162 | 140 | 145 | 144 | 145 |
| 3 | MCNR-18-3 | DRMRCI 114 | 2222 | 3056 | 2021 | 1976 | **2319** | | 121 | 145 | 124 | 159 | 139 | 147 | 143 | 147 |
| 4 | MCNR-18-4 | NPJ- 226 | 2734 | 3107 | 2086 | 1346 | **2319** | | 120 | 170 | 127 | 139 | 132 | 148 | 141 | 137 |
| **5** | MCNR-18-5 | DRMRCI 95 | 2435 | 3348 | 1872 | 1994 | **2412** | | 119 | 190 | 125 | 156 | 130 | 143 | 141 | 137 |
| 6 | MCNR-18-6 | 8IJ0117 | 2754 | 3396 | 2029 | 1877 | **2514** | | 118 | 192 | 132 | 127 | 129 | 147 | 143 | 137 |
| 7 | MCNR-18-7 | Kranti (NC) | 2569 | 2870 | 1996 | 1729 | **2291** | | 121 | 190 | 137 | 153 | 134 | 150 | 144 | 140 |
| **8** | **MCNR-18-8** | **RH 725 (LR)** | **2675** | **3367** | **1947** | **2416** | **2601** | | **124** | **167** | **135** | **138** | **138** | **149** | **141** | **144** |
| 9 | MCNR-18-9 | TM 179 | 2151 | 2185 | 2045 | 1126 | **1877** | | 118 | 182 | 135 | 51 | 135 | 147 | 145 | 147 |
| 10 | MCNR-18-10 | DRMRHJ1118 (Hybrid) | 2679 | 2974 | 2399 | 2495 | **2637** | | 123 | 150 | 124 | 138 | 140 | 148 | 143 | 146 |
| **11** | **MCNR-18-11** | **RH 1424** | **2994** | **3456** | **2074** | **2650** | **2794** | * | **119** | **144** | **126** | **142** | **127** | **146** | **140** | **137** |
| **12** | MCNR-18-12 | RB- 100 | 2652 | 3169 | 1568 | 1865 | **2313** | | 122 | 192 | 124 | 164 | 142 | 151 | 139 | 144 |
| 13 | MCNR-18-13 | RGN- 444 | 2790 | 3337 | 2004 | 1754 | **2471** | | 119 | 194 | 125 | 148 | 140 | 152 | 143 | 143 |
| 14 | MCNR-18-14 | JM- 11-9 | 2309 | 2963 | 1885 | 1998 | **2289** | | 122 | 192 | 116 | 156 | 141 | 154 | 146 | 142 |
| 15 | MCNR-18-15 | NPJ- 225 | 2801 | 3115 | 1609 | 1783 | **2327** | | 118 | 180 | 121 | 169 | 132 | 147 | 145 | 138 |
| 16 | MCNR-18-16 | CAU- RM 2 | 1919 | 2678 | 1967 | 1408 | **1993** | | 127 | 185 | 131 | 147 | 123 | 148 | 142 | 136 |
| 17 | MCNR-18-17 | DRMR 2017-8 | 2301 | 2957 | 1909 | 2072 | **2310** | | 119 | 190 | 131 | 180 | 141 | 143 | 144 | 144 |
| 18 | MCNR-18-18 | RGN 229 (ZC) | 2364 | 2694 | 2058 | 2618 | **2434** | | 122 | 180 | 134 | 175 | 142 | 148 | 140 | 147 |
| | | GM | 2557 | 3055 | 1982 | 1966 | | | | | | | | | | |
| | | CD (5%) | 526 | 520 | 354 | 256 | | | | | | | | | | |
| | | CV (%) | 12.9 | 10.6 | 11.2 | 8.2 | | | | | | | | | | |
| | | DOS | 12.10.2018 | 25.10.2018 | 29.10.2018 | 20.10.2018 | | | | | | | | | | |

* Strain(s) outyielding the best check by a margin of > 10 percent oil yield

# Table2.3.19b. Performance of Indian mustard strains in IVT timely sown (rainfed), Zone - II

| S.No. | Code | Strain | 1000 Seed Weight | | | | Oil Content (%) | | | | | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | SGN | LDH | BAW | HSR | SGN | LDH | BAW | Mean | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-4) | (1-4) |
| 1 | MCNR-18-1 | RH 1584 | 5.4 | 6 | 4.2 | 5.3 | 41.5 | 41.6 | 41.8 | 41.5 | **41.6** | **1142** |
| 2 | MCNR-18-2 | RB- 102 | 5.1 | 4.8 | 5.9 | 4.7 | 40.9 | 41.8 | 42.5 | 41.3 | **41.6** | **989** |
| 3 | MCNR-18-3 | DRMRCI 114 | 5.3 | 5.8 | 4.9 | 5.3 | 40.4 | 40.7 | 40.7 | 40.1 | **40.5** | **938** |
| 4 | MCNR-18-4 | NPJ- 226 | 5.8 | 6.6 | 4.2 | 6.0 | 40.4 | 41.2 | 42.2 | 40.4 | **41.0** | **952** |
| 5 | MCNR-18-5 | DRMRCI 95 | 5.8 | 6.0 | 4.9 | 5.6 | 40.2 | 41.6 | 41.6 | 41.3 | **41.2** | **993** |
| 6 | MCNR-18-6 | 8IJ0117 | 5.3 | 6.0 | 4.3 | 5.9 | 39.7 | 40.3 | 42.4 | 41.0 | **40.8** | **1027** |
| 7 | MCNR-18-7 | Kranti (NC) | 4.4 | 4.6 | 5.0 | 4.4 | 41.5 | 40.5 | 41.3 | 40.5 | **41.0** | **939** |
| **8** | **MCNR-18-8** | **RH 725 (LR)** | **6.1** | **6.0** | **3.9** | **5.9** | **40.8** | **40.3** | **41.6** | **40.6** | **40.8** | **1061** |
| 9 | MCNR-18-9 | TM 179 | 6.6 | 7.0 | 4.4 | 6.3 | 40.3 | 38.4 | 41.3 | 39.8 | **39.9** | **750** |
| 10 | MCNR-18-10 | DRMRHJ1118 (Hybrid) | 4.6 | 4.8 | 5.1 | 4.3 | 41.7 | 40.2 | 42.7 | 40.6 | **41.3** | **1088** |
| **11** | **MCNR-18-11** | **RH 1424** | **4.8** | **5.6** | **5.7** | **4.6** | **41.9** | **41.7** | **42.9** | **41.6** | **42.0** | **1173** |
| **12** | MCNR-18-12 | RB- 100 | 4.8 | 5.2 | 4.1 | 4.6 | 40.4 | 40.7 | 41.4 | 40.8 | **40.8** | **944** |
| 13 | MCNR-18-13 | RGN- 444 | 5.5 | 5.6 | 3.8 | 5.3 | 41.9 | 41.0 | 41.4 | 43.4 | **41.9** | **1036** |
| 14 | MCNR-18-14 | JM- 11-9 | 4.9 | 5.0 | 4.1 | 4.6 | 41.1 | 40.7 | 39.8 | 40.8 | **40.6** | **929** |
| 15 | MCNR-18-15 | NPJ- 225 | 5.7 | 6.6 | 3.2 | 5.4 | 40.6 | 41.9 | 42.3 | 41.1 | **41.5** | **965** |
| 16 | MCNR-18-16 | CAU- RM 2 | 6.2 | 6.4 | 4.5 | 5.3 | 41.2 | 40.2 | 39.6 | 41.4 | **40.6** | **809** |
| 17 | MCNR-18-17 | DRMR 2017-8 | 5.7 | 6.2 | 3.9 | 5.7 | 42.0 | 42.5 | 42.6 | 41.7 | **42.2** | **975** |
| 18 | MCNR-18-18 | RGN 229 (ZC) | 4.8 | 5.4 | 4.0 | 4.7 | 41.5 | 41.2 | 40.9 | 41.7 | **41.3** | **1006** |

## Table 2.3.20a. Performance of Indian mustard strains in IVT timely sown (rainfed), Zone - V

| S. No. | Code | Strain | Seed Yield (kg/ha) | | | | | | Plant Stand | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IMP | SHL | BHU | JAG | KNK | Mean | IMP | SHL | BHU | JAG | KNK |
| | | | 1 | 2 | 3 | 4 | 5 | (1-5) | 1 | 2 | 3 | 4 | 5 |
| 1 | MCNR-18-1 | RH 1584 | 1117 | 806 | 915 | 2241 | 1557 | **1327** | 221 | 178 | 130 | 170 | 209 |
| 2 | MCNR-18-2 | RB- 102 | 1235 | 694 | 894 | 1698 | 1228 | **1150** | 214 | 176 | 128 | 171 | 201 |
| 3 | MCNR-18-3 | DRMRCI 114 | 1583 | 661 | 989 | 2287 | 1466 | **1397** | 231 | 197 | 126 | 146 | 213 |
| **4** | MCNR-18-4 | NPJ- 226 | 1605 | 839 | 953 | 1605 | 1555 | **1312** | 234 | 196 | 132 | 247 | 206 |
| 5 | MCNR-18-5 | DRMRCI 95 | 1393 | 1283 | 941 | 1327 | 1758 | **1340** | 221 | 176 | 131 | 201 | 213 |
| 6 | MCNR-18-6 | 8IJ0117 | 1223 | 1028 | 848 | 1605 | 1298 | **1200** | 235 | 179 | 124 | 173 | 210 |
| 7 | MCNR-18-7 | Kranti (NC) | 1109 | 1206 | 897 | 1821 | 1608 | **1328** | 220 | 168 | 122 | 192 | 214 |
| **8** | **MCNR-18-8** | **DRMR 150-35 (LR)** | **1081** | **1678** | **896** | **1896** | **1798** | **1470** | **215** | **204** | **131** | **185** | **213** |
| 9 | MCNR-18-9 | TM 179 | 1146 | 1544 | 844 | 2444 | 1529 | **1502** | 220 | 222 | 123 | 124 | 209 |
| 10 | MCNR-18-10 | DRMRHJ1118 (Hybrid) | 1307 | 1083 | 775 | 2349 | 1561 | **1415** | 220 | 201 | 119 | 213 | 209 |
| 11 | MCNR-18-11 | RH 1424 | 1617 | 889 | 882 | 2446 | 1402 | **1447** | 231 | 193 | 125 | 189 | 211 |
| **12** | MCNR-18-12 | RB- 100 | 1584 | 956 | 725 | 2293 | 1295 | **1370** | 221 | 187 | 120 | 187 | 211 |
| 13 | MCNR-18-13 | RGN- 444 | 1658 | 1172 | 874 | 1940 | 1691 | **1467** | 231 | 205 | 129 | 207 | 218 |
| 14 | MCNR-18-14 | JM- 11-9 | 1306 | 661 | 897 | 2420 | 1503 | **1357** | 235 | 199 | 132 | 216 | 216 |
| 15 | MCNR-18-15 | NPJ- 225 | 1616 | 733 | 694 | 1222 | 1370 | **1127** | 227 | 211 | 123 | 166 | 213 |
| 16 | MCNR-18-16 | CAU- RM 2 | 1603 | 650 | 666 | 1969 | 1428 | **1263** | 232 | 201 | 125 | 172 | 205 |
| 17 | MCNR-18-17 | DRMR 2017-8 | 1294 | 867 | 677 | 2165 | 1648 | **1330** | 203 | 178 | 121 | 186 | 212 |
| 18 | MCNR-18-18 | NRCHB 101 (ZC) | 1369 | 1106 | 704 | 1824 | 1356 | **1272** | 215 | 210 | 123 | 184 | 207 |
| | | GM | 1380 | 992 | 837 | 1975 | 1503 | | | | | | |
| | | CD (5%) | 320 | 229 | 116 | 370 | 182 | | | | | | |
| | | CV (%) | 14.5 | 14.4 | 8.6 | 11.7 | 7.6 | | | | | | |
| | | DOS | 12.11.2018 | 14.11.2018 | 1.12.2018 | 15.11.2018 | 27.10.2018 | | | | | | |

## Table 2.3.20b. Performance of Indian mustard strains in IVT timely sown (rainfed), Zone - V

| S.No. | Code | Strain | Days to Maturity | | | | | 1000-Seed Wt. (g) | | | | | Oil Content (%) | | | Oil Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | IMP | SHL | BHU | JAG | KNK | IMP | SHL | BHU | JAG | KNK | IMP | KNK | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 5 | (1,5) | (1-5) |
| 1 | MCNR-18-1 | RH 1584 | 119 | 117 | 101 | 118 | 117 | 5.9 | 3.4 | 4.5 | 4.6 | 5.6 | 37.6 | 41.2 | **39.4** | **522** |
| 2 | MCNR-18-2 | RB- 102 | 120 | 117 | 99 | 116 | 117 | 5.13 | 3.3 | 4.2 | 4.4 | 3.9 | 38.2 | 41.8 | **40.0** | **460** |
| 3 | MCNR-18-3 | DRMRCI 114 | 121 | 117 | 103 | 116 | 120 | 5.77 | 4.3 | 4.5 | 4.7 | 4.2 | 40.2 | 41.1 | **40.6** | **567** |
| 4 | MCNR-18-4 | NPJ- 226 | 117 | 113 | 98 | 112 | 115 | 6.33 | 4.0 | 4.4 | 4.6 | 5.2 | 38.2 | 41.6 | **39.9** | **523** |
| 5 | MCNR-18-5 | DRMRCI 95 | 117 | 115 | 97 | 112 | 116 | 6.7 | 3.6 | 4.3 | 5.5 | 5.2 | 37.3 | 39.9 | **38.6** | **517** |
| 6 | MCNR-18-6 | 8IJ0117 | 117 | 115 | 99 | 112 | 114 | 6.4 | 3.9 | 4.2 | 6.4 | 3.8 | 39.0 | 41.0 | **40.0** | **480** |
| 7 | MCNR-18-7 | Kranti (NC) | 117 | 117 | 99 | 116 | 116 | 5 | 3.3 | 4.4 | 3.8 | 3.9 | 39.0 | 42.7 | **40.8** | **542** |
| **8** | **MCNR-18-8** | **DRMR 150-35 (LR)** | **119** | **117** | **100** | **118** | **118** | **5.77** | **3.2** | **4.5** | **3.9** | **5.3** | **38.9** | **41.5** | **40.2** | **591** |
| 9 | MCNR-18-9 | TM 179 | 120 | 117 | 98 | 116 | 118 | 6.73 | 5.0 | 4.2 | 6.1 | 5.9 | 38.8 | 40.4 | **39.6** | **595** |
| 10 | MCNR-18-10 | DRMRHJ1118 (Hybrid) | 117 | 117 | 103 | 112 | 118 | 5.53 | 3.4 | 4.0 | 6.0 | 3.8 | 38.9 | 41.2 | **40.0** | **566** |
| 11 | MCNR-18-11 | RH 1424 | 116 | 115 | 98 | 116 | 116 | 5.17 | 3.4 | 4.3 | 5.0 | 4.4 | 39.2 | 42.2 | **40.7** | **589** |
| **12** | MCNR-18-12 | RB- 100 | 119 | 117 | 101 | 112 | 119 | 6 | 3.6 | 3.9 | 3.4 | 4.2 | 39.1 | 42.1 | **40.6** | **557** |
| 13 | MCNR-18-13 | RGN- 444 | 119 | 115 | 100 | 115 | 119 | 6.3 | 3.8 | 4.4 | 4.8 | 4.3 | 38.3 | 39.8 | **39.0** | **573** |
| 14 | MCNR-18-14 | JM- 11-9 | 119 | 115 | 100 | 116 | 117 | 5.7 | 3.6 | 4.4 | 3.6 | 4.8 | 38.2 | 41.1 | **39.7** | **538** |
| 15 | MCNR-18-15 | NPJ- 225 | 118 | 115 | 100 | 116 | 115 | 5.73 | 3.4 | 4.0 | 4.3 | 4.6 | 37.5 | 41.6 | **39.6** | **446** |
| 16 | MCNR-18-16 | CAU- RM 2 | 118 | 113 | 97 | 116 | 116 | 5.8 | 3.9 | 3.9 | 5.2 | 5.0 | 39.8 | 43.0 | **41.4** | **523** |
| 17 | MCNR-18-17 | DRMR 2017-8 | 121 | 117 | 98 | 116 | 115 | 5.93 | 4.3 | 4.0 | 4.4 | 3.7 | 39.3 | 42.0 | **40.7** | **541** |
| 18 | MCNR-18-18 | NRCHB 101 (ZC) | 118 | 115 | 100 | 116 | 116 | 7.07 | 4.2 | 4.0 | 4.4 | 4.9 | 38.6 | 42.3 | **40.4** | **514** |

# Table 2.3.21a. Performance of Indian mustard strains in IVT late sown (irrigated) Zone - II

| S.No. | Code | Strain | Seed Yield (kg/h) | | | | | Plant Stand | | | | Days to Maturity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | SGN | NDH | Mean | HSR | LDH | SGN | NDH | HSR | LDH | SGN | NDH |
| | | | 1 | 2 | 3 | 4 | (1-4) | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **1** | MCNL-18-1 | RH 1658 | 2329 | 1420 | 1263 | 1944 | **1739** | 128 | 127 | 149 | 125 | 133 | 132 | 131 | 135 |
| 2 | MCNL-18-2 | DRMR 2017-27 | 2270 | 1173 | 1520 | 1872 | **1709** | 129 | 129 | 160 | 129 | 134 | 137 | 130 | 136 |
| **3** | MCNL-18-3 | NPJ- 228 | 2204 | 979 | 1761 | 1883 | **1707** | 124 | 115 | 153 | 143 | 132 | 136 | 130 | 135 |
| 4 | MCNL-18-4 | HUJM 17-8 | 2128 | 1514 | 1641 | 1144 | **1607** | 123 | 140 | 166 | 110 | 137 | 138 | 130 | 137 |
| **5** | MCNL-18-5 | CAU- RM 4 | 1909 | 1276 | 1420 | 1744 | **1587** | 126 | 133 | 173 | 126 | 132 | 139 | 133 | 135 |
| 6 | MCNL-18-6 | RVM 2 (LR) | 1696 | 881 | 2002 | 1067 | **1411** | 124 | 119 | 178 | 113 | 135 | 136 | 139 | 137 |
| **7** | MCNL-18-7 | RGN- 449 | 1809 | 1000 | 2339 | 1322 | **1617** | 124 | 131 | 181 | 113 | 137 | 136 | 137 | 137 |
| 8 | MCNL-18-8 | KMR (L) 18-5 | 2204 | 992 | 2206 | 2144 | **1887** | 126 | 130 | 188 | 133 | 133 | 136 | 137 | 135 |
| **9** | MCNL-18-9 | DRMRHJ 1403 | 2181 | 1366 | 1681 | 1672 | **1725** | 123 | 138 | 173 | 139 | 133 | 135 | 131 | 136 |
| 10 | MCNL-18-10 | DRMRCI 111 | 2116 | 1202 | 1980 | 1533 | **1708** | 124 | 134 | 172 | 118 | 137 | 137 | 136 | 136 |
| 11 | MCNL-18-11 | NPJ- 227 | 2104 | 663 | 2093 | 1944 | **1701** | 128 | 125 | 180 | 128 | 135 | 135 | 137 | 136 |
| 12 | MCNL-18-12 | PRL- 2016-6 | 2453 | 918 | 2126 | 2150 | **1912** | 124 | 127 | 183 | 137 | 134 | 136 | 136 | 136 |
| 13 | MCNL-18-13 | SVJH- 106 | 2222 | 1029 | 1918 | 2206 | **1844** | 123 | 130 | 156 | 137 | 132 | 138 | 136 | 133 |
| **14** | MCNL-18-14 | PRL- 2013-9 | 1803 | 996 | 1702 | 1100 | **1400** | 126 | 126 | 159 | 119 | 135 | 137 | 139 | 137 |
| 15 | MCNL-18-15 | DRMRIJ 17-92 | 2547 | 1321 | 2028 | 1917 | **1953** | 130 | 130 | 163 | 129 | 135 | 128 | 137 | 136 |
| 16 | MCNL-18-16 | KMR (L) 18-6 | 1797 | 1251 | 1681 | 1628 | **1589** | 123 | 124 | 164 | 130 | 139 | 138 | 138 | 137 |
| 17 | MCNL-18-17 | TM 130 | 1785 | 749 | 1222 | 889 | **1161** | 123 | 125 | 166 | 107 | 137 | 134 | 140 | 138 |
| 18 | MCNL-18-18 | RH 1657 | 2524 | 1000 | 1574 | 1706 | **1701** | 128 | 128 | 158 | 129 | 133 | 139 | 135 | 135 |
| **19** | **MCNL-18-19** | **PM 26 (ZC)** | **2181** | **1374** | **1891** | **2161** | **1902** | **128** | **135** | **163** | **139** | **132** | **128** | **130** | **132** |
| 20 | MCNL-18-20 | Kranti (NC) | 1939 | 1201 | 1952 | 1878 | **1742** | 127 | 129 | 170 | 141 | 135 | 138 | 137 | 135 |
| | | GM | 2110 | 1115 | 1800 | 1695 | | | | | | | | | |
| | | CD (5%) | 362 | 196 | 294 | 270 | | | | | | | | | |
| | | CV (%) | 10.7 | 11.0 | 10.2 | 9.9 | | | | | | | | | |
| | | DOS | 15.11.2018 | 19.11.2018 | 24.11.2018 | 20.11.2018 | | | | | | | | | |

# Table 2.3.21b. Performance of Indian mustard strains in IVT late sown (irrigated) Zone - II

| S.No. | Code | Strain | 1000 Seed Wt. (g) | | | | Oil Content (%) | | | | | Oil yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | SGN $ | NDH | HSR | LDH | SGN $ | NDH | Mean | |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-4) | (1-4) |
| **1** | MCNL-18-1 | RH 1658 | 5.3 | 4.9 | 5.2 | 5.39 | 39.6 | 39.6 | 39.2 | 38.7 | **39.3** | **683** |
| 2 | MCNL-18-2 | DRMR 2017-27 | 3.8 | 4.4 | 3.8 | 3.79 | 39.9 | 41.0 | 39.8 | 38.8 | **39.9** | **681** |
| **3** | MCNL-18-3 | NPJ- 228 | 4.2 | 3.9 | 4.2 | 3.29 | 41.1 | 39.6 | 39.0 | 39.2 | **39.7** | **678** |
| 4 | MCNL-18-4 | HUJM 17-8 | 5.1 | 5.1 | 5 | 3.54 | 39.4 | 40.0 | 39.1 | 38.0 | **39.1** | **629** |
| **5** | MCNL-18-5 | CAU- RM 4 | 3.0 | 2.6 | 3.6 | 2.6 | 40.0 | 41.4 | 39.0 | 39.7 | **40.0** | **635** |
| 6 | MCNL-18-6 | RVM 2 (LR) | 3.5 | 3.6 | 4.6 | 2.94 | 40.7 | 39.5 | 39.9 | 38.1 | **39.6** | **558** |
| **7** | MCNL-18-7 | RGN- 449 | 4.0 | 3.6 | 5.4 | 3.23 | 39.9 | 40.9 | 38.8 | 39.2 | **39.7** | **642** |
| 8 | MCNL-18-8 | KMR (L) 18-5 | 4.7 | 4.7 | 5 | 4.83 | 39.4 | 38.9 | 39.0 | 38.8 | **39.0** | **736** |
| **9** | MCNL-18-9 | DRMRHJ 1403 | 4.2 | 4.1 | 5.4 | 3.79 | 40.4 | 38.7 | 39.9 | 39.5 | **39.6** | **683** |
| 10 | MCNL-18-10 | DRMRCI 111 | 4.0 | 3.6 | 5 | 3.77 | 38.5 | 40.5 | 39.1 | 39.7 | **39.5** | **674** |
| 11 | MCNL-18-11 | NPJ- 227 | 4.3 | 3.5 | 4.6 | 4.15 | 40.0 | 39.6 | 39.2 | 39.4 | **39.5** | **672** |
| 12 | MCNL-18-12 | PRL- 2016-6 | 5.1 | 4.9 | 5.4 | 5.17 | 39.9 | 40.1 | 39.3 | 38.5 | **39.4** | **754** |
| 13 | MCNL-18-13 | SVJH- 106 | 4.7 | 4.0 | 4.8 | 3.41 | 40.7 | 41.8 | 40.2 | 39.2 | **40.5** | **746** |
| **14** | MCNL-18-14 | PRL- 2013-9 | 4.3 | 3.8 | 3.8 | 3.54 | 38.5 | 38.8 | 40.5 | 38.8 | **39.2** | **548** |
| 15 | MCNL-18-15 | DRMRIJ 17-92 | 4.3 | 4.4 | 4.6 | 3.78 | 39.8 | 40.6 | 39.5 | 38.0 | **39.5** | **771** |
| 16 | MCNL-18-16 | KMR (L) 18-6 | 3.9 | 3.8 | 4.4 | 3.71 | 40.5 | 40.0 | 39.5 | 38.4 | **39.6** | **630** |
| 17 | MCNL-18-17 | TM 130 | 5.0 | 4.7 | 4.8 | 4.74 | 37.5 | 40.1 | 39.0 | 37.0 | **38.4** | **446** |
| 18 | MCNL-18-18 | RH 1657 | 4.1 | 3.4 | 4.4 | 3.49 | 39.9 | 41.0 | 39.6 | 39.0 | **39.9** | **678** |
| **19** | **MCNL-18-19** | **PM 26 (ZC)** | **4.4** | **3.4** | **4.2** | **3.34** | **38.3** | **38.4** | **39.2** | **39.2** | **38.8** | **737** |
| 20 | MCNL-18-20 | Kranti (NC) | 3.8 | 3.5 | 4 | 3.44 | 39.4 | 41.0 | 40.0 | 39.2 | **39.9** | **695** |

# Table 2.3.22a. Performance of Indian mustard strains in IVT Late sown (irrigated) Zone - III

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | | Plant Stand | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR$ | VAR | DOL | Mean | MOR | PNT | KPR | VAR | DOL |
| | | | 1 | 2 | 3 | 4 | 5 | (1-2,4-5) | 1 | 2 | 3 | 4 | 5 |
| 1 | MCNL-18-1 | RH 1658 | 1908 | 1182 | 1647 | 2158 | 1648 | **1724** | 174 | 114 | 123 | 189 | 161 |
| 2 | MCNL-18-2 | DRMR 2017-27 | 1630 | 1731 | 1827 | 1717 | 2302 | **1845** | 176 | 118 | 126 | 202 | 160 |
| 3 | MCNL-18-3 | NPJ- 228 | 1691 | 1332 | 1544 | 2145 | 2148 | **1829** | 173 | 129 | 117 | 188 | 162 |
| 4 | MCNL-18-4 | HUJM 17-8 | 1556 | 2324 | 1441 | 1795 | 1981 | **1914** | 173 | 137 | 118 | 209 | 156 |
| 5 | MCNL-18-5 | CAU- RM 4 | 1698 | 1302 | 1621 | 1422 | 1531 | **1488** | 172 | 121 | 116 | 206 | 161 |
| **6** | **MCNL-18-6** | **CS 56 (LR)** | **1377** | **1726** | **1647** | **2470** | **2000** | **1893** | **175** | **125** | **117** | **199** | **163** |
| 7 | MCNL-18-7 | RGN- 449 | 1729 | 1957 | 1956 | 1942 | 1796 | **1856** | 174 | 119 | 121 | 200 | 157 |
| 8 | MCNL-18-8 | KMR (L) 18-5 | 1704 | 1125 | 1698 | 2082 | 1630 | **1635** | 174 | 130 | 122 | 200 | 161 |
| **9** | MCNL-18-9 | DRMRHJ 1403 | **1747** | 1417 | 1724 | 2022 | 2074 | **1815** | **171** | 117 | 122 | 199 | 159 |
| 10 | MCNL-18-10 | DRMRCI 111 | 1562 | 1778 | 2007 | 1912 | 1710 | **1740** | 175 | 115 | 125 | 195 | 156 |
| 11 | MCNL-18-11 | NPJ- 227 | 1568 | 1110 | 1750 | 1648 | 1321 | **1412** | 175 | 115 | 119 | 179 | 159 |
| 12 | MCNL-18-12 | PRL- 2016-6 | 1648 | 1835 | 1879 | 2523 | 1772 | **1944** | 173 | 131 | 120 | 190 | 161 |
| 13 | MCNL-18-13 | SVJH- 106 | 1858 | 1865 | 1776 | 2355 | 1763 | **1960** | 177 | 126 | 120 | 198 | 160 |
| 14 | MCNL-18-14 | PRL- 2013-9 | 1383 | 1869 | 1724 | 1724 | 1296 | **1568** | 173 | 137 | 118 | 183 | 160 |
| 15 | MCNL-18-15 | DRMRIJ 17-92 | 2031 | 1739 | 1673 | 2021 | 1519 | **1828** | 174 | 160 | 120 | 208 | 159 |
| 16 | MCNL-18-16 | KMR (L) 18-6 | 1636 | 1617 | 1750 | 2065 | 1722 | **1760** | 172 | 155 | 122 | 185 | 158 |
| 17 | MCNL-18-17 | TM 130 | 1124 | 1441 | 1647 | 2026 | 1364 | **1489** | 175 | 138 | 123 | 185 | 160 |
| 18 | MCNL-18-18 | RH 1657 | 1803 | 1417 | 1750 | 2009 | 1309 | **1634** | 174 | 134 | 122 | 198 | 158 |
| 19 | MCNL-18-19 | NRCHB 101 (ZC) | 1574 | 1627 | 1724 | 1736 | 1352 | **1572** | 176 | 119 | 122 | 208 | 159 |
| 20 | MCNL-18-20 | Kranti (NC) | 1833 | 1974 | 1827 | 2147 | 1438 | **1848** | 174 | 131 | 125 | 199 | 161 |
| | | GM | 1653 | 1618 | 1731 | 1996 | 1684 | | | | | | |
| | | CD (5%) | 337.5 | 213 | 116 | 660 | 293 | | | | | | |
| | | CV (%) | 12.8 | 8.2 | 6.5 | 13.1 | 10.9 | | | | | | |
| | | DOS | 22.11.2018 | 22.11.2018 | 19.11.2018 | 14.11.2018 | 20.11.2018 | | | | | | |

$ data of KPR centre excluded from computation of mean due to trial rejection by monetoring team

## Table 2.3.22b. Performance of Indian mustard strains in IVT Late sown (irrigated) Zone - III

| S.No. | Code | Strain | Days to Maturity | | | | | 1000-Seed Wt.(g) | | | | | Oil Content (%) | | | | | | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | VAR | DOL | MOR | PNT | KPR | VAR | DOL | MOR | PNT | KPR | VAR | DOL | Mean | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1-2,4-5) | (1-2,4-5) |
| 1 | MCNL-18-1 | RH 1658 | 129 | 119 | 127 | 124 | 103 | 4.7 | 4.5 | 4.8 | 5.5 | 5.0 | 39.2 | 40.4 | 39.9 | 39.5 | 39.5 | **39.7** | **684** |
| 2 | MCNL-18-2 | DRMR 2017-27 | 131 | 119 | 122 | 135 | 108 | 3.7 | 4.1 | 4.52 | 3.3 | 3.5 | 38.4 | 41.1 | 38.7 | 38.0 | 39.4 | **39.2** | **724** |
| 3 | MCNL-18-3 | NPJ- 228 | 128 | 121 | 120 | 136 | 110 | 4.6 | 3.3 | 3.52 | 4.7 | 3.8 | 40.0 | 39.5 | 42.6 | 39.9 | 38.9 | **39.6** | **724** |
| 4 | MCNL-18-4 | HUJM 17-8 | 130 | 122 | 123 | 138 | 111 | 5.0 | 4.3 | 4.16 | 4.9 | 4.2 | 38.7 | 40.1 | 39.8 | 38.2 | 38.3 | **38.8** | **743** |
| 5 | MCNL-18-5 | CAU- RM 4 | 128 | 116 | 125 | 125 | 103 | 3.6 | 2.5 | 3.24 | 2.7 | 2.7 | 40.8 | 40.2 | 42.6 | 40.0 | 38.8 | **39.9** | **594** |
| **6** | **MCNL-18-6** | **CS 56 (LR)** | **134** | **120** | **120** | **138** | **110** | **5.1** | **4.5** | **4.6** | **4.9** | **3.6** | **37.4** | **39.6** | **38.0** | **39.3** | **37.7** | **38.5** | **729** |
| 7 | MCNL-18-7 | RGN- 449 | 135 | 124 | 120 | 139 | 113 | 4.2 | 3.9 | 4.44 | 3.5 | 3.5 | 39.9 | 40.6 | 37.8 | 38.8 | 37.0 | **39.1** | **725** |
| 8 | MCNL-18-8 | KMR (L) 18-5 | 130 | 119 | 124 | 136 | 107 | 5.4 | 3.6 | 4.12 | 4.5 | 4.1 | 38.3 | 39.3 | 40.1 | 37.4 | 37.6 | **38.1** | **623** |
| **9** | MCNL-18-9 | DRMRHJ 1403 | 134 | 122 | 123 | 139 | 108 | 4.9 | 3.5 | 4.68 | 3.5 | 4.0 | 39.9 | 41.0 | 39.1 | 38.1 | **39.2** | **39.6** | **718** |
| 10 | MCNL-18-10 | DRMRCI 111 | 132 | 123 | 121 | 140 | 109 | 4.3 | 3.9 | 4.16 | 3.9 | 3.2 | 39.2 | 41.0 | 40.2 | 40.7 | 38.9 | **40.0** | **695** |
| 11 | MCNL-18-11 | NPJ- 227 | 130 | 121 | 122 | 136 | 104 | 4.6 | 3.1 | 3.68 | 4.3 | 2.6 | 39.4 | 39.3 | 39.0 | 39.7 | 37.0 | **38.8** | **548** |
| 12 | MCNL-18-12 | PRL- 2016-6 | 127 | 121 | 123 | 136 | 109 | 5.3 | 4.7 | 4.2 | 4.3 | 4.7 | 39.5 | 40.7 | 38.9 | 39.0 | 37.3 | **39.1** | **761** |
| 13 | MCNL-18-13 | SVJH- 106 | 125 | 117 | 126 | 124 | 103 | 4.0 | 3.4 | 3.72 | 5.1 | 2.5 | 39.8 | 40.4 | 39.5 | 40.6 | 38.6 | **39.8** | **781** |
| 14 | MCNL-18-14 | PRL- 2013-9 | 131 | 125 | 119 | 141 | 114 | 3.9 | 3.5 | 3.12 | 3.9 | 3.1 | 39.9 | 40.6 | 40.0 | 38.4 | 38.8 | **39.4** | **618** |
| 15 | MCNL-18-15 | DRMRIJ 17-92 | 128 | 121 | 121 | 124 | 105 | 3.8 | 3.8 | 4.08 | 3.7 | 3.8 | 39.8 | 40.7 | 38.7 | 38.8 | 39.3 | **39.6** | **724** |
| 16 | MCNL-18-16 | KMR (L) 18-6 | 134 | 126 | 123 | 137 | 113 | 4.1 | 3.0 | 3.52 | 4.9 | 2.9 | 39.3 | 41.2 | 40.8 | 38.6 | 39.1 | **39.6** | **696** |
| 17 | MCNL-18-17 | TM 130 | 134 | 124 | 125 | 137 | 109 | 5.7 | 4.4 | 4.8 | 3.3 | 3.6 | 38.9 | 38.3 | 38.0 | 37.1 | 38.6 | **38.2** | **569** |
| 18 | MCNL-18-18 | RH 1657 | 127 | 120 | 120 | 135 | 110 | 4.6 | 3.7 | 3.76 | 3.7 | 3.6 | 39.5 | 39.0 | 41.0 | 37.9 | 38.0 | **38.6** | **631** |
| 19 | MCNL-18-19 | NRCHB 101 (ZC) | 129 | 122 | 122 | 137 | 107 | 5.2 | 4.1 | 4.6 | 4.9 | 2.7 | 39.5 | 40.1 | 38.4 | 39.2 | 38.7 | **39.4** | **619** |
| 20 | MCNL-18-20 | Kranti (NC) | 126 | 115 | 126 | 137 | 109 | 4.0 | 3.2 | 3.4 | 3.3 | 2.5 | 39.3 | 40.2 | 37.8 | 39.1 | 39.1 | **39.4** | **728** |

## Table 2.3.23a. Performance of Indian mustard strains in AVT-I Late sown Repeat (Irrigated) Zone - II

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | Plant Stand | | | | Days to Maturity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LDH | SGN | HSR# | NDH | Mean | LDH | SGN | HSR | NDH | LDH | SGN | HSR | NDH |
| | | | 1 | 2 | 3 | 4 | (1-2,4) | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **1** | **MCNL-18-21** | **DRMR 2017-15** | **1080** | **2306** | **2411** | **2156** | **1847** | **259** | **290** | **264** | **261** | **131** | **130** | **136** | **136** |
| 2 | MCNL-18-22 | Filler (Kranti) | 1327 | 1733 | 1833 | 1850 | **1637** | 286 | 300 | 261 | 268 | 126 | 132 | 134 | 132 |
| 3 | MCNL-18-23 | NPJ 216 | 1019 | 1637 | 1991 | 2004 | **1553** | 263 | 295 | 258 | 245 | 130 | 136 | 134 | 133 |
| 4 | MCNL-18-24 | Raj Vijay Mustard 2 (LR) | 1204 | 1719 | 1752 | 1575 | **1499** | 276 | 302 | 262 | 253 | 127 | 138 | 137 | 136 |
| **5** | MCNL-18-25 | RH 1599-41 | 1080 | 1754 | 2461 | 2133 | **1656** | 272 | 270 | 267 | 244 | 130 | 131 | 133 | 133 |
| 6 | MCNL-18-26 | PM 26 (ZC) | 1235 | 1376 | 1852 | 1998 | **1536** | 287 | 280 | 266 | 264 | 117 | 129 | 132 | 130 |
| 7 | **MCNL-18-27** | **DRMRIC 16-38** | **1420** | **1663** | **2009** | **2065** | **1716** | **297** | **310** | **268** | **241** | **130** | **136** | **135** | **135** |
| 8 | MCNL-18-28 | RMWR 09-1 | 1188 | 1621 | 1736 | 1373 | **1394** | 267 | 300 | 264 | 246 | 138 | 138 | 137 | 136 |
| **9** | **MCNL-18-29** | **Kranti (NC)** | **1265** | **1535** | **1975** | **1823** | **1541** | **284** | **298** | **265** | **267** | **127** | **131** | **136** | **132** |
| | | GM | 1202 | 1705 | 2002 | 1886 | | | | | | | | | |
| | | CD (5%) | 222 | 217 | 348 | 207 | | | | | | | | | |
| | | CV (%) | 13.3 | 9.2 | 10.4 | 7.9 | | | | | | | | | |
| | | DOS | 15.10.2018 | 24.11.2018 | 15.11.2018 | 20.11.2018 | | | | | | | | | |

# data of HSR centre excluded rom computation of mean due to impoper conduct of trial (less no. of reps)

## Table 2.3.23b. Performance of Indian mustard strains in AVT-I Late sown (irrigated) Zone - II

| S.No. | Code | Strain | 1000-Seed Wt.(g) | | | Oil Content (%) | | | | | | Oil Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LDH | SGN | HSR | NDH | LDH | SGN | HSR | NDH | Mean | |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-2,4) | (1-2,4) |
| **1** | **MCNL-18-21** | **DRMR 2017-15** | **5.1** | **4.4** | **4.2** | **3.6** | **40.7** | **40.3** | **39.5** | **40.1** | **40.4** | **746** |
| 2 | MCNL-18-22 | Filler (Kranti) | 4.1 | 4.2 | 3.7 | 2.9 | 40.2 | 39.6 | 39.2 | 38.8 | **39.5** | **647** |
| 3 | MCNL-18-23 | NPJ 216 | 3.9 | 4.6 | 3.9 | 4.0 | 39.1 | 40.0 | 39.3 | 39.6 | **39.5** | **614** |
| 4 | MCNL-18-24 | Raj Vijay Mustard 2 (LR) | 4.0 | 4.2 | 3.5 | 3.9 | 38.8 | 40.0 | 38.2 | 38.3 | **39.0** | **585** |
| **5** | MCNL-18-25 | RH 1599-41 | 3.4 | 4.6 | 4.0 | 3.3 | 40.7 | 39.0 | 39.3 | 38.8 | **39.5** | **654** |
| 6 | MCNL-18-26 | PM 26 (ZC) | 3.6 | 4.6 | 3.5 | 3.4 | 42.0 | 39.9 | 41.2 | 39.9 | **40.6** | **623** |
| **7** | **MCNL-18-27** | **DRMRIC 16-38** | **4.7** | **3.6** | **4.6** | **4.1** | **40.9** | **37.6** | **41.3** | **39.7** | **39.4** | **676** |
| 8 | MCNL-18-28 | RMWR 09-1 | 3.6 | 3.8 | 3.5 | 2.5 | 40.5 | 39.2 | 40.7 | 38.3 | **39.3** | **548** |
| **9** | **MCNL-18-29** | **Kranti (NC)** | **3.5** | **4.2** | **3.6** | **3.0** | **39.9** | **40.5** | **40.8** | **39.4** | **39.9** | **615** |

## Table 2.3.24a. Performance of Indian mustard strains in AVT-I+II (repeat) late sown Zone - V

| S. No. | Code | Strain | Seed Yield (Kg/ha) | | | | | Plant Stand | | | | Days to Maturity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | JAG | KNK | SHL$ | IMP | Mean | JAG | KNK | SHL | IMP | JAG | KNK | SHL | IMP |
| | | | 1 | 2 | 3 | 4 | (1-2,4) | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1 | MCNL-18-30 | DRMR- 1153-12* | 952 | 1931 | 831 | 1203 | **1362** | 264 | 408 | 178 | 341 | 110 | 122 | 113 | 120 |
| 2 | MCNL-18-31 | Kranti (NC) | 1116 | 1695 | 788 | 1447 | **1419** | 275 | 405 | 182 | 330 | 100 | 121 | 113 | 120 |
| **3** | MCNL-18-32 | Filler 1 (JD 6) | 886 | 1808 | 398 | 1263 | **1319** | 278 | 405 | 162 | 353 | 100 | 123 | 113 | 119 |
| 4 | MCNL-18-33 | PRO 5222# | 1192 | 1866 | 917 | 1246 | **1435** | 267 | 407 | 228 | 351 | 98 | 122 | 113 | 118 |
| 5 | MCNL-18-34 | JD- 6 (LR) | 1137 | 1572 | 515 | 1417 | **1375** | 318 | 409 | 175 | 359 | 106 | 123 | 110 | 119 |
| 6 | MCNL-18-35 | RH 919# | 787 | 2098 | 681 | 1567 | **1484** | 281 | 407 | 190 | 369 | 97 | 124 | 113 | 121 |
| 7 | MCNL-18-36 | Filler 2 (Kranti) | 1236 | 1702 | 623 | 1241 | **1393** | 277 | 410 | 178 | 348 | 103 | 122 | 110 | 119 |
| 8 | MCNL-18-37 | RGN 368# | 1081 | 1718 | 608 | 1091 | **1297** | 280 | 409 | 172 | 343 | 105 | 122 | 113 | 120 |
| **9** | **MCNL-18-38** | **Pusa Bold (ZC)** | **1046** | **1760** | **442** | **1601** | **1469** | **282** | **411** | **178** | **360** | **108** | **124** | **113** | **122** |
| 10 | MCNL-18-39 | RH 923# | 961 | 1797 | 652 | 1288 | **1348** | 271 | 405 | 191 | 343 | 110 | 121 | 113 | 120 |
| | | GM | 1039 | 1795 | 645 | 1336 | | | | | | | | | |
| | | CD (5%) | 164 | 281 | 138 | 243 | | | | | | | | | |
| | | CV (%) | 10.9 | 10.8 | 15.5 | 13.1 | | | | | | | | | |
| | | DOS | 6.12.2018 | 11.11.2018 | 29.11.2018 | 5.11.2018 | | | | | | | | | |

$ data of SHL excluded from computation of mean due to high CV

* AVT -II Entry

# Repeat entry

## Table 2.3.24b. Performance of Indian mustard strains in AVT-I+II (repeat) late sown Zone - V

| S.No. | Code | Strain | 1000-Seed Wt. (g) | | | | Oil Content (%) | | Mean | Oil Yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | JAG | KNK | SHL | IMP | KNK | IMP | | |
| | | | 1 | 2 | 3 | 4 | 2 | 4 | (2,4) | (1-2,4) |
| 1 | MCNL-18-30 | DRMR- 1153-12* | 4.1 | 5.4 | 3.7 | 4.8 | 41.6 | 39.7 | 40.6 | 553 |
| 2 | MCNL-18-31 | Kranti (NC) | 4.1 | 4.6 | 3.3 | 4.9 | 41.3 | 40.0 | 40.6 | 577 |
| **3** | MCNL-18-32 | Filler 1 (JD 6) | 3.7 | 4.6 | 4.2 | 5.0 | 41.3 | **39.9** | 40.6 | 536 |
| 4 | MCNL-18-33 | PRO 5222# | 3.6 | 3.8 | 3.5 | 5.3 | 41.3 | 40.0 | 40.7 | 583 |
| 5 | MCNL-18-34 | JD- 6 (LR) | 4.7 | 4.1 | 2.9 | 5.5 | 41.4 | 40.1 | 40.8 | 560 |
| 6 | MCNL-18-35 | RH 919# | 4.1 | 5.6 | 3.9 | 4.6 | 40.7 | 39.2 | 40.0 | 593 |
| 7 | MCNL-18-36 | Filler 2 (Kranti) | 4.1 | 4.2 | 3.3 | 4.8 | 41.6 | 37.9 | 39.8 | 554 |
| 8 | MCNL-18-37 | RGN 368# | 4.3 | 4.3 | 3.0 | 6.3 | 40.0 | 36.8 | 38.4 | 498 |
| **9** | **MCNL-18-38** | **Pusa Bold (ZC)** | **3.8** | **6.3** | **4.6** | **5.8** | **40.9** | **39.1** | **40.0** | 588 |
| 10 | MCNL-18-39 | RH 923# | 4.1 | 4.8 | 3.7 | 5.3 | 40.2 | 39.1 | 39.6 | 534 |

# Table 2.3.25a. Performance of Indian mustard hybrids in IHT, Zone-II

| S. No. | Code | Strain | Seed Yield (kg/ha) | | | | | | | Plant Stand | | | | | Days to Maturity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | PAL | NDH | MDG | Mean | | HSR | LDH | PAL | NDH | MDG | HSR | LDH | PAL | NDH | MDG |
| | | | 1 | 2 | 3 | 4 | 5 | (1-5) | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| 1 | MH-18-1 | DRMRHJ 517 | 2687 | 2737 | 3026 | 2604 | 2641 | **2739** | | 120 | 134 | 142 | 137 | 196 | 146 | 143 | 138 | 155 | 134 |
| **2** | **MH-18-2** | **8IJ1004** | **3408** | **2868** | **3315** | **3296** | **2959** | **3169** | * | **127** | **137** | **132** | **139** | **198** | **133** | **141** | **135** | **138** | **132** |
| 3 | MH-18-3 | RHH 1802 | 3357 | 2901 | 3209 | 2381 | 2391 | **2848** | | 123 | 141 | 140 | 137 | 195 | 138 | 145 | 137 | 152 | 132 |
| 4 | MH-18-4 | DMH- 1 (Check) | 2861 | 2597 | 3007 | 1915 | 2588 | **2593** | | 121 | 137 | 144 | 128 | 196 | 141 | 146 | 134 | 148 | 131 |
| **5** | MH-18-5 | RCH 2 | 2467 | 2403 | 2672 | 2556 | 2516 | **2523** | | 124 | 130 | 147 | 129 | 192 | 149 | 144 | 143 | 156 | 142 |
| **6** | **MH-18-6** | **RH 0749 (ZC)** | **2671** | **2469** | **3052** | **2974** | **2747** | **2783** | | **123** | **139** | **134** | **134** | **195** | **147** | **148** | **142** | **156** | **139** |
| 7 | MH-18-7 | PHR- 1096 | 2461 | 2490 | 2635 | 2015 | 2520 | **2424** | | 120 | 129 | 154 | 129 | 198 | 151 | 147 | 144 | 156 | 145 |
| 8 | MH-18-8 | Pusa MH-16 | 2266 | 2070 | 2300 | 2278 | 3414 | **2466** | | 125 | 126 | 141 | 136 | 196 | 134 | 146 | 133 | 142 | 131 |
| **9** | MH-18-9 | NRCHB- 506 (Check) | 2604 | 2477 | 2856 | 2433 | 2443 | **2563** | | 123 | 131 | 138 | 120 | 193 | 147 | 147 | 140 | 154 | 136 |
| 10 | MH-18-10 | DRMRHJ 1417 | 2935 | 2654 | 2992 | 2622 | 2514 | **2744** | | 122 | 142 | 139 | 141 | 196 | 145 | 144 | 137 | 153 | 144 |
| 11 | MH-18-11 | RHH 1801 | 3077 | 2506 | 3061 | 2904 | 2360 | **2782** | | 125 | 138 | 115 | 128 | 197 | 143 | 140 | 136 | 149 | 135 |
| 12 | MH-18-12 | SVJH- 101 | 2636 | 2436 | 3317 | 3237 | 3410 | **3007** | | 118 | 127 | 135 | 129 | 193 | 133 | 142 | 136 | 143 | 135 |
| 13 | MH-18-13 | PHR- 3313 | 3377 | 2403 | 2761 | 2896 | 2736 | **2835** | | 122 | 133 | 140 | 135 | 193 | 146 | 144 | 142 | 154 | 134 |
| **14** | **MH-18-14** | **SVJH- 108** | **2817** | **2572** | **3348** | **2622** | **3877** | **3047** | ** | **120** | **127** | **131** | **126** | **192** | **146** | **145** | **140** | **152** | **144** |
| 15 | MH-18-15 | DRMRHJ 2518 | 2853 | 2844 | 2622 | 2759 | 2324 | **2680** | | 128 | 136 | 145 | 139 | 193 | 145 | 136 | 138 | 153 | 130 |
| 16 | MH-18-16 | PHR- 3489 | 2975 | 2494 | 2792 | 2444 | 2411 | **2623** | | 120 | 136 | 121 | 125 | 191 | 146 | 143 | 137 | 152 | 136 |
| 17 | MH-18-17 | Pusa MH-20 | 2254 | 2461 | 2820 | 2785 | 3203 | **2705** | | 119 | 132 | 132 | 118 | 193 | 143 | 139 | 135 | 143 | 130 |
| 18 | MH-18-18 | Kranti (NC) | 2616 | 2695 | 2798 | 2489 | 2345 | **2589** | | 122 | 142 | 136 | 130 | 194 | 145 | 142 | 137 | 153 | 134 |
| | | GM | 2796 | 2560 | 2921 | 2623 | 2744 | | | | | | | | | | | | |
| | | CD (5%) | 425 | 334 | 373 | 231 | 435 | | | | | | | | | | | | |
| | | CV (%) | 9.5 | 8.2 | 12.0 | 5.3 | 9.9 | | | | | | | | | | | | |
| | | DOS | 8.10.2018 | 16.10.2018 | 22.10.2018 | 13.10.2018 | 26.10.2018 | | | | | | | | | | | | |

* Strain (s) outyielding the best check by a margin of > 10 percent seed and oil yield

** Strain (s) outyielding the best check by a margin of > 10 percent oil yield

## Table 2.3.25b. Performance of Indian mustard hybrids in IHT, Zone-II

| S.No. | Code | Strain | 1000-Seed Wt.(g) | | | | | Oil Content (%) | | | | | | Oil Yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | PAL | NDH | MDG | HSR | LDH | PAL | NDH | MDG | Mean | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1-5) | (1-5) |
| 1 | MH-18-1 | DRMRHJ 517 | 4.5 | 5.0 | 4.1 | 3.51 | 5.8 | 41.4 | 42.2 | 39.8 | 39.3 | 40.4 | **40.6** | **1112** |
| **2** | **MH-18-2** | **8IJ1004** | **5.2** | **5.1** | **4.3** | **4.63** | **5.4** | **40.0** | **42.3** | **40.2** | **40.3** | **40.5** | **40.7** | **1289** |
| 3 | MH-18-3 | RHH 1802 | 4.8 | 2.6 | 3.8 | 3.62 | 5.1 | 41.0 | 41.9 | 40.6 | 40.5 | 41.3 | **41.1** | **1169** |
| 4 | MH-18-4 | DMH- 1 (Check) | 3.5 | 3.5 | 3.2 | 2.95 | 4.1 | 39.9 | 39.9 | 40.4 | 38.7 | 41.3 | **40.0** | **1038** |
| **5** | MH-18-5 | RCH 2 | 4.4 | 4.3 | 3.8 | 3.55 | 4.0 | 41.3 | 41.2 | **40.6** | 38.8 | 41.6 | **40.7** | **1026** |
| **6** | **MH-18-6** | **RH 0749 (ZC)** | **6.1** | **3.4** | **4.8** | **4.88** | **5.7** | **41.1** | **41.8** | **41.2** | **40.3** | **40.4** | **41.0** | **1139** |
| 7 | MH-18-7 | PHR- 1096 | 3.9 | 3.9 | 3.6 | 3.15 | 4.1 | 40.5 | 40.7 | 40.4 | 40.2 | 41.0 | **40.5** | **983** |
| 8 | MH-18-8 | Pusa MH-16 | 4.5 | 4.9 | 4.6 | 4.35 | 4.9 | 41.7 | 41.2 | 40.3 | 39.9 | 40.4 | **40.7** | **1003** |
| **9** | MH-18-9 | NRCHB- 506 (Check) | 4.9 | 5.1 | 4.4 | 4.28 | 5.1 | 42.1 | 39.6 | 41.0 | 40.9 | 41.4 | **41.0** | **1052** |
| 10 | MH-18-10 | DRMRHJ 1417 | 5.1 | 4.7 | 3.9 | 4.18 | 4.8 | 42.8 | 42.7 | 40.9 | 40.3 | 41.4 | **41.6** | **1142** |
| 11 | MH-18-11 | RHH 1801 | 4.2 | 4.4 | 3.7 | 3.82 | 5.4 | 42.2 | 42.5 | 41.7 | 40.0 | 42.0 | **41.7** | **1159** |
| 12 | MH-18-12 | SVJH- 101 | 5.1 | 5.1 | 4.5 | 5.28 | 5.9 | 42.2 | 42.6 | 40.6 | 40.6 | 41.3 | **41.5** | **1247** |
| 13 | MH-18-13 | PHR- 3313 | 3.7 | 5.2 | 3.5 | 3.11 | 4.8 | 41.9 | 42.0 | 40.4 | 40.1 | 40.1 | **40.9** | **1160** |
| **14** | **MH-18-14** | **SVJH- 108** | **5.8** | **5.9** | **4.9** | **5.59** | **6.3** | **41.3** | **41.8** | **41.1** | **41.3** | **41.2** | **41.3** | **1259** |
| 15 | MH-18-15 | DRMRHJ 2518 | 4.1 | 4.2 | 3.7 | 3.79 | 5.1 | 40.3 | 42.9 | 39.9 | 40.5 | 41.1 | **40.9** | **1097** |
| 16 | MH-18-16 | PHR- 3489 | 3.7 | 4.3 | 3.4 | 3.7 | 5.3 | 43.1 | 41.9 | 39.6 | 40.3 | 41.2 | **41.2** | **1081** |
| 17 | MH-18-17 | Pusa MH-20 | 4.6 | 4.5 | 4.3 | 4.19 | 5.2 | 43.6 | 42.6 | 41.5 | 40.3 | 41.0 | **41.8** | **1130** |
| 18 | MH-18-18 | Kranti (NC) | 4.2 | 4.4 | 3.6 | 3.74 | 5.0 | 43.9 | 41.4 | 40.6 | 40.5 | 41.3 | **41.5** | **1074** |

# Table 2.3.26a. Performance of Indian mustard hybrids in IHT, Zone-III

| S. No. | Code | Strain | Seed Yield (kg/ha) | | | | | | | | Plant Stand | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR$ | BPR | KOT | VAR | DOL | Mean | MOR | PNT | KPR | BPR | KOT | VAR | DOL |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | (1-2,4-7) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | MH-18-1 | DRMRHJ 517 | 3299 | 1702 | 2623 | 3081 | 2973 | 2248 | 2222 | **2588** | 173 | 123 | 119 | 142 | 98 | 173 | 86 |
| 2 | MH-18-2 | 8IJ1004 | 2785 | 2531 | 2597 | 3285 | 3068 | 2785 | 2571 | **2838** | 154 | 137 | 117 | 110 | 99 | 165 | 86 |
| 3 | MH-18-3 | RHH 1802 | 3452 | 2149 | 2495 | 2874 | 3142 | 2549 | 1926 | **2682** | 157 | 132 | 116 | 128 | 96 | 170 | 87 |
| 4 | MH-18-4 | DMH- 1 (Check) | 3229 | 2365 | 2573 | 3033 | 3141 | 2617 | 1909 | **2716** | 170 | 133 | 111 | 142 | 102 | 167 | 88 |
| **5** | MH-18-5 | RCH 2 | 3289 | 1994 | 2392 | 2615 | 3090 | 2651 | 2370 | **2668** | 159 | 121 | 118 | 132 | 98 | 169 | 88 |
| 6 | MH-18-6 | RGN 73 (ZC) | 4247 | 1923 | 2365 | 2726 | 2799 | 2682 | 1679 | **2676** | 172 | 136 | 118 | 146 | 98 | 165 | 86 |
| 7 | MH-18-7 | PHR- 1096 | 3881 | 1821 | 2392 | 2359 | 2912 | 2491 | 1710 | **2529** | 171 | 117 | 118 | 138 | 99 | 170 | 88 |
| 8 | MH-18-8 | Pusa MH-16 | 2380 | 2046 | 2341 | 2022 | 2963 | 2106 | 1383 | **2150** | 161 | 127 | 116 | 134 | 95 | 165 | 86 |
| **9** | MH-18-9 | NRCHB-506 (Check) | 3704 | 1723 | 2418 | 3167 | 2817 | 2343 | 1597 | **2558** | 163 | 120 | 118 | 135 | 100 | 172 | 90 |
| 10 | MH-18-10 | DRMRHJ 1417 | 3862 | 2283 | 2511 | 3504 | 2795 | 2781 | 1547 | **2795** | 152 | 127 | 117 | 140 | 97 | 160 | 91 |
| 11 | MH-18-11 | RHH 1801 | 3931 | 2360 | 2315 | 2715 | 2708 | 2731 | 1992 | **2740** | 169 | 126 | 119 | 125 | 101 | 163 | 88 |
| 12 | MH-18-12 | SVJH- 101 | 2908 | 2006 | 2649 | 3011 | 2887 | 2639 | 2025 | **2579** | 174 | 106 | 118 | 118 | 100 | 160 | 90 |
| 13 | MH-18-13 | PHR- 3313 | 3442 | 2170 | 2495 | 2759 | 3008 | 2705 | 2239 | **2721** | 171 | 139 | 116 | 132 | 98 | 172 | 87 |
| 14 | MH-18-14 | SVJH- 108 | 3644 | 2090 | 2365 | 3074 | 2764 | 2689 | 1350 | **2602** | 173 | 123 | 116 | 125 | 97 | 159 | 88 |
| 15 | MH-18-15 | DRMRHJ 2518 | 4326 | 1837 | 2392 | 2778 | 2928 | 2502 | 2354 | **2787** | 161 | 125 | 109 | 145 | 103 | 166 | 87 |
| 16 | MH-18-16 | PHR- 3489 | 3412 | 2136 | 2134 | 2370 | 2811 | 2583 | 2041 | **2559** | 162 | 131 | 116 | 137 | 99 | 167 | 83 |
| 17 | MH-18-17 | Pusa MH-20 | 2889 | 1444 | 2495 | 2341 | 2941 | 2611 | 1196 | **2237** | 169 | 108 | 119 | 140 | 94 | 164 | 86 |
| **18** | **MH-18-18** | **Kranti (NC)** | **3704** | **2268** | **2469** | **3089** | **2844** | **2638** | **1909** | **2742** | **167** | **115** | **116** | **139** | **100** | **171** | **91** |
| | | GM | 3466 | 2047 | 2446 | 2822 | 2922 | 2575 | 1890 | | | | | | | | |
| | | CD (5%) | 572 | 307 | 125 | 495 | 481 | 355 | 257 | | | | | | | | |
| | | CV (%) | 11.9 | 9.4 | 4.9 | 11.0 | 10.3 | 8.3 | 8.5 | | | | | | | | |
| | | DOS | 14.10.2018 | 25.10.2018 | 26.10.2018 | 15.10.2018 | 25.10.2018 | 28.10.2018 | 17.10.2018 | | | | | | | | |

$ data of KNP Centre excluded from computation of mean due to low CV (< 5.0) in field experimentation

## Table 2.3.26b. Performance of Indian mustard hybrids in IHT, Zone-III

| S. No. | Code | Strain | Days to maturity | | | | | | | 1000-Seed Wt.(g) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | BPR | KOT | VAR | DOL | MOR | PNT | KPR$ | BPR | KOT | VAR | DOL |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | MH-18-1 | DRMRHJ 517 | 143 | 130.3 | 135 | 132 | 132 | 139 | 123 | 5.4 | 2.6 | 4.4 | 4.4 | 4.6 | 3.5 | 5.4 |
| 2 | MH-18-2 | 8IJ1004 | 140 | 126.3 | 130 | 130 | 127 | 128.7 | 120 | 5.8 | 2.8 | 4.7 | 4.2 | 4.7 | 3.7 | 4.4 |
| 3 | MH-18-3 | RHH 1802 | 145 | 127.3 | 132 | 134 | 130 | 136 | 121 | 5.4 | 3.0 | 4.5 | 3.7 | 4.5 | 3.9 | 4.6 |
| 4 | MH-18-4 | DMH- 1 (Check) | 139 | 130.7 | 131 | 132 | 131 | 141 | 123 | 3.8 | 2.5 | 3.9 | 3.2 | 3.8 | 2.9 | 3.8 |
| **5** | MH-18-5 | RCH 2 | 149 | 132.3 | 134 | 143 | 136 | 141 | 124 | 4.7 | 2.8 | 3.7 | 3.7 | 4.5 | 3.6 | 3.9 |
| 6 | MH-18-6 | RGN 73 (ZC) | 150 | 132 | 132 | 142 | 132 | 143 | 121 | 4.8 | 2.5 | 3.9 | 4.3 | 4.1 | 3.3 | 4.3 |
| 7 | MH-18-7 | PHR- 1096 | 149 | 135.7 | 135 | 145 | 135 | 148 | 121 | 4.6 | 2.2 | 3.3 | 3.5 | 4.3 | 3.4 | 4.3 |
| 8 | MH-18-8 | Pusa MH-16 | 143 | 124.7 | 136 | 126 | 130 | 129 | 115 | 5.1 | 2.8 | 5.0 | 4.2 | 4.2 | 3.5 | 4.1 |
| **9** | MH-18-9 | NRCHB- 506 (Check) | 145 | 127.3 | 134 | 130 | 132 | 137 | 122 | 6.1 | 2.8 | 4.4 | 5 | 3.9 | 3.5 | 4.2 |
| 10 | MH-18-10 | DRMRHJ 1417 | 149 | 128 | 130 | 133 | 134 | 138 | 123 | 5.3 | 3.0 | 4.3 | 4.7 | 4.9 | 3.5 | 4.6 |
| 11 | MH-18-11 | RHH 1801 | 143 | 122.7 | 132 | 132 | 133 | 138 | 119 | 6.5 | 2.6 | 4.0 | 3.9 | 4.4 | 3.5 | 3.7 |
| 12 | MH-18-12 | SVJH- 101 | 138 | 121.3 | 134 | 121 | 123 | 124.3 | 118 | 5.5 | 3.2 | 4.3 | 4.8 | 3.6 | 3.7 | 4.0 |
| 13 | MH-18-13 | PHR- 3313 | 147 | 130.7 | 134 | 140 | 131 | 137 | 123 | 4.3 | 3.3 | 3.9 | 3.5 | 4.2 | 3.4 | 3.6 |
| 14 | MH-18-14 | SVJH- 108 | 146 | 123.7 | 135 | 132 | 133 | 140 | 119 | 5.4 | 3.5 | 5.6 | 5.9 | 3.4 | 4.7 | 5.0 |
| 15 | MH-18-15 | DRMRHJ 2518 | 145 | 134.3 | 133 | 126 | 134 | 142 | 125 | 5.6 | 2.6 | 3.8 | 4.5 | 4.8 | 3.8 | 3.2 |
| 16 | MH-18-16 | PHR- 3489 | 147 | 130.7 | 130 | 128 | 132 | 142 | 126 | 4.6 | 3.0 | 3.9 | 3.7 | 3.7 | 3.3 | 3.6 |
| 17 | MH-18-17 | Pusa MH-20 | 148 | 126.7 | 129 | 128 | 129 | 133 | 118 | 5.0 | 2.9 | 4.6 | 4.6 | 5.0 | 3.9 | 4.5 |
| **18** | **MH-18-18** | **Kranti (NC)** | **144** | **124** | **132** | **128** | **131** | **135** | **119** | **5.2** | **3.4** | **4.3** | **4.5** | **3.2** | **3.6** | **6.2** |

## Table 2.3.26c. Performance of Indian mustard hybrids in IHT, Zone-III

| S. No. | Code | Strain | Oil Content (%) | | | | | | | Mean | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR$ | BPR | KOT | VAR | DOL | | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | (1-2,4-7) | (1-2,4-7) |
| 1 | MH-18-1 | DRMRHJ 517 | 41.0 | 40.1 | 37.4 | 39.7 | 41.8 | 39.2 | 41.1 | **40.5** | **1048** |
| 2 | MH-18-2 | 8IJ1004 | 40.6 | 37.7 | 37.5 | 39.5 | 41.7 | 38.0 | 39.2 | **39.4** | **1119** |
| 3 | MH-18-3 | RHH 1802 | 42.0 | 38.4 | 40.3 | 41.2 | 39.6 | 37.3 | 41.0 | **39.9** | **1070** |
| 4 | MH-18-4 | DMH- 1 (Check) | 43.2 | 38.8 | 40.0 | 41.2 | 40.3 | 39.3 | 41.0 | **40.6** | **1103** |
| 5 | MH-18-5 | RCH 2 | 40.8 | 39.3 | 40.7 | 39.7 | 39.6 | 39.9 | 41.3 | **40.1** | **1070** |
| 6 | MH-18-6 | RGN 73 (ZC) | 41.2 | 39.1 | 40.7 | 40.7 | 41.6 | 39.9 | 40.7 | **40.5** | **1085** |
| 7 | MH-18-7 | PHR- 1096 | 41.4 | 39.0 | 40.5 | 40.7 | 41.5 | 38.7 | 40.9 | **40.3** | **1020** |
| 8 | MH-18-8 | Pusa MH-16 | 41.0 | 37.4 | 39.8 | 39.8 | 40.6 | 38.3 | 40.5 | **39.6** | **851** |
| 9 | MH-18-9 | NRCHB- 506 (Check) | 42.0 | 38.2 | 40.3 | 42.1 | 40.9 | 39.0 | 40.1 | **40.4** | **1033** |
| 10 | MH-18-10 | DRMRHJ 1417 | 41.3 | 39.1 | 40.9 | 41.3 | 40.8 | 40.5 | 39.8 | **40.5** | **1131** |
| 11 | MH-18-11 | RHH 1801 | 41.0 | 39.1 | 38.9 | 40.9 | 42.7 | 39.8 | 41.8 | **40.9** | **1120** |
| 12 | MH-18-12 | SVJH- 101 | 41.7 | 39.7 | 40.9 | 42.1 | 42.8 | 39.8 | 41.4 | **41.2** | **1064** |
| 13 | MH-18-13 | PHR- 3313 | 40.8 | 40.3 | 41.1 | 41.2 | 40.7 | 39.7 | 41.9 | **40.8** | **1109** |
| 14 | MH-18-14 | SVJH- 108 | 41.2 | 38.6 | 38.4 | 41.1 | 39.7 | 39.1 | 40.3 | **40.0** | **1041** |
| 15 | MH-18-15 | DRMRHJ 2518 | 40.5 | 39.5 | 38.9 | 41.5 | 40.8 | 39.1 | 41.4 | **40.4** | **1127** |
| 16 | MH-18-16 | PHR- 3489 | 41.1 | 39.0 | 40.4 | 41.4 | 40.1 | 39.0 | 41.2 | **40.3** | **1031** |
| 17 | MH-18-17 | Pusa MH-20 | 41.0 | 37.1 | 39.3 | 41.7 | 39.5 | 38.0 | 39.5 | **39.5** | **883** |
| 18 | MH-18-18 | Kranti (NC) | 40.8 | 39.7 | 39.9 | 41.8 | 40.8 | 37.6 | 41.6 | **40.4** | **1107** |

## Table 2.3.27a. Performance of Indian mustard hybrids in IHT, Zone-IV

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | Plant Stand | | | | Days to maturity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SKN | MDR | DSA | PHR | Mean | SKN | MDR | DSA | PHR | SKN | MDR | DSA | PHR |
| | | | 1 | 2 | 3 | 4 | (1-4) | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1 | MH-18-1 | DRMRHJ 517 | 3797 | 2922 | 3087 | 2995 | **3200** | 145 | 298 | 145 | 119 | 124 | 131 | 121 | 120 |
| 2 | MH-18-2 | 8IJ1004 | 3823 | 2787 | 3457 | 3353 | **3355** | 155 | 306 | 145 | 125 | 116 | 130 | 119 | 114 |
| 3 | MH-18-3 | RHH 1802 | 3977 | 3510 | 2816 | 3226 | **3382** | 153 | 304 | 147 | 115 | 116 | 131 | 121 | 120 |
| 4 | MH-18-4 | DMH- 1 (Check) | 3521 | 3712 | 2812 | 3138 | **3296** | 148 | 306 | 143 | 111 | 118 | 131 | 121 | 116 |
| **5** | MH-18-5 | RCH 2 | 3504 | 3562 | 2156 | 3278 | **3125** | 145 | 304 | 142 | 119 | 125 | 134 | 124 | 120 |
| **6** | **MH-18-6** | **GDM 4 (ZC)** | **3234** | **3683** | **3070** | **3277** | **3316** | **157** | **300** | **156** | **123** | **124** | **131** | **123** | **118** |
| 7 | MH-18-7 | PHR- 1096 | 3421 | 3128 | 2061 | 2780 | **2848** | 167 | 295 | 123 | 116 | 125 | 133 | 122 | 117 |
| 8 | MH-18-8 | Pusa MH-16 | 3071 | 2283 | 1466 | 2884 | **2426** | 148 | 296 | 156 | 119 | 122 | 132 | 121 | 119 |
| **9** | MH-18-9 | NRCHB- 506 (Check) | 3448 | 3483 | 2592 | 3395 | **3229** | 156 | 304 | 158 | 118 | 124 | 135 | 123 | 118 |
| 10 | MH-18-10 | DRMRHJ 1417 | 3978 | 3112 | 3153 | 3365 | **3402** | 157 | 307 | 154 | 112 | 121 | 131 | 121 | 118 |
| 11 | MH-18-11 | RHH 1801 | 4135 | 3777 | 2832 | 2969 | **3428** | 155 | 308 | 146 | 127 | 123 | 131 | 122 | 116 |
| 12 | MH-18-12 | SVJH- 101 | 3440 | 3597 | 2549 | 2986 | **3143** | 162 | 304 | 148 | 112 | 115 | 131 | 119 | 113 |
| 13 | MH-18-13 | PHR- 3313 | 3168 | 3532 | 2567 | 3129 | **3099** | 139 | 297 | 156 | 120 | 122 | 132 | 122 | 117 |
| 14 | MH-18-14 | SVJH- 108 | 4001 | 3196 | 2937 | 2736 | **3217** | 152 | 300 | 159 | 125 | 124 | 132 | 124 | 116 |
| 15 | MH-18-15 | DRMRHJ 2518 | 3816 | 3744 | 3244 | 3082 | **3471** | 151 | 294 | 145 | 126 | 122 | 132 | 122 | 118 |
| 16 | MH-18-16 | PHR- 3489 | 3818 | 3802 | 2656 | 3127 | **3351** | 154 | 304 | 167 | 116 | 124 | 131 | 120 | 120 |
| 17 | MH-18-17 | Pusa MH-20 | 3753 | 2280 | 2331 | 2320 | **2671** | 152 | 300 | 146 | 111 | 121 | 131 | 123 | 118 |
| 18 | MH-18-18 | Kranti (NC) | 3474 | 2817 | 2788 | 3291 | **3092** | 153 | 301 | 167 | 116 | 121 | 132 | 122 | 117 |
| | | GM | 3632 | 3274 | 2698 | 3074 | | | | | | | | | |
| | | CD (5%) | 509 | 188 | 246 | 435 | | | | | | | | | |
| | | CV (%) | 8.8 | 6.6 | 8.5 | 8.9 | | | | | | | | | |
| | | DOS | 23.10.2018 | 23.10.2018 | 30.10.2018 | 20.10.2018 | | | | | | | | | |

## Table 2.3.27b. Performance of Indian mustard hybrids in IHT, Zone-IV

| S. No. | Code | Strain | 1000-Seed Wt.(g) | | | | Oil Content (%) | | | Oil Yield |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | SKN | MDR | DSA | PHR | SKN | DSA | Mean | (kg/ha) |
| | | | 1 | 2 | 3 | 4 | 1 | 3 | (1,3) | (1-4) |
| 1 | MH-18-1 | DRMRHJ 517 | 4.79 | 6.0 | 4.9 | 5.7 | 40.3 | 41.1 | 40.7 | 1302 |
| 2 | MH-18-2 | 8IJ1004 | 4.94 | 5.4 | 4.8 | 5.5 | 41.1 | 39.2 | 40.1 | 1346 |
| 3 | MH-18-3 | RHH 1802 | 5.02 | 5.8 | 4.6 | 5.7 | 41.8 | 40.2 | 41.0 | 1386 |
| 4 | MH-18-4 | DMH- 1 (Check) | 3.87 | 4.5 | 3.6 | 4.4 | 41.2 | 41.2 | 41.2 | 1357 |
| **5** | MH-18-5 | RCH 2 | 4.45 | 5.1 | 3.7 | 4.4 | 41.8 | 40.2 | 41.0 | 1281 |
| **6** | **MH-18-6** | **GDM 4 (ZC)** | **4.55** | **5.1** | **5.1** | **5.0** | **40.9** | **40.8** | 40.8 | **1354** |
| 7 | MH-18-7 | PHR- 1096 | 3.84 | 5.8 | 3.7 | 4.4 | 39.4 | 39.9 | 39.7 | 1129 |
| 8 | MH-18-8 | Pusa MH-16 | 5.53 | 5.8 | 4.4 | 5.6 | 40.0 | 40.3 | 40.1 | 974 |
| **9** | MH-18-9 | NRCHB- 506 (Check) | 5.04 | 5.4 | 4.8 | 5.4 | 41.3 | 40.7 | 41.0 | 1325 |
| 10 | MH-18-10 | DRMRHJ 1417 | 4.66 | 5.5 | 4.5 | 5.5 | 41.4 | 41.7 | 41.6 | 1414 |
| 11 | MH-18-11 | RHH 1801 | 4.28 | 5.4 | 4.1 | 4.5 | 41.4 | 41.4 | 41.4 | 1419 |
| 12 | MH-18-12 | SVJH- 101 | 5.28 | 4.6 | 4.9 | 5.3 | 41.5 | 40.7 | 41.1 | 1292 |
| 13 | MH-18-13 | PHR- 3313 | 3.97 | 4.7 | 3.6 | 3.7 | 40.9 | 41.0 | 41.0 | 1269 |
| 14 | MH-18-14 | SVJH- 108 | 6.32 | 6.0 | 5.7 | 5.7 | 41.3 | 41.5 | 41.4 | 1332 |
| 15 | MH-18-15 | DRMRHJ 2518 | 4.22 | 5.5 | 4.4 | 4.6 | 40.4 | 40.9 | 40.6 | 1411 |
| 16 | MH-18-16 | PHR- 3489 | 4.01 | 5.1 | 4.0 | 4.1 | 41.6 | 40.4 | 41.0 | 1374 |
| 17 | MH-18-17 | Pusa MH-20 | 5.32 | 5.1 | 4.7 | 5.0 | 41.7 | 40.3 | 41.0 | 1095 |
| 18 | MH-18-18 | Kranti (NC) | 4.3 | 5.1 | 4.3 | 4.7 | 40.9 | 41.2 | 41.0 | 1269 |

## Table 2.3.27c. Percent sterile plants in different entries of IHT

| S. No. | Code | Strain | Zone II | | | | Zone III | | | Zone IV | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH # | NDH | PAL # | PNT | KOT | BPR | DSA | PHR | |
| | | | 1 | 2 | 3 | 4 | 2 | 4 | 5 | 3 | 5 | |
| 1 | MH-18-1 | DRMRHJ 517 | 11 | 18 | 0 | 38 | 16 | 18 | 25 | 35 | 14 | **19** |
| 2 | MH-18-2 | **8IJ1004** | 0 | 5 | 0 | 0 | 0 | 23 | 0 | 0 | 0 | **3** |
| 3 | MH-18-3 | RHH 1802 | 5 | 15 | 0 | 0 | 12 | 18 | 30 | 0 | 3 | **9** |
| 4 | MH-18-4 | DMH- 1 (Check) | 0 | 5 | 0 | 0 | 0 | 32 | 0 | 0 | 7 | **5** |
| 5 | MH-18-5 | RCH 2 | 9 | 20 | 26 | 14 | 33 | 18 | 60 | 12 | 16 | **23** |
| 6 | MH-18-6 | **RH 0749 (ZC)** | 0 | 0 | 0 | 0 | 0 | 9 | 10 | 0 | 0 | **2** |
| 7 | MH-18-7 | PHR- 1096 | 10 | 5 | 0 | 16 | 16 | 14 | 60 | 14 | 17 | **17** |
| 8 | MH-18-8 | Pusa MH-16 | 0 | 15 | 0 | 12 | 0 | 9 | 0 | 11 | 3 | **6** |
| 9 | MH-18-9 | NRCHB- 506 (Check) | 0 | 10 | 0 | 16 | 0 | 0 | 15 | 15 | 0 | **6** |
| 10 | MH-18-10 | DRMRHJ 1417 | 0 | 5 | 4 | 31 | 0 | 14 | 15 | 24 | 14 | **12** |
| 11 | MH-18-11 | RHH 1801 | 2 | 0 | 0 | 0 | 0 | 23 | 10 | 0 | 0 | **4** |
| 12 | MH-18-12 | SVJH- 101 | 8 | 10 | 0 | 7 | 10 | 9 | 70 | 6 | 10 | **14** |
| 13 | MH-18-13 | PHR- 3313 | 12 | 10 | 11 | 15 | 33 | 55 | 15 | 13 | 21 | **20** |
| 14 | MH-18-14 | SVJH- 108 | 0 | 15 | 0 | 14 | 0 | 14 | 0 | 12 | 0 | **6** |
| 15 | MH-18-15 | DRMRHJ 2518 | 12 | 10 | 13 | 38 | 13 | 50 | 25 | 33 | 5 | **22** |
| 16 | MH-18-16 | PHR- 3489 | 13 | 9 | 3 | 43 | 32 | 23 | 20 | 35 | 8 | **21** |
| 17 | MH-18-17 | Pusa MH-20 | 10 | 0 | 3 | 42 | 16 | 23 | 20 | 35 | 17 | **18** |
| 18 | MH-18-18 | Kranti (NC) | 0 | 0 | 0 | 10 | 0 | 18 | 0 | 9 | 0 | **4** |

# Table 2.3.28a. Performance of Quality Indian mustard strains in IVT, Zone-II

| S.No. | Code | Strain | Seed Yield (kg/ha) | | | | | | Plant Stand | | | | Days to Maturity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | NDH | SGN | Mean | | HSR | LDH | NDH | SGN | HSR | LDH | NDH | SGN |
| | | | 1 | 2 | 3 | 4 | (1-4) | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| **1** | QM-18-1 | DRMRQ1-16-27# | 2187 | 1893 | 1785 | 2613 | **2119** | | 121 | 129 | 146 | 170 | 135 | 126 | 138 | 144 |
| 2 | QM-18-2 | PM 29 (LR) | 2159 | 2136 | 1737 | 2939 | **2243** | | 118 | 126 | 132 | 167 | 140 | 141 | 149 | 151 |
| 3 | QM-18-3 | LES- 59 | 2526 | 2193 | 2815 | 3363 | **2724** | | 121 | 131 | 138 | 124 | 137 | 123 | 137 | 146 |
| 4 | QM-18-4 | PDZ- 1 (double low check) | 2069 | 2053 | 2315 | 2802 | **2310** | | 120 | 134 | 152 | 154 | 139 | 129 | 146 | 150 |
| **5** | QM-18-5 | RLC 8# | 2474 | 1860 | 1626 | 2580 | **2135** | | 122 | 132 | 137 | 125 | 140 | 138 | 149 | 141 |
| **6** | **QM-18-6** | **RH (OE)1706** | **2817** | **2457** | **3100** | **3113** | **2872** | * | **125** | **141** | **150** | **112** | **135** | **125** | **137** | **147** |
| **7** | **QM-18-7** | **PDZ- 12#** | **2640** | **2700** | **2711** | **3150** | **2800** | * | **127** | **148** | **133** | **127** | **139** | **126** | **140** | **143** |
| **8** | **QM-18-8** | **RH (OE)1705** | **3014** | **2416** | **2233** | **3289** | **2738** | * | **120** | **137** | **143** | **135** | **137** | **129** | **143** | **148** |
| 9 | QM-18-9 | RLC 9# | 2664 | 2037 | 1748 | 3048 | **2374** | | 119 | 133 | 138 | 138 | 138 | 130 | 148 | 150 |
| **10** | QM-18-10 | Kranti (NC) | 2600 | 2494 | 2237 | 3128 | **2615** | | 121 | 135 | 154 | 182 | 138 | 126 | 148 | 147 |
| **11** | QM-18-11 | PDZ- 11# | 2608 | 2243 | 2704 | 3302 | **2714** | | 120 | 131 | 142 | 150 | 136 | 126 | 140 | 143 |
| **12** | QM-18-12 | DRMRQ4-7-23# | 2269 | 1831 | 1193 | 1793 | **1772** | | 123 | 126 | 151 | 166 | 150 | 142 | 156 | 150 |
| 13 | QM-18-13 | LES- 58 | 2325 | 2095 | 2481 | 3396 | **2574** | | 121 | 125 | 146 | 163 | 138 | 136 | 137 | 150 |
| 14 | QM-18-14 | RCH 3# Hybrid | 2183 | 1901 | 1437 | 2752 | **2068** | | 123 | 127 | 136 | 167 | 145 | 125 | 146 | 143 |
| **15** | **QM-18-15** | **RH 749 (ZC)** | **2478** | **2412** | **2685** | **3391** | **2741** | | **121** | **144** | **133** | **174** | **146** | **129** | **148** | **149** |
| 16 | QM-18-16 | RLC 10# | 2640 | 1835 | 2137 | 3122 | **2434** | | 123 | 131 | 152 | 180 | 134 | 123 | 142 | 149 |
| | | GM | 2478 | 2160 | 2184 | 2977 | | | | | | | | | | |
| | | CD (5%) | 431 | 286 | 504 | 435 | | | | | | | | | | |
| | | CV (%) | 10.9 | 8.3 | 14.4 | 9.1 | | | | | | | | | | |
| | | DOS | 8.10.2018 | 17.10.2018 | 13.10.2018 | 26.10.2018 | | | | | | | | | | |

* Strain(s) having low erucic acid content in oil and /or low glucosinolate content in seed meal and at par/outyielding the best check
# Strain inducted with double low characteristics

## Table 2.3.28b. Performance of Quality Indian mustard strains in IVT Zone-II

| S. No | Code | Strain | 1000-Seed Wt. (g) | | | | Oil Content (%) | | | | | Oil Yield (Kg/ha) | Erucic acid (%) | | | Mean | Glucosinolates (µmol/g) | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HSR | LDH | NDH | SGN | HSR | LDH | NDH | SGN | Mean | | LDH | BPR | NDH | | LDH | BPR | NDH | |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (1-4) | (1-4) | | | | | | | | |
| **1** | QM-18-1 | DRMRQ1-16-27# | 2.4 | 2.6 | 2.4 | 3.2 | 42.3 | 42.2 | 38.9 | 41.1 | **41.1** | **872** | 0.0 | 3.1 | 0.8 | **1.3** | 13.9 | 19.6 | 20.4 | **18.0** |
| 2 | QM-18-2 | PM 29 (LR) | 5.7 | 5.7 | 4.5 | 6.6 | 37.8 | 38.1 | 37.5 | 37.9 | **37.8** | **848** | 0.0 | 3.2 | 0.1 | **1.1** | 96.3 | 50.6 | 57.5 | **68.1** |
| 3 | QM-18-3 | LES- 59 | 6.1 | 6.3 | 5.8 | 6.6 | 36.6 | 37.6 | 37.7 | 36.9 | **37.2** | **1014** | 0.0 | 2.1 | 0.8 | **1.0** | 72.4 | 58.4 | 56.9 | **62.6** |
| 4 | QM-18-4 | PDZ- 1 (double low check) | 3.0 | 3.3 | 3.2 | 3.8 | 41.5 | 42.4 | 41.2 | 41.9 | **41.7** | **964** | 0.0 | 2.0 | 0.0 | **0.7** | 26.7 | 31.5 | 24.5 | **27.6** |
| **5** | QM-18-5 | RLC 8# | 3.3 | 3.4 | 3.0 | 3.6 | 39.9 | 39.9 | 39.5 | 39.7 | **39.7** | **848** | 0.7 | 1.5 | 0.0 | **0.7** | 9.3 | 23.1 | 17.1 | **16.5** |
| **6** | **QM-18-6** | **RH (OE)1706** | **5.2** | **4.9** | **4.2** | **5** | **39.6** | **40.4** | **38.7** | **38.6** | **39.3** | **1129** | **1.6** | **5.5** | **0.7** | **2.6** | **71.0** | **49.3** | **57.9** | **59.4** |
| **7** | **QM-18-7** | **PDZ- 12#** | **3.6** | **3.3** | **3.4** | **4.2** | **40.6** | **39.6** | **38.6** | **38.8** | **39.4** | **1104** | **0.0** | **1.1** | **0.2** | **0.4** | **36.2** | **42.5** | **28.8** | **35.8** |
| **8** | **QM-18-8** | **RH (OE)1705** | **5.1** | **4.9** | **4.3** | **4.4** | **38.6** | **38.2** | **37.1** | **36.7** | **37.6** | **1030** | **1.0** | **1.2** | **0.0** | **0.8** | **67.5** | **61.7** | **62.1** | **63.8** |
| 9 | QM-18-9 | RLC 9# | 3.3 | 3.6 | 2.6 | 3.4 | 41.0 | 40.4 | 37.7 | 40.4 | **39.9** | **946** | 0.0 | 1.2 | 0.1 | **0.4** | 14.2 | 24.4 | 19.9 | **19.5** |
| **10** | QM-18-10 | Kranti (NC) | 4.3 | 4.1 | 3.3 | 4.8 | 42.1 | 41.5 | 39.8 | 40.3 | **40.9** | **1070** | 46.7 | 38.6 | 21.1 | **35.5** | 81.1 | 51.8 | 67.0 | **66.6** |
| **11** | QM-18-11 | PDZ- 11# | 3.6 | 3.6 | 3.5 | 4 | 40.9 | 40.6 | 38.2 | 40.1 | **39.9** | **1084** | 2.0 | 1.2 | 0.2 | **1.1** | 13.7 | 25.6 | 22.4 | **20.6** |
| **12** | QM-18-12 | DRMRQ4-7-23# | 2.1 | 2.8 | 2.0 | 2.4 | 42.5 | 42.3 | 40.5 | 41.0 | **41.6** | **737** | 0.0 | 6.7 | 0.1 | **2.3** | 8.2 | 17.8 | 17.2 | **14.4** |
| 13 | QM-18-13 | LES- 58 | 5.8 | 5.6 | 5.0 | 6.2 | 38.3 | 38.5 | 37.8 | 37.7 | **38.1** | **980** | 0.0 | 4.1 | 0.0 | **1.4** | 63.7 | 58.8 | 52.4 | **58.3** |
| 14 | QM-18-14 | RCH 3# Hybrid | 3.4 | 3.5 | 3.0 | 3.8 | 40.4 | 39.3 | 39.9 | 38.6 | **39.6** | **818** | 2.0 | 2.0 | 2.0 | **2.0** | 18.2 | 28.8 | 9.5 | **18.8** |
| **15** | **QM-18-15** | **RH 749 (ZC)** | **6.4** | **5.8** | **5.8** | **6** | **40.8** | **41.9** | **40.1** | **40.4** | **40.8** | **1118** | **44.7** | **21.6** | **16.6** | **27.6** | **84.0** | **69.7** | **59.4** | **71.0** |
| 16 | QM-18-16 | RLC 10# | 3.2 | 3.3 | 3.0 | 4.2 | 41.6 | 41.0 | 39.4 | 41.0 | **40.7** | **991** | 1.9 | 5.2 | 0.8 | **2.6** | 17.7 | 23.8 | 17.2 | **19.6** |

# inducted as double low strains

## Table 2.3.29a. Performance of Quality Indian mustard strains in IVT, Zone-III

| S. No. | Code | Strain | Seed Yield (kg/ha) | | | | | | | Plant Stand | | | | | Days to Maturity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | BPR | DOL | Mean | | MOR | PNT | KPR | BPR | DOL | MOR | PNT | KPR | BPR | DOL |
| | | | 1 | 2 | 3 | 4 | 5 | (1-5) | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| 1 | QM-18-1 | DRMRQ1-16-27# | 1432 | 1320 | 1825 | 2213 | 1352 | **1628** | | 172 | 149 | 117 | 127 | 158 | 136 | 106 | 136 | 138 | 118 |
| 2 | QM-18-2 | PM 30 (LR) | 2908 | 1856 | 1671 | 2512 | 1852 | **2160** | | 171 | 130 | 117 | 133 | 161 | 144 | 121 | 133 | 144 | 121 |
| 3 | QM-18-3 | LES- 59 | 2704 | 2053 | 1569 | 2796 | 2210 | **2266** | | 174 | 139 | 117 | 134 | 156 | 142 | 115 | 135 | 139 | 110 |
| 4 | QM-18-4 | PDZ- 1 (double low check) | 2513 | 1631 | 1671 | 2311 | 1538 | **1933** | | 171 | 149 | 118 | 133 | 161 | 136 | 112 | 132 | 143 | 116 |
| 5 | QM-18-5 | RLC 8# | 2877 | 1463 | 1543 | 2553 | 1698 | **2027** | | 171 | 145 | 114 | 129 | 158 | 141 | 112 | 134 | 142 | 117 |
| **6** | **QM-18-6** | **RH (OE)1706** | **3229** | **1632** | **1929** | **3336** | **1901** | **2405** | * | **168** | **131** | **118** | **138** | **161** | **138** | **119** | **136** | **142** | **109** |
| 7 | QM-18-7 | PDZ- 12# | 2605 | 2271 | 1569 | 2275 | 2241 | **2192** | | 175 | 134 | 117 | 134 | 161 | 146 | 122 | 133 | 142 | 121 |
| 8 | QM-18-8 | RH (OE)1705 | 2173 | 1441 | 1646 | 2730 | 1741 | **1946** | | 174 | 142 | 115 | 135 | 161 | 149 | 121 | 128 | 141 | 114 |
| 9 | QM-18-9 | RLC 9# | 2908 | 1493 | 1774 | 2506 | 1525 | **2041** | | 174 | 166 | 117 | 131 | 157 | 143 | 116 | 132 | 146 | 117 |
| **10** | **QM-18-10** | **Kranti (NC)** | **3080** | **1864** | **1774** | **2571** | **2364** | **2331** | | **171** | **152** | **118** | **133** | **157** | **147** | **125** | **133** | **147** | **121** |
| 11 | QM-18-11 | **PDZ- 11#** | **2556** | **2241** | **1825** | **2603** | **2451** | **2335** | * | **176** | **132** | **120** | **139** | **160** | **142** | **111** | **130** | **143** | **115** |
| **12** | QM-18-12 | DRMRQ4-7-23# | 1994 | 842 | 1415 | 1052 | 1531 | **1367** | | 168 | 142 | 115 | **133** | 159 | 146 | 120 | 131 | **142** | 122 |
| 13 | QM-18-13 | LES- 58 | 2908 | 1707 | 1801 | 2683 | 2358 | **2291** | | 170 | 145 | 119 | 131 | 159 | 145 | 124 | 129 | 142 | 119 |
| 14 | QM-18-14 | RCH 3# Hybrid | 2414 | 1496 | 2392 | 2290 | 1630 | **2044** | | 168 | 168 | 118 | **139** | 159 | 143 | 119 | 130 | **144** | 117 |
| 15 | QM-18-15 | RGN 73 (ZC) | 2753 | 1633 | 2288 | 2101 | 1833 | **2122** | | 168 | 146 | 118 | 136 | 160 | 148 | 127 | 132 | 144 | 123 |
| 16 | QM-18-16 | RLC 10# | 2050 | 1468 | 2288 | 1874 | 1735 | **1883** | | 176 | 135 | 118 | 138 | 160 | 141 | 114 | 130 | 143 | 118 |
| | | GM | 2569 | 1651 | 1811 | 2400 | 1872 | | | | | | | | | | | | |
| | | CD (5%) | 407 | 197 | 95 | 381 | 237 | | | | | | | | | | | | |
| | | CV (%) | 9.9 | 7.5 | 5.1 | 9.5 | 7.9 | | | | | | | | | | | | |
| | | DOS | 14.10.2018 | 18.10.2018 | 26.10.2018 | 14.10.2018 | 17.10.2018 | | | | | | | | | | | | |

* Strain(s) having low erucic acid content in oil and /or low glucosinolate content in seed meal and at par/outyielding the best check

# inducted as double low strains

## Table 2.3.29b. Performance of Quality Indian mustard strains in IVT, Zone-III

| S. No | Code | Strain | 1000-Seed Wt. (g) | | | | | Oil Content (%) | | | | | Mean | Oil Yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MOR | PNT | KPR | BPR | DOL | MOR | PNT | KPR | BPR | DOL | | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1-5) | (1-5) |
| 1 | QM-18-1 | DRMRQ1-16-27# | 3.3 | 2.2 | 3.5 | 2.6 | 2.9 | 41.5 | 42.1 | 41.7 | 37.7 | 41.4 | **40.9** | **666** |
| 2 | QM-18-2 | PM 30 (LR) | 7.1 | 4.2 | 3.2 | 5.7 | 6.1 | 38.4 | 37.5 | 39.3 | 38.5 | 37.5 | **38.2** | **825** |
| 3 | QM-18-3 | LES- 59 | 6.9 | 4.7 | 5.5 | 6.5 | 6.1 | 38.2 | 37.0 | 41.7 | 37.7 | 39.5 | **38.8** | **880** |
| 4 | QM-18-4 | PDZ- 1 (double low check) | 6.0 | 2.6 | 3.4 | 3.6 | 3.4 | 41.7 | 41.3 | 36.6 | 42.0 | 40.6 | **40.4** | **781** |
| 5 | QM-18-5 | RLC 8# | 3.8 | 2.7 | 3.7 | 3.2 | 4.8 | 38.6 | 39.8 | 40.3 | 40.1 | 37.5 | **39.3** | **796** |
| **6** | **QM-18-6** | **RH (OE)1706** | **5.3** | **3.1** | **4.9** | **4.6** | **4.4** | **40.0** | **38.4** | **38.9** | **40.0** | **39.3** | **39.3** | **946** |
| 7 | QM-18-7 | PDZ- 12# | 3.9 | 2.5 | 3.0 | 3.0 | 3.7 | 40.1 | 38.2 | 39.7 | 38.9 | 39.0 | **39.2** | **859** |
| 8 | QM-18-8 | RH (OE)1705 | 5.0 | 2.9 | 3.9 | 4.2 | 4.0 | 37.7 | 35.5 | 36.8 | 37.0 | 38.5 | **37.1** | **722** |
| 9 | QM-18-9 | RLC 9# | 3.6 | 2.7 | 3.2 | 2.8 | 2.9 | 41.1 | 39.7 | 39.8 | 39.9 | 39.9 | **40.1** | **818** |
| **10** | **QM-18-10** | **Kranti (NC)** | **4.5** | **2.7** | **4.4** | **3.6** | **4.0** | **41.7** | **40.5** | **40.8** | **40.8** | **40.4** | **40.9** | **952** |
| **11** | **QM-18-11** | **PDZ- 11#** | **3.8** | **2.7** | **4.4** | **3.5** | **3.2** | **40.5** | **39.5** | **40.0** | **40.0** | **39.0** | **39.8** | **929** |
| 12 | QM-18-12 | DRMRQ4-7-23# | 2.8 | 2.6 | 3.3 | 1.8 | 3.1 | 42.5 | 40.6 | 41.0 | 41.1 | 41.2 | **41.3** | **564** |
| 13 | QM-18-13 | LES- 58 | 6.4 | 3.8 | 5.5 | 5.6 | 5.3 | 37.1 | 36.4 | 36.7 | 37.8 | 37.5 | **37.1** | **850** |
| 14 | QM-18-14 | RCH 3# Hybrid | 3.5 | 2.5 | 3.5 | 3.2 | 3.5 | 37.7 | 38.9 | 41.5 | 40.2 | 39.4 | **39.5** | **808** |
| 15 | QM-18-15 | RGN 73 (ZC) | 5.1 | 3.0 | 3.4 | 3.4 | 4.6 | 39.1 | 38.3 | 40.8 | 39.9 | 40.0 | **39.6** | **841** |
| 16 | QM-18-16 | RLC 10# | 3.7 | 2.3 | 3.4 | 3.2 | 3.1 | 39.7 | 38.6 | 40.3 | 40.3 | 40.8 | **39.9** | **752** |

## Table 2.3.30a. Performance of Quality Indian mustard strains in AVT-I, Zone- II

| S. No. | Code | Strain | Seed Yield (Kg/ha) | | | | | | Plant Stand | | | | Days to Maturity | | | | 1000-Seed Wt. (g) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | NDH | HSR# | LDH | SGN | Mean | | NDH | HSR | LDH | SGN | NDH | HSR | LDH | SGN | NDH | HSR | LDH | SGN |
| | | | 1 | 2 | 3 | 4 | (1,3-4) | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1 | QM-18-17 | RLC 3# | 2057 | 2754 | 2340 | 2640 | **2346** | | 247 | 252 | 266 | 295 | 142 | 143 | 120 | 143 | 2.9 | 3.2 | 3.6 | 3.4 |
| 2 | QM-18-18 | Kranti (NC) | 2356 | 2510 | 2316 | 3111 | **2594** | | 248 | 265 | 267 | 275 | 148 | 145 | 134 | 145 | 3.7 | 4.0 | 4.6 | 4.4 |
| 3 | QM-18-19 | RLC 7 | 2039 | 2011 | 2329 | 2718 | **2362** | | 227 | 259 | 261 | 260 | 138 | 145 | 121 | 150 | 3.4 | 3.2 | 4.0 | 3.8 |
| **4** | **QM-18-20** | **LES 54#** | **2790** | **2713** | **2273** | **3332** | **2798** | * | **235** | **261** | **265** | **275** | **146** | **146** | **132** | **149** | **4.4** | **4.9** | **5.1** | **6.2** |
| 5 | QM-18-21 | Pusa Mustard 29 (LR) | 1806 | 2368 | 2235 | 2736 | **2259** | | 249 | 246 | 281 | 290 | 151 | 145 | 136 | 141 | 5.1 | 5.8 | 5.5 | 6.2 |
| **6** | QM-18-22 | 7IJ0002 | 1706 | 2835 | 1941 | 2918 | **2188** | | 203 | 255 | 254 | 320 | 152 | 151 | 139 | 147 | 2.8 | 2.9 | 3.7 | 3.2 |
| 7 | **QM-18-23** | **RH 749 (ZC)** | **2667** | **2561** | **2417** | **3350** | **2811** | | **254** | **257** | **261** | **260** | **150** | **145** | **135** | **143** | **4.9** | **5.8** | **5.8** | **5.6** |
| **8** | QM-18-24 | LES 57 | 2732 | 2185 | 2211 | 2981 | **2641** | | 247 | 250 | 273 | 285 | 141 | 139 | 127 | 151 | 5.0 | 5.5 | 5.4 | 5.8 |
| 9 | QM-18-25 | RCH 1## | 2215 | 2508 | 2429 | 3021 | **2555** | | 209 | 202 | 278 | 305 | 150 | 151 | 127 | 149 | 3.1 | 3.1 | 3.1 | 4.0 |
| | | GM | 2263 | 2494 | 2277 | 2979 | | | | | | | | | | | | | | |
| | | CD (5%) | 338 | 465 | 258 | 298 | # data of HSR excluded from computation of mean due to improper conduct of trial (less no. of reps) | | | | | | | | | | | | | |
| | | CV (%) | 10.8 | 11.1 | 8.2 | 7.2 | * Strain(s) having low erucic acid content in oil and /or low glucosinolate content in seed meal | | | | | | | | | | | | | |
| | | DOS | 13.10.2018 | 8.10.2018 | 15.10.2018 | 26.10.2018 | and at par/outyielding the best check | | | | | | | | | | | | | |

## Table 2.3.30b. Performance of Quality Indian mustard strains in AVT I, Zone- II

| S.No. | Code | Strain | Oil Content (%) | | | | | | Oil Yield (kg/ha) | Erucic acid content (%) | | | Mean | Glucosinolate content (u mol/g) | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | NDH | HSR | LDH | SGN | Mean | | | LDH | BPR | NDH | | LDH | BPR | NDH | |
| | | | 1 | 2 | 3 | 4 | (1,3-4) | | (1,3-4) | | | | | | | | |
| 1 | QM-18-17 | RLC 3# | 40.1 | 42.2 | 41.5 | 40.4 | **40.7** | | **954** | 1.9 | 7.84 | 3.2 | **4.3** | 10.7 | 24.15 | 19.2 | **18.0** |
| 2 | QM-18-18 | Kranti (NC) | 39.7 | 41.4 | 41.5 | 40.7 | **40.7** | | **1055** | 48.1 | 37.9 | 24.3 | **36.8** | 69.6 | 51.41 | 64.5 | **61.8** |
| **3** | QM-18-19 | RLC 7 | 39.3 | 39.6 | 39.8 | 39.3 | **39.5** | | **932** | 1.5 | 12.1 | 0.9 | **4.8** | 17.1 | 26.04 | 10.4 | **17.9** |
| **4** | **QM-18-20** | **LES 54#** | **39.0** | **39.2** | **38.7** | **39.3** | **39.0** | | **1092** | **0.3** | 4.31 | **0.0** | **1.5** | **66.6** | **41.74** | **68.5** | **58.9** |
| 5 | QM-18-21 | Pusa Mustard 29 (LR) | 38.1 | 38.7 | 38.4 | 38.1 | **38.2** | | **863** | 0.3 | **1.33** | 0.0 | **0.5** | 71.3 | 61.66 | 69.5 | **67.5** |
| 6 | QM-18-22 | 7IJ0002 | 40.9 | 38.5 | 39.8 | 41.0 | **40.5** | | **887** | 2.0 | 14.3 | 4.7 | **7.0** | 19.6 | 35.71 | 26.9 | **27.4** |
| **7** | **QM-18-23** | **RH 749 (ZC)** | **39.2** | **39.0** | **41.6** | **41.3** | **40.7** | | **1144** | **51.3** | 41.8 | **25.5** | **39.5** | **90.9** | **73.55** | **74.9** | **79.8** |
| 8 | QM-18-24 | LES 57 | 39.3 | 39.5 | 38.3 | 38.1 | **38.5** | | **1018** | 0.6 | **2.88** | 0.0 | **1.2** | 62.5 | 56.87 | 70.6 | **63.3** |
| 9 | QM-18-25 | RCH 1## | 38.8 | 39.1 | 39.6 | 38.5 | **39.0** | | **996** | 0.0 | 2.89 | 1.4 | **1.4** | 24.1 | 28.7 | 19.7 | **24.2** |

# Repeat entry

## Double low strain

## Table 2.3.31a. Performance of Quality Indian mustard strains in AVT-I, Zone - III

| S. No. | Code | Strain | Seed Yield (kg/ha) | | | | | | Plant Stand | | | | | Days to Maturity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | PNT | KPR$ | MOR | BPR | VAR | Mean | PNT | KPR | MOR | BPR | VAR | PNT | KPR | MOR | BPR | VAR |
| | | | 1 | 2 | 3 | 4 | 5 | (1,3-5) | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| 1 | QM-18-26 | RGN 73 (ZC) | 1904 | 2232 | 2854 | 2188 | 2599 | **2387** | 282 | 220 | 282 | 246 | 304.5 | 127 | 135 | 139 | 147 | 145 |
| 2 | QM-18-27 | 7IJ0002 | 1836 | 2133 | 3021 | 1937 | 2766 | **2390** | 260 | 218 | 285 | 248 | 303.8 | 131 | 134 | 141 | 153 | 142 |
| **3** | **QM-18-28** | **Kranti (NC)** | **2307** | **2058** | **3084** | **2279** | **2867** | **2634** | **259** | **217** | **306** | **237** | **317.5** | **124** | **135** | **140** | **149** | **135** |
| 4 | QM-18-29 | Pusa Mustard 30 (LR) | 1786 | 2116 | 2519 | 2379 | 3735 | **2605** | 281 | 217 | 309 | 247 | 305.3 | 126 | 133 | 142 | 152 | 137 |
| 5 | QM-18-30 | RCH 1## | 1978 | 2480 | 2581 | 2020 | 3101 | **2420** | 278 | 221 | 282 | 233 | 324.3 | 131 | 137 | 137 | 146 | 136 |
| | | GM | 1962 | 2204 | 2812 | 2161 | 3014 | | | | | | | | | | | |
| | | CD (5%) | 276 | 140 | 292 | 222 | 465.18 | | | | | | | | | | | |
| | | CV (%) | 9.5 | 2.8 | 7.0 | 7.7 | 10.0 | | | | | | | | | | | |
| | | DOS | 18.10.2018 | 26.10.2018 | 18.10.2018 | 14.10.2018 | 28.10.2018 | | | | | | | | | | | |

$ data of KNP centre excluded from computation of mean due to low CV (< 5.0) in field experimentation

## Table 2.3.31b. Performance of Quality Indian mustard strains in AVT I, Zone-III

| S.No. | Code | Strain | 1000-Seed Wt. (g) | | | | | Oil Content (%) | | | | | | Oil Yield (kg/ha) | Erucic acid content (%) | | Glucosinolate content (u mol/g) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | PNT | KPR | MOR | BPR | VAR | PNT | KPR | MOR | BPR | VAR | Mean | | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | (1,3-5) | (1,3-5) | LDH | BPR | LDH | BPR |
| 1 | QM-18-26 | RGN 73 (ZC) | 2.7 | 3.9 | 4.7 | 4.0 | 4.0 | 39.7 | 38.9 | 41.0 | 39.6 | 38.9 | **39.8** | **950** | 49.1 | 35.5 | 81.8 | 53.8 |
| 2 | QM-18-27 | 7IJ0002 | 2.3 | 5.3 | 3.7 | 2.8 | 2.9 | 41.6 | 37.9 | 42.4 | 41.0 | 39.8 | **41.2** | **985** | 2.1 | 3.7 | 24.3 | 31.4 |
| 3 | **QM-18-28** | **Kranti (NC)** | **2.7** | **5.2** | **5.0** | **3.7** | **4.1** | **38.9** | **37.4** | **41.4** | **41.4** | **39.8** | **40.4** | **1063** | **49.8** | **32.3** | **71.7** | **63.0** |
| 4 | QM-18-29 | Pusa Mustard 30 (LR) | 3.0 | 2.8 | 7.0 | 5.5 | 5.7 | 36.4 | 40.4 | 38.9 | 38.1 | 38.0 | **37.8** | **986** | 0.5 | 1.9 | 98.8 | 51.3 |
| 5 | QM-18-30 | RCH 1## | 2.3 | 4.0 | 3.5 | 3.1 | 3.0 | 38.7 | 40.2 | 41.4 | 40.8 | 39 | **40.0** | **967** | 2.1 | 2.6 | 14.1 | 17.1 |

## Table2.3.32a. Performance of Indian mustard strains in AVT- I+II Under saline/alkaline conditions

| S. No. | Code | Strain | Seed Yield (kg/ha) | | | | | | | | Plant Stand | | | | Days to maturity | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AGR$ | BPR$$ | HSR## | KAR## | PNP## | LKW## | KPR# | Mean | BPR | KAR | PNP | KPR | BPR | LKW | KPR |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | (1-7) | 2 | 4 | 5 | 7 | 2 | 7 | 8 |
| 1 | CSCN-18-1 | CS 508-1 P2* | 1893 | 2130 | 1949 | 2171 | 2285 | 1465 | 1695 | **1941** | 271 | 219 | 231 | 213 | 136 | 136 | 133 |
| 2 | CSCN-18-2 | CS 2009-154 | 1913 | 2219 | 2009 | 2200 | 2103 | 1471 | 1645 | **1937** | 277 | 233 | 232 | 215 | 136 | 135 | 134 |
| 3 | CSCN-18-3 | Giriraj (LR) | 1678 | 2698 | 1653 | 1565 | 1561 | 1460 | 1644 | **1751** | 278 | 218 | 215 | 222 | 135 | 136 | 136 |
| 4 | CSCN-18-4 | Filler (Kranti) | 1647 | 2512 | 1635 | 1410 | 1496 | 1413 | 1637 | **1679** | 271 | 223 | 211 | 215 | 137 | 136 | 135 |
| 5 | CSCN-18-5 | CS 15000-1-1-1-1-2 | 1717 | 2728 | 1673 | 2322 | 2218 | 1802 | 1595 | **2008** | 275 | 225 | 225 | 214 | 138 | 135 | 134 |
| **6** | **CSCN-18-6** | **CS-54 (Check)** | **1886** | **2568** | **1854** | **2223** | **2297** | **1786** | **1678** | **2042** | **279** | **221** | **213** | **218** | **139** | **134** | **136** |
| 7 | CSCN-18-7 | CS 900-1-2-2-1-3* | 1976 | 2398 | 2005 | 2497 | 2472 | 1806 | 1620 | **2110** | 275 | 227 | 222 | 213 | 138 | 135 | 137 |
| 8 | CSCN-18-8 | Filler (Giriraj) | 1786 | 2796 | 1741 | 2320 | 2393 | 1765 | 1720 | **2074** | 274 | 225 | 218 | 214 | 137 | 133 | 135 |
| 9 | CSCN-18-9 | CS 13000-3-1-1-4-2 | 1678 | 2685 | 1613 | 1412 | 1480 | 1455 | 1810 | **1733** | 282 | 231 | 222 | 220 | 138 | 135 | 134 |
| 10 | CSCN-18-10 | CS 700-2-1-4* | 1780 | 2552 | 1759 | 2243 | 2400 | 1819 | 1661 | **2031** | 278 | 235 | 233 | 218 | 138 | 135 | 135 |
| 11 | CSCN-18-11 | CS 2009-335 | 1801 | 2423 | 1744 | 2496 | 2503 | 1862 | 1769 | **2085** | 281 | 235 | 232 | 215 | 138 | 136 | 136 |
| 12 | CSCN-18-12 | Kranti (NC) | 1794 | 2130 | 1882 | 2330 | 2139 | 1744 | 1620 | **1948** | 283 | 222 | 218 | 211 | 136 | 136 | 138 |
| | | GM | 1796 | 2487 | 1793 | 2099 | 2112 | 1654 | 1675 | | | | | | | | |
| | | CD (5%) | 242 | 514 | 231 | 296 | 295 | 215 | 124 | | | | | | | | |
| | | C.V. (%) | 9.4 | 12.7 | 9.4 | 10.3 | 10.1 | 9.4 | 3.5 | | | | | | | | |
| | | ECe/ pH** | | | 10.1ds/m | 9.3 | 11.0ds/m | 9.1 | | | | | | | | | |
| | | DOS | 31.10.2018 | 24.10.2018 | 23.10.2018 | 17.10.2018 | 25.10.2018 | 16.10.2018 | 26.10.2018 | | | | | | | | |

***AVT II strains**

$ data of AGR exluded from computation of mean on the recommendation of monitoring team;

$$ data of BPR centre excluded from computation of mean due to not meeting the prescibed norms of ECe/ pH

# data of KPR centre excluded from computation of mean due to low CV (< 5.0) in field experimentation and also due to not meeting prescibed norms of salinity/alkalinity

## data of HSR, KAR, PNP and LKW centres excluded from computation of mean due to significant differences between same strain as check/filler

## Table2.3.32b. Performance of Indian mustard strains in AVT- I+II Under saline/alkaline conditions

| S.No. | Code | Strain | 1000 Seed Wt. (g) | | | | Oil Content (%) | | | | Mean | Oil Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BPR | KAR | PNP | KPR | BPR | KAR | PNP | KPR | | |
| | | | 2 | 3 | 4 | 7 | 2 | 3 | 4 | 7 | (2,3,4,7) | (1-7) |
| 1 | CSCN-18-1 | CS 508-1 P2# | 4.4 | 4.7 | 5.0 | 5.3 | 40.8 | 38.0 | 37.9 | 38.8 | **38.9** | **755** |
| 2 | CSCN-18-2 | CS 2009-154 | 4.9 | 4.6 | 4.7 | 5.1 | 41.2 | 38.9 | 38.8 | 38.9 | **39.5** | **765** |
| 3 | CSCN-18-3 | Giriraj (LR) | 5.5 | 4.5 | 4.7 | 5.8 | 40.7 | 37.5 | 37.8 | 40.3 | **39.1** | **684** |
| 4 | CSCN-18-4 | Filler (Kranti) | 3.7 | 3.4 | 3.9 | 4.8 | 40.6 | 37.0 | 37.0 | 39.9 | **38.6** | **648** |
| 5 | CSCN-18-5 | CS 15000-1-1-1-1-2 | 4.7 | 4.7 | 4.7 | 5.5 | 41.2 | 38.2 | 38.6 | 39.5 | **39.4** | **791** |
| **6** | **CSCN-18-6** | **CS-54 (Check)** | **5.1** | **5.2** | **5.3** | **5.6** | **40.7** | **38.3** | **38.6** | **39.6** | **39.3** | **802** |
| 7 | CSCN-18-7 | CS 900-1-2-2-1-3# | 4.7 | 4.9 | 5.0 | 5.3 | 41.5 | 39.3 | 39.7 | 39.1 | **39.9** | **842** |
| 8 | CSCN-18-8 | Filler (Giriraj) | 5.2 | 4.8 | 5.4 | 5.8 | 40.6 | 39.6 | 39.5 | 40.5 | **40.0** | **831** |
| 9 | CSCN-18-9 | CS 13000-3-1-1-4-2 | 4.5 | 4.4 | 3.9 | 5.0 | 40.7 | 37.0 | 37.0 | 38.5 | **38.3** | **664** |
| **10** | CSCN-18-10 | CS 700-2-1-4# | 4.4 | 4.2 | 4.4 | 5.0 | 40.1 | 38.9 | 38.8 | 39.5 | **39.3** | **798** |
| 11 | CSCN-18-11 | CS 2009-335 | 4.7 | 5.058 | 5.12 | 5.4 | 41.3 | 40.05 | 40.0 | 39.1 | **40.1** | **837** |
| 12 | CSCN-18-12 | Kranti (NC) | 3.9 | 3.76 | 3.83 | 4.2 | 40.8 | 39.38 | 39.4 | 40.3 | **40.0** | **778** |

## Table 2.3.33a Performance of Gobhi Sarson strains in IVT

| S. No | Code | Strain | Seed yield (kg/ha) | | | | | | | | | Plant Stand | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | KHD | DLK | KNG | CHT | LDH | SRN | BJR | Mean | | SRN | DLK | KNG | CHT | LDH | KHD | BJR |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | (1-7) | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | NCN-18-1 | HNS 1201 | 627 | 981 | 1331 | 2002 | 1630 | 643 | 1307 | **1217** | # | 231.3 | 158 | 143 | 122 | 128 | 132.3 | 131 |
| **2** | **NCN-18-2** | **GSH- 1699** | **739** | **1124** | **1700** | **1748** | **2095** | **786** | **1513** | **1386** | * | **232.7** | **154** | **145** | **125** | **140** | **134.7** | **142** |
| 3 | NCN-18-3 | Kranti (NC) | 546 | 730 | 940 | 1969 | 1646 | 619 | 1000 | **1064** | | 235.3 | 159 | 150 | 121 | 116 | 130.3 | 112 |
| **4** | NCN-18-4 | GSH- 1707 | 864 | 1148 | 1847 | 2360 | 1905 | 857 | 1944 | **1561** | * | 236.3 | 157 | 148 | 126 | 134 | 136 | 143 |
| **5** | **NCN-18-5** | **GSC- 6 (Quality Check)** | **546** | **1176** | **1222** | **1890** | **1918** | **643** | **1324** | **1246** | | **235.3** | **158** | **146** | **128** | **137** | **125.3** | **130** |
| **6** | **NCN-18-6** | **AKGS- 8146** | **927** | **1204** | **1654** | **2276** | **2251** | **929** | **1690** | **1561** | * | **224.3** | **155** | **146** | **131** | **146** | **136** | **124** |
| **7** | **NCN-18-7** | **HNS 1102** | **672** | **1213** | **1255** | **1864** | **2584** | **714** | **1305** | **1373** | * | **222.3** | **158** | **150** | **120** | **154** | **124.3** | **132** |
| 8 | NCN-18-8 | AKGS- 8217 | 1022 | 1382 | 1857 | 2357 | 1951 | 983 | 1461 | **1573** | * | 224 | 156 | 142 | 129 | 140 | 137 | 128 |
| 9 | NCN-18-9 | GSL- 1 (NC) | 457 | 1102 | 1326 | 1994 | 2004 | 555 | 1222 | **1237** | | 223.7 | 161 | 143 | 127 | 139 | 125 | 114 |
| 10 | NCN-18-10 | GSC- 6 (Filler) | 429 | 1055 | 1323 | 2041 | 2597 | 531 | 1320 | **1328** | | 222.3 | 158 | 147 | 131 | 143 | 129 | 113 |
| 11 | NCN-18-11 | JGS- 12-3 | 739 | 1046 | 1354 | 1842 | 1741 | 779 | 1675 | **1311** | | 222 | 162 | 147 | 123 | 137 | 132 | 121 |
| **12** | **NCN-18-12** | **GSH- 1717** | **840** | **1009** | **1867** | **1602** | **2165** | **826** | **1537** | **1406** | * | **234.7** | **160** | **147** | **121** | **136** | **133.7** | **126** |
| | | GM | 701 | 1098 | 1473 | 1995 | 2040 | 739 | 1441 | | | | | | | | | |
| | | CD (5%) | 86 | 191 | 169 | 433 | 300 | 106 | 186 | | | | | | | | | |
| | | CV (%) | 7.7 | 10.8 | 7.1 | 13.3 | 9.2 | 9.0 | 8.1 | | | | | | | | | |
| | | DOS | 11.10.2018 | 30.10.2018 | 10.10.2018 | 16.10.2018 | 17.10.2018 | 13.10.2018 | 18.10.2018 | | | | | | | | | |

* Strain(s) outyielding the best check by a margin of > 10 percent seed and oil yield

## Table 2.3.33b Performance of Gobhi Sarson strains in IVT

| S. No. | Code | Strain | Days to Maturity | | | | | | | 1000-Seed Wt. (g) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SRN | DLK | KNG | CHT | LDH | KHD | BJR | SRN | DLK | KNG | KHD | CHT | LDH | BJR |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | NCN-18-1 | HNS 1201 | 133 | 154 | 189 | 160 | 159 | 225 | 186 | 5.0 | 3.0 | 3.4 | 5.2 | 3.7 | 3.6 | 2.2 |
| 2 | NCN-18-2 | GSH- 1699 | 134 | 153 | 190 | 162 | 160 | 228 | 191 | 4.6 | 2.8 | 3.1 | 4.8 | 4.9 | 2.9 | 4.3 |
| 3 | NCN-18-3 | Kranti (NC) | 129.7 | 137 | 176 | 142 | 143 | 229.3 | 172 | 5.0 | 3.6 | 3.4 | 5.2 | 3.6 | 4.2 | 5.3 |
| **4** | NCN-18-4 | GSH- 1707 | 133.3 | 154 | 188 | 161 | 162 | 231 | 188 | 5.1 | 2.7 | 2.9 | 5.2 | 4.4 | 3.8 | 5.3 |
| 5 | NCN-18-5 | GSC- 6 (Quality Check) | 125.3 | 145 | 178 | 147 | 147 | 230.3 | 181 | 5.1 | 3.2 | 3.7 | 5.1 | 3.6 | 3.0 | 3.8 |
| 6 | NCN-18-6 | AKGS- 8146 | 135.7 | 151 | 181 | 159 | 152 | 224 | 187 | 4.6 | 3.5 | 4.0 | 3.8 | 4.5 | 3.6 | 2.6 |
| **7** | NCN-18-7 | HNS 1102 | 126 | 145 | 176 | 163 | 157 | 221.7 | 182 | 4.9 | 3.5 | 3.4 | 4.8 | 3.3 | 3.4 | 2.2 |
| 8 | NCN-18-8 | AKGS- 8217 | 134.7 | 153 | 184 | 162 | 156 | 220.7 | 186 | 5.0 | 3.9 | 4.1 | 5.1 | 3.8 | 3.8 | 4.1 |
| 9 | NCN-18-9 | GSL- 1 (NC) | 125 | 154 | 184 | 159 | 161 | 222.7 | 186 | 4.8 | 3.1 | 3.2 | 5.0 | 3.7 | 3.3 | 2.1 |
| **10** | NCN-18-10 | GSC- 6 (Filler) | 127.3 | 147 | 177 | 161 | 146 | 222.3 | 181 | 4.7 | 3.6 | 3.6 | 4.8 | 3.6 | 3.9 | 3.8 |
| 11 | NCN-18-11 | JGS- 12-3 | 129.3 | 155 | 190 | 159 | 156 | 221 | 187 | 4.5 | 2.7 | 3.3 | 4.8 | 3.9 | 3.3 | 5.0 |
| **12** | **NCN-18-12** | **GSH- 1717** | **130.7** | **159** | **196** | **162** | **159** | **230.3** | **191** | **4.3** | **2.5** | **2.5** | **4.3** | **4.2** | **2.7** | **3.8** |

## Table 2.3.33c Performance of Gobhi Sarson strains in IVT

| S. No | Code | Strain | Oil Content (%) | | | | | Mean | Oil Yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|
| | | | DLK | KNG | CHT | LDH | BJR | | |
| | | | 2 | 3 | 4 | 5 | 7 | (2-5,7) | (1-7) |
| 1 | NCN-18-1 | HNS 1201 | 40.0 | 40.2 | 41.7 | 42.4 | 42.7 | **41.4** | **504** |
| 2 | NCN-18-2 | GSH- 1699 | 38.6 | 38.2 | 40.7 | 42.5 | 41.6 | **40.3** | **559** |
| 3 | NCN-18-3 | Kranti (NC) | 39.8 | 40.0 | 38.3 | 42.1 | 40.7 | **40.2** | **428** |
| **4** | NCN-18-4 | GSH- 1707 | **39.9** | **40.2** | 41.4 | 42.2 | 40.0 | **40.7** | **636** |
| 5 | NCN-18-5 | GSC- 6 (Quality Check) | 38.3 | 38.4 | 39.5 | 42.6 | 39.2 | **39.6** | **493** |
| 6 | NCN-18-6 | AKGS- 8146 | 39.4 | 37.3 | 40.9 | 42.2 | 41.2 | **40.2** | **628** |
| **7** | NCN-18-7 | HNS 1102 | **38.3** | **39.1** | 41.8 | 42.5 | 40.9 | **40.5** | **556** |
| 8 | NCN-18-8 | AKGS- 8217 | 37.3 | 38.1 | 41.8 | 42.6 | 39.5 | **39.9** | **627** |
| 9 | NCN-18-9 | GSL- 1 (NC) | 38.2 | 40.0 | 41.0 | 42.1 | 42.1 | **40.7** | **503** |
| **10** | NCN-18-10 | GSC- 6 (Filler) | **39.2** | **38.3** | 38.6 | 42.8 | 40.4 | **39.9** | **529** |
| 11 | NCN-18-11 | JGS- 12-3 | 40.2 | 38.6 | 41.29 | 42.4 | 42.49 | **41.0** | **537** |
| **12** | **NCN-18-12** | **GSH- 1717** | **40.2** | **39.1** | **40.52** | **41.3** | **41.73** | **40.6** | **571** |

## Table 2.3.34a Performance of Gobhi Sarson strains in AVT-I

| S. No | Code | Strain | Seed yield (kg/ha) | | | | | | | | | Plant Stand | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | KHD | DLK | KNG | CHT | LDH | SRN | BJR | Mean | | SRN | DLK | KNG | CHT | LDH | KHD | BJR |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | (1-7) | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | NCN-18-13 | GSL 1 (NC/ZC) | 1020 | 1150 | 1432 | 1701 | 2623 | 889 | 1137 | **1422** | | 226 | 395 | 338 | 264 | 290 | 174 | 360 |
| **2** | **NCN-18-14** | **AKMS 8141** | **1580** | **1385** | **1907** | **2080** | **2778** | **1322** | **1697** | **1821** | * | **225** | **401** | **338** | **261** | **305** | **178** | **403** |
| **3** | **NCN-18-15** | **GSC 6 (QC)** | **1067** | **1167** | **1455** | **2100** | **2901** | **916** | **1398** | **1572** | | **230** | **400** | **337** | **269** | **306** | **179** | **368** |
| **4** | NCN-18-16 | GSH 1754 | 910 | 1145 | 1683 | 2345 | 2716 | 742 | 1139 | **1526** | | 228 | 402 | 339 | 263 | 310 | 178 | 40 |
| 5 | NCN-18-17 | Kranti (NC) | 643 | 753 | 1034 | 1896 | 2130 | 633 | 962 | **1150** | | 227 | 412 | 343 | 261 | 291 | 178 | 351 |
| | | GM | 1044 | 1120 | 1502 | 2024 | 2630 | 900 | 1266 | | | | | | | | | |
| | | CD (5%) | 71 | 204 | 207 | 375 | 381 | 110 | 226 | | | | | | | | | |
| | | CV (%) | 3.9 | 10.4 | 7.9 | 12.5 | 9.4 | 7.0 | 10.2 | | | | | | | | | |
| | | DOS | 15.10.2018 | 30.10.2018 | 10.10.2018 | 16.10.2018 | 15.10.2018 | 17.10.2018 | 18.10.2018 | | | | | | | | | |

* Strain(s) out yielding the best check by a margin of > 10 percent seed and oil yield

## Table 2.3.34b Performance of Gobhi Sarson strains in AVT-I

| S.No. | Code | Strain | Days to Maturity | | | | | | | 1000-Seed Wt. (g) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SRN | DLK | KNG | CHT | LDH | KHD | BJR | SRN | DLK | KNG | KHD | CHT | LDH | BJR |
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | NCN-18-13 | GSL 1 (NC/ZC) | 121 | 151 | 190 | 160 | 160 | 194 | 188 | 5.0 | 3.1 | 3.3 | 5.2 | 3.9 | 3.3 | 2.9 |
| **2** | **NCN-18-14** | **AKMS 8141** | **133** | **149** | **181** | **158** | **155** | **195** | **182** | **5.2** | **3.4** | **3.7** | **5.2** | **3.6** | **3.5** | **3.4** |
| **3** | **NCN-18-15** | **GSC 6 (QC)** | **128** | **146** | **175** | **154** | **153** | **198** | **182** | **4.4** | **3.1** | **4.1** | **5.3** | **3.8** | **4.3** | **3.9** |
| **4** | NCN-18-16 | GSH 1754 | 128 | 150 | 183 | 162 | 157 | 197 | 186 | 4.4 | 2.4 | 3.5 | 5.2 | 3.9 | 2.8 | 2.7 |
| 5 | NCN-18-17 | Kranti (NC) | 127 | 137 | 176 | 140 | 159 | 196 | 172 | 4.7 | 3.5 | 4.2 | 4.9 | 3.7 | 4.4 | 4.6 |

## Table 2.3.34c. Performance of Gobhi Sarson strains in IVT

| S.No | Code | Strain | Oil Content (%) | | | | | Mean | Oil Yield (Kg/ha) |
|---|---|---|---|---|---|---|---|---|---|
| | | | DLK | KNG | CHT | LDH | BJR | | |
| | | | 2 | 3 | 4 | 5 | 7 | (2-5,7) | (1-7) |
| 1 | NCN-18-13 | GSL 1 (NC/ZC) | 40.5 | 40.0 | 41.4 | 42.9 | 41.2 | **41.2** | **586** |
| **2** | **NCN-18-14** | **AKMS 8141** | **38.7** | **37.5** | **41.7** | **42.8** | **42.7** | **40.7** | **741** |
| **3** | **NCN-18-15** | **GSC 6 (QC)** | **38.7** | **36.9** | **39.6** | **42.0** | **39.7** | **39.4** | **619** |
| **4** | NCN-18-16 | GSH 1754 | **40.2** | **38.6** | **40.6** | 42.2 | 41.1 | **40.5** | **618** |
| 5 | NCN-18-17 | Kranti (NC) | 40.4 | 39.3 | 39.8 | 41.8 | 40.0 | **40.2** | **463** |

## Table 2.3.35a. Performance of Taramira strains in AVT- 1

| S.No. | Code | Strain | Seed yield (kg/ha) | | | | | Plant Stand | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BAW$ | JOB | DIG | MOR | MEAN | BAW | JOB | DIG | MOR |
| | | | 1 | 2 | 3 | 4 | (2-4) | 1 | 2 | 3 | 4 |
| **1** | **TMCN-18-1** | Filler 1 (RTM 1351) | 439 | 912 | 1011 | 2209 | **1377** | 244 | 266 | 287 | 291 |
| **2** | **TMCN-18-2** | RTM 1624 | 374 | 1117 | 1258 | 1949 | **1441** | 257 | 273 | 291 | 303 |
| **3** | **TMCN-18-3** | **RTM- 314 (ZC)** | **473** | **1002** | **954** | **3209** | **1722** | **263** | **270** | **287** | **291** |
| 4 | **TMCN-18-4** | RTM 1351 (LR) | 420 | 907 | 1029 | 2366 | **1434** | 239 | 276 | 283 | 304 |
| 5 | **TMCN-18-5** | T- 27 (NC) | 488 | 862 | 975 | 2296 | **1378** | 265 | 280 | 278 | 309 |
| | | GM | 439 | 960 | 1045 | 2406 | | | | | |
| | | CD (5%) | 91 | 166 | 180 | 304 | | | | | |
| | | CV (%) | 14.1 | 11.7 | 11.6 | 8.5 | | | | | |
| | | DOS | 20.10.2018 | 20.10.2018 | 16.10.2018 | 14.10.2018 | | | | | |

$ data of BAW is excluded from computation of mean due to low general mean than the 75% of state average

## Table 2.3.35b. Performance of Taramira strains in AVT- I

| S. No. | Code | Strain | Days to maturity | | | | 1000-Seed wt. (g) | | | | Oil content (%) | | | | Mean | Oil Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BAW | JOB | DIG | MOR | BAW | JOB | DIG | MOR | BAW | JOB | DIG | MOR | | |
| | | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | (2-4) | (2-4) |
| 1 | **TMCN-18-1** | **Filler 1 (RTM 1351)** | 154 | 132 | 130 | 161 | 4 | 3.55 | 3.8 | 4.17 | 37.57 | 40.25 | 40.07 | 38.11 | **39.5** | **544** |
| 2 | **TMCN-18-2** | **RTM 1624** | 155 | 135 | 136 | 163 | 2.8 | 3.48 | 3.73 | 4 | 38.91 | 40.65 | 40.62 | 38.08 | **39.8** | **573** |
| **3** | **TMCN-18-3** | **RTM- 314 (ZC)** | **155** | **138** | **135** | **165** | **3.5** | **3.18** | **3.38** | **4.1** | **39.69** | **40.1** | **40.2** | **38.6** | **39.6** | **682** |
| 4 | **TMCN-18-4** | **RTM 1351 (LR)** | 154 | 136 | 131 | 167 | 3.7 | 3.53 | 3.78 | 4.93 | 38.65 | 39.35 | 40.82 | 37.56 | **39.2** | **563** |
| 5 | **TMCN-18-5** | **T- 27 (NC)** | 154 | 133 | 137 | 162 | 3.4 | 3.28 | 3.3 | 4.19 | 39.05 | 40.83 | 40.56 | 37.76 | **39.7** | **547** |

# Agronomy

# 3. Agronomy

Experiments on six major areas of agronomic practices were conducted during 2018-19 at 23 coordinating centres across the five zones. The results have been presented below:

## 3.1 Long-term fertility experiment on cropping systems involving rapeseed-mustard

The experiment was started in the year 2011-12 and conducted for this year at 11centres in 5 Zones. In the Zone I, the highest seed yield (1376 kg/ha) was recorded with the application of 150% NPK at KDW though, at par with 100% NPK but higher over 100% NP, NK and PK (Table 3.1.1). At LDH and HSR in Zone II, application of 150% NPK recorded highest seed yield (1586 and 2279 kg/ha, respectively) though at par with 100% NPK. Whereas, at SGN in Zone II, the highest seed yield (4008 kg/ha) was realized with 100% NPK + FYM @2.5t/ha which was significantly higher over control and 100% PK.

**Table 3.1.1 Seed yield (kg/ha) of rapeseed-mustard under different fertility levels in Zone- I and II**

| Treatments | | Zone I | Zone II | | | | |
|---|---|---|---|---|---|---|---|
| | | KDW | LDH | | HSR | | SGN |
| $T_1$ | Control | 612 | 553 | (40.8) | 800 | (38.7) | 2782 |
| $T_2$ | 100% PK | 780 | 764 | (41.1) | 983 | (38.9) | 3427 |
| $T_3$ | 100% NPK | 1295 | 1441 | (40.9) | 2227 | (39.0) | 3877 |
| $T_4$ | 150% NPK | 1376 | 1586 | (40.8) | 2279 | (40.0) | 3947 |
| $T_5$ | 100%NPK + S @ 40 kg S/ha | 1357 | 1496 | (41.2) | 2110 | (39.8) | 3737 |
| $T_6$ | 100% NPK + Zn @ 25 kg $ZnSO_4$/ha | 1322 | 1529 | (41.2) | 2003 | (38.8) | 3737 |
| $T_7$ | 100% NPK + B @ 1kg B/ha | 1305 | 1492 | (41.3) | 1615 | (38.8) | 3753 |
| $T_8$ | 100% NPK + FYM @2.5t/ha (dry wt.) | 1369 | 1557 | (41.2) | 2143 | (39.0) | 4008 |
| $T_9$ | 100%NP | 1231 | 1520 | (41.0) | 1773 | (38.7) | 3543 |
| $T_{10}$ | 100%NK | 1006 | 1137 | (40.8) | 1697 | (39.1) | 3590 |
| | CD (p = 0.05) | 136 | 240 | (NS) | 272 | (0.5) | 576 |
| | Date of sowing | Oct 18 | Nov 06 | | Oct 23 | | Oct 05 |
| | Variety | Shalimar sarson-2 | PBR 357 | | RH 749 | | IJ 31 |
| | RDF (NPKS kg/ha) | 80:50:40:25 | 100:30:0 | | 80:30:20 | | 75:40:20 |
| | Year of start | 2011-12 | 2011-12 | | 2011-12 | | 2018-19 |
| | Preceding crop | Rice | Maize | | Pearl millet | | P.millet |

In Zone III at DOL, application of 150% NPK recorded significantly higher seed yield (1854 kg/ha) over rest of the treatments (Table 3.1.2). Application of 100% NPK + FYM @2.5t/ha obtained significantly higher seed yield (2190 kg/ha) at PNT over 100% NP, NK and PK as well as 150% NPK. At MOR, application of 150% NPK though on par with 100% NPK, 100% NPK + S @ 40 kg S/ha and 100% NPK + FYM @2.5t/ha recorded highest seed yield (2961 kg/ha) in the Zone III. At KOT in Zone III, application of 150% NPK recorded highest seed yield (2440 kg/ha) which on par with 100% NPK and significant over 100% NP, NK and PK.

**Table 3.1.2 Seed yield (kg/ha) of rapeseed-mustard under different fertility levels in Zone III, IV and V**

| Treatments | Zone III | | | | Zone IV | | Zone V | |
|---|---|---|---|---|---|---|---|---|
| | DOL | PNT | MOR | KOT | SKN | | BHU | SHL |
| Control | 341 | 736 | 989 (41.1) | 1496 | 1533 | (36.4) | 467 | 437 |
| 100% PK | 831 | 1156 | 1307 (41.0) | 1786 | 1709 | (36.6) | 630 | 714 |
| 100% NPK | 1624 | 1863 | 2754 (41.0) | 2310 | 2250 | (36.8) | 788 | 948 |
| 150% NPK | 1854 | 1750 | 2961 (40.6) | 2440 | 2270 | (36.6) | 832 | 1381 |
| 100%NPK + S @ 40 kg S/ha | 1662 | 2013 | 2834 (41.2) | 2367 | 2101 | (36.9) | 903 | 1032 |
| 100% NPK + Zn @ 25 kg $ZnSO_4$/ha | 1670 | 1996 | 2543 (41.2) | 2311 | 1917 | (36.6) | 855 | 968 |
| 100% NPK + B @ 1kg B/ha | 1576 | 1970 | 2596 (41.2) | 2342 | 2035 | (36.9) | 833 | 972 |
| 100% NPK + FYM @2.5t/ha (dry wt.) | 1641 | 2190 | 2818 (41.0) | 2419 | 2179 | (36.7) | 784 | 1072 |
| 100%NP | 920 | 1823 | 2220 (41.0) | 2068 | 2230 | (36.0) | 730 | 817 |
| 100%NK | 878 | 1663 | 2365 (41.1) | 1999 | 1748 | (36.3) | 599 | 752 |
| CD (p = 0.05) | 164 | 230 | 278 | 329 | 425 | (0.7) | 150 | 143 |
| Date of Sowing | Nov 28 | Oct 15 | Nov 01 | Oct 22 | Oct 29 | | Dec 10 | Dec 01 |
| Variety | - | NDRE 4 | JM 3 | Giriraj | GM 3 | | NRCHB 101 | TS 38 |
| RDF (NPK kg/ha) | 80:40:40 | 120:40:20 | 80:40:20 | 80:40:30 | 50:50:20 | | 80:40:40 | 60:30:30 |
| Year of start | 2011-12 | 2011-12 | 2011-12 | 2017-18 | 2011-12 | | 2017-18 | 2017-18 |
| Preceding crop | Rice | Maize | P.millet | Urdbean | Moong | | Rice | Rice |

*Oil content (%) in parenthesis

In Zone IV at SKN, the use of 150% NPK recorded significantly higher seed yield (2270 kg/ha) over 100% PK and 100% NK but remained *at par* with rest of the treatment (Table 3.1.2). In Zone V at BHU, application of 100% NPK + S @ 40 kg S/ha recorded significantly higher seed yield (903 kg/ha) over 100% NP, NK and PK but remained *at par* with rest of the treatment. At SHL, application of 150% NPK recorded significantly higher seed yield of toria (1381 kg/ha) over rest of the fertility levels including control.

### 3.2 Survey and surveillance of dominant weed flora in rapeseed-mustard crops under changing climate scenario

A study on survey and surveillance of weed flora in rapeseed-mustard crop was undertaken at 14 centres in 5 states to identify important weed flora and their distribution and dominance in rapeseed-mustard crops. The most common weeds under rapeseed-mustard in descending order of important value index are; *Orobanche aegyptica, Echinochloa colonum, Chenopodium album/murale, Aspodelus tenuifolius, Melilotus alba/indica, Cynodon dactylon, Fumeria parviflora, Convolvulus arvensis, Solanum nigrum, Medicago denticulate, Vicia sp., Alternanthera sessile* (Table 3.2.1).

**Table 3.2.1 Important weed flora of rapeseed-mustard in India**

| Weed Species | District | Weed density ($m^{-2}$) | | Relative density (%) | Relative frequency (%) | Important value index |
|---|---|---|---|---|---|---|
| | | Mean | Range | | | |
| *Orobanche aegyptica* | 2 | 20.3 | 0.5-40.0 | 17.1 | 18.2 | 35.2 |
| *Echinochloa colonum* | 2 | 8.1 | 7.2-9.0 | 16.7 | 13.1 | 34.5 |
| *Chenopodium album/murale* | 16 | 12.7 | 1.7-32.2 | 19.6 | 14.6 | 34.2 |
| *Aspodelus tenuifolius* | 6 | 12.5 | 0.7-30.5 | 17.3 | 14.4 | 31.7 |
| *Melilotus alba/indica* | 9 | 3.9 | 2.3-5.6 | 9.2 | 10.8 | 20.0 |
| *Cynodon dactylon* | 8 | 3.8 | 1.3-7.1 | 8.8 | 10.8 | 19.7 |
| *Anagalis arvensis* | 3 | 2.5 | 2.2-3.1 | 8.4 | 10.3 | 18.7 |
| *Cyperus rotundus* | 9 | 4.8 | 1.5-8.8 | 9.2 | 9.6 | 18.4 |
| *Fumeria parviflora* | 2 | 5.0 | 3.3-6.6 | 6.0 | 11.6 | 17.7 |
| *Convolvulus arvensis* | 5 | 3.7 | 0.4-8.4 | 7.8 | 8.8 | 16.6 |
| *Solanum nigrum* | 2 | 1.9 | 1.0-2.8 | 4.6 | 10.6 | 15.6 |
| *Medicago denticulate* | 4 | 3.1 | 1.8-4.4 | 4.8 | 10.0 | 14.7 |
| *Vicia sp.* | 8 | 1.7 | 1.1-2.3 | 3.8 | 8.8 | 12.6 |
| *Alternanthera sessile* | 2 | 0.5 | 0.1-0.8 | 1.0 | 4.2 | 5.3 |

**Table 3.2.2 District-wise status of important weed flora of rapeseed-mustard**

| Weed Species | WD ($m^{-2}$) | RD (%) | RF (%) | IVI |
|---|---|---|---|---|
| **Mohindergarh (Haryana)** | | | | |
| *Avena ludoviciana* | 2.6 | 8.4 | 7.1 | 15.5 |
| *Chenopodium murale* | 1.7 | 3.3 | 5.2 | 8.5 |
| *Chenopodium album* | 12.5 | 32.9 | 23.7 | 56.6 |
| *Rumex maritimus* | 0.4 | 1.7 | 2.4 | 4.2 |
| *Convolvulus arvensis* | 0.4 | 1.9 | 3.5 | 5.3 |
| *Melilotus alba* | 2.3 | 8.7 | 7.4 | 16.2 |
| *Asphodelus tenuifolius* | 0.7 | 2.3 | 3.7 | 6.0 |
| *Orobanche aegyptica* | 0.5 | 1.0 | 1.6 | 2.6 |
| **Sirsa (Haryana)** | | | | |
| *Asphodelus tenuifolius* | 20.0 | 31.5 | 20.6 | 52.2 |
| *Chenopodium murale* | 5.4 | 8.5 | 15.5 | 24.0 |
| *Chenopodium album* | 28.6 | 45.1 | 25.8 | 70.9 |
| *Convolvulus arvensis* | 8.4 | 11.8 | 11.4 | 23.3 |
| *Melilotus indica* | 5.6 | 8.8 | 12.9 | 21.7 |
| *Medicago denticulata* | 3.0 | 4.7 | 10.3 | 15.0 |
| *Polypogon monspeliensis* | 3.3 | 5.2 | 7.7 | 12.9 |
| *Rumex spp.* | 2.0 | 2.8 | 5.7 | 8.5 |
| *Vicia sativa* | 2.3 | 3.6 | 10.3 | 13.9 |
| **Hisar (Haryana)** | | | | |
| *Anagallis arvensis* | 2.2 | 3.1 | 8.7 | 11.8 |
| *Asphodelus tenuifolius* | 20.0 | 28.2 | 17.5 | 45.7 |
| *Chenopodium album* | 32.2 | 45.5 | 14.5 | 60.0 |
| *Chenopodium murale* | 6.6 | 9.3 | 8.7 | 18.0 |
| *Convolvulus arvensis* | 5.5 | 7.8 | 8.7 | 16.5 |
| *Cynodon dactylon* | 3.3 | 4.7 | 2.9 | 7.6 |
| *Euphorbia helioscopia* | 4.4 | 6.2 | 4.4 | 10.6 |
| *Fumaria parviflora* | 6.6 | 9.3 | 11.6 | 21.0 |
| *Medicago denticulata* | 3.3 | 4.7 | 8.7 | 13.4 |
| *Melilotus indica* | 3.6 | 5.1 | 8.7 | 13.8 |
| **Bhiwani (Haryana)** | | | | |

| Weed Species | WD ($m^{-2}$) | RD (%) | RF (%) | IVI |
|---|---|---|---|---|
| *Asphodelus tenuifolius* | 30.5 | 25.2 | 25.5 | 50.7 |
| *Chenopodium album* | 30.2 | 25.0 | 23.1 | 48.1 |
| *Chenopodium murale* | 20.2 | 16.7 | 18.5 | 35.2 |
| *Fumaria parviflora* | 3.3 | 2.7 | 11.6 | 14.3 |
| *Medicago denticulata* | 4.4 | 3.6 | 11.6 | 15.2 |
| *Melilotus indica* | 5.0 | 4.1 | 11.6 | 15.7 |
| *Orobanche spp.* | 40.0 | 33.1 | 34.7 | 67.8 |
| *Spergula arvensis* | 2.0 | 1.7 | 9.3 | 10.9 |
| **Mandsaur (MP)** | | | | |
| *Chenopodium* | 3.6 | 12.5 | 9.2 | 21.6 |
| *Anagalis arvensis* | 2.2 | 7.7 | 9.2 | 16.9 |
| *Asphodelous spp* | 0.9 | 3.0 | 5.3 | 8.4 |
| *Cyperus spp* | 1.5 | 5.1 | 8.8 | 13.8 |
| *Cynoden spp* | 1.3 | 4.3 | 7.6 | 12.0 |
| *Convalvulus arvesis* | 1.1 | 3.9 | 6.9 | 10.8 |
| *Melitotus spp* | 4.3 | 15.0 | 9.2 | 24.2 |
| *Medicago spp* | 1.8 | 6.1 | 9.2 | 15.2 |
| *Argimon spp* | 3.5 | 12.1 | 9.2 | 21.3 |
| *Parthenium spp* | 2.2 | 7.6 | 9.2 | 16.7 |
| *Vicia spp* | 1.1 | 3.9 | 7.3 | 11.2 |
| **Kota (Raj)** | | | | |
| *Cynodon dactylon* | 1.9 | 8.4 | 9.5 | 17.9 |
| *Phalaris minor* | 1.7 | 7.4 | 7.9 | 15.3 |
| *Aspodelus tenuifolius* | 2.9 | 13.8 | 13.6 | 27.4 |
| *Anagallis arvensis* | 3.1 | 14.3 | 13.0 | 27.3 |
| *Melilotus alba* | 2.8 | 13.3 | 14.8 | 28.1 |
| *Chenopodium album* | 3.8 | 17.9 | 14.8 | 32.7 |
| *Convolvulus arvensis* | 3.0 | 13.6 | 13.4 | 27.0 |
| *Carthamus oxycantha* | 0.7 | 2.9 | 3.7 | 6.6 |
| *Cyperus rotundus* | 1.8 | 8.5 | 8.1 | 15.5 |
| **Nagaon (Assam)** | | | | |
| *Cynodon dactylon* | 5.3 | 13.5 | 21.7 | 35.2 |
| *Echinochloa colona* | 7.2 | 13.9 | 10.3 | 33.7 |
| *Eleusine indica* | 0.6 | 1.7 | 1.7 | 3.8 |
| *Paspalum longifolium* | 0.6 | 1.6 | 8.2 | 1.9 |
| *Chenopodium album* | 5.8 | 15.4 | 10.0 | 25.4 |
| *Alternanthera sessiles* | 0.1 | 0.1 | 2.3 | 2.5 |
| *Solanum nigrum* | 1.0 | 2.6 | 9.4 | 12.7 |
| *Oxalis corniculata* | 0.6 | 0.1 | 1.7 | 1.7 |
| *Leucus linifolia* | 4.4 | 5.6 | 11.2 | 16.8 |
| *Cyperus rotundus* | 8.8 | 11.1 | 10.5 | 21.6 |
| **Marigaon (Assam)** | | | | |
| *Eleusine indica* | 0.4 | 0.6 | 1.5 | 2.1 |
| *Cynodon dactylon* | 7.1 | 13.2 | 12.5 | 25.7 |
| *Echinochloa colona* | 9.0 | 19.5 | 15.8 | 35.3 |
| *Paspalum longifolium* | 0.8 | 1.8 | 13.1 | 14.9 |
| *Chenopodium album* | 1.8 | 2.7 | 6.6 | 9.3 |
| *Solanum nigrum* | 2.8 | 6.6 | 11.8 | 18.4 |
| *Oxalis corniculata* | 5.5 | 7.8 | 4.5 | 12.3 |
| *Leucus linifolia* | 15.8 | 31.9 | 7.2 | 39.1 |
| *Alternanthera sessiles* | 0.8 | 1.9 | 6.1 | 8.0 |
| *Cyperus rotundus* | 7.0 | 12.0 | 10.8 | 22.8 |
| **Murshidabad (West Bengal)** | | | | |
| *Melilotus indica* | 24.0 | 25.3 | 19.0 | 44.3 |
| *Avena fatua* | 6.0 | 6.3 | 14.3 | 20.6 |
| *Anagalis arvense* | 8.0 | 8.4 | 14.3 | 22.7 |
| *Vicia hirsuta* | 23.0 | 24.2 | 19.0 | 43.2 |
| *Chenopodium album* | 20.0 | 21.1 | 19.0 | 40.1 |
| *Cyperus rotundus* | 14.0 | 14.7 | 14.3 | 29.0 |
| **Nadia (West Bengal)** | | | | |
| *Cheopodiurm album* | 18.0 | 18.0 | 12.9 | 30.9 |
| *Cyperus rotundus* | 11.0 | 11.0 | 12.9 | 23.9 |
| *Anagalis arvense* | 10.0 | 10.0 | 12.9 | 22.9 |
| *Vicia hirsuta* | 20.0 | 20.0 | 12.9 | 32.9 |
| *Spergulla arvensis* | 5.0 | 5.0 | 12.9 | 17.9 |
| *Portulaca olererecea* | 6.0 | 6.0 | 12.9 | 18.9 |
| *Physalis minima* | 20.0 | 20.0 | 12.9 | 32.9 |
| *Amarantus spinosus* | 10.0 | 10.0 | 9.7 | 19.7 |
| **24 Paraganas (West Bengal)** | | | | |
| *Cheopodiurm album* | 17.0 | 15.3 | 12.9 | 28.2 |
| *Cyperus rotundus* | 15.0 | 13.5 | 12.9 | 26.4 |
| *Alternanthera echinata* | 10.0 | 9.0 | 12.9 | 21.9 |
| *Vicia sp.* | 17.0 | 15.3 | 12.9 | 28.2 |
| *Melilotus indica* | 18.0 | 16.2 | 12.9 | 29.1 |
| *Wild spinach* | 9.0 | 8.1 | 12.9 | 21.0 |
| *Physalis minima* | 20.0 | 18.0 | 12.9 | 30.9 |
| *Euphorbia sp.* | 5.0 | 4.5 | 9.7 | 14.2 |
| **Dinajpur (West Bengal)** | | | | |
| *Cheopodiurm album* | 14.0 | 11.7 | 12.9 | 24.6 |
| *Amaranthus spinosus* | 11.0 | 9.2 | 12.9 | 22.1 |
| *Digera arvensis* | 12.0 | 10.0 | 12.9 | 22.9 |

| Weed Species | WD ($m^{-2}$) | RD (%) | RF (%) | IVI |
|---|---|---|---|---|
| *Vicia sativa* | 9.0 | 7.5 | 12.9 | 20.4 |
| *Melilotus indica* | 13.0 | 10.8 | 12.9 | 23.7 |
| *Cynodon dactylon* | 17.0 | 14.2 | 12.9 | 27.1 |
| *Solanum nigrum* | 27.0 | 22.5 | 12.9 | 35.4 |
| *Oxalis coniculata* | 17.0 | 14.2 | 9.7 | 23.9 |
| **Malda(West Bengal)** | | | | |
| *Cyperus rotundus* | 15.0 | 15.5 | 12.9 | 28.4 |
| *Potulaca olerecea* | 8.0 | 8.2 | 12.9 | 21.1 |
| *Cirsium arvensis* | 13.0 | 13.4 | 12.9 | 26.3 |
| *Vicia hirsuta* | 14.0 | 14.4 | 12.9 | 27.3 |
| *Poa annua* | 13.0 | 13.4 | 12.9 | 26.3 |
| *Cynodon dactylon* | 13.0 | 13.4 | 12.9 | 26.3 |
| *Solanum nigrum* | 12.0 | 12.4 | 12.9 | 25.3 |

| Weed Species | WD ($m^{-2}$) | RD (%) | RF (%) | IVI |
|---|---|---|---|---|
| *Fumaria parviflora* | 9.0 | 9.3 | 9.7 | 19.0 |
| **Birbhum (West Bengal)** | | | | |
| *Parthenium sp.* | 15.0 | 17.4 | 13.8 | 31.2 |
| *Medicago denticulata* | 10.0 | 11.6 | 13.8 | 25.4 |
| *Cirsium arvensis* | 4.0 | 4.7 | 10.3 | 15.0 |
| *Vicia hirsuta* | 13.0 | 15.1 | 13.8 | 28.9 |
| *Melilotus alba* | 10.0 | 11.6 | 13.8 | 25.4 |
| *Cynodon dactylon* | 11.0 | 12.8 | 10.3 | 23.1 |
| *Argemon mexicana* | 12.0 | 14.0 | 13.8 | 27.8 |
| *Cyperus rotundus* | 11.0 | 12.8 | 10.3 | 23.1 |

**WD**= Weed density/$m^2$,
**RD**= Relative weed density (%),
**RF**= Relative weed frequency (%),
**IVI**= Importance value index

### 3.3 Performance of promising rapeseed-mustard entries under saline/alkaline conditions

The entries CS 900-1-2-2-1-3, CS 508-1P2 and CS 700-2-1-4 were evaluated with 4 checks under saline/alkali conditions at 4 locations. The evaluated entries yielded less than the best check CS 54 at Agra and Hisar and CS 58 at Lucknow at various fertility levels. At Karnal, the entry CS 508-1P2 gave 6.9% higher seed yield over best check CS 58 (Table 3.3).

**Table 3.3: Seed yield (kg/ha) of salinity/alkalinity entries of Indian mustard as influenced by different fertility levels during 2018-19.**

| Entries/ Varieties | Fertility levels | | | |
|---|---|---|---|---|
| | 100% RDF | 125% RDF | 150% RDF | Mean |
| **Agra** | | | | |
| **CS 900-1-2-2-1-3** | 1713 | 1875 | 1938 | 1842 |
| **CS 508-1P2** | 1819 | 1731 | 1859 | 1803 |
| **CS700-2-1-4** | 1443 | 1688 | 1943 | 1691 |
| CS 54 | 2102 | 2136 | 2188 | 2142 |
| CS 58 | 2024 | 2028 | 2193 | 2082 |
| Giriraj | 1700 | 1950 | 2143 | 1931 |
| Kranti | 1739 | 1946 | 2131 | 1939 |
| **Mean** | 1791 | 1908 | 2056 | - |
| CD (p=0.05) | E= 151, F=75, ExF=NS, FxE=NS | | | |
| **DOS:** Oct 30; **Recommended fertility level-** 120kg N, 60 kg $P_2O_5$, 60 kg $K_2O$/ha | | | | |
| **Hisar** | | | | |
| **CS 900-1-2-2-1-3** | 1522 | 1779 | 1908 | 1736 |
| **CS 508-1P2** | 1525 | 1623 | 1748 | 1632 |
| **CS700-2-1-4** | 1463 | 1730 | 1837 | 1677 |
| CS 54 | 1628 | 1841 | 1805 | 1758 |
| CS 58 | 1820 | 2028 | 2026 | 1958 |
| Giriraj | 1305 | 1578 | 1659 | 1514 |
| Kranti | 1328 | 1722 | 1874 | 1642 |
| **Mean** | 1513 | 1757 | 1837 | - |
| CD (p=0.05) | E= 149, F=92, ExF=NS, FxE=NS | | | |
| **DOS:** Oct 25; **Recommended fertility level-** 80kg N, 40 kg $P_2O_5$/ha | | | | |

| | | | | |
|---|---|---|---|---|
| **Karnal** | | | | |
| **CS 900-1-2-2-1-3** | 2038 | 2570 | 2670 | 2426 |
| **CS 508-1P2** | 2427 | 2555 | 2739 | 2574 |
| **CS700-2-1-4** | 2206 | 2311 | 2555 | 2357 |
| CS 54 | 2039 | 2380 | 2596 | 2338 |
| CS 58 | 2087 | 2496 | 2641 | 2408 |
| Giriraj | 1909 | 2112 | 2239 | 2087 |
| Kranti | 1854 | 1951 | 2227 | 2011 |
| **Mean** | 2080 | 2339 | 2524 | - |
| CD (p=0.05) | E= 176, F=81, ExF=NS, FxE=NS | | | |
| **DOS:** Oct 01; **Recommended fertility level**- 80kg N, 40 kg $P_2O_5$/ha | | | | |
| **Lucknow** | | | | |
| **CS 900-1-2-2-1-3** | 1615 | 1851 | 2016 | 1827 |
| **CS 508-1P2** | 1353 | 1477 | 1620 | 1483 |
| **CS700-2-1-4** | 1386 | 1584 | 1844 | 1605 |
| CS 54 | 1736 | 1886 | 2092 | 1905 |
| CS 58 | 1677 | 1691 | 1922 | 1763 |
| Giriraj | 1703 | 1907 | 2042 | 1884 |
| Kranti | 1549 | 1741 | 1978 | 1756 |
| **Mean** | 1574 | 1734 | 1931 | - |
| CD (p=0.05) | E= 132, F=81, ExF=NS, FxE=NS | | | |
| **DOS:** Oct 16; **Recommended fertility level**- 80kg N, 40 kg $P_2O_5$, 40 kg $K_2O$/ha | | | | |

### 3.4 Developing resource efficient and resilient rapeseed- mustard based cropping systems under current and future climates.

The experiment was started from rabi 2016-17 to find out the location specific most efficient rapeseed-mustard based cropping system and tillage practices under the changing climate scenario. The experiment was conducted at four locations (Chatha, Kanpur, Pantnagar and Morena) during 2018-19. At Chatha, green gram-mustard cropping system recorded significantly higher mustard seed yield (1489 kg/ha) followed by sesame-mustard cropping systems. Among tillage systems, raised bed planting in green gram-mustard system was found most productive than zero and conventional tillage at Chatha (Table 3.4). At Kanpur, green gram-mustard system found most productive and recorded highest mustard seed when sown in raised bed planting method (1987 kg/ha). At Pantanagar and Morena, green gram-mustard system also recorded highest mustard seed yield of 1985 and 1946 kg/ha, respectively. Raised bed planting method recorded maximum mustard seed yield at all the locations over zero and conventional tillage.

**Table 3.4: Effect of cropping systems and planting methods on seed yield of Indian mustard at different location during 2018-19.**

| **Croppping syatems (CS)** | **Tillage system (TS)** | | | **Mean** |
|---|---|---|---|---|
| | Zero Tillage | Conventional tillage | Raised bed planting | |
| **Chatha** | | | | |
| Pearl millet- mustard | 1200 | 1308 | 1433 | 1314 |
| Sesame- mustard | 1233 | 1402 | 1567 | 1401 |
| Green gram- mustard | 1313 | 1503 | 1650 | 1489 |
| Maize- mustard | 1173 | 1288 | 1413 | 1292 |
| **Mean** | 1230 | 1375 | 1516 | |
| CD (p=0.05) | TS=36 | CS=79 | Interaction =NS | |
| **DOS:** Nov 05; **Recommended fertility level**- 80 kg N, 40 kg $P_2O_5$, 20 kg $K_2O$/ha | | | | |
| **Kanpur** | | | | |
| Green Gram - mustard | 1305 | 1728 | 1987 | 1673 |
| Urd- mustard | 1399 | 1781 | 1881 | 1687 |
| Maize- mustard | 1199 | 1452 | 1922 | 1525 |
| **Mean** | 1654 | 1301 | 1930 | |
| CD (p=0.05) | TS=66 | CS=52 | Interaction =98 | |
| **DOS:** Nov 12; **Recommended fertility level**- 120 kg N, 60 kg $P_2O_5$, 60 kg $K_2O$ /ha | | | | |

| | | | | |
|---|---|---|---|---|
| **Pantnagar** | | | | |
| Maize-mustard | 1827 | 1957 | 1983 | 1922 |
| Green Gram -mustard | 1763 | 2073 | 2120 | 1985 |
| Soybean-mustard | 647 | 933 | 973 | 851 |
| **Mean** | 1412 | 1654 | 1692 | - |
| CD (p=0.05) | TS=NS | CS=NS | Interaction =NS | |
| **DOS:** Oct 18 ; **Recommended fertility level-** 120 kg N, 40 kg $P_2O_5$, 20 kg $K_2O$/ha | | | | |
| **Morena** | | | | |
| Pearl millet- mustard | 1436 | 1817 | 2222 | 1825 |
| Maize- mustard | 1460 | 1972 | 2186 | 1873 |
| Soybean- mustard | 1488 | 1922 | 2139 | 1850 |
| Green Gram - mustard | 1474 | 2048 | 2316 | 1946 |
| Sesamum- mustard | 1354 | 1582 | 1875 | 1604 |
| Cluter bean - mustard | 1428 | 1953 | 2132 | 1837 |
| **Mean** | 1440 | 1882 | 2145 | |
| CD (p=0.05) | TS=48 | CS=138 | Interaction =NS | |
| **DOS:** Nov 16; **Recommended fertility level-** 80 kg N, 40 kg $P_2O_5$, 20 kg $K_2O$/ha | | | | |

## 3.5 Studies on system of mustard intensification (SMI) in rapeseed-mustard through transplanting.

The experiment was started from rabi 2017-18 to enhance the resource use efficiency of rapeseed-mustard production system. *Brassica juncea* recorded highest seed yield at Morena, Sriganganagar and Imphal (3941, 2514 and 1744 kg/ha, respectively) over *B. carinata* and *B. napus* when planted at 30 x 15 cm, and at Nagpur and Varanasi (2239 and 2330 kg/ha, respectively) when planted at wider spacing i.e 60 x 60 cm (Table 3.5.1 and 3.5.3).

**Table 3.5.1 Seed yield (kg/ha) of *Brassica* sp as influenced by planting method during 2018-19.**

| ***Brassica* sp** | **Planting method (PM)** | | | |
|---|---|---|---|---|
| | **45x15** | **45x45#** | **60x60#** | **Mean** |
| **Sriganganagar** | | | | |
| *Brassica carinata* (PC-6) | 2284 | 2114 | 1929 | 2109 |
| *Brassica napus* (GSC-7) | 1482 | 1867 | 1528 | 1626 |
| *Brassica juncea* (RGN 73) | 2514 | 2361 | 2253 | 2371 |
| **Mean** | 2093 | 2124 | 1833 | - |
| CD (p=0.05) | B. spp=402 | PM=181 | Interaction=NS | |
| DOS: Oct 02; DOT: Oct 30, Recommended fertility level- 75 kg N, 40 kg $P_2O_5$ /ha | | | | |
| **Imphal** | | | | |
| *Brassica carinata* (PC-6) | 1205* | 981 | 900 | 1029 |
| *Brassica napus* (GSC-7) | 1681* | 1244 | 1091 | 1339 |
| *Brassica juncea* (NRCHB-101) | 1744 | 844 | 722 | 1104 |
| **Mean** | 1544 | 1023 | 904 | - |
| CD (p=0.05) | B. spp=168 | PM=108 | B spp x PM=187 | PM x B spp=225 |
| DOS: Nov 08; DOT: Nov 30, Recommended fertility level- 60 kg N, 30 kg $P_2O_5$, 30 $K_2O$/ha | | | | |

*:45x15cm

**Table 3.5.2 Seed yield (kg/ha) of Brassica spp as influenced by plant geometry and age of seedling for transplanting during 2018-19 at Ludhiana.**

| **Brassica spp.** | **Age of seedlings for transplanting** | **Spacing (cm)** | **Seed yield (kg/ha)** |
|---|---|---|---|
| | Direct sowing | | 2003 |
| | 21 | 45 x 15 | 1805 |

| | | | |
|---|---|---|---|
| *Brassica napus* (GSC-7) | 21 | 30 x 30 | 1616 |
| | 21 | 45 x 45 | 1619 |
| | 30 | 45 x 15 | 1839 |
| *Brassica carinata* (PC-6) | Direct sowing | | 1615 |
| | 21 | 45 x 15 | 1361 |
| | 21 | 30 x 30 | 1164 |
| | 21 | 45 x 45 | 1370 |
| | 30 | 45 x 15 | 1300 |
| *Brassica juncea* (RLC-3) | Direct sowing | | 1698 |
| | 21 | 45 x 15 | 1263 |
| | 21 | 30 x 30 | 1017 |
| | 21 | 45 x 45 | 1022 |
| | 30 | 45 x 15 | 1167 |
| CD (p=0.05) | | | 200 |
| DOS: Oct 27; DOT: Nov 17, Recommended fertility level- 100 kg N, 30 kg $P_2O_5$, 15 $K_2O$/ha | | | |

Transplanting of *B. carinata* recorded highest seed yield (3730 kg/ha) at New Delhi, *B. juncea* and *B. napus,* when planted at 60 x 60 cm, remained at par in seed yield with 30 x 15 cm spacing. However, transplanting of *B. napus* at Pantnagar recorded highest seed yield (3297 kg/ha) over *B. carinata* and *B. juncea* at 60 x 60 cm. Experiment was conducted at Ludhiana to compare transplanting of *B. juncea*, *B. carinata* and *B. napus* with direct sowing resulted inferior seed yield of all the species under transplanting as compared to direct sowing (Table 3.5.2).

**Table 3.5.3 Seed yield (kg/ha) of *Brassica* sp as influenced by planting method during 2018-19.**

| ***Brassica* sp** | **Planting method (PM)** | | | |
|---|---|---|---|---|
| | **30x15** | **45x45#** | **60x60#** | **Mean** |
| **IARI, New Delhi** | | | | |
| *Brassica carinata* (PC-6) | 3520* | 3370 | 3730 | 3540 |
| *Brassica napus* (GSC-7) | 2930 | 3180 | 3110 | 3073 |
| *Brassica juncea* (Pusa Vijay) | 2140 | 2380 | 2630 | 2383 |
| **Mean** | 2863 | 2977 | 3157 | |
| CD (p=0.05) | B. spp=535 | PM=242 | Interaction=NS | |
| DOS: Oct 28; DOT: Nov 10, Recommended fertility level- 80 kg N, 40 kg $P_2O_5$ ,40 kg $K_2O$, 30 kg S/ha | | | | |
| **Nagpur** | | | | |
| *Brassica carinata* (PC-6) | 953 | 1178 | 1398 | 1176 |
| *Brassica napus* (GSC-7) | 445 | 356 | 706 | 502 |
| *Brassica juncea* (NRCHB 101) | 1581 | 1121 | 2239 | 1647 |
| **Mean** | 993 | 885 | 1448 | - |
| CD (p=0.05) | B. spp=115 | PM=105 | Interaction=182 | |
| DOS: Oct 23; Recommended fertility level- 80 kg N, 40 kg $P_2O_5$, 0 $K_2O$/ha | | | | |
| **Morena** | | | | |
| *Brassica carinata* (PC-6) | 3889 | 3502 | 3072 | 3488 |
| *Brassica napus* (GSC-7) | 3440 | 2734 | 2449 | 2874 |
| *Brassica juncea* (RH 749) | 3941 | 3020 | 2860 | 3274 |
| **Mean** | 3757 | 3086 | 2794 | - |
| CD (p=0.05) | B. spp=348 | PM=303 | B. spp x PM=NS | PM x B. spp=NS |
| DOS: Oct 11; DOT: Nov 11, Recommended fertility level- 100 kg N, 50 kg $P_2O_5$, 25 $K_2O$/ha | | | | |
| **Pantnagar** | | | | |
| *Brassica carinata* (PC-6) | 1902 | 2627 | 2206 | 2245 |
| *Brassica napus* (GSC-7) | 2186 | 2590 | 3297 | 2691 |
| *Brassica juncea* (Kranti) | 2703 | 2430 | 1842 | 2325 |

| *Brassica* sp | Planting method (PM) | | | |
|---|---|---|---|---|
| | 30x15 | 45x45# | 60x60# | Mean |
| **Mean** | 2264 | 2549 | 2448 | |
| CD (p=0.05) | B. spp=265 | PM=312 | | |
| DOS: Oct 12; DOT: Nov 01, Recommended fertility level- 120kg N, 40 kg $P_2O_5$, 20 kg $K_2O$/ha | | | | |
| **SK Nagar** | | | | |
| *Brassica carinata* (PC-6) | 2762* | 2337 | 2009 | 2369 |
| *Brassica napus* (GSC-7) | 903 | 788 | 779 | 823 |
| *Brassica juncea* (GDM-4) | 2716 | 1521 | 1441 | 1893 |
| **Mean** | 2127 | 1549 | 1410 | - |
| CD (p=0.05) | B. spp=385 | PM=255 | | |
| DOS: Oct 10; DOT: Oct 30, Recommended fertility level- 50 kg N, 50 kg $P_2O_5$, 0 $K_2O$/ha | | | | |
| **Varanasi** | | | | |
| *Brassica carinata* (PC-6) | 1598 | 1785 | 1916 | 1766 |
| *Brassica napus* (GSC-7) | 1107 | 1344 | 1561 | 1338 |
| *Brassica juncea* (Giriraj) | 1861 | 2140 | 2330 | 2110 |
| **Mean** | 1522 | 1756 | 1936 | - |
| CD (p=0.05) | B. spp=222 | PM=136 | B spp x PM=NS | PM x B spp=NS |
| DOS: Oct 30; DOT: Nov 12, Recommended fertility level- 80 kg N, 40 kg $P_2O_5$, 40 $K_2O$/ha | | | | |

*:45x15cm, #: Transplanting

**Table 3.5.4 Seed yield (kg/ha) of *Brassica* sp as influenced by planting method during 2018-19.**

| *Brassica* sp | Planting method (PM) | | | |
|---|---|---|---|---|
| | 30x15 | 45x45# | 60x60# | Mean |
| **Sriganganagar** | | | | |
| *Brassica carinata* (PC-6) | 2284 | 2114 | 1929 | 2109 |
| *Brassica napus* (GSC-7) | 1482 | 1867 | 1528 | 1626 |
| *Brassica juncea* (RGN 73) | 2469 | 2438 | 2207 | 2371 |
| **Mean** | 2078 | 2140 | 1888 | - |
| CD (p=0.05) | B. spp=457 | PM=190 | Interaction=NS | |
| DOS: Oct 02; DOT: Oct 30, Recommended fertility level- 75 kg N, 40 kg $P_2O_5$ /ha | | | | |
| **Imphal** | | | | |
| *Brassica carinata* (PC-6) | 1205* | 981 | 900 | 1029 |
| *Brassica napus* (GSC-7) | 1681 | 1244 | 1091 | 1339 |
| *Brassica juncea* (NRCHB-101) | 1744 | 844 | 722 | 1104 |
| **Mean** | 1544 | 1023 | 904 | - |
| CD (p=0.05) | B. spp=168 | PM=108 | B spp x PM=187 | PM x B spp=225 |
| DOS: Nov 08; DOT: Nov 30, Recommended fertility level- 60 kg N, 30 kg $P_2O_5$, 30 $K_2O$/ha | | | | |

*:45x15cm

**Table 3.5.5 Seed yield (kg/ha) of Brassica spp as influenced by plant geometry and age of seedling for transplanting during 2018-19 at Ludhiana.**

| Brassica spp. | Age of seedlings for transplanting | Spacing (cm) | Seed yield (kg/ha) |
|---|---|---|---|
| *Brassica napus* (GSC-7) | Direct sowing | | 2003 |
| | 21 | 45 x 15 | 1805 |
| | 21 | 30 x 30 | 1616 |
| | 21 | 45 x 45 | 1619 |
| | 30 | 45 x 15 | 1839 |
| *Brassica carinata* (PC-6) | Direct sowing | | 1615 |
| | 21 | 45 x 15 | 1361 |
| | 21 | 30 x 30 | 1164 |
| | 21 | 45 x 45 | 1370 |

| | | | |
|---|---|---|---|
| | 30 | 45 x 15 | 1300 |
| *Brassica juncea* (RLC-3) | Direct sowing | | 1698 |
| | 21 | 45 x 15 | 1263 |
| | 21 | 30 x 30 | 1017 |
| | 21 | 45 x 45 | 1022 |
| | 30 | 45 x 15 | 1167 |
| CD (p=0.05) | | | 200 |
| DOS: Oct 27; DOT: Nov 17, Recommended fertility level- 100 kg N, 30 kg $P_2O_5$, 15 $K_2O$/ha | | | |

### 3.6 Enhancing of water use efficiency in rapeseed-mustard under rain fed conditions.

The experiment was started during 2017-18 to enhance the water productivity in mustard under rainfed conditions. The results revealed that, application of hydrogel 5 kg/ha at sowing along with foliar spray of salicylic acid 200 ppm at flowering and siliqua formation stages recorded the highest seed yield of mustard at KDW, KNG, LDH, HSR, BAW, SGN, JOB, NAG, DOL, KAN, KOT, VAR, SHL and BHU of 1323, 967, 2087, 2886, 2313, 2999, 1942, 1395, 1432, 1806, 2584, 1678, 1173 and 770 kg/ha, respectively. Whereas, at CHT & Kalyani, application of hydrogel 5 kg/ha+salicylic acid 100 ppm and at IARI only salicylic acid 100 ppm at flowering and siliqua formation stages recorded the highest seed yield of 1332 & 1689 and 2359 kg/ha, respectively (Table 3.6.1 &2).

**Table 3.6.1: Seed yield (kg/ha) of rapeseed-mustard as influenced by agro-chemicals (Zone I, II & IV) during 2018-19**

| **Treatment** | **Seed Yield (Kg/ha)** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **KDW** | **KNG** | **LDH** | **CHT** | **IARI** | **HSR** | **BAW** | **SGN** | **JOB** | **NAG** |
| Control | 1210 | 756 | 1308 | 1032 | 1172 | 2093 | 1772 | 2556 | 1106 | 822 |
| Hydrogel (H) @ 2.5 kg/ha | 1248 | 800 | 1582 | 1142 | 2161 | 2473 | 2046 | 2743 | 1388 | 896 |
| H @ 5.0 kg/ha | 1282 | 900 | 1759 | 1148 | 2040 | 2764 | 2100 | 2852 | 1460 | 1076 |
| Salcylic acid (S.A.)100 ppm at Flowering and Siliqua formation | 1215 | 839 | 1539 | 1199 | 2359 | 2379 | 1961 | 2968 | 1382 | 981 |
| S.A.200 ppm at Flowering and Siliqua formation | 1230 | 850 | 1745 | 1195 | 1918 | 2531 | 1985 | 2805 | 1391 | 1061 |
| H @ 2.5 kg/ha + S.A. 100 ppm at Flowering and Siliqua formation | 1266 | 800 | 1952 | 1252 | 2314 | 2581 | 2194 | 2914 | 1788 | 1162 |
| H @ 2.5 kg/ha + S.A. 200 ppm at Flowering and Siliqua formation | 1286 | 783 | 2055 | 1208 | 2329 | 2667 | 2268 | 2992 | 1798 | 1180 |
| H @ 5.0 kg/ha+ S.A.100 ppm at Flowering and Siliqua formation | 1302 | 817 | 2016 | 1332 | 2192 | 2783 | 2264 | 2938 | 1898 | 1249 |
| H @ 5.0 kg/ha + S.A. 200 ppm at Flowering and Siliqua formation | 1323 | 967 | 2087 | 1309 | 2153 | 2886 | 2313 | 2999 | 1942 | 1395 |
| CD (p=0.05) | N.S | 46 | 406 | 169 | 494 | 412 | 103 | NS | 156 | 250 |
| **DOS** | Oct 19 | Nov 09 | Oct 05 | Oct 15 | Oct 15 | Oct 13 | Oct 18 | Oct 29 | Oct 20 | Oct 30 |
| **(N,:$P_2O_5$ : $K_2O$:S kg/ha)** | 80:50:40:25 | 40:20:0 | 40:20:00 | 80:40:20 | 40:20:20 | 40:30:20 | 40:20:0:30 | 75:40:00 | 60:40:0 | 40:20:0 |

| **Variety** | Shalimar sarson 2 | GSC 7 | PBR 97 | RH 406 | | RH-725 | | IJ-31 | NRCHB 101 |
|---|---|---|---|---|---|---|---|---|---|

**Table 3.6.2 Seed yield (kg/ha) of rapeseed-mustard as influenced by agro-chemicals (Zone-III & V) during 2018-19**

| **Treatment** | **Seed Yield (Kg/ha)** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **DOL** | **KAN** | **KOT** | **JHANSI** | **VAR** | **IMP** | **KNK** | **SHL** | **BHU** | **KALYANI** |
| Control | 869 | 1445 | 2154 | 1154 | 892 | 1183 | 327 | 858 | 484 | 911 |
| Hydrogel (H) @ 2.5 kg/ha | 1000 | 1482 | 2213 | 1251 | 922 | 1250 | 1749 | 956 | 589 | 1203 |
| H @ 5.0 kg/ha | 1064 | 1509 | 2263 | 1303 | 1096 | 1266 | 1981 | 991 | 675 | 1543 |
| Salcylic acid (S.A.)100 ppm at Flowering and Siliqua formation | 1135 | 1537 | 2200 | 1090 | 1256 | 1301 | 1848 | 985 | 577 | 1344 |
| S.A.200 ppm at Flowering and Siliqua formation | 1175 | 1565 | 2223 | 1114 | 1333 | 1518 | 1748 | 1000 | 617 | 1439 |
| H @ 2.5 kg/ha + S.A. 100 ppm at Flowering and Siliqua formation | 1204 | 1639 | 2399 | 1285 | 1346 | 1639 | 1727 | 1041 | 639 | 1503 |
| H @ 2.5 kg/ha + S.A. 200 ppm at Flowering and Siliqua formation | 1311 | 1704 | 2464 | 1112 | 1390 | 1558 | 1999 | 1093 | 675 | 1605 |
| H @ 5.0 kg/ha+ S.A.100 ppm at Flowering and Siliqua formation | 1284 | 1731 | 2575 | 1014 | 1490 | 1355 | 1959 | 1122 | 731 | 1689 |
| H @ 5.0 kg/ha + S.A. 200 ppm at Flowering and Siliqua formation | 1432 | 1806 | 2584 | 1047 | 1678 | 1343 | 1943 | 1173 | 770 | 1513 |
| CD (p=0.05) | 180 | 107 | 367 | 174 | 156 | 288 | 290 | 238 | 122 | 118 |
| **DOS** | Nov 10 | Nov 12 | Oct 22 | Nov 26 | Nov 03 | Nov 08 | Nov 01 | Oct 25 | Dec 04 | Nov 13 |
| **(N,:$P_2O_5$ : $K_2O$:S kg/ha)** | 40:20:20 | 120:60:60 | 80:40:30:40 | - | 60:30:30 | 60:30:30 | 80:40:20 | 60:30:30 | 40:20:20 | 60:40:40 |
| **Variety** | Rajendra Sufalam | - | Giriraj | DRMR 135-50 | Kranti | NRCHB -101 | DRMR 1153-12 | TS 46 | Parbati | Pitambari |

# Plant Pathology

# 4. Plant Pathology

**Disease Scenario**

During 2018-19, moderate to severe occurrence of Alternaria blight was recorded at SHL, DOL, LDH, JHS, HSR, NDH, VAR and PNT. However, low to the medium severity of Alternaria blight was recorded from BPR and SGN. White rust appeared in moderate to severe form at MOR and NDH while low to moderate at PNT, SGN, LDH and BPR. Low to medium prevalence of DM was observed at the cotyledonary stage at JHS and PNT. Powdery mildew severity was moderate to high at JHS, SKN, MOR and low at JAG and BPR. Low to moderate incidence of Sclerotinia rot was observed at NDH, MOR, PNT, SGN, LDH and VAR. Different trials were on dates as given below:

| Centre | Date of sowing of different trials | | | | | | |
|---|---|---|---|---|---|---|---|
| | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 4.6 | 4.9 |
| PNT | (A) 22.10.2018<br>(B) 22.10.2018 | 22.10.2018 | 22.10.2018 | 22.10.2018 | 25.10.2018 | 25.10.2018 | 18.10.2018 |
| HSR | (A) 13.11.2.18 | 13.11.2018 | 13.11.2018 | 13.11.2018 | 13.11.2018 | 13.11.2018 | 08.10.2018 |
| LDH | (A) 04.11.2018<br>(B) 04.11.2018 | 04.11.2018 | 04.11.2018 | - | 04.11.2018 | 04.11.2018 | - |
| SGN | (A) 27.10.2018 | 27.10.2018 | 27.10.2018 | - | - | 27.10.2018 | 01.11.2018 |
| NDH | (A) 3.11.2018 | 03.11.2018 | - | - | - | - | - |
| MOR | (A) 05.11.2018<br>(B) 05.11.2018 | 05.11.2018 | 06.11.2018 | 06.11.2018 | - | 06.11.2018 | 11.11.2018 |
| SKN | (A)19.11.2018 | 19.11.2018 | - | - | - | 19.11.2018 | 30.10.2018 |
| JAG | (A)15.11.2018 | 15.12.2018 | - | - | - | 05.12.2018 | 05.12.2018 |
| DOL | (A) 08.11.2018<br>(B) 08.11.2018 | 09.11.2018 | 09.11.2018 | - | 08.11.2018 | 09.11.2018 | 10.11.2018 |
| SHL | (A) 27.10.2018<br>(B) 27.10.2018 | 30.10.2018 | 29.10.2018 | - | 29.10.2019 | 26.10.2018 | 08.11.2018 |
| BPR | (A) 26.10.2018 | - | - | - | 26.10.2018 | - | 26.10.2018 |
| JHS | (A) 30.10.2018 | 30.10.2018 | - | - | - | - | - |
| KPR | (A) 22.11.2018 | - | 22.11.2018 | - | - | 22.11.2018 | - |
| VAR | (A) 02.11.2018 | 16.11.2018 | - | - | - | 16.11.2018 | - |

### 4.1. Screening of *Brassica* germplasm and breeding materials

Natural conditions: DOL, PNT, MOR, JAG, LDH, SGN, SHL, NDH, JHS, HSR, DOL, KPR, VAR, SKN and BPR.

Artificial conditions: **AB:** DOL, MOR, PNT, LDH and SHL **WR:** PNT, MOR, HSR and LDH **DM:** PNT **SR:** LDH, HSR, MOR, PNT and BPR.

35 strains including 8 checks were sown in single 3-m row in randomized completely block design (RCBD) with 2 replications. Susceptible checks were used after every two test rows. Under artificial conditions, repeated inoculation was done after collecting inoculum from naturally infected

plants for AB to facilitate the secondary spread. For screening against WR and DM, the oosporic material of local isolate was added with seed after grinding hypertrophied plant material collected from the previous year's crop as per standard procedure.

Observations on Alternaria blight on leaves (ABL), WR, DM, PM and SR were recorded at 75 and/or 90-100 days after sowing (DAS). Number of staghead and Alternaria pod blight (ABP) severity/incidence were recorded 15 days before harvest. The results are given in Table 4.1.1-5.

**WR**: Under natural condition 71J0002 (Bj), AKMS 8141, GSH 1754 (Bn), and RTM 1624 (*E. sativa*) were found resistant at all six locations. Entries including RAUDT 14-09, TS-38 of *B. rapa var Toria* escaped WR infection at most of the locations. Under artificial condition GSH 1754, AKMS 1841 (Bn) and 71J0002, RLC 3, RCH 1, RLC 7 of *B. juncea* were found resistant to WR at HSR, PNT and LDH.

**DM**: None of the entries of *B. juncea* showed tolerance to DM at PNT and JHS.

**PM:** None of the entries of *B. juncea* were tolerant at JHS, SKN, JAG, MOR and BPR.

**SR**: DRMR 2017-15, RGN 394, RH 1326, RLC 7, RCH 1 and RMWR 09-1 were tolerant to SR under natural condition (4 locations).

**4.2. Uniform Disease Nursery for major diseases**

Locations: SHL, MOR, DOL, NDH, PNT, HSR, LDH, VAR, JHS and SGN.

61 entries, including 9 checks, were sown in a single 3-m row with two replications in RCBD. Susceptible checks were sown after every two test rows. Artificial inoculation of *Alternaria brassicae* (AB) and *Albugo candida* (WR) was done following standard procedure to record their reaction. Observations on DM and PM were also recorded under natural infection conditions (Tables 4.2.1-4).

**WR:** PDZ 2, PDZ 3, DRMRIJ-12-39, DRMR 2018-41, DRMRIJ-12-26, DRMRIJ-12-28, DRMRIJ-12-37, DRMRIJ-12-44, DRMRSJ-22, DRMRSJ-18, DRMRSJ-26, PDZ 7, PDZ 5, PRD 14-16, DRMRSJ-1, DRMRSJ-34, DRMR-2018-37 and DRMRSJ-21 of *B. juncea* showed resistance reaction to WR under natural conditions.

**4.3 National Disease Nursery (NDN) for Alternaria blight**

Locations: PNT, DOL, HSR, LDH, MOR, KPR and SHL.

28 strains were sown in paired rows of 3 m length. Observation on AB was recorded on leaves 75, 100 DAS at siliquae formation stage and 15 days before harvesting under artificial inoculation conditions. Reaction to WR, DM, SR and PM was also recorded under natural conditions (Table 4.3.1-2).

DRMR-2018-37, DRMRSJ-22, DRMRSJ-18, DRMRSJ-21, DRMRSJ-34, DRMRSJ-26, DRMRSJ-25, DRMR 5206 and DRMR 2018-41 of *B. juncea* showed resistant reaction to WR except PNT centre.

**4.4 National Disease Nursery (NDN) for white rust**

Locations:PNT, MORand HSR

70 genotypes, including 3 checks, were sown in paired-row of 3 m length between susceptible check. Observation for WR on leaves and staghead formation was recorded at 75, 100 DAS under artificial inoculation conditions. Reaction to AB, SR, DM and PM was also recorded under natural conditions (Table 4.4.1-2). DRMRJA 35, DRMRIJ 12-26, DRMRIJ 12-39, PDZ-3 strains of *B. juncea*

showed immune reaction to WR at three locations. Some of the promising strains sowing resistance to WR were DRMRIJ 12-21, DRMR-5206, RH 1400, RH 1700, and DRMRIJ 12-48 (3 locations).

DRMRIJ 12-26, DRMRIJ 12-39, and DRMRMJA-35 were found consistently resistant to WR during 2014-15, 2015-16, 2016-17 and 2017-18.

**PM:** DRMRSJ-21 and RH 1700 of *B. juncea* showed resistance to PM at MOR.

**4.5 National Disease Nursery (NDN) for Sclerotinia Rot**

Locations: PNT, HSR, LDH, BPR and SHL

15 strains including 3 checks were sown in paired rows of 3 m length between susceptible check (Rohini) and NRCYS-5-2. Stem inoculation was done to ensure SR infection. Sclerotinia rot was recorded prior to harvest. In addition, reaction to AB, WR, DM and PM was also recorded (Table 4.5.1-2). DRMRSJ-25 and DRMRSJ-22 (*B. juncea*) showed a resistant reaction to WR at PNT, HSR and LDH. DRMRSJ-22 and DRMR 5206 showed tolerance to SR with small lesion size and <50% incidence under artificial conditions.

**4.6 Screening of IVT entries of Brassica against different diseases**

Locations: MOR, DOL, SHL, PNT, HSR, LDH, KPR, VAR, SGN, SKN and JAG

Total 129 strains including 7 checks were sown in single 3m row in RCBD with 2 replications. Susceptible check(s) were used after every 2 test rows. Susceptible variety 'Rohini' was used as filler. Observations on Alternaria blight on leaves, WR, DM, PM, SR and BR were recorded at 75 and 100 DAS. Number of staghead and Alternaria pod blight incidence was recorded 15 days before harvesting. Entries showing resistance/ tolerance to AB, WR, DM, PM and SR under natural conditions are listed in Table 4.6.1-2).

**WR:** Nine entries were found resistant to WR at three locations, JGS-12-3, HNS 1102, GSH-1717, PYS-2016-8, AKGS-8217, YSKM 18-1, GSH-1699, GSH-1707 and AKGS-8146. Almost all the entries of *B. rapa* var. Toriaand *B. rapa* var Yellow Sarson*, B. napus* escaped WR infection.

**PM:** AKGS-8217, GSH-1699, AKGS-8146 and GSH-1707 showed tolerance to PM.

**4.7 Standardization of differential hosts for identification of races in *A. candida***

The reaction of 11 rapeseed-mustard genotypes was recorded against 4 isolates of *Albugo candida* (PNT, HSR) at PNT and HSR. Genotype DRMRIJ 12-40 gave resistant reaction against 4 isolate at PNT, HSR and BPR. While, genotypes EC 399301, RH-30 and DRMRAB-753 were found susceptible reaction against all 4 isolates of *A. candida* at 3 locations (Table.4.7.1).

**4.8 Epidemiology of Alternaria blight, white rust, powdery and downy mildew**

**PNT**

Experiments on the epidemiology of foliar diseases of rapeseed-mustard were laid out using cv. Varuna and Kranti was sown on eight different dates at the weekly interval starting from October 01 to November 19 without adopting any protection measures against pest and diseases (Table 4.8).

Downy mildew disease first appeared 10 DAS on Oct 12, Oct 22 and Nov 12 sown crop whereas, on Oct 01 sown crop the disease appeared 19 DAS on both the cultivars. The white rust disease first appeared 30 DAS on Nov 21 sown crop during 2017-18 while 45 DAS on Oct 1, Oct 22, Oct 29 and continued up to 54 DAS on Nov 19 sown crop during 2018-19. Alternaria blight disease was first noticed 53 DAS on Oct 15, Oct 29 and Nov 19 instead of 44 DAS on leaves on Nov 07 sown crop on both the cultivars last year. While, on Oct 01 sown crop, the disease appeared very late i.e. 67

DAS same as last year. The Alternaria blight on pods first appeared 88 DAS on late (Nov 19) sown crop. On early (Oct 08) sown crop, the symptoms on pod appeared late after 120 days of sowing.

**SHL**

Experiment was laid out with cv. Varuna and TM 2. The crop was sown with 7 dates of sowing started from Oct 08 to Nov. 19 at weekly intervals. AB was first observed at 66 DAS in Oct 08 seeded crop while it was appeared in 39 DAS in Nov 19 sown crop. Maximum disease severity was at 100 DAS (40.6%) in Nov 19 on cv TM 2 (Table 4.8). Maximum yield was recorded in Oct 19 sown cv Varuna (16.7 q/ha) while in TM 2 it was 12.5 q/ha (Oct 29).

**SKN**

Experiments were laid out with cv. Varuna and GM 2 sown on 8 dates of sowing started from Oct 01 to Nov. 19 at weekly intervals. Powdery mildew disease appeared at 83 DAS instead of 76 DAS last year first on Nov 19 sown crop of Varuna and 88 DAS in Nov 19 sown GM 2 continued to progress up to 114 DAS. The maximum disease severity was observed 98% in Nov 19 followed 95% in Nov 12 sown Varuna. The maximum reduction in seed yield was observed in late sown crop (Table 4.8).

**MOR**

Experiments on the epidemiology of foliar diseases of rapeseed-mustard were laid out with cv. Varuna and Rohini. The crop was sown with 8 dates of sowing started from Oct 01 to Nov. 19 at weekly intervals. Alternaria blight appeared 68 DAS in Nov 12 and Nov 19 sown Rohini while appeared 100 DAS in Oct 01 sown both cultivars.

WR severity was appeared first on 48 DAS in Nov 19 and appeared till 90 DAS in Oct 01 sown crop. WR disease severity was maximum upto 43.6% in Nov 19 sown crop both in Varuna and Rohini (Table 4.8).

PM was observed first 83 DAS and was maximum 47.1 % reported in cv Rohini at 130 DAS in Nov 19, sown crop. SR incidence appeared between 80-102 DAS first in late sown and delayed in optimum sowing dates.

**DOL**

Experiment was laid out with cv. Varuna and Rajendra Suflam. The crop was sown with 8 dates of sowing started from Oct 01 to Nov 19 at weekly intervals. AB was first observed at 38 DAS in Nov 19 sown both Varuna and Rajendra Suflam, while appeared late in early sown Oct 01 sown crop (89 DAS). The disease continued to progress up to 140 DAS on leaves on both the cultivars (Table 4.8).

### 4.9 Testing of IDM module for major rapeseed-mustard diseases

Locations:BPR,LDH,DOL, JAG,MOR, PNT, SHL,HSR and SGN

The experiment was conducted in plot size 15x7m with 45x20 cm spacing in three replications. Variety DRMRIJ 31 was used in the experiment sown between 10-20 Oct using recommended fertilizer doses. After 100-days of sowing, 20 plants from each replication showing disease symptoms were tagged for observation and yield assessment in the experiment.

AB, WR, DM, PM, SR diseases were observed in integrated disease management practices and farmer's practices to standardise the best integrated disease management module. Module

includes seed treatment with *Trichoderma harzianum* @10g/ kg seed, soil application of *Trichoderma* (1 kg/ 50 kg FYM), basal application of zinc sulphate @ 15 kg/ h + S (dose as per location recommendation) + boron (10 kg borax/ ha), line sowing 45 x 20 cm spacing, no irrigation during 25$^{th}$ to 15$^{th}$ Jan. AB severity recorded from 1.8% at BPR to 26.7% at PNT in module while in farmers practices severity ranged from minimum 1.8% at BPR to highest at PNT (33.3%). Similarly, WR severity was recorded minimum 2.1 % at LDH and maximum 44.0 % at MOR in farmer's practices while low at BPR (0.6%) and maximum at 29.6% at SGN in module. SR disease was also reduced from 26.9% in farmer's practices to 1.5% in module at SGN likewise 51.7% in farmer's practices to 10.0% in module at MOR. As per results, we found the significant increase in yield by using IDM module over farmer's practices (Table 4.9.1-3).

**Survey of farmer's field for disease outbreak**

**HSR**

Survey was conducted to observe the presence and severity of diseases of Indian mustard at nearly 30 locations in major mustard growing regions of Haryana. WR disease appeared in second week of January. WR disease severity ranged between 0-10% at farmers field, however up to 15-20% white rust severity was noticed at Hisar, Dadri and Bhiwani districts. AB remained low as disease severity ranged 0-5% throughout the state. Bacteria stalk rot was noticed at few locations after first irrigation in low lying areas. Incidence of SR was also low throughout state ranging between 0-4% due to dry and cool weather conditions. Low intensity of PM disease appeared in late sown conditions in Haryana.

**MOR**

The overall pressure of foliar disease like ABL and ABP was low to moderate at the farmers field, ABL first appeared on Oct. 10 and pod blight in traces. White-rust first appeared on Dec 17 with high to very high in medium to late sown crop where as the incidence of staghead disease was seen on after 5 Feb in late sown crop. Sclerotinia rot was observed on 15 Jan. at farmer's field. While, PM disease was first appeared on Feb 8, and found high pressure in late sown crop.

**SKN**

Survey for disease outbreak at farmer's field was conducted. Powdery mildew was observed in severe form on late sown crops while in timely sown crop, powdery mildew disease severity was observed between 10-15%.

**PNT**

Downy mildew disease first appeared at cotyledonary stage on Oct 20, 2018, WR appeared on Nov 15, 2018 and AB disease on leaves was observed on Dec 6, 2018 while on pod AB was appeared on Jan 29, 2019. Sclerotinia rot was initially observed on Jan 10, 2019. The first appearance of bacterial blight disease was observed on Nov 15, 2018. The weather condition was not much favorable to diseases. WR was more severe between Jan 15-25, 2019 while AB during Feb 20-25, 2019. Staghead due to WR+DM was also observed in few plants. SR was more severe during Feb 5-10, 2019.

**Table 4.1.1: Reaction of oilseed Brassica germplasm to Alternaria Blight under natural condition**

| Code No. | Entries | % ABL (75 DAS) | | | | % ABL (100 DAS) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SHL | DOL | Mean | MOR | JHS | NDH | PNT | HSR | DOL | LDH | KPR | VAR | Mean | BPR | SGN |
| SBG-18-01 | DRMR 2017-15 | 25.5 | 29.3 | **27.4** | 20.0 | 23.6 | 30.0 | 17.5 | 21.1 | 36.4 | 31.6 | 40.2 | 44.4 | **30.6** | 1.9 | 1.1 |
| SBG-18-02 | MCP 626 | 26.2 | 27.0 | **26.6** | 14.9 | 5.1 | 32.8 | 17.5 | 20.5 | 34.7 | 32.1 | 36.7 | 40.0 | **27.4** | 3.2 | 0.0 |
| SBG-18-03 | DRMR 1153-12 | 23.5 | 29.0 | **26.3** | 18.4 | 15.0 | 33.3 | 22.5 | 29.5 | 38.5 | 36.4 | 25.0 | 37.8 | **29.7** | 3.2 | 12.9 |
| SBG-18-04 | GSH 1754 | 26.5 | 22.6 | **24.6** | 0.0 | 14.9 | 18.9 | 5.0 | 8.9 | 31.4 | 21.2 | 6.2 | 20.0 | **15.8** | 0.6 | 27.6 |
| SBG-18-05 | 71 J 0002 | 27.3 | 28.4 | **27.8** | 3.8 | 13.7 | 17.8 | 22.5 | 12.8 | 38.7 | 29.7 | 8.6 | 37.8 | **22.7** | 2.8 | 14.2 |
| SBG-18-06 | RH 1550 | 26.2 | 39.3 | **32.7** | 9.1 | 11.6 | 22.2 | 17.5 | 30.0 | 44.3 | 26.1 | 6.4 | 28.9 | **23.4** | 1.5 | 11.3 |
| SBG-18-07 | PHR 2 | 25.3 | 26.7 | **26.0** | 2.0 | 15.5 | 42.2 | 15.0 | 18.9 | 38.4 | 31.6 | 0.0 | 15.6 | **22.1** | 1.9 | 10.9 |
| SBG-18-08 | RGN 368 | 26.0 | 35.6 | **30.8** | 14.9 | 35.1 | 36.9 | 27.5 | 36.7 | 41.3 | 41.2 | 26.0 | 37.8 | **35.3** | 2.8 | 10.7 |
| SBG-18-09 | DRMR 2035 | 27.2 | 28.4 | **27.8** | 12.0 | 25.9 | 37.2 | 17.5 | 20.0 | 38.8 | 32.1 | 18.9 | 37.8 | **28.5** | 3.6 | 10.7 |
| SBG-18-10 | RGN 394 | 26.5 | 28.4 | **27.4** | 8.0 | 2.6 | 44.4 | 27.5 | 17.8 | 37.3 | 40.3 | 12.0 | 35.6 | **27.2** | 3.2 | 0.0 |
| SBG-18-11 | RL 1359 | 26.7 | 27.3 | **27.0** | 10.9 | 29.8 | 34.4 | 25.0 | 34.5 | 31.5 | 33.9 | 19.9 | 20.0 | **28.6** | 2.8 | 13.3 |
| SBG-18-12 | RTM 1624 | 26.6 | 21.9 | **24.2** | 20.0 | 16.4 | 12.7 | 50.0 | - | 35.3 | 28.0 | 32.2 | 80.0 | **36.4** | 0.0 | 31.6 |
| SBG-18-13 | DLSC 1 | 17.2 | 27.1 | **22.1** | 2.3 | 3.3 | 20.5 | 12.5 | 6.7 | 35.6 | 18.4 | 7.4 | 71.1 | **21.9** | 1.1 | 10.7 |
| SBG-18-14 | TS- 38 | 32.7 | 24.3 | **28.5** | 6.0 | 30.5 | 19.4 | 32.5 | 35.6 | 35.7 | 34.0 | 4.2 | 84.4 | **34.5** | 0.7 | 29.3 |
| SBG-18-15 | YSB 9 | 26.4 | 25.3 | **25.8** | 6.0 | 25.6 | 19.4 | 27.5 | 33.4 | 35.7 | 28.6 | 12.3 | 64.4 | **30.9** | 0.0 | 14.4 |
| SBG-18-16 | RH 919 | 27.2 | 23.8 | **25.5** | 14.9 | 29.6 | 32.2 | 22.5 | 30.0 | 32.9 | 32.5 | 23.6 | 64.4 | **33.5** | 2.4 | 0.0 |
| SBG-18-17 | RH 1326 | 26.4 | 26.3 | **26.3** | 16.0 | 2.2 | 23.9 | 20.0 | 31.1 | 37.1 | 30.0 | 18.2 | 46.7 | **26.1** | 1.6 | 32.4 |
| SBG-18-18 | PRO 5222 | 26.3 | 35.8 | **31.0** | 14.9 | 1.1 | 23.3 | 27.5 | 24.5 | 43.3 | 21.9 | 12.6 | 46.7 | **25.1** | 2.1 | 15.6 |
| SBG-18-19 | 71J0003 | 26.6 | 27.6 | **27.1** | 10.9 | 22.3 | 32.2 | 25.0 | 35.6 | 34.5 | 21.4 | 28.2 | 42.2 | **30.2** | 2.0 | 10.0 |
| SBG-18-20 | RH 1599-41 | 25.6 | 30.5 | **28.0** | 3.8 | 18.9 | 21.6 | 22.5 | 31.7 | 39.6 | 26.8 | 0.0 | 51.1 | **26.5** | 2.4 | 32.7 |
| SBG-18-21 | NPJ 216 | 22.9 | 25.2 | **24.0** | 5.1 | 24.2 | 27.8 | 27.5 | 30.0 | 38.9 | 24.7 | 20.6 | 24.4 | **27.3** | 1.2 | 0.7 |
| SBG-18-22 | LES 54 | 26.2 | 31.8 | **29.0** | 3.8 | 19.8 | 34.4 | 20.0 | 28.9 | 39.4 | 26.9 | 9.4 | 24.4 | **25.4** | 2.8 | 0.0 |
| SBG-18-23 | RLC 7 | 24.7 | 30.6 | **27.6** | 1.8 | 24.7 | 30.0 | 25.0 | 15.6 | 37.8 | 21.2 | 8.2 | 24.4 | **23.4** | 2.4 | 12.2 |
| SBG-18-24 | NPJ 203 | 25.5 | 30.7 | **28.1** | 10.0 | 20.1 | 19.4 | 22.5 | 32.2 | 40.2 | 28.7 | 22.2 | 28.9 | **26.8** | 2.2 | 28.9 |
| SBG-18-25 | RAUDT 14-09 | 33.4 | 32.0 | **32.7** | 5.1 | 21.3 | 25.5 | 35.0 | 40.0 | 40.3 | 26.1 | 15.2 | 46.7 | **31.3** | 1.6 | 52.9 |
| SBG-18-26 | PT 303 | 34.3 | 34.0 | **34.2** | 3.8 | 21.5 | 21.1 | 40.0 | 42.2 | 44.2 | 26.3 | 17.2 | 51.1 | **32.9** | 1.3 | 42.4 |
| SBG-18-27 | RH 923 | 26.4 | 27.8 | **27.1** | 3.6 | 47.7 | 36.7 | 25.0 | 27.8 | 38.3 | 26.6 | 7.2 | 46.7 | **32.0** | 3.2 | 11.8 |
| SBG-18-28 | GSL 1 | 22.2 | 23.3 | **22.8** | 2.0 | 1.6 | 22.2 | 12.5 | 7.8 | 32.4 | 22.1 | 9.6 | 60.0 | **21.0** | 1.4 | 12.4 |
| SBG-18-29 | AKMS 8141 | 25.3 | 21.5 | **23.4** | 1.8 | 2.2 | 25.5 | 10.0 | 8.9 | 31.3 | 20.5 | 0.0 | 15.6 | **14.2** | 1.3 | 30.9 |
| SBG-18-30 | LES 57 | 25.7 | 28.4 | **27.0** | 18.2 | 16.0 | 32.2 | 22.5 | 28.9 | 39.0 | 33.7 | 39.7 | 24.4 | **29.6** | 4.4 | 52.4 |
| SBG-18-31 | RTM 314 | 22.5 | 31.3 | **26.9** | 10.9 | 19.7 | 21.6 | 55.0 | - | 39.4 | 33.7 | 24.6 | 80.0 | **39.1** | 0.0 | 52.9 |
| SBG-18-32 | Rohini | 27.2 | 33.4 | **30.3** | 14.9 | 22.8 | 23.9 | 20.0 | 36.7 | 42.2 | 26.9 | 34.4 | 42.2 | **31.1** | 4.8 | 10.7 |
| SBG-18-33 | RLC 3 | 23.5 | 30.9 | **27.2** | 17.1 | 24.2 | 35.5 | 30.0 | 16.8 | 44.4 | 25.6 | 23.9 | 42.2 | **30.3** | 2.0 | 26.7 |
| SBG-18-34 | RCH 1 | 22.5 | 26.8 | **24.6** | 12.0 | 22.4 | 33.3 | 27.5 | 18.9 | 37.7 | 23.4 | 16.4 | 42.2 | **27.7** | 2.8 | 28.9 |
| SBG-18-35 | RMWR 09-1 | 25.2 | 33.4 | **29.3** | 9.1 | 22.0 | 34.4 | 22.5 | 30.0 | 41.3 | 25.7 | 6.2 | 20.0 | **25.3** | 2.3 | 12.9 |
| **CD(*P*=0.05)** | | **1.8** | **1.7** | | **1.6** | **4.3** | **3.6** | **8.6** | **4.1** | **1.9** | **4.0** | **2.3** | **5.6** | | **1.0** | **3.3** |
| **CV(%)** | | **2.9** | **2.6** | | **4.7** | **14.1** | **-** | **17.3** | **6.8** | **2.4** | **6.0** | **13.5** | **6.5** | | **3.2** | **7.0** |

Check: Rohini, RL 1359 (SC); DRMR-2035 (RC); PHR-2 (TC-AB); GSL-1, DLSC-1 (RC-WR); YSB-9 (SC); PT-303 (RC-WR); RTM-314 (SC)

**Table 4.1.2: Reaction of oilseed Brassica germplasm to Alternaria Pod Blight under natural condition**

| Entries | % ABP (15 days before harvest) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **JHS** | **HSR** | **DOL** | **Mean** | **PNT** | **SGN** | **LDH** | **SHL (100)** |
| DRMR 2017-15 | 13.7 | 16.8 | 18.3 | **16.3** | 32.5 | 0.0 | 12.9 | 17.8 |
| MCP 626 | 7.2 | 15.6 | 17.3 | **13.4** | 17.5 | 0.0 | 12.0 | 16.6 |
| DRMR 1153-12 | 15.6 | 22.2 | 18.1 | **18.6** | 17.5 | 8.7 | 18.7 | 20.5 |
| GSH 1754 | 15.9 | 6.7 | 13.4 | **12.0** | 12.5 | 24.7 | 15.1 | 19.1 |
| 71 J 0002 | 15.7 | 10.6 | 18.3 | **14.9** | 17.5 | 3.6 | 24.0 | 18.5 |
| RH 1550 | 9.2 | 20.5 | 29.4 | **19.7** | 17.5 | 0.0 | 20.9 | 17.6 |
| PHR 2 | 16.3 | 15.6 | 18.4 | **16.8** | 12.5 | 17.3 | 22.0 | 18.2 |
| RGN 368 | 20.9 | 29.5 | 26.3 | **25.6** | 10.0 | 27.8 | 20.7 | 20.2 |
| DRMR 2035 | 20.0 | 16.8 | 19.5 | **18.8** | 17.5 | 28.2 | 24.9 | 16.3 |
| RGN 394 | 1.8 | 13.4 | 18.7 | **11.3** | 17.5 | 13.3 | 22.6 | 14.7 |
| RL 1359 | 21.2 | 24.5 | 17.3 | **21.0** | 17.5 | 10.0 | 17.1 | 18.3 |
| RTM 1624 | 15.3 | - | 14.3 | **14.8** | 45.0 | 23.8 | 30.0 | 17.2 |
| DLSC 1 | 1.9 | 5.0 | 17.3 | **8.1** | 7.5 | 22.2 | 7.8 | 7.3 |
| TS- 38 | 26.5 | 25.1 | 15.1 | **22.2** | 37.5 | 29.6 | 21.6 | 20.2 |
| YSB 9 | 26.5 | 23.4 | 15.2 | **21.7** | 37.5 | 24.9 | 16.8 | 18.2 |
| RH 919 | 23.4 | 22.2 | 14.6 | **20.1** | 12.5 | 8.4 | 14.5 | 17.6 |
| RH 1326 | 2.2 | 18.9 | 16.6 | **12.6** | 12.5 | 29.1 | 15.1 | 17.8 |
| PRO 5222 | 0.0 | 17.8 | 26.3 | **14.7** | 17.5 | 31.6 | 21.5 | 16.3 |
| 71J0003 | 16.2 | 30.0 | 18.3 | **21.5** | 17.5 | 12.4 | 16.5 | 15.9 |
| RH 1599-41 | 14.8 | 21.1 | 19.5 | **18.5** | 37.5 | 13.8 | 14.5 | 14.7 |
| NPJ 216 | 17.6 | 25.1 | 15.4 | **19.4** | 12.5 | 1.3 | 13.0 | 17.4 |
| LES 54 | 15.2 | 20.0 | 19.7 | **18.3** | 22.5 | 0.0 | 13.1 | 16.4 |
| RLC 7 | 20.8 | 10.0 | 18.3 | **16.4** | 17.5 | 13.8 | 15.3 | 16.8 |
| NPJ 203 | 16.6 | 22.2 | 19.6 | **19.5** | 17.5 | 29.8 | 16.1 | 17.4 |
| RAUDT 14-09 | 16.5 | 33.4 | 21.8 | **23.9** | 17.5 | 47.1 | 18.5 | 20.3 |
| PT 303 | 16.6 | 30.0 | 19.5 | **22.0** | 37.5 | 45.8 | 19.0 | 21.2 |
| RH 923 | 18.0 | 21.1 | 18.5 | **19.2** | 17.5 | 15.1 | 14.4 | 17.2 |
| GSL 1 | 2.4 | 7.3 | 13.2 | **7.6** | 7.5 | 11.6 | 16.1 | 16.2 |
| AKMS 8141 | 1.4 | 6.7 | 12.7 | **6.9** | 22.5 | 45.3 | 15.4 | 17.9 |
| LES 57 | 10.1 | 20.0 | 18.6 | **16.2** | 17.5 | 50.4 | 21.5 | 15.2 |
| RTM 314 | 17.7 | - | 21.9 | **19.8** | 47.5 | 51.1 | 22.9 | 15.5 |
| Rohini | 20.2 | 28.9 | 23.6 | **24.2** | 17.5 | 10.0 | 18.7 | 16.3 |
| RLC 3 | 17.9 | 13.4 | 22.1 | **17.8** | 22.5 | 31.6 | 21.7 | 17.4 |
| RCH 1 | 18.8 | 11.7 | 17.5 | **16.0** | 22.5 | 14.2 | 21.1 | 16.2 |
| RMWR 09-1 | 12.0 | 25.1 | 24.4 | **20.5** | 37.5 | 15.6 | 21.4 | 15.7 |
| **CD(P=0.05)** | **4.5** | **4.9** | **2.0** | | **7.4** | **4.2** | **4.1** | **2.2** |
| **CV(%)** | **19.1** | **9.5** | **3.9** | | **16.8** | **8.6** | **8.1** | **4.5** |

## Table 4.1.3: Reaction of oilseed Brassica germplasm to WR and SR (natural condition)

| Entries | % WR severity | | | | | | | | Staghead | | | | % SR incidence | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MOR | NDH | Mean | PNT | SGN | LDH | BPR | JHS | MOR | SGN | LDH | JHS | NDH | MOR | PNT | SGN | LDH | VAR |
| DRMR 2017-15 | 20.0 | 31.1 | **25.6** | 20.0 | 12.2 | 2.0 | 1.6 | 25.3 | 0.0 | 0.0 | 0.0 | 8.8 | 4.1 | 0.0 | 13.5 | 0.0 | 0.0 | 0.0 |
| MCP 626 | 33.6 | 25.0 | **29.3** | 17.5 | 9.8 | 3.9 | 1.6 | 0.0 | 16.7 | 0.0 | 1.5 | 0.0 | 0.0 | 2.5 | 5.2 | 6.4 | 0.0 | 30.0 |
| DRMR 1153-12 | 34.9 | 21.7 | **28.3** | 30.0 | 25.8 | 5.3 | 2.8 | 0.0 | 18.5 | 0.0 | 2.0 | 0.0 | 8.7 | 2.5 | 6.4 | 3.4 | 0.0 | 0.0 |
| GSH 1754 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 0.0 | 31.2 | 0.0 | 0.0 | 0.0 | 14.8 | 7.6 | 7.5 | 3.9 | 3.7 | 0.0 | 25.0 |
| 71 J 0002 | 0.0 | 0.0 | **0.0** | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.5 | 12.5 | 3.1 | 0.0 | 0.0 | 0.0 |
| RH 1550 | 31.3 | 32.2 | **31.8** | 27.5 | 0.0 | 15.0 | 1.6 | 23.5 | 8.1 | 0.0 | 3.1 | 14.3 | 5.9 | 7.5 | 9.7 | 3.5 | 0.0 | 0.0 |
| PHR 2 | 15.1 | 44.5 | **29.8** | 15.0 | 28.0 | 24.0 | 1.4 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 3.2 | 5.0 | 0.0 | 8.2 | 0.0 | 30.0 |
| RGN 368 | 34.0 | 38.9 | **36.5** | 32.5 | 42.7 | 16.3 | 1.5 | 13.7 | 29.2 | 12.1 | 0.0 | 14.9 | 0.0 | 5.0 | 4.3 | 3.5 | 0.0 | 0.0 |
| DRMR 2035 | 2.0 | 20.0 | **11.0** | 5.0 | 0.0 | 2.1 | 0.7 | 24.4 | 0.0 | 0.0 | 0.0 | 15.5 | 0.0 | 2.5 | 0.0 | 3.9 | 0.0 | 0.0 |
| RGN 394 | 9.3 | 19.5 | **14.4** | 15.0 | 9.3 | 0.0 | 0.5 | 1.7 | 8.0 | 3.9 | 0.0 | 0.0 | 0.0 | 0.0 | 9.7 | 0.0 | 4.1 | 0.0 |
| RL 1359 | 16.2 | 31.1 | **23.7** | 35.0 | 0.0 | 18.7 | 2.8 | 16.3 | 6.0 | 0.0 | 4.7 | 10.5 | 3.4 | 7.5 | 9.7 | 0.0 | 62.6 | 5.0 |
| RTM 1624 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 0.0 | 14.9 | 0.0 | 0.0 | 0.0 | 8.9 | 20.9 | 37.5 | 25.2 | 38.1 | 0.0 | 42.5 |
| DLSC 1 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 3.1 | 0.0 | 25.0 | 8.2 | 5.3 | 47.5 |
| TS- 38 | 0.0 | 0.0 | **0.0** | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 18.3 | 50.0 | 24.8 | 22.5 | 14.3 | 52.5 |
| YSB 9 | 0.0 | 17.3 | **8.7** | 2.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 14.6 | 60.0 | 10.5 | 4.5 | 0.0 | 25.0 |
| RH 919 | 19.0 | 26.0 | **22.5** | 22.5 | 13.3 | 10.4 | 1.5 | 0.0 | 7.6 | 4.0 | 2.7 | 0.0 | 0.0 | 10.0 | 8.4 | 7.9 | 0.0 | 0.0 |
| RH 1326 | 34.2 | 32.2 | **33.2** | 17.5 | 30.0 | 6.9 | 2.0 | 2.4 | 21.9 | 4.1 | 1.5 | 0.0 | 0.0 | 7.5 | 1.7 | 0.0 | 0.0 | 0.0 |
| PRO 5222 | 0.0 | 27.8 | **13.9** | 12.5 | 30.4 | 1.4 | 0.0 | 1.6 | 0.0 | 4.7 | 0.0 | 1.9 | 0.0 | 2.5 | 5.5 | 0.0 | 0.0 | 25.0 |
| 71J0003 | 19.8 | 32.2 | **26.0** | 27.5 | 0.0 | 5.5 | 1.6 | 0.0 | 20.6 | 0.0 | 1.5 | 0.0 | 0.0 | 5.0 | 3.7 | 0.0 | 5.6 | 5.0 |
| RH 1599-41 | 12.9 | 23.3 | **18.1** | 17.5 | 32.4 | 5.4 | 0.6 | 0.0 | 12.2 | 3.9 | 1.8 | 0.0 | 0.0 | 2.5 | 8.0 | 13.4 | 0.0 | 5.0 |
| NPJ 216 | 10.9 | 23.3 | **17.1** | 20.0 | 0.0 | 4.4 | 1.4 | 0.0 | 6.7 | 0.0 | 1.2 | 0.0 | 0.0 | 0.0 | 9.7 | 0.0 | 9.1 | 30.0 |
| LES 54 | 14.5 | 25.6 | **20.0** | 5.0 | 0.0 | 8.9 | 1.4 | 0.0 | 0.0 | 0.0 | 1.7 | 0.0 | 0.0 | 2.5 | 9.5 | 0.0 | 4.2 | 25.0 |
| RLC 7 | 9.8 | 23.4 | **16.6** | 17.5 | 11.3 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 13.0 | 0.0 | 4.2 | 0.0 |
| NPJ 203 | 10.9 | 31.1 | **21.0** | 25.0 | 8.2 | 14.8 | 1.6 | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 22.5 | 12.4 | 5.7 | 13.1 | 0.0 |
| RAUDT 14-09 | 0.0 | 0.0 | **0.0** | 12.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.6 | 22.5 | 11.6 | 24.9 | 1.9 | 25.0 |
| PT 303 | 0.0 | 0.0 | **0.0** | 7.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.5 | 0.0 | 0.0 | 15.0 | 20.0 | 18.4 | 24.3 | 19.3 | 0.0 |
| RH 923 | 16.0 | 35.8 | **25.9** | 20.0 | 10.7 | 12.0 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.5 | 12.1 | 4.0 | 0.0 | 0.0 |
| GSL 1 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 0.0 | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.3 | 17.4 | 3.9 | 30.0 |
| AKMS 8141 | 0.0 | 27.2 | **13.6** | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 14.5 | 3.8 | 4.2 | 0.0 |
| LES 57 | 34.0 | 28.6 | **31.3** | 17.5 | 8.7 | 12.2 | 2.0 | 0.0 | 27.0 | 4.6 | 1.9 | 0.0 | 0.0 | 0.0 | 17.4 | 4.6 | 12.1 | 0.0 |
| RTM 314 | 0.0 | 22.2 | **11.1** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 17.6 | 27.5 | 24.3 | 29.7 | 65.6 | 47.5 |
| Rohini | 34.5 | 31.1 | **32.8** | 17.5 | 9.3 | 15.2 | 2.0 | 0.0 | 15.5 | 4.1 | 1.6 | 0.0 | 0.0 | 2.5 | 17.1 | 9.9 | 6.9 | 7.0 |
| RLC 3 | 0.0 | 21.1 | **10.6** | 2.5 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 | 0.0 | 5.0 | 18.4 | 4.3 | 0.0 | 0.0 |
| RCH 1 | 0.0 | 25.6 | **12.8** | 0.0 | 33.8 | 0.0 | 0.0 | 0.0 | 0.0 | 3.7 | 0.0 | 0.0 | 0.0 | 0.0 | 20.2 | 0.0 | 4.4 | 0.0 |
| RMWR 09-1 | 4.0 | 28.9 | **16.5** | 15.0 | 30.9 | 0.9 | 0.0 | 2.2 | 0.0 | 19.3 | 0.0 | 0.0 | 0.0 | 0.0 | 10.5 | 11.6 | 0.0 | 0.0 |
| **CD(*P*=0.05)** | **2.1** | **3.6** | | **8.2** | **2.4** | **5.4** | **2.1** | **2.7** | **2.7** | **1.2** | **1.6** | **2.2** | **5.6** | **9.0** | **12.2** | **2.9** | **6.1** | **2.3** |
| **CV(%)** | **6.8** | **-** | | **28.6** | **9.1** | **28.2** | **12.3** | **31.1** | **15.6** | **11.6** | **24.7** | **44.1** | **-** | **33.5** | **54.8** | **11.6** | **31.8** | **8.7** |

**Table 4.1.4: Reaction of oilseed Brassica germplasm to powdery mildew and downy mildew (natural condition)**

| Entries | % PM severity (75 DAS) | % PM severity (100 DAS) | | | | | | % DM severity (20 DAS) | |
|---|---|---|---|---|---|---|---|---|---|
| | JAG | JHS | SKN | MOR | Mean | JAG | BPR | JHS | PNT |
| DRMR 2017-15 | 7.5 | 19.1 | 90.0 | 34.7 | **47.9** | 11.0 | 2.4 | 10.6 | 47.5 |
| MCP 626 | 0.0 | 42.8 | 85.0 | 21.1 | **49.6** | 0.0 | 1.7 | 4.9 | 42.5 |
| DRMR 1153-12 | 11.0 | 22.5 | 75.0 | 17.1 | **38.2** | 12.5 | 2.8 | 19.7 | 42.5 |
| GSH 1754 | 0.0 | 34.5 | 20.0 | 6.2 | **20.2** | 0.0 | 0.0 | 4.4 | 0.0 |
| 71 J 0002 | 8.0 | 27.5 | 65.0 | 8.0 | **33.5** | 12.5 | 2.8 | 6.7 | 52.5 |
| RH 1550 | 6.5 | 33.1 | 100.0 | 20.0 | **51.0** | 9.0 | 1.7 | 11.8 | 52.5 |
| PHR 2 | 21.0 | 26.9 | 100.0 | 6.2 | **44.4** | 24.5 | 1.3 | 4.2 | 20.0 |
| RGN 368 | 23.0 | 38.3 | 90.0 | 12.0 | **46.8** | 26.0 | 2.4 | 22.0 | 37.5 |
| DRMR 2035 | 22.5 | 23.0 | 75.0 | 8.0 | **35.3** | 25.5 | 2.1 | 5.4 | 27.5 |
| RGN 394 | 7.5 | 25.9 | 85.0 | 16.8 | **42.6** | 10.0 | 2.8 | 2.6 | 55.0 |
| RL 1359 | 23.5 | 17.1 | 90.0 | 14.0 | **40.4** | 26.5 | 2.4 | 15.0 | 37.5 |
| RTM 1624 | 27.5 | 25.1 | 0.0 | 0.0 | **8.4** | 31.0 | 0.0 | 2.8 | 0.0 |
| DLSC 1 | 24.0 | 3.3 | 0.0 | 0.0 | **1.1** | 27.0 | 0.0 | 0.0 | 0.0 |
| TS- 38 | 21.0 | 1.4 | 85.0 | 0.0 | **28.8** | 24.0 | 0.5 | 0.0 | 0.0 |
| YSB 9 | 15.0 | 3.5 | 65.0 | 0.0 | **22.8** | 16.5 | 0.5 | 2.5 | 52.5 |
| RH 919 | 13.5 | 1.8 | 85.0 | 10.0 | **32.3** | 16.5 | 2.4 | 16.9 | 32.5 |
| RH 1326 | 13.0 | 34.1 | 65.0 | 13.1 | **37.4** | 16.0 | 1.9 | 0.0 | 32.5 |
| PRO 5222 | 30.0 | 3.0 | 95.0 | 10.9 | **36.3** | 32.5 | 1.6 | 2.8 | 37.5 |
| 71J0003 | 37.5 | 19.0 | 85.0 | 17.1 | **40.4** | 41.5 | 1.7 | 14.9 | 35.0 |
| RH 1599-41 | 31.0 | 22.0 | 65.0 | 16.0 | **34.3** | 35.0 | 1.3 | 14.6 | 27.5 |
| NPJ 216 | 26.5 | 20.2 | 75.0 | 12.0 | **35.7** | 30.0 | 0.8 | 5.9 | 57.5 |
| LES 54 | 30.0 | 16.7 | 65.0 | 17.1 | **32.9** | 35.0 | 2.4 | 4.8 | 50.0 |
| RLC 7 | 22.5 | 16.8 | 75.0 | 10.9 | **34.2** | 27.5 | 3.0 | 5.8 | 62.5 |
| NPJ 203 | 21.0 | 22.2 | 75.0 | 14.0 | **37.1** | 25.0 | 1.6 | 31.0 | 27.5 |
| RAUDT 14-09 | 16.5 | 24.9 | 65.0 | 0.0 | **30.0** | 17.5 | 0.0 | 12.3 | 0.0 |
| PT 303 | 19.0 | 19.1 | - | 0.0 | **9.6** | 21.0 | 1.1 | 20.6 | 17.5 |
| RH 923 | 21.5 | 32.6 | 85.0 | 3.8 | **40.5** | 22.5 | 2.4 | 6.5 | 42.5 |
| GSL 1 | 24.0 | 18.7 | 20.0 | 5.1 | **14.6** | 27.5 | 0.7 | 4.2 | 0.0 |
| AKMS 8141 | 27.0 | 18.6 | 45.0 | 6.9 | **23.5** | 28.5 | 0.7 | 0.0 | 0.0 |
| LES 57 | 26.5 | 14.0 | 75.0 | 26.0 | **38.3** | 29.0 | 2.4 | 11.9 | 52.5 |
| RTM 314 | 12.0 | 31.9 | 5.0 | 0.0 | **12.3** | 15.0 | 0.0 | 2.5 | 0.0 |
| Rohini | 0.0 | 23.1 | 100.0 | 24.0 | **49.0** | 0.0 | 1.3 | 7.6 | 47.5 |
| RLC 3 | 5.0 | 25.2 | 85.0 | 10.0 | **40.1** | 8.0 | 1.6 | 3.0 | 42.5 |
| RCH 1 | 0.0 | 18.4 | 90.0 | 22.9 | **43.8** | 0.0 | 2.8 | 5.3 | 37.5 |
| RMWR 09-1 | 5.0 | 25.6 | 75.0 | 23.8 | **41.5** | 6.5 | 2.5 | 6.9 | 52.5 |
| **CD(*P*=0.05)** | **42.4** | **4.5** | **10.2** | **1.7** | | **48.8** | **3.3** | **3.2** | **5.5** |
| **CV (%)** | **71.4** | **12.7** | **7.2** | **4.7** | | **71.4** | **12.7** | **24.1** | **8.0** |

**Table 4.1.5: Reaction of oilseed Brassica germplasm to Alternaria Blight (artificial condition)**

| Entries | % ABL severity (75 DAS) | | | | % ABL severity (100 DAS) | | | | % ABP (100 DAS) | | | | % ABP (15 DAS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SHL | DOL | Mean | MOR | PNT | DOL | LDH | Mean | DOL | LDH | Mean | SHL | PNT |
| DRMR 2017-15 | 30.1 | 31.7 | **30.9** | 19.9 | 45.0 | 42.9 | 50.8 | **46.2** | 20.7 | 18.4 | **19.5** | 19.9 | 37.5 |
| MCP 626 | 29.2 | 29.5 | **29.3** | 15.1 | 47.5 | 38.5 | 50.4 | **45.5** | 19.5 | 16.7 | **18.1** | 18.4 | 22.5 |
| DRMR 1153-12 | 27.6 | 32.3 | **29.9** | 21.1 | 42.5 | 42.9 | 50.7 | **45.4** | 20.7 | 21.9 | **21.3** | 22.7 | 22.5 |
| GSH 1754 | 30.7 | 25.3 | **28.0** | 0.0 | 22.5 | 35.4 | 25.5 | **27.8** | 16.3 | 16.7 | **16.5** | 21.4 | 15.0 |
| 71 J 0002 | 31.2 | 36.5 | **33.8** | 2.9 | 40.0 | 47.5 | 35.6 | **41.0** | 20.7 | 25.3 | **23.0** | 23.4 | 22.5 |
| RH 1550 | 31.7 | 42.4 | **37.1** | 10.0 | 47.5 | 52.3 | 37.2 | **45.7** | 30.6 | 23.5 | **27.1** | 19.8 | 14.0 |
| PHR 2 | 29.2 | 29.9 | **29.5** | 2.2 | 32.5 | 41.0 | 47.7 | **40.4** | 20.7 | 26.1 | **23.4** | 21.9 | 22.5 |
| RGN 368 | 30.3 | 39.4 | **34.8** | 15.0 | 37.5 | 48.8 | 53.4 | **46.6** | 28.8 | 24.2 | **26.5** | 23.6 | 22.5 |
| DRMR 2035 | 31.2 | 31.3 | **31.2** | 10.9 | 37.5 | 42.2 | 48.8 | **42.8** | 21.6 | 25.9 | **23.8** | 18.9 | 27.5 |
| RGN 394 | 30.1 | 35.7 | **32.9** | 9.1 | 40.0 | 45.2 | 58.7 | **48.0** | 25.4 | 26.2 | **25.8** | 16.7 | 25.0 |
| RL 1359 | 30.8 | 34.0 | **32.4** | 10.0 | 42.5 | 43.5 | 39.1 | **41.7** | 23.9 | 26.2 | **25.1** | 21.1 | 22.5 |
| RTM 1624 | 30.3 | 34.3 | **32.3** | 20.5 | 52.5 | 44.3 | 63.8 | **53.5** | 22.1 | 31.6 | **26.8** | 19.4 | 37.5 |
| DLSC 1 | 19.8 | 34.6 | **27.2** | 2.0 | 22.5 | 44.3 | 26.7 | **31.2** | 23.4 | 10.5 | **17.0** | 9.3 | 12.5 |
| TS- 38 | 38.3 | 32.1 | **35.2** | 8.0 | 37.5 | 41.5 | 59.7 | **46.2** | 22.2 | 25.9 | **24.0** | 23.0 | 27.5 |
| YSB 9 | 30.3 | 32.6 | **31.4** | 6.2 | 32.5 | 42.9 | 45.6 | **40.3** | 22.2 | 22.7 | **22.4** | 21.5 | 25.0 |
| RH 919 | 30.4 | 30.0 | **30.2** | 15.8 | 42.5 | 39.3 | 43.5 | **41.8** | 21.6 | 18.7 | **20.1** | 20.5 | 22.5 |
| RH 1326 | 29.8 | 34.4 | **32.1** | 15.8 | 47.5 | 44.2 | 38.2 | **43.3** | 23.4 | 19.9 | **21.7** | 20.3 | 27.5 |
| PRO 5222 | 31.4 | 42.8 | **37.1** | 14.2 | 42.5 | 52.6 | 33.6 | **42.9** | 33.7 | 22.3 | **28.0** | 18.8 | 22.5 |
| 71J0003 | 28.7 | 34.8 | **31.7** | 10.0 | 35.0 | 44.2 | 35.4 | **38.2** | 25.3 | 21.2 | **23.2** | 19.4 | 22.5 |
| RH 1599-41 | 29.8 | 37.8 | **33.8** | 5.1 | 42.5 | 46.9 | 42.5 | **44.0** | 26.3 | 15.6 | **21.0** | 16.6 | 32.5 |
| NPJ 216 | 30.1 | 32.0 | **31.0** | 5.3 | 42.5 | 40.6 | 40.7 | **41.3** | 22.3 | 20.6 | **21.5** | 20.0 | 25.0 |
| LES 54 | 32.7 | 38.9 | **35.8** | 4.0 | 37.5 | 48.6 | 46.6 | **44.2** | 26.4 | 20.2 | **23.3** | 18.2 | 27.5 |
| RLC 7 | 29.4 | 37.7 | **33.5** | 2.2 | 40.0 | 46.3 | 36.7 | **41.0** | 24.0 | 21.7 | **22.9** | 19.3 | 25.0 |
| NPJ 203 | 30.3 | 37.6 | **33.9** | 10.9 | 42.5 | 46.3 | 39.5 | **42.8** | 25.7 | 26.5 | **26.1** | 19.3 | 25.0 |
| RAUDT 14-09 | 37.2 | 38.8 | **38.0** | 5.1 | 37.5 | 47.3 | 51.7 | **45.5** | 30.1 | 29.1 | **29.6** | 23.5 | 22.5 |
| PT 303 | 36.9 | 37.7 | **37.3** | 4.0 | 42.5 | 46.7 | 53.8 | **47.7** | 22.2 | 29.6 | **25.9** | 23.7 | 37.5 |
| RH 923 | 29.3 | 31.3 | **30.3** | 2.0 | 37.5 | 41.1 | 52.4 | **43.7** | 20.6 | 19.6 | **20.1** | 19.1 | 27.5 |
| GSL 1 | 26.2 | 26.2 | **26.2** | 2.0 | 27.5 | 36.2 | 41.7 | **35.1** | 15.7 | 23.1 | **19.4** | 18.8 | 22.5 |
| AKMS 8141 | 29.3 | 24.5 | **26.9** | 2.2 | 15.0 | 34.2 | 31.7 | **27.0** | 13.8 | 21.3 | **17.5** | 20.2 | 12.5 |
| LES 57 | 29.5 | 31.7 | **30.6** | 20.0 | 37.5 | 40.1 | 50.4 | **42.7** | 20.7 | 23.4 | **22.0** | 18.2 | 22.5 |
| RTM 314 | 26.8 | 35.4 | **31.1** | 10.9 | 35.0 | 45.2 | 54.9 | **45.0** | 24.3 | 29.5 | **26.9** | 18.7 | 22.5 |
| Rohini | 30.0 | 36.6 | **33.3** | 16.2 | 37.5 | 47.1 | 43.7 | **42.8** | 27.4 | 25.1 | **26.2** | 17.7 | 17.5 |
| RLC 3 | 29.3 | 34.3 | **31.8** | 16.7 | 35.0 | 44.3 | 45.2 | **41.5** | 25.2 | 23.1 | **24.2** | 19.3 | 22.5 |
| RCH 1 | 27.5 | 29.5 | **28.5** | 10.9 | 37.5 | 40.1 | 43.6 | **40.4** | 20.4 | 22.1 | **21.2** | 18.2 | 27.5 |
| RMWR 09-1 | 29.8 | 36.6 | **33.2** | 7.8 | 37.5 | 46.7 | 55.2 | **46.5** | 27.4 | 25.7 | **26.5** | 17.8 | 37.5 |
| **CD(*P*=0.05)** | **2.4** | **2.2** | | **1.8** | **6.0** | **1.9** | **6.6** | | **2.5** | **5.2** | | **2.4** | **8.4** |
| **CV (%)** | **3.5** | **3.0** | | **5.3** | **7.7** | **2.3** | **7.6** | | **4.3** | **8.9** | | **4.4** | **17.0** |

**Table 4.1.6: Reaction of oilseed Brassica germplasm to WR, SR, PM and DM (artificial condition)**

| Entries | % WR (75 DAS) | % WR severity (100 DAS) | | | | Staghead | | % Sclerotinia rot | | | | | | | | % DM (20 DAS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MOR | PNT | HSR | LDH | Mean | MOR | LDH | LDH | BPR | HSR | Mean | MOR | PNT | lesion in cms | | PNT |
| | | | | | | | | | | | | | | LDH | BPR | |
| DRMR 2017-15 | 22.9 | 27.5 | 12.3 | 1.8 | **13.9** | 3.3 | 1.7 | 95.0 | 40.9 | 40.6 | **58.8** | 0.0 | 15.9 | 15.2 | 23.2 | 52.5 |
| MCP 626 | 34.9 | 22.5 | 8.9 | 2.8 | **11.4** | 29.0 | 0.0 | 100.0 | 26.1 | 25.8 | **50.6** | 7.5 | 20.2 | 10.4 | 12.0 | 47.5 |
| DRMR 1153-12 | 35.8 | 20.0 | 40.0 | 13.7 | **24.6** | 25.0 | 2.4 | 80.0 | 40.7 | 45.2 | **55.3** | 0.0 | 12.5 | 8.4 | 13.1 | 45.0 |
| GSH 1754 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 100.0 | 23.2 | 12.9 | **45.4** | 2.5 | 5.8 | 10.0 | 6.3 | 0.0 |
| 71 J 0002 | 0.0 | 2.0 | 0.0 | 0.0 | **0.7** | 0.0 | 0.0 | 90.0 | 33.3 | 51.3 | **58.2** | 12.5 | 3.8 | 15.7 | 4.3 | 62.5 |
| RH 1550 | 24.9 | 27.5 | 31.1 | 20.3 | **26.3** | 15.8 | 2.9 | 85.0 | 30.3 | 34.8 | **50.0** | 7.5 | 9.7 | 12.0 | 4.2 | 57.5 |
| PHR 2 | 17.1 | 17.5 | 10.0 | 19.4 | **15.6** | 9.2 | 0.0 | 80.0 | 53.6 | 52.3 | **62.0** | 10.0 | 0.0 | 14.9 | 4.3 | 22.5 |
| RGN 368 | 34.9 | 30.0 | 43.4 | 20.5 | **31.3** | 33.3 | 4.5 | 90.0 | 28.4 | 78.9 | **65.8** | 7.5 | 7.8 | 9.5 | 7.6 | 42.5 |
| DRMR 2035 | 16.9 | 5.0 | 18.9 | 4.8 | **9.6** | 0.0 | 3.0 | 90.0 | 50.0 | 73.9 | **71.3** | 12.5 | 9.1 | 13.4 | 6.3 | 32.5 |
| RGN 394 | 10.9 | 17.5 | 0.0 | 1.5 | **6.3** | 16.3 | 0.0 | 90.0 | 40.9 | 34.3 | **55.1** | 15.0 | 7.6 | 7.5 | 7.2 | 60.0 |
| RL 1359 | 18.5 | 30.0 | 46.7 | 22.2 | **33.0** | 10.9 | 1.6 | 95.0 | 33.3 | 41.0 | **56.4** | 10.0 | 20.0 | 10.5 | 6.7 | 45.0 |
| RTM 1624 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 95.0 | 35.4 | 92.0 | **74.1** | 55.0 | 18.1 | 17.2 | 10.1 | 0.0 |
| DLSC 1 | 0.0 | 1.0 | 0.0 | 0.0 | **0.3** | 0.0 | 0.0 | 50.0 | 40.7 | 18.9 | **36.5** | 5.0 | 21.4 | 1.4 | 9.3 | 0.0 |
| TS- 38 | 0.0 | 7.5 | 0.0 | 0.0 | **2.5** | 0.0 | 0.0 | 100.0 | 39.3 | 76.0 | **71.8** | 80.0 | 14.6 | 16.0 | 8.2 | 0.0 |
| YSB 9 | 0.0 | 5.0 | 0.0 | 0.0 | **1.7** | 0.0 | 0.0 | 95.0 | 26.4 | 80.9 | **67.4** | 52.5 | 12.5 | 16.7 | 4.5 | 57.5 |
| RH 919 | 21.1 | 32.5 | 33.4 | 27.0 | **31.0** | 18.5 | 2.7 | 95.0 | 25.9 | 54.9 | **58.6** | 10.0 | 16.6 | 10.3 | 5.4 | 37.5 |
| RH 1326 | 35.8 | 27.5 | 32.2 | 14.8 | **24.8** | 36.5 | 0.0 | 90.0 | 34.4 | 55.8 | **60.1** | 17.5 | 21.8 | 13.4 | 5.5 | 37.5 |
| PRO 5222 | 0.0 | 20.0 | 30.0 | 9.7 | **19.9** | 0.0 | 1.5 | 95.0 | 49.4 | 41.7 | **62.0** | 15.0 | 25.6 | 4.7 | 7.6 | 45.0 |
| 71J0003 | 22.7 | 25.0 | 40.0 | 16.5 | **27.2** | 27.8 | 0.0 | 100.0 | 38.1 | 72.0 | **70.0** | 15.0 | 3.9 | 9.1 | 11.2 | 37.5 |
| RH 1599-41 | 14.9 | 27.5 | 38.9 | 16.9 | **27.8** | 27.4 | 1.0 | 100.0 | 53.6 | 74.9 | **76.2** | 27.5 | 19.1 | 19.4 | 9.8 | 30.0 |
| NPJ 216 | 11.8 | 22.5 | 35.6 | 7.7 | **21.9** | 15.8 | 0.0 | 100.0 | 41.5 | 59.4 | **67.0** | 15.0 | 22.6 | 12.2 | 9.7 | 57.5 |
| LES 54 | 10.9 | 12.5 | 31.1 | 21.4 | **21.7** | 0.0 | 2.9 | 90.0 | 25.9 | 54.8 | **56.9** | 22.5 | 17.6 | 13.5 | 8.2 | 52.5 |
| RLC 7 | 10.9 | 5.0 | 0.0 | 0.0 | **1.7** | 0.0 | 0.0 | 80.0 | 48.4 | 59.1 | **62.5** | 7.5 | 18.4 | 11.8 | 6.9 | 62.5 |
| NPJ 203 | 11.8 | 30.0 | 36.7 | 20.2 | **29.0** | 0.0 | 2.1 | 90.0 | 22.5 | 41.2 | **51.2** | 30.0 | 29.7 | 13.1 | 7.2 | 30.0 |
| RAUDT 14-09 | 0.0 | 10.0 | 0.0 | 0.0 | **3.3** | 0.0 | 0.0 | 95.0 | 23.6 | 83.7 | **67.4** | 37.5 | 23.6 | 19.0 | 4.9 | 0.0 |
| PT 303 | 0.0 | 7.5 | 0.0 | 0.0 | **2.5** | 0.0 | 0.0 | 100.0 | 34.5 | 80.4 | **71.6** | 82.5 | 25.0 | 11.1 | 9.3 | 20.0 |
| RH 923 | 18.4 | 25.0 | 31.2 | 20.8 | **25.7** | 0.0 | 0.0 | 90.0 | 29.7 | 51.7 | **57.1** | 25.0 | 55.7 | 19.1 | 6.8 | 47.5 |
| GSL 1 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 85.0 | 28.0 | 19.0 | **44.0** | 22.5 | 5.6 | 15.4 | 6.1 | 0.0 |
| AKMS 8141 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 95.0 | 35.9 | 36.6 | **55.8** | 32.5 | 12.7 | 10.2 | 9.5 | 0.0 |
| LES 57 | 35.6 | 25.0 | 30.0 | 23.7 | **26.2** | 32.9 | 0.0 | 90.0 | 38.2 | 51.5 | **59.9** | 22.5 | 23.8 | 7.9 | 12.2 | 57.5 |
| RTM 314 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 100.0 | 59.8 | 95.7 | **85.2** | 47.5 | 20.2 | 17.6 | 15.9 | 0.0 |
| Rohini | 36.2 | 27.5 | 33.4 | 20.3 | **27.1** | 23.6 | 1.8 | 100.0 | 27.7 | 71.0 | **66.2** | 7.5 | 17.5 | 13.9 | 9.6 | 52.5 |
| RLC 3 | 0.0 | 7.5 | 0.0 | 0.0 | **2.5** | 0.0 | 0.0 | 95.0 | 37.0 | 53.6 | **61.9** | 2.5 | 10.3 | 22.8 | 8.8 | 47.5 |
| RCH 1 | 0.0 | 2.0 | 0.0 | 0.0 | **0.7** | 0.0 | 0.0 | 100.0 | 30.3 | 46.2 | **58.8** | 10.0 | 8.9 | 24.6 | 9.8 | 42.5 |
| RMWR 09-1 | 6.0 | 17.5 | 35.6 | 2.2 | **18.4** | 0.0 | 3.6 | 90.0 | 39.3 | 32.5 | **53.9** | 12.5 | 14.0 | 12.9 | 13.9 | 52.5 |
| **CD(*P*=0.05)** | **6.0** | **7.6** | **3.4** | **4.1** | | **5.3** | **1.6** | **-** | **2.9** | **9.4** | | **7.3** | **21.3** | **6.6** | **-** | **7.0** |
| **CV (%)** | **18.1** | **23.0** | **8.8** | **15.9** | | **22.4** | **24.4** | **14.7** | **3.8** | **9.6** | | **14.4** | **67.8** | **24.6** | **-** | **9.2** |

**Table4.2.1: Reaction of oilseed Brassica germplasm against Alternaria blight in UDN (natural condition)**

| Code No. | Entries | % ABL | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 75 DAS | | | 100 DAS | | | | | | | | |
| | | SHL | MOR | DOL | NDH | PNT | HSR | DOL | LDH | VAR | Mean | JHS | SGN |
| UDN-18-01 | DRMR 2018-44 | 22.3 | 10.0 | 16.1 | 22.2 | 17.5 | 16.8 | 26.2 | 28.8 | 64.4 | **29.3** | 19.3 | 6.2 |
| UDN-18-02 | PAB-14-26 | 18.2 | 8.0 | 14.7 | 27.8 | 22.5 | 22.2 | 26.2 | 38.1 | 57.8 | **32.4** | 17.8 | 10.9 |
| UDN-18-03 | PAB-14-5 | 20.1 | 15.8 | 11.5 | 30.6 | 20.0 | 20.0 | 21.2 | 21.7 | 64.4 | **29.7** | 15.6 | 25.8 |
| UDN-18-04 | PAB-14-11 | 23.4 | 12.0 | 9.5 | 33.4 | 22.5 | 30.0 | 19.4 | 44.6 | 68.9 | **36.5** | 23.5 | 28.9 |
| UDN-18-05 | DRMRSJ-26 | 20.8 | 2.0 | 11.4 | 21.1 | 22.5 | 21.1 | 19.4 | 37.6 | 46.7 | **28.1** | 22.0 | 16.2 |
| UDN-18-06 | PAB-14-25 | 19.4 | 10.9 | 11.5 | 31.1 | 27.5 | 23.4 | 19.5 | 27.5 | 42.2 | **28.5** | 18.3 | 14.0 |
| UDN-18-07 | PAB-14-10 | 21.4 | 8.0 | 17.5 | 33.4 | 20.0 | 18.9 | 26.4 | 37.6 | 55.6 | **32.0** | 22.0 | 13.6 |
| UDN-18-08 | DRMRSJ-25 | 20.8 | 4.0 | 17.2 | 31.2 | 25.0 | 17.8 | 26.2 | 29.7 | 60.0 | **31.6** | 25.2 | 10.7 |
| UDN-18-09 | DRMR 5206 | 20.8 | 3.8 | 14.1 | 32.3 | 32.5 | 16.8 | 24.2 | 35.4 | 46.7 | **31.3** | 17.9 | 30.0 |
| UDN-18-10 | RMM 10-11 | 24.2 | 6.0 | 17.5 | 33.3 | 30.0 | 32.2 | 26.4 | 48.0 | 46.7 | **36.1** | 27.2 | 6.9 |
| UDN-18-11 | RMM 10-12 | 27.7 | 17.1 | 11.9 | 25.0 | 37.5 | 33.4 | 21.2 | 38.6 | 55.6 | **35.2** | 16.6 | 34.7 |
| UDN-18-12 | PDZ-4 | 26.5 | 4.0 | 23.1 | 26.7 | 32.5 | 20.0 | 32.8 | 45.6 | 55.6 | **35.5** | 19.4 | 9.6 |
| UDN-18-13 | DRMRSJ-18 | 20.6 | 8.0 | 11.5 | 45.6 | 37.5 | 21.1 | 19.5 | 40.9 | 55.6 | **36.7** | 3.2 | 12.7 |
| UDN-18-14 | PDZ-5 | 23.5 | 12.0 | 23.3 | 30.0 | 35.0 | 15.6 | 32.8 | 42.9 | 60.0 | **36.0** | 18.0 | 0.0 |
| UDN-18-15 | PRD-14-6 | 24.0 | 16.1 | 14.9 | 30.0 | 35.0 | 33.4 | 24.4 | 29.7 | 55.6 | **34.7** | 31.7 | 29.6 |
| UDN-18-16 | PDZ-3 | 23.8 | 3.8 | 23.3 | 30.0 | 32.5 | 24.5 | 32.8 | 37.3 | 55.6 | **35.4** | 22.0 | 9.3 |
| UDN-18-17 | DRMRSJ-20 | 20.3 | 5.1 | 11.4 | 30.0 | 27.5 | 22.2 | 19.7 | 23.6 | 77.8 | **33.5** | 28.9 | 33.1 |
| UDN-18-18 | PDZ-2 | 22.8 | 2.2 | 24.9 | 18.9 | 27.5 | 17.8 | 34.0 | 36.8 | 77.8 | **35.5** | 24.5 | 42.0 |
| UDN-18-19 | PDZ-7 | 23.5 | 3.8 | 24.9 | 21.7 | 32.5 | 26.7 | 34.0 | 30.4 | 68.9 | **35.7** | 30.9 | 30.9 |
| UDN-18-20 | DRMRSJ-21 | 20.6 | 1.8 | 18.3 | 33.3 | 27.5 | 18.9 | 28.5 | 21.8 | 75.6 | **34.3** | 16.1 | 43.1 |
| UDN-18-21 | DRMRIJ-12-37 | 24.4 | 16.0 | 15.4 | 36.7 | 27.5 | 27.2 | 22.6 | 34.2 | 75.6 | **37.3** | 17.1 | 49.8 |
| UDN-18-22 | DRMRIJ-12-52 | 20.3 | 16.2 | 15.5 | 35.0 | 30.0 | 23.4 | 22.6 | 31.4 | 77.8 | **36.7** | 29.4 | 45.6 |
| UDN-18-23 | DRMRSJ-1 | 22.8 | 14.9 | 16.4 | 19.4 | 22.5 | 22.2 | 25.7 | 28.2 | 75.6 | **32.3** | 31.0 | 30.9 |
| UDN-18-24 | DRMRIJ-12-27 | 22.2 | 12.0 | 17.7 | 27.8 | 30.0 | 16.8 | 26.4 | 33.8 | 64.4 | **33.2** | 16.8 | 48.4 |
| UDN-18-25 | DRMR-M-18-1 | 24.6 | 18.9 | 22.6 | 31.1 | 37.5 | 31.2 | 30.2 | 34.4 | 77.8 | **40.4** | 19.8 | 49.3 |
| UDN-18-26 | DRMRSJ-32 | 27.2 | 10.0 | 24.7 | 23.4 | 32.5 | 32.2 | 33.0 | 26.8 | 77.8 | **37.6** | 24.2 | 46.0 |
| UDN-18-27 | DRMRSJ-31(18-1-1) | 24.7 | 5.1 | 19.7 | 31.1 | 32.5 | 21.1 | 28.6 | 26.6 | 77.8 | **36.3** | 32.7 | 48.9 |
| UDN-18-28 | DRMRIJ-12-26 | 18.8 | 4.0 | 19.5 | 15.0 | 25.0 | 20.5 | 30.2 | 23.2 | 55.6 | **28.2** | 38.7 | 28.9 |
| UDN-18-29 | DRMRIJ-12-28 | 21.4 | 6.0 | 14.2 | 34.4 | 37.5 | 23.4 | 24.2 | 23.0 | 68.9 | **35.2** | 34.9 | 32.2 |
| UDN-18-30 | DRMRSJ-22 | 23.0 | 3.8 | 15.5 | 27.2 | 27.5 | 22.2 | 25.5 | 21.7 | 64.4 | **31.4** | 30.5 | 5.8 |
| UDN-18-31 | NDRS 2009-1-2 | 23.6 | 20.0 | 13.0 | 17.8 | 27.5 | 31.2 | 21.3 | 45.6 | 64.4 | **34.6** | 22.2 | 33.8 |
| UDN-18-32 | NDYS-424 | 24.4 | 19.8 | 15.4 | 30.0 | 40.0 | 33.4 | 23.3 | 28.1 | 55.6 | **35.0** | 6.4 | 44.4 |
| UDN-18-33 | DRMRSJ-33 | 21.3 | 18.9 | 14.9 | 36.7 | 32.5 | 31.7 | 22.3 | 36.7 | 64.4 | **37.4** | 2.0 | 51.3 |
| UDN-18-34 | DRMRSJ-34 | 20.4 | 18.9 | 15.0 | 32.2 | 27.5 | 18.9 | 22.1 | 31.0 | 64.4 | **32.7** | 12.9 | 46.2 |
| UDN-18-35 | DRMR 2018-35 | 20.1 | 17.8 | 15.3 | 36.7 | 32.5 | 14.5 | 24.3 | 49.0 | 77.8 | **39.1** | 2.2 | 47.6 |
| UDN-18-36 | NDRS-2011 | 20.2 | 18.2 | 22.4 | 22.2 | 32.5 | 36.7 | 28.5 | 56.4 | 77.8 | **42.3** | 1.7 | 38.9 |
| UDN-18-37 | DRMRSJ-42 | 24.7 | 17.8 | 19.7 | 33.4 | 37.5 | 33.4 | 25.4 | 23.6 | 68.9 | **37.0** | 41.9 | 32.4 |
| UDN-18-38 | DRMR 2018-37 | 22.8 | 21.1 | 24.4 | 25.5 | 30.0 | 28.9 | 32.6 | 27.2 | 55.6 | **33.3** | 28.4 | 11.1 |
| UDN-18-39 | NDRS 2008-1 | 21.2 | 14.7 | 13.1 | 33.3 | 30.0 | 32.2 | 22.1 | 25.3 | 64.4 | **34.6** | 18.3 | 28.9 |
| UDN-18-40 | DRMR 2018-41 | 19.9 | 20.2 | 11.4 | 38.9 | 37.5 | 17.8 | 21.1 | 22.4 | 60.0 | **32.9** | 11.0 | 26.7 |
| UDN-18-41 | RL 1359 | 21.7 | 20.4 | 15.4 | 32.2 | 27.5 | 34.5 | 24.2 | 52.0 | 95.6 | **44.3** | 25.5 | 32.9 |
| UDN-18-42 | PT 303 | 30.7 | 9.1 | 13.1 | 32.2 | 45.0 | 33.4 | 22.2 | 52.5 | 88.9 | **45.7** | 18.6 | 32.2 |
| UDN-18-43 | PHR 2 | 26.2 | 8.2 | 16.3 | 31.1 | 20.0 | 30.0 | 25.3 | 44.4 | 57.8 | **34.8** | 14.6 | 4.0 |
| UDN-18-44 | DLSC 1 | 14.1 | 18.7 | 14.9 | 8.9 | 10.0 | 8.9 | 22.5 | 17.9 | 60.0 | **21.4** | 15.4 | 0.0 |
| UDN-18-45 | Rohini | 21.4 | 16.4 | 17.5 | 28.9 | 30.0 | 32.2 | 26.4 | 50.2 | 60.0 | **37.9** | 16.1 | 2.4 |
| UDN-18-46 | DRMRIJ-12-44 | 20.6 | 11.2 | 22.4 | 36.7 | 32.5 | 20.0 | 30.2 | 46.2 | 46.7 | **35.4** | 4.7 | 6.7 |
| UDN-18-47 | DRMR 2035 | 26.2 | 20.2 | 24.8 | 30.0 | 30.0 | 23.4 | 33.2 | 55.8 | 68.9 | **40.2** | 32.2 | 9.1 |
| UDN-18-48 | GSL 1 | 24.2 | 0.0 | 24.4 | 29.4 | 17.5 | 7.3 | 32.2 | 49.3 | 97.8 | **38.9** | 33.0 | 29.3 |
| UDN-18-49 | YSB 9 | 29.7 | 0.0 | 25.5 | 13.4 | 35.0 | 31.7 | 35.3 | 43.4 | 97.8 | **42.7** | 19.4 | 32.0 |
| UDN-18-50 | RTM 314 | 24.5 | 20.0 | 8.4 | 16.7 | 42.5 | - | 16.3 | 56.1 | 86.7 | **43.7** | 30.8 | 26.9 |
| UDN-18-51 | JMM-991 | 23.0 | 18.9 | 11.9 | 34.5 | 32.5 | 21.1 | 21.1 | 26.3 | 91.1 | **37.8** | 22.2 | 4.7 |
| UDN-18-52 | NDRE 8-14-1 | 23.5 | 17.1 | 11.4 | 27.8 | 27.5 | 35.6 | 20.1 | 42.4 | 93.3 | **41.1** | 19.8 | 32.7 |
| UDN-18-53 | RMT-10-15 | 20.6 | 0.0 | 14.4 | 23.3 | 45.0 | 38.9 | 24.5 | 55.9 | 75.6 | **43.9** | 21.2 | 40.9 |
| UDN-18-54 | RMM-10-1-1 | 23.1 | 20.0 | 14.4 | 24.5 | 37.5 | 33.4 | 24.5 | 41.8 | 86.7 | **41.4** | 20.6 | 30.0 |
| UDN-18-55 | RMWR-09-1 | 24.2 | 10.9 | 11.9 | 31.1 | 37.5 | 28.9 | 23.2 | 42.3 | 77.8 | **40.1** | 21.2 | 38.9 |
| UDN-18-56 | RMT-10-17 | 25.6 | 20.0 | 11.7 | 21.1 | 42.5 | 40.0 | 19.8 | 56.7 | 82.2 | **43.7** | 19.0 | 49.3 |
| UDN-18-57 | DRMR-2019 | 24.5 | 15.0 | 11.7 | 38.9 | 32.5 | 25.1 | 19.8 | 32.0 | 77.8 | **37.7** | 29.2 | 28.7 |
| UDN-18-58 | RMM-09-06 | 19.4 | 20.0 | 11.4 | 43.3 | 37.5 | 29.5 | 21.1 | 36.1 | 77.8 | **40.9** | 27.5 | 46.9 |
| UDN-18-59 | DRMR-2035 | 21.2 | 20.0 | 16.3 | 27.2 | 27.5 | 22.2 | 25.8 | 51.0 | 60.0 | **35.6** | 16.6 | 46.7 |
| UDN-18-60 | RMWR-09-2 | 26.2 | 18.9 | 14.9 | 34.5 | 32.5 | 20.0 | 25.5 | 54.5 | 55.6 | **37.1** | 18.8 | 52.9 |
| UDN-18-61 | DRMRIJ-12-39 | 25.3 | 17.1 | 14.4 | 16.1 | 22.5 | 16.8 | 24.2 | 50.7 | 55.6 | **31.0** | 18.2 | 44.2 |
| **C(*P*=0.05)** | | **2.2** | **1.5** | **2.9** | **4.4** | **10.0** | **4.5** | **2.1** | **4.8** | **3.9** | | **5.9** | **3.3** |
| **CV (%)** | | **3.8** | **3.8** | **6.1** | **-** | **16.5** | **7.5** | **3.4** | **6.4** | **2.8** | | **17.7** | **5.4** |

Check: Rohini, RL 1359 (SC); DRMR-2035 (RC); PHR-2 (TC-AB), GSL-1 (RC-WR); DLSC-1 (RC-WR); YSB-9 (SC); PT-303 (RC-WR); RTM-314 (SC)

**Table4.2.2: Reaction of oilseed *Brassica* germplasm against Alternaria Pod blight in Uniform Disease Nursery (natural condition)**

| Entries | % ABP | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | POD (15 Days Before Harvest) | | | | | | | |
| | PNT | HSR | LDH | Mean | JHS | SGN | DOL | SHL (100 DAS) |
| DRMR 2018-44 | 12.5 | 11.7 | 20.6 | **14.9** | 17.4 | 8.9 | 10.3 | 16.2 |
| PAB-14-26 | 35.0 | 17.8 | 13.4 | **22.1** | 14.1 | 3.6 | 10.3 | 14.2 |
| PAB-14-5 | 17.5 | 13.4 | 17.8 | **16.2** | 10.9 | 34.7 | 7.4 | 16.8 |
| PAB-14-11 | 20.0 | 22.2 | 22.9 | **21.7** | 17.1 | 38.7 | 7.1 | 16.3 |
| DRMRSJ-26 | 12.5 | 12.8 | 23.5 | **16.3** | 13.4 | 11.8 | 7.4 | 14.6 |
| PAB-14-25 | 22.5 | 17.8 | 21.8 | **20.7** | 7.7 | 12.0 | 7.4 | 15.2 |
| PAB-14-10 | 32.5 | 14.5 | 23.1 | **23.4** | 12.0 | 10.4 | 9.6 | 16.5 |
| DRMRSJ-25 | 22.5 | 11.7 | 20.4 | **18.2** | 17.7 | 4.2 | 9.4 | 16.8 |
| DRMR 5206 | 22.5 | 13.4 | 23.9 | **19.9** | 13.5 | 18.7 | 9.2 | 15.9 |
| RMM 10-11 | 25.0 | 27.2 | 22.9 | **25.0** | 20.8 | 2.9 | 10.1 | 16.3 |
| RMM 10-12 | 27.5 | 25.1 | 27.1 | **26.6** | 6.9 | 34.2 | 8.8 | 17.5 |
| PDZ-4 | 22.5 | 16.8 | 21.7 | **20.3** | 11.1 | 5.6 | 17.5 | 18.3 |
| DRMRSJ-18 | 25.0 | 20.0 | 24.2 | **23.1** | 1.8 | 8.2 | 7.4 | 16.7 |
| PDZ-5 | 22.5 | 10.6 | 21.0 | **18.0** | 18.4 | 0.0 | 17.5 | 14.5 |
| PRD-14-6 | 32.5 | 26.7 | 21.7 | **27.0** | 21.6 | 21.6 | 10.3 | 14.9 |
| PDZ-3 | 22.5 | 17.8 | 21.6 | **20.6** | 20.9 | 4.4 | 17.5 | 14.6 |
| DRMRSJ-20 | 12.5 | 15.6 | 21.5 | **16.5** | 23.6 | 8.9 | 7.4 | 16.2 |
| PDZ-2 | 12.5 | 11.7 | 19.6 | **14.6** | 15.5 | 6.7 | 17.7 | 15.3 |
| PDZ-7 | 22.5 | 22.2 | 21.0 | **21.9** | 24.1 | 20.4 | 17.7 | 14.3 |
| DRMRSJ-21 | 22.5 | 13.4 | 18.8 | **18.2** | 14.1 | 32.9 | 10.1 | 15.6 |
| DRMRIJ-12-37 | 27.5 | 21.1 | 18.0 | **22.2** | 17.6 | 29.1 | 10.9 | 14.5 |
| DRMRIJ-12-52 | 17.5 | 12.8 | 20.5 | **16.9** | 20.0 | 24.0 | 10.9 | 14.3 |
| DRMRSJ-1 | 27.5 | 15.6 | 24.4 | **22.5** | 24.2 | 0.0 | 10.9 | 16.1 |
| DRMRIJ-12-27 | 22.5 | 13.4 | 26.3 | **20.7** | 14.1 | 30.4 | 12.4 | 13.5 |
| DRMR-M-18-1 | 22.5 | 25.1 | 18.1 | **21.9** | 9.2 | 35.8 | 17.6 | 14.5 |
| DRMRSJ-32 | 12.5 | 26.7 | 22.3 | **20.5** | 12.2 | 36.9 | 18.2 | 15.5 |
| DRMRSJ-31(18-1-1) | 32.5 | 16.8 | 24.4 | **24.6** | 25.4 | 33.8 | 12.3 | 15.2 |
| DRMRIJ-12-26 | 32.5 | 20.0 | 21.4 | **24.6** | 30.6 | 12.0 | 12.3 | 14.6 |
| DRMRIJ-12-28 | 42.5 | 17.8 | 18.7 | **26.3** | 27.3 | 19.6 | 11.0 | 15.6 |
| DRMRSJ-22 | 27.5 | 18.9 | 18.1 | **21.5** | 19.1 | 0.0 | 10.9 | 13.6 |
| NDRS 2009-1-2 | 32.5 | 23.4 | 21.6 | **25.8** | 13.5 | 11.3 | 9.5 | 14.3 |
| NDYS-424 | 22.5 | 22.2 | 23.8 | **22.8** | 6.3 | 11.1 | 10.9 | 13.2 |
| DRMRSJ-33 | 27.5 | 25.1 | 18.0 | **23.5** | 1.7 | 41.8 | 10.7 | 13.8 |
| DRMRSJ-34 | 22.5 | 12.3 | 21.4 | **18.7** | 17.6 | 31.1 | 10.7 | 14.0 |
| DRMR 2018-35 | 17.5 | 10.6 | 28.1 | **18.7** | 1.7 | 24.9 | 10.9 | 13.7 |
| NDRS-2011 | 27.5 | 31.7 | 25.2 | **28.1** | 0.0 | 20.4 | 17.6 | 14.3 |
| DRMRSJ-42 | 27.5 | 28.9 | 20.1 | **25.5** | 35.8 | 8.7 | 12.3 | 13.5 |
| DRMR 2018-37 | 25.0 | 23.4 | 25.1 | **24.5** | 23.7 | 0.0 | 17.6 | 14.5 |
| NDRS 2008-1 | 25.0 | 26.7 | 19.7 | **23.8** | 23.5 | 23.8 | 9.5 | 15.5 |
| DRMR 2018-41 | 22.5 | 15.6 | 20.5 | **19.5** | 8.0 | 10.2 | 8.7 | 16.2 |
| RL 1359 | 32.5 | 30.0 | 29.2 | **30.6** | 16.5 | 11.3 | 10.9 | 14.3 |
| PT 303 | 37.5 | 29.5 | 26.9 | **31.3** | 13.1 | 27.8 | 9.5 | 20.3 |
| PHR 2 | 22.5 | 22.2 | 18.5 | **21.1** | 9.6 | 0.0 | 10.9 | 15.5 |
| DLSC 1 | 7.5 | 6.7 | 10.2 | **8.1** | 12.4 | 0.0 | 10.7 | 8.7 |
| Rohini | 25.0 | 27.2 | 20.5 | **24.2** | 10.0 | 0.0 | 12.4 | 14.6 |
| DRMRIJ-12-44 | 32.5 | 13.4 | 26.5 | **24.1** | 2.8 | 10.2 | 17.6 | 15.5 |
| DRMR 2035 | 25.0 | 18.9 | 30.6 | **24.8** | 25.4 | 9.6 | 17.6 | 17.1 |
| GSL 1 | 17.5 | 5.0 | 33.3 | **18.6** | 24.4 | 31.8 | 17.6 | 15.6 |
| YSB 9 | 37.5 | 25.1 | 25.2 | **29.3** | 10.6 | 12.7 | 20.1 | 22.9 |
| RTM 314 | 47.5 | - | 31.5 | **39.5** | 22.0 | 0.0 | 6.0 | 14.3 |
| JMM-991 | 22.5 | 13.4 | 21.6 | **19.2** | 21.1 | 4.2 | 8.5 | 11.3 |
| NDRE 8-14-1 | 32.5 | 30.0 | 21.7 | **28.1** | 20.1 | 26.9 | 8.5 | 14.3 |
| RMT-10-15 | 42.5 | 31.7 | 28.7 | **34.3** | 20.4 | 29.6 | 8.7 | 13.6 |
| RMM-10-1-1 | 42.5 | 26.7 | 27.7 | **32.3** | 14.3 | 9.6 | 8.7 | 15.1 |
| RMWR-09-1 | 27.5 | 23.4 | 21.5 | **24.1** | 20.8 | 9.3 | 8.5 | 12.8 |
| RMT-10-17 | 32.5 | 28.4 | 24.6 | **28.5** | 14.3 | 23.6 | 7.4 | 14.3 |
| DRMR-2019 | 27.5 | 20.0 | 24.3 | **23.9** | 29.5 | 8.9 | 7.4 | 13.6 |
| RMM-09-06 | 27.5 | 21.1 | 28.0 | **25.5** | 20.8 | 2.4 | 7.4 | 14.6 |
| DRMR-2035 | 32.5 | 18.9 | 22.3 | **24.6** | 12.0 | 7.1 | 10.3 | 14.8 |
| RMWR-09-2 | 37.5 | 15.6 | 20.2 | **24.4** | 14.0 | 38.7 | 10.3 | 13.7 |
| DRMRIJ-12-39 | 32.5 | 11.7 | 31.3 | **25.2** | 10.1 | 31.6 | 8.7 | 14.7 |
| **CD(*P*=0.05)** | **3.5** | **5.0** | **3.2** | | **3.6** | **2.5** | **2.8** | **2.0** |
| **CV (%)** | **6.6** | **9.7** | **5.6** | | **14.3** | **5.9** | **7.2** | **4.4** |

**Table 4.2.3: Reaction of oilseed Brassica germplasm to white rust and Sclerotinia rot under UDN (natural condition)**

| Entries | % WR | | | | | | | Stage head (100 DAS) | | | % SR | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 75 DAS | 100 DAS | | | | | | | | | | | | | |
| | MOR | NDH | PNT | HSR | LDH | Mean | SGN | SGN | LDH | MOR | NDH | MOR | PNT | SGN | VAR |
| DRMR 2018-44 | 19.6 | 27.8 | 20.0 | 0.0 | 3.3 | **12.8** | 0.0 | 0.0 | 2.4 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PAB-14-26 | 35.3 | 27.8 | 20.0 | 31.1 | 17.0 | **24.0** | 10.0 | 4.2 | 5.3 | 27.8 | 0.0 | 10.0 | 0.0 | 4.2 | 0.0 |
| PAB-14-5 | 1.4 | 27.8 | 20.0 | 5.0 | 1.1 | **13.5** | 28.7 | 12.6 | 1.2 | 0.0 | 0.0 | 0.0 | 9.0 | 4.2 | 0.0 |
| PAB-14-11 | 33.3 | 33.9 | 25.0 | 40.0 | 20.9 | **29.9** | 12.9 | 0.0 | 0.0 | 26.0 | 0.0 | 17.5 | 4.8 | 4.5 | 0.0 |
| DRMRSJ-26 | 0.0 | 11.7 | 20.0 | 1.7 | 0.0 | **8.4** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.1 | 0.0 | 20.0 |
| PAB-14-25 | 31.8 | 28.3 | 22.5 | 25.1 | 17.1 | **23.3** | 8.4 | 3.6 | 0.0 | 13.8 | 0.0 | 0.0 | 9.9 | 3.6 | 15.0 |
| PAB-14-10 | 21.2 | 31.7 | 15.0 | 8.4 | 3.7 | **14.7** | 9.8 | 0.0 | 0.0 | 9.2 | 0.0 | 0.0 | 0.0 | 3.3 | 10.0 |
| DRMRSJ-25 | 0.0 | 20.0 | 20.0 | 0.0 | 0.0 | **10.0** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.5 | 0.0 | 0.0 |
| DRMR 5206 | 0.0 | 19.5 | 27.5 | 0.0 | 0.0 | **11.8** | 28.2 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 20.5 | 4.5 | 15.0 |
| RMM 10-11 | 17.1 | 12.2 | 25.0 | 38.9 | 15.7 | **23.0** | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 | 11.6 | 0.0 | 0.0 |
| RMM 10-12 | 33.8 | 31.1 | 25.0 | 41.1 | 14.7 | **28.0** | 9.8 | 0.0 | 2.7 | 18.2 | 0.0 | 0.0 | 9.7 | 8.3 | 5.0 |
| PDZ-4 | 0.0 | 30.6 | 10.0 | 1.7 | 0.0 | **10.6** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.6 | 0.0 | 10.0 |
| DRMRSJ-18 | 17.3 | 8.3 | 17.5 | 0.0 | 0.0 | **6.5** | 47.6 | 26.1 | 0.0 | 0.0 | 0.0 | 0.0 | 7.6 | 7.4 | 0.0 |
| PDZ-5 | 6.4 | 0.0 | 17.5 | 2.8 | 0.0 | **5.1** | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 0.0 | 5.5 | 7.8 | 10.0 |
| PRD-14-6 | 35.8 | 25.0 | 1.0 | 30.0 | 27.4 | **20.8** | 12.4 | 0.0 | 4.3 | 30.9 | 0.0 | 0.0 | 12.4 | 0.0 | 15.0 |
| PDZ-3 | 0.0 | 0.0 | 30.0 | 0.0 | 0.0 | **7.5** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.3 | 0.0 | 20.0 |
| DRMRSJ-20 | 13.4 | 19.4 | 17.5 | 2.8 | 11.5 | **12.8** | 13.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.7 | 4.3 | 0.0 |
| PDZ-2 | 0.0 | 0.0 | 5.0 | 5.0 | 0.0 | **2.5** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.7 | 0.0 | 15.0 |
| PDZ-7 | 0.0 | 15.0 | 2.5 | 1.7 | 0.0 | **4.8** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 3.9 | 5.0 |
| DRMRSJ-21 | 0.0 | 13.9 | 15.0 | 2.8 | 0.0 | **7.9** | 7.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.3 | 4.9 | 10.0 |
| DRMRIJ-12-37 | 0.0 | 7.2 | 5.0 | 0.0 | 0.0 | **3.1** | 28.9 | 4.4 | 0.0 | 0.0 | 4.1 | 0.0 | 3.7 | 0.0 | 10.0 |
| DRMRIJ-12-52 | 2.3 | 27.8 | 22.5 | 26.7 | 10.9 | **22.0** | 11.3 | 0.0 | 2.0 | 0.0 | 0.0 | 5.0 | 22.4 | 4.8 | 0.0 |
| DRMRSJ-1 | 8.2 | 7.8 | 10.0 | 10.6 | 0.0 | **7.1** | 10.2 | 8.3 | 3.6 | 0.0 | 0.0 | 0.0 | 14.9 | 0.0 | 10.0 |
| DRMRIJ-12-27 | 14.2 | 18.3 | 12.5 | 8.9 | 0.0 | **9.9** | 29.8 | 3.9 | 0.0 | 0.0 | 0.0 | 0.0 | 23.6 | 3.9 | 10.0 |
| DRMR-M-18-1 | 35.1 | 34.5 | 27.5 | 30.0 | 19.2 | **27.8** | 10.7 | 0.0 | 1.9 | 18.9 | 0.0 | 5.0 | 6.0 | 6.8 | 15.0 |
| DRMRSJ-32 | 34.0 | 19.4 | 22.5 | 27.2 | 5.3 | **18.6** | 30.4 | 4.2 | 2.7 | 19.5 | 4.0 | 0.0 | 13.0 | 4.2 | 10.0 |
| DRMRSJ-31 (18-1-1) | 9.6 | 20.0 | 22.5 | 22.2 | 0.0 | **16.2** | 49.6 | 11.4 | 3.5 | 21.5 | 0.0 | 0.0 | 12.7 | 7.6 | 10.0 |
| DRMRIJ-12-26 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | **0.5** | 9.6 | 4.1 | 0.0 | 0.0 | 0.0 | 0.0 | 10.1 | 9.8 | 0.0 |
| DRMRIJ-12-28 | 0.0 | 0.0 | 7.5 | 2.8 | 0.0 | **2.6** | 7.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 21.2 | 13.1 | 0.0 |
| DRMRSJ-22 | 14.9 | 0.0 | 17.5 | 0.0 | 0.0 | **4.4** | 0.0 | 0.0 | 0.0 | 9.3 | 0.0 | 0.0 | 6.0 | 4.5 | 0.0 |
| NDRS 2009-1-2 | 34.0 | 42.2 | 22.5 | 38.9 | 17.3 | **30.2** | 0.0 | 0.0 | 5.1 | 59.9 | 0.0 | 0.0 | 3.2 | 6.4 | 10.0 |
| NDYS-424 | 0.0 | 15.0 | 20.0 | 36.7 | 3.1 | **18.7** | 10.4 | 0.0 | 3.3 | 0.0 | 0.0 | 12.5 | 11.3 | 0.0 | 5.0 |
| DRMRSJ-33 | 34.0 | 33.3 | 17.5 | 34.5 | 7.0 | **23.1** | 34.0 | 8.0 | 3.7 | 16.0 | 0.0 | 7.5 | 8.0 | 4.0 | 0.0 |
| DRMRSJ-34 | 16.5 | 16.1 | 20.0 | 0.0 | 1.5 | **9.4** | 32.0 | 4.1 | 0.0 | 0.0 | 0.0 | 17.5 | 13.1 | 6.1 | 0.0 |
| DRMR 2018-35 | 10.9 | 15.0 | 20.0 | 8.9 | 4.9 | **12.2** | 30.7 | 11.6 | 5.1 | 0.0 | 0.0 | 7.5 | 12.7 | 3.9 | 10.0 |
| NDRS-2011 | 10.0 | 21.1 | 22.5 | 42.2 | 8.4 | **23.5** | 10.0 | 0.0 | 2.5 | 0.0 | 0.0 | 7.5 | 0.0 | 0.0 | 0.0 |
| DRMRSJ-42 | 7.2 | 28.4 | 25.0 | 30.0 | 4.3 | **21.9** | 30.2 | 4.2 | 19.9 | 0.0 | 0.0 | 0.0 | 13.8 | 0.0 | 0.0 |
| DRMR 2018-37 | 4.2 | 16.1 | 2.5 | 13.4 | 0.0 | **8.0** | 32.4 | 4.6 | 0.0 | 0.0 | 0.0 | 7.5 | 7.7 | 9.1 | 0.0 |
| NDRS 2008-1 | 19.7 | 31.7 | 27.5 | 41.1 | 8.5 | **27.2** | 52.4 | 19.3 | 5.7 | 9.6 | 0.0 | 10.0 | 6.9 | 3.9 | 0.0 |
| DRMR 2018-41 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | **0.3** | 11.6 | 3.6 | 0.0 | 0.0 | 0.0 | 12.5 | 11.8 | 0.0 | 10.0 |
| RL 1359 | 10.0 | 23.9 | 22.5 | 36.7 | 20.7 | **25.9** | 0.0 | 0.0 | 3.1 | 0.0 | 0.0 | 87.5 | 13.7 | 0.0 | 45.0 |
| PT 303 | 0.0 | 0.0 | 15.0 | 0.0 | 0.0 | **3.8** | 0.0 | 0.0 | 0.0 | 0.0 | 8.8 | 92.5 | 21.9 | 11.3 | 40.0 |
| PHR 2 | 35.3 | 25.0 | 12.5 | 22.2 | 25.8 | **21.4** | 27.1 | 18.0 | 0.0 | 31.7 | 0.0 | 20.0 | 15.9 | 9.0 | 15.0 |
| DLSC 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 87.5 | 17.3 | 0.0 | 10.0 |
| Rohini | 30.9 | 28.9 | 20.0 | 43.4 | 20.7 | **28.3** | 8.9 | 0.0 | 5.4 | 18.3 | 0.0 | 22.5 | 20.9 | 8.5 | 10.0 |
| DRMRIJ-12-44 | 0.0 | 0.0 | 2.0 | 2.8 | 0.0 | **1.2** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.0 | 18.3 | 0.0 | 10.0 |
| DRMR 2035 | 0.0 | 24.4 | 7.5 | 12.3 | 12.9 | **14.3** | 31.8 | 4.5 | 2.6 | 0.0 | 0.0 | 0.0 | 9.5 | 6.8 | 10.0 |
| GSL 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 92.5 | 21.4 | 22.1 | 40.0 |
| YSB 9 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | **0.5** | 0.0 | 0.0 | 0.0 | 0.0 | 38.7 | 97.5 | 25.2 | 5.7 | 40.0 |
| RTM 314 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 30.0 | 4.0 | 0.0 | 0.0 | 26.6 | 95.0 | 19.0 | 0.0 | 0.0 |
| JMM-991 | 22.9 | 28.3 | 5.0 | 0.0 | 10.5 | **10.9** | 30.7 | 0.0 | 2.0 | 24.6 | 0.0 | 12.5 | 22.8 | 8.0 | 30.0 |
| NDRE 8-14-1 | 16.0 | 36.7 | 17.5 | 41.1 | 14.4 | **27.4** | 8.7 | 4.5 | 3.3 | 13.4 | 0.0 | 15.0 | 16.2 | 9.0 | 10.0 |
| RMT-10-15 | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | **1.5** | 29.8 | 0.0 | 0.0 | 0.0 | 14.9 | 100.0 | 17.9 | 8.6 | 10.0 |
| RMM-10-1-1 | 30.7 | 21.7 | 25.0 | 36.7 | 20.1 | **25.9** | 0.0 | 0.0 | 2.9 | 16.7 | 0.0 | 20.0 | 14.2 | 8.9 | 10.0 |
| RMWR-09-1 | 6.4 | 35.6 | 20.0 | 16.8 | 6.0 | **19.6** | 9.3 | 0.0 | 1.2 | 0.0 | 0.0 | 27.5 | 7.9 | 8.3 | 0.0 |
| RMT-10-17 | 0.0 | 0.0 | 15.0 | 0.0 | 0.0 | **3.8** | 35.6 | 0.0 | 0.0 | 0.0 | 12.3 | 92.5 | 16.2 | 0.0 | 0.0 |
| DRMR-2019 | 8.0 | 31.1 | 22.5 | 17.8 | 10.3 | **20.4** | 49.8 | 4.3 | 6.8 | 0.0 | 0.0 | 5.0 | 13.4 | 6.3 | 0.0 |
| RMM-09-06 | 7.6 | 36.7 | 1.0 | 30.0 | 0.0 | **16.9** | 32.4 | 3.9 | 2.5 | 0.0 | 0.0 | 7.5 | 8.9 | 0.0 | 0.0 |
| DRMR-2035 | 3.3 | 6.1 | 3.5 | 20.0 | 0.0 | **7.4** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.0 | 0.0 | 3.7 | 0.0 |
| RMWR-09-2 | 33.6 | 35.0 | 20.0 | 36.7 | 15.1 | **26.7** | 49.3 | 4.2 | 0.0 | 24.3 | 0.0 | 7.5 | 10.9 | 10.7 | 0.0 |
| DRMRIJ-12-39 | 18.9 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 | 11.9 | 0.0 | 0.0 | 0.0 | 17.1 | 0.0 |
| **CD(*P*=0.05)** | **7.9** | **3.9** | **7.9** | **7.4** | **4.5** | | **2.2** | **1.3** | **2.9** | **3.0** | **4.1** | **5.2** | **4.3** | **2.9** | **-** |
| **CV (%)** | **25.4** | **-** | **26.2** | **20.8** | **22.9** | | **5.9** | **10.5** | **29.8** | **16.3** | **-** | **14.6** | **19.6** | **14.1** | **-** |

* Data of JHS for WR and NDH for SR excluded due to no disease in all entries included susceptible check except few

**Table 4.2.4: Reaction of oilseed Brassica germplasm to Downy mildew and Powdery mildew (natural condition)**

| Entries | % DM severity (20 DAS) | | % PM severity (75 DAS) | % Powdery mildew severity (100 DAS) | | | | |
|---|---|---|---|---|---|---|---|---|
| | JHS | PNT | JAG | SKN | JHS | Mean | JAG | MOR |
| DRMR 2018-44 | 2.6 | 42.5 | 9.0 | 95.0 | 14.6 | **54.8** | 12.0 | 19.8 |
| PAB-14-26 | 5.0 | 37.5 | 14.0 | 95.0 | 35.9 | **65.5** | 6.0 | 40.9 |
| PAB-14-5 | 5.7 | 17.5 | 16.5 | 95.0 | 34.6 | **64.8** | 17.5 | 20.0 |
| PAB-14-11 | 13.3 | 37.5 | 13.0 | 100.0 | 30.6 | **65.3** | 15.0 | 26.0 |
| DRMRSJ-26 | 5.8 | 27.5 | 8.0 | 95.0 | 40.6 | **67.8** | 10.0 | 16.4 |
| PAB-14-25 | 4.7 | 32.5 | 9.0 | 100.0 | 31.6 | **65.8** | 10.0 | 20.2 |
| PAB-14-10 | 11.3 | 37.5 | 13.0 | 85.0 | 23.2 | **54.1** | 17.5 | 22.0 |
| DRMRSJ-25 | 7.4 | 35.0 | 10.0 | 90.0 | 30.3 | **60.2** | 12.5 | 24.9 |
| DRMR 5206 | 9.6 | 32.5 | 16.0 | 65.0 | 25.2 | **45.1** | 17.5 | 13.1 |
| RMM 10-11 | 11.5 | 17.5 | 17.5 | 65.0 | 44.7 | **54.8** | 21.0 | 16.0 |
| RMM 10-12 | 13.8 | 27.5 | 13.0 | 70.0 | 29.9 | **50.0** | 15.0 | 27.1 |
| PDZ-4 | 0.0 | 37.5 | 10.0 | 85.0 | 22.1 | **53.6** | 13.5 | 30.9 |
| DRMRSJ-18 | 4.1 | 27.5 | 13.0 | 75.0 | 13.2 | **44.1** | 15.0 | 31.1 |
| PDZ-5 | 21.1 | 47.5 | 14.0 | 90.0 | 1.9 | **46.0** | 17.5 | 20.2 |
| PRD-14-6 | 5.1 | 47.5 | 11.0 | 90.0 | 4.0 | **47.0** | 12.5 | 9.1 |
| PDZ-3 | 11.6 | 22.5 | 10.5 | 90.0 | 26.1 | **58.0** | 12.5 | 4.0 |
| DRMRSJ-20 | 0.0 | 37.5 | 15.0 | 100.0 | 18.3 | **59.2** | 19.0 | 17.1 |
| PDZ-2 | 2.7 | 22.5 | 16.5 | 85.0 | 2.4 | **43.7** | 20.0 | 2.0 |
| PDZ-7 | 0.0 | 37.5 | 11.0 | 85.0 | 22.6 | **53.8** | 14.0 | 4.9 |
| DRMRSJ-21 | 3.1 | 27.5 | 13.0 | 90.0 | 15.9 | **53.0** | 15.0 | 18.0 |
| DRMRIJ-12-37 | 2.9 | 32.5 | 8.5 | 65.0 | 30.1 | **47.6** | 10.0 | 20.0 |
| DRMRIJ-12-52 | 5.1 | 37.5 | 11.0 | 85.0 | 23.1 | **54.1** | 12.5 | 30.2 |
| DRMRSJ-1 | 13.2 | 27.5 | 24.5 | 85.0 | 42.8 | **63.9** | 27.5 | 34.0 |
| DRMRIJ-12-27 | 4.9 | 37.5 | 0.0 | 85.0 | 34.5 | **59.8** | 0.0 | 8.0 |
| DRMR-M-18-1 | 5.2 | 47.5 | 5.0 | 100.0 | 12.2 | **56.1** | 9.0 | 18.0 |
| DRMRSJ-32 | 0.0 | 17.5 | 23.0 | 65.0 | 15.1 | **40.1** | 25.0 | 17.3 |
| DRMRSJ-31 (18-1-1) | 0.0 | 27.5 | 17.0 | 80.0 | 19.5 | **49.7** | 20.0 | 26.9 |
| DRMRIJ-12-26 | 19.4 | 17.5 | 11.0 | 75.0 | 24.1 | **49.6** | 15.0 | 17.1 |
| DRMRIJ-12-28 | 6.7 | 47.5 | 15.0 | 85.0 | 3.7 | **44.4** | 17.5 | 20.9 |
| DRMRSJ-22 | 7.6 | 62.5 | 11.0 | 75.0 | 37.1 | **56.1** | 13.5 | 26.0 |
| NDRS 2009-1-2 | 20.3 | 47.5 | 9.5 | 80.0 | 43.0 | **61.5** | 11.0 | 8.0 |
| NDYS-424 | 15.6 | 42.5 | 16.5 | 85.0 | 32.4 | **58.7** | 17.5 | 10.9 |
| DRMRSJ-33 | 15.6 | 37.5 | 11.0 | 75.0 | 23.6 | **49.3** | 15.0 | 9.1 |
| DRMRSJ-34 | 20.5 | 32.5 | 0.0 | 65.0 | 34.1 | **49.6** | 0.0 | 5.1 |
| DRMR 2018-35 | 15.4 | 32.5 | 13.0 | 95.0 | 32.4 | **63.7** | 15.0 | 20.0 |
| NDRS-2011 | 0.0 | 40.0 | 10.0 | 95.0 | 21.0 | **58.0** | 13.5 | 18.9 |
| DRMRSJ-42 | 19.0 | 32.5 | 12.0 | 90.0 | 28.5 | **59.3** | 12.5 | 9.2 |
| DRMR 2018-37 | 5.2 | 37.5 | 17.0 | 95.0 | 17.4 | **56.2** | 20.0 | 34.0 |
| NDRS 2008-1 | 22.1 | 47.5 | 16.0 | 80.0 | 23.5 | **51.8** | 20.0 | 27.8 |
| DRMR 2018-41 | 16.1 | 37.5 | 0.0 | 65.0 | 25.4 | **45.2** | 0.0 | 39.8 |
| RL 1359 | 15.5 | 37.5 | 11.0 | 92.5 | 31.9 | **62.2** | 12.5 | 42.0 |
| PT 303 | 0.0 | 7.5 | 9.0 | - | 19.8 | **19.8** | 9.0 | 11.8 |
| PHR 2 | 0.0 | 12.5 | 8.0 | 80.0 | 17.1 | **48.6** | 9.0 | 10.9 |
| DLSC 1 | 2.6 | 0.0 | 0.0 | 0.0 | 18.7 | **9.4** | 0.0 | 10.9 |
| Rohini | 2.6 | 37.5 | 15.5 | 95.0 | 27.6 | **61.3** | 17.5 | 10.0 |
| DRMRIJ-12-44 | 30.2 | 22.5 | 21.0 | 55.0 | 31.8 | **43.4** | 23.5 | 33.3 |
| DRMR 2035 | 10.8 | 27.5 | 8.5 | 65.0 | 22.6 | **43.8** | 9.5 | 4.0 |
| GSL 1 | 6.6 | 0.0 | 0.0 | 40.0 | 13.3 | **26.7** | 0.0 | 0.0 |
| YSB 9 | 4.8 | 27.5 | 14.0 | 50.0 | 25.5 | **37.8** | 15.0 | 0.0 |
| RTM 314 | 0.0 | 0.0 | 0.0 | 12.5 | 13.4 | **13.0** | 0.0 | 0.0 |
| JMM-991 | 4.7 | 32.5 | 14.0 | 80.0 | 24.1 | **52.1** | 15.0 | 21.1 |
| NDRE 8-14-1 | 0.0 | 27.5 | 10.5 | 70.0 | 19.2 | **44.6** | 11.0 | 22.2 |
| RMT-10-15 | 2.5 | 27.5 | 22.0 | - | 22.8 | **22.8** | 25.0 | 0.0 |
| RMM-10-1-1 | 2.5 | 32.5 | 8.0 | 95.0 | 2.5 | **48.8** | 9.0 | 15.8 |
| RMWR-09-1 | 9.7 | 42.5 | 11.5 | 90.0 | 23.1 | **56.6** | 12.0 | 2.0 |
| RMT-10-17 | 2.5 | 7.5 | 0.0 | 80.0 | 45.3 | **62.7** | 0.0 | 10.9 |
| DRMR-2019 | 2.3 | 37.5 | 23.0 | 75.0 | 27.3 | **51.2** | 25.0 | 8.0 |
| RMM-09-06 | 0.0 | 37.5 | 9.0 | 80.0 | 12.0 | **46.0** | 10.0 | 21.1 |
| DRMR-2035 | 7.6 | 37.5 | 10.0 | 90.0 | 20.2 | **55.1** | 14.0 | 18.9 |
| RMWR-09-2 | 2.9 | 32.5 | 15.5 | 85.0 | 22.7 | **53.9** | 23.0 | 27.8 |
| DRMRIJ-12-39 | 0.0 | 82.5 | 0.0 | 55.0 | 19.6 | **37.3** | 0.0 | 26.0 |
| **CD(*P*=0.05)** | **2.1** | **6.8** | **45.2** | **10.2** | **3.9** | | **52.6** | **1.3** |
| **CV (%)** | **17.7** | **10.2** | **65.7** | **6.4** | **10.4** | | **65.7** | **2.8** |

**Table 4.3.1: Reaction of oilseed Brassica germplasm against AB in NDN for Alternaria blight (artificial condition)**

| Code No. | Entries | % AB severity | | | | | | | | | | | % ABP (15 Days Before Harvesting) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 75 DAS | | | | | 100 DAS | | | | | | | | | | | |
| | | SHL | MOR | PNT | DOL | Mean | PNT | DOL | LDH | KPR | HSR | Mean | PNT | LDH | HSR | Mean | DOL | SHL (100 DAS) |
| NDN-18-01 | DRMRSJ-26 | 26.6 | 18.2 | 22.5 | 23.7 | **22.7** | 37.5 | 29.2 | 36.7 | 36.0 | 22.2 | **32.3** | 27.5 | 21.5 | 18.9 | **22.6** | 12.3 | 16.3 |
| NDN-18-02 | DRMR 2018-41 | 25.1 | 19.6 | 17.5 | 21.6 | **20.9** | 27.5 | 26.1 | 43.5 | 38.2 | 23.4 | **31.7** | 22.5 | 22.5 | 20.0 | **21.7** | 12.3 | 15.1 |
| NDN-18-03 | DRMRSJ-25 | 26.8 | 19.1 | 22.5 | 23.4 | **22.9** | 27.5 | 29.2 | 32.7 | 30.6 | 21.1 | **28.2** | 22.5 | 22.8 | 17.8 | **21.0** | 13.4 | 16.2 |
| NDN-18-04 | DRMR 2018-35 | 27.3 | 19.2 | 27.5 | 21.6 | **23.9** | 37.5 | 26.1 | 48.7 | 32.7 | 27.8 | **34.5** | 27.5 | 26.8 | 22.2 | **25.5** | 12.3 | 16.0 |
| NDN-18-05 | DRMR 5206 | 26.2 | 14.9 | 17.5 | 21.7 | **20.1** | 30.0 | 26.1 | 60.3 | 26.2 | 17.8 | **32.1** | 22.5 | 29.0 | 16.8 | **22.8** | 12.3 | 14.6 |
| NDN-18-06 | DRMR-M-18-1 | 28.3 | 6.0 | 20.0 | 23.3 | **19.4** | 35.0 | 29.2 | 51.6 | 4.8 | 33.4 | **30.8** | 35.0 | 30.8 | 26.7 | **30.8** | 13.4 | 16.2 |
| NDN-18-07 | DRMR 2018-44 | 27.6 | 4.0 | 27.5 | 21.6 | **20.2** | 32.5 | 26.1 | 55.6 | 10.6 | 35.6 | **32.1** | 37.5 | 29.4 | 25.1 | **30.7** | 12.3 | 15.4 |
| NDN-18-08 | RH 1599-40 | 26.2 | 17.8 | 17.5 | 30.9 | **23.1** | 45.0 | 37.3 | 56.9 | 25.4 | 16.8 | **36.3** | 32.5 | 27.5 | 13.4 | **24.5** | 17.6 | 14.2 |
| NDN-18-09 | DRMR 2018-37 | 26.8 | 12.0 | 20.0 | 21.8 | **20.1** | 40.0 | 26.1 | 47.6 | 20.4 | 20.0 | **30.8** | 25.0 | 24.6 | 15.6 | **21.7** | 12.3 | 16.3 |
| NDN-18-10 | PAB-14-5 | 28.2 | 18.9 | 22.5 | 25.9 | **23.9** | 37.5 | 31.7 | 61.3 | 36.6 | 32.2 | **39.9** | 27.5 | 29.2 | 23.4 | **26.7** | 15.2 | 17.3 |
| NDN-18-11 | DRMRSJ-42 | 27.5 | 20.9 | 15.0 | 26.5 | **22.5** | 37.5 | 31.8 | 45.3 | 42.7 | 21.1 | **35.7** | 25.0 | 22.0 | 11.7 | **19.6** | 15.2 | 14.4 |
| NDN-18-12 | DRMRSJ-22 | 26.3 | 6.0 | 22.5 | 23.9 | **19.7** | 32.5 | 29.2 | 30.6 | 12.6 | 18.9 | **24.8** | 25.0 | 21.0 | 16.8 | **20.9** | 12.3 | 15.2 |
| NDN-18-13 | DRMRSJ-1 | 27.3 | 12.2 | 27.5 | 25.5 | **23.1** | 42.5 | 30.7 | 34.5 | 16.4 | 25.1 | **29.8** | 25.0 | 21.7 | 17.8 | **21.5** | 13.5 | 16.5 |
| NDN-18-14 | DRMRSJ-32 | 28.6 | 19.8 | 17.5 | 34.4 | **25.1** | 47.5 | 39.8 | 56.4 | 37.2 | 22.2 | **40.6** | 30.0 | 31.3 | 11.7 | **24.3** | 20.5 | 15.5 |
| NDN-18-15 | DRMRSJ-20 | 26.4 | 16.2 | 22.5 | 21.9 | **21.7** | 35.0 | 26.2 | 48.4 | 36.2 | 25.1 | **34.2** | 27.5 | 26.0 | 20.0 | **24.5** | 12.3 | 16.6 |
| NDN-18-16 | DRMRSJ-33 | - | 14.0 | 20.0 | 24.9 | **19.6** | 35.0 | 30.9 | 51.5 | 38.2 | 28.9 | **36.9** | 32.5 | 24.1 | 21.1 | **25.9** | 13.5 | - |
| NDN-18-17 | DRMRSJ-21 | 27.4 | 14.9 | 22.5 | 24.9 | **22.4** | 30.0 | 30.9 | 46.5 | 21.6 | 8.4 | **27.5** | 25.0 | 22.1 | 5.0 | **17.4** | 13.5 | 16.7 |
| NDN-18-18 | DRMRSJ-18 | 26.2 | 19.1 | 22.5 | 23.1 | **22.7** | 45.0 | 26.3 | 58.2 | 18.2 | 13.4 | **32.2** | 25.0 | 26.3 | 10.0 | **20.4** | 13.4 | 16.6 |
| NDN-18-19 | DRMRSJ-34 | 27.3 | 20.9 | 22.5 | 26.5 | **24.3** | 32.5 | 31.8 | 35.4 | 32.6 | 16.8 | **29.8** | 27.5 | 21.4 | 13.4 | **20.8** | 15.2 | 14.7 |
| NDN-18-20 | DRMRSJ-31 (18-1-1) | 28.4 | 17.1 | 22.5 | 23.7 | **22.9** | 35.0 | 29.2 | 49.4 | 19.2 | 32.2 | **33.0** | 27.5 | 23.4 | 22.2 | **24.4** | 12.3 | 16.7 |
| NDN-18-21 | PAB-14-16 | 26.7 | 16.0 | 27.5 | 25.5 | **23.9** | 35.0 | 30.7 | 38.8 | 14.8 | 30.0 | **29.8** | 22.5 | 23.7 | 20.5 | **22.2** | 13.5 | 14.6 |
| NDN-18-22 | RMWR-09-5 | 27.2 | 18.2 | 27.5 | 25.5 | **24.6** | 42.5 | 30.7 | 52.3 | 12.6 | 22.2 | **32.0** | 35.0 | 25.7 | 18.9 | **26.5** | 13.5 | 15.4 |
| NDN-18-23 | PAB14-17 | 27.9 | 20.7 | 32.5 | 26.2 | **26.8** | 47.5 | 31.7 | 48.9 | 36.4 | 33.4 | **39.6** | 35.0 | 26.0 | 21.1 | **27.4** | 15.2 | 15.3 |
| NDN-18-24 | RMWR-09-1 | 27.0 | 19.3 | 32.5 | 28.0 | **26.7** | 45.0 | 33.6 | 52.8 | 37.2 | 27.8 | **39.3** | 32.5 | 23.7 | 22.2 | **26.1** | 17.2 | 16.2 |
| NDN-18-25 | Rohini | 26.2 | 20.0 | 27.5 | 26.1 | **24.9** | 45.0 | 31.7 | 44.5 | 31.2 | 36.7 | **37.8** | 32.5 | 24.4 | 24.5 | **27.1** | 15.2 | 15.6 |
| NDN-18-26 | PAB-2016-5 | 28.5 | 15.9 | 27.5 | 27.5 | **24.9** | 40.0 | 33.6 | 41.7 | 18.4 | 8.4 | **28.4** | 27.5 | 22.3 | 6.7 | **18.8** | 17.2 | 14.7 |
| NDN-18-27 | PAB-14-14 | 27.2 | 9.1 | 27.5 | 27.5 | **22.8** | 37.5 | 33.6 | 40.6 | 18.8 | 20.0 | **30.1** | 22.5 | 22.5 | 13.4 | **19.5** | 17.2 | 14.4 |
| NDN-18-28 | PAB 2016-2 | 27.3 | 5.1 | 27.5 | 24.9 | **21.2** | 42.5 | 30.7 | 51.3 | 16.2 | 36.7 | **35.5** | 32.5 | 25.6 | 31.2 | **29.8** | 13.5 | 15.4 |
| **CD(*P*=0.05)** | | **-** | **3.6** | **3.2** | **2.9** | | **6.1** | **2.8** | **6.1** | **1.7** | **5.0** | | **8.8** | **2.8** | **5.1** | | **2.9** | **-** |
| **CV (%)** | | **2.8** | **7.6** | **6.5** | **4.8** | | **8.0** | **4.0** | **6.8** | **6.9** | **8.3** | | **15.4** | **4.5** | **9.9** | | **6.3** | **-** |

Check: Rohini (SC)

**Table 4.3.2: Reaction of oilseed Brassica germplasm against WR, DM, PM & SR in NDN for Alternaria blight (natural condition)**

| Entries | % WR severity | | | | Stag Head | | % DM severity | % PM severity | % SR incidence | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 75 DAS | 100 DAS | | | | | | | | | |
| | MOR | PNT | HSR | LDH | MOR | LDH | PNT | MOR | MOR | LDH | PNT |
| DRMRSJ-26 | 0.0 | 22.5 | 0.0 | 0.0 | 0.0 | 0.0 | 22.5 | 10.0 | 0.0 | 0.0 | 3.2 |
| DRMR 2018-41 | 0.0 | 7.5 | 0.0 | 2.2 | 0.0 | 0.0 | 12.5 | 10.9 | 2.5 | 0.0 | 1.8 |
| DRMRSJ-25 | 0.0 | 22.5 | 0.0 | 0.0 | 0.0 | 0.0 | 25.0 | 14.9 | 0.0 | 3.9 | 4.7 |
| DRMR 2018-35 | 6.9 | 7.5 | 21.1 | 2.7 | 0.0 | 3.5 | 20.0 | 16.2 | 5.0 | 0.0 | 8.7 |
| DRMR 5206 | 0.0 | 22.5 | 0.0 | 0.0 | 0.0 | 0.0 | 42.5 | 8.0 | 7.5 | 0.0 | 6.0 |
| DRMR-M-18-1 | 9.1 | 25.0 | 38.9 | 9.3 | 0.0 | 5.1 | 32.5 | 17.1 | 10.0 | 11.0 | 3.2 |
| DRMR 2018-44 | 33.1 | 17.5 | 35.6 | 5.9 | 25.7 | 6.4 | 32.5 | 25.1 | 10.0 | 6.0 | 6.8 |
| RH 1599-40 | 2.9 | 7.5 | 5.0 | 2.4 | 9.3 | 4.6 | 32.5 | 17.1 | 15.0 | 0.0 | 24.2 |
| DRMR 2018-37 | 0.0 | 7.5 | 0.0 | 0.0 | 0.0 | 0.0 | 42.5 | 10.9 | 10.0 | 0.0 | 8.0 |
| PAB-14-5 | 1.4 | 22.5 | 30.0 | 2.1 | 0.0 | 1.8 | 32.5 | 6.9 | 27.5 | 0.0 | 4.6 |
| DRMRSJ-42 | 14.9 | 7.5 | 4.5 | 10.4 | 10.5 | 0.0 | 27.5 | 6.0 | 5.0 | 5.8 | 1.9 |
| DRMRSJ-22 | 0.0 | 7.5 | 1.7 | 0.0 | 0.0 | 0.0 | 32.5 | 20.0 | 2.5 | 0.0 | 3.2 |
| DRMRSJ-1 | 0.0 | 17.5 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | 7.5 | 5.9 | 5.5 |
| DRMRSJ-32 | 4.7 | 17.5 | 21.1 | 0.0 | 10.4 | 2.8 | 22.5 | 22.0 | 25.0 | 4.2 | 10.0 |
| DRMRSJ-20 | 12.7 | 22.5 | 27.2 | 0.0 | 12.4 | 0.0 | 32.5 | 14.0 | 7.5 | 0.0 | 4.7 |
| DRMRSJ-33 | 11.3 | 17.5 | 20.5 | 0.0 | 14.4 | 4.7 | 32.5 | 15.8 | 7.5 | 16.6 | 1.9 |
| DRMRSJ-21 | 2.0 | 17.5 | 0.0 | 0.0 | 0.0 | 1.3 | 32.5 | 5.1 | 7.5 | 2.1 | 0.0 |
| DRMRSJ-18 | 0.0 | 17.5 | 0.0 | 0.0 | 0.0 | 4.3 | 32.5 | 18.9 | 2.5 | 7.1 | 1.7 |
| DRMRSJ-34 | 0.0 | 17.5 | 0.0 | 0.0 | 0.0 | 0.0 | 17.5 | 16.2 | 7.5 | 2.4 | 4.2 |
| DRMRSJ-31 (18-1-1) | 1.1 | 22.5 | 30.0 | 0.0 | 0.0 | 5.4 | 37.5 | 20.9 | 2.5 | 5.3 | 1.7 |
| PAB-14-16 | 12.2 | 17.5 | 33.4 | 3.7 | 0.0 | 1.6 | 42.5 | 8.4 | 10.0 | 7.0 | 6.0 |
| RMWR-09-5 | 12.0 | 17.5 | 20.0 | 0.0 | 0.0 | 4.7 | 42.5 | 20.2 | 7.5 | 0.0 | 5.1 |
| PAB14-17 | 10.0 | 22.5 | 36.7 | 4.3 | 0.0 | 2.0 | 27.5 | 10.9 | 12.5 | 0.0 | 9.3 |
| RMWR-09-1 | 8.2 | 25.0 | 30.0 | 7.4 | 0.0 | 5.4 | 17.5 | 15.1 | 7.5 | 3.8 | 4.8 |
| Rohini | 22.2 | 7.5 | 31.1 | 2.4 | 11.2 | 2.1 | 42.5 | 17.1 | 20.0 | 5.6 | 0.0 |
| PAB-2016-5 | 8.7 | 20.0 | 5.0 | 0.0 | 0.0 | 0.0 | 27.5 | 11.6 | 17.5 | 7.2 | 9.3 |
| PAB-14-14 | 17.3 | 25.0 | 32.2 | 11.3 | 22.2 | 0.0 | 32.5 | 20.5 | 0.0 | 0.0 | 2.6 |
| PAB 2016-2 | 36.2 | 17.5 | 38.9 | 20.4 | 28.3 | 6.4 | 32.5 | 10.9 | 10.0 | 11.7 | 7.0 |
| **CD(*P*=0.05)** | **5.2** | **6.4** | **6.0** | **2.1** | **2.5** | **2.5** | **6.4** | **1.5** | **14.4** | **6.2** | **3.8** |
| **CV (%)** | **19.6** | **18.1** | **15.1** | **16.4** | **16.4** | **19.1** | **10.4** | **3.2** | **50.5** | **37.6** | **32.8** |

**Table 4.4.1: Reaction of oilseed Brassica germplasm against AB in NDN for White Rust (natural condition)**

| Code No | Entries | % AB severity (75 DAS) | % AB severity (100 DAS) | | | % ABP | | |
|---|---|---|---|---|---|---|---|---|
| | | MOR | PNT | HSR | Mean | PNT | HSR | Mean |
| NDN-18-29 | DRMR-2019 | 5.1 | 25.0 | 36.7 | **30.9** | 17.5 | 22.2 | **19.9** |
| NDN-18-30 | DRMR-2035 | 3.8 | 25.0 | 28.9 | **27.0** | 15.0 | 20.0 | **17.5** |
| NDN-18-31 | DRMRIJ 12-37 | 20.2 | 25.0 | 22.2 | **23.6** | 27.5 | 16.8 | **22.2** |
| NDN-18-32 | DRMRIJ 12-21 | 2.0 | 22.5 | 21.1 | **21.8** | 22.5 | 15.6 | **19.1** |
| NDN-18-33 | DRMR-5206 | 18.9 | 32.5 | 20.0 | **26.3** | 22.5 | 13.4 | **18.0** |
| NDN-18-34 | DRMRIJ 12-27 | 22.0 | 27.5 | 28.9 | **28.2** | 32.5 | 17.8 | **25.2** |
| NDN-18-35 | DRMRIJ 12-14 | 21.0 | 30.0 | 30.0 | **30.0** | 22.5 | 21.1 | **21.8** |
| NDN-18-36 | DRMRSJ-9-1-1 | 20.2 | 30.0 | 35.6 | **32.8** | 22.5 | 22.2 | **22.4** |
| NDN-18-37 | DRMRIJ 12-06 | 20.5 | 27.5 | 23.4 | **25.5** | 17.5 | 16.8 | **17.2** |
| NDN-18-38 | DRMRJA 35 | 4.0 | 22.5 | 25.1 | **23.8** | 27.5 | 18.9 | **23.2** |
| NDN-18-39 | DRMRIJ 12-26 | 14.0 | 20.0 | 26.7 | **23.4** | 15.0 | 15.6 | **15.3** |
| NDN-18-40 | DRMRIJ 12-39 | 10.0 | 30.0 | 27.8 | **28.9** | 32.5 | 18.9 | **25.7** |
| NDN-18-41 | DRMRIJ-16-124-1 | 16.4 | 27.5 | 29.5 | **28.5** | 15.0 | 17.8 | **16.4** |
| NDN-18-42 | DRMRIJ-16-7-1 | 18.0 | 27.5 | 27.2 | **27.4** | 17.5 | 20.5 | **19.0** |
| NDN-18-43 | DRMRIJ-16-99-2 | 16.9 | 25.0 | 21.1 | **23.1** | 17.5 | 14.5 | **16.0** |
| NDN-18-44 | DRMRIJ-16-19-2 | 18.9 | 22.5 | 24.5 | **23.5** | 17.5 | 16.8 | **17.2** |
| NDN-18-45 | DRMRSJ-26 | 20.0 | 25.0 | 25.1 | **25.1** | 12.5 | 11.7 | **12.1** |
| NDN-18-46 | DRMRIJ-16-28-1 | 20.0 | 25.0 | 20.0 | **22.5** | 17.5 | 15.6 | **16.6** |
| NDN-18-47 | DRMRSJ-25 | 16.0 | 25.0 | 17.8 | **21.4** | 12.5 | 18.9 | **15.7** |
| NDN-18-48 | DRMRIJ-16-94-1 | 19.5 | 27.5 | 23.4 | **25.5** | 27.5 | 13.4 | **20.5** |
| NDN-18-49 | DRMRIJ-16-112-1 | 18.9 | 27.5 | 18.9 | **23.2** | 32.5 | 12.8 | **22.7** |
| NDN-18-50 | DRMR 5206 | 16.2 | 35.0 | 16.8 | **25.9** | 32.5 | 14.5 | **23.5** |
| NDN-18-51 | PDZ-5 | 19.9 | 27.5 | 10.0 | **18.8** | 22.5 | 8.4 | **15.5** |
| NDN-18-52 | DRMRIJ-16-274-2 | 20.2 | 32.5 | 21.1 | **26.8** | 27.5 | 10.6 | **19.1** |
| NDN-18-53 | PDZ-4 | 19.9 | 27.5 | 28.9 | **28.2** | 27.5 | 20.0 | **23.8** |
| NDN-18-54 | NPJ-220 | 19.2 | 27.5 | 35.6 | **31.6** | 32.5 | 22.2 | **27.4** |
| NDN-18-55 | NPJ-217 | 10.9 | 32.5 | 33.4 | **33.0** | 37.5 | 21.1 | **29.3** |
| NDN-18-56 | PDZ-3 | 20.4 | 30.0 | 22.2 | **26.1** | 37.5 | 16.8 | **27.2** |
| NDN-18-57 | NPJ-218 | 18.2 | 30.0 | 36.7 | **33.4** | 27.5 | 18.9 | **23.2** |
| NDN-18-58 | PDZ-2 | 20.0 | 25.0 | 23.4 | **24.2** | 22.5 | 17.8 | **20.2** |
| NDN-18-59 | NPJ-219 | 13.1 | 30.0 | 32.2 | **31.1** | 17.5 | 15.6 | **16.6** |
| NDN-18-60 | DRMRIJ-16-131-1 | 20.3 | 27.5 | 30.0 | **28.8** | 17.5 | 20.0 | **18.8** |
| NDN-18-61 | DRMRSJ-22 | 14.0 | 22.5 | 20.5 | **21.5** | 22.5 | 11.7 | **17.1** |
| NDN-18-62 | DRMR 2018-41 | 3.8 | 25.0 | 18.9 | **22.0** | 22.5 | 12.8 | **17.7** |
| NDN-18-63 | DRMRSJ-33 | 17.1 | 30.0 | 31.7 | **30.9** | 22.5 | 18.9 | **20.7** |
| NDN-18-64 | DRMRSJ-42 | 16.0 | 32.5 | 26.7 | **29.6** | 15.0 | 16.8 | **15.9** |
| NDN-18-65 | DRMRSJ-34 | 9.1 | 30.0 | 24.5 | **27.3** | 15.0 | 15.6 | **15.3** |
| NDN-18-66 | DRMR 2018-35 | 20.0 | 25.0 | 27.2 | **26.1** | 12.5 | 17.8 | **15.2** |
| NDN-18-67 | DRMRSJ-31 (18-1-1) | 19.6 | 27.5 | 28.4 | **28.0** | 27.5 | 21.1 | **24.3** |
| NDN-18-68 | DRMR 2018-37 | 19.7 | 30.0 | 25.1 | **27.6** | 22.5 | 16.8 | **19.7** |
| NDN-18-69 | DRMRSJ-32 | 10.9 | 35.0 | 23.4 | **29.2** | 20.0 | 20.0 | **20.0** |
| NDN-18-70 | DRMR 2018-44 | 21.1 | 27.5 | 28.9 | **28.2** | 20.0 | 12.3 | **16.2** |
| NDN-18-71 | RH 1400 | 20.0 | 25.0 | 27.8 | **26.4** | 22.5 | 22.2 | **22.4** |
| NDN-18-72 | PDZ-7 | 20.9 | 27.5 | 20.0 | **23.8** | 17.5 | 12.8 | **15.2** |
| NDN-18-73 | PAB-14-5 | 12.2 | 27.5 | 24.5 | **26.0** | 12.5 | 13.4 | **13.0** |
| NDN-18-74 | RH 1700 | 2.9 | 42.5 | 26.7 | **34.6** | 22.5 | 18.9 | **20.7** |
| NDN-18-75 | RH 1231 | 20.0 | 32.5 | 29.5 | **31.0** | 17.5 | 16.8 | **17.2** |
| NDN-18-76 | RH 1700-2 | 19.1 | 32.5 | 27.2 | **29.9** | 22.5 | 11.7 | **17.1** |
| NDN-18-77 | RH 1235 | 16.0 | 32.5 | 30.0 | **31.3** | 27.5 | 20.5 | **24.0** |
| NDN-18-78 | RH 1400-1 | 19.8 | 27.5 | 17.8 | **22.7** | 32.5 | 13.4 | **23.0** |
| NDN-18-79 | RH 1700-1 | 18.0 | 35.0 | 16.8 | **25.9** | 22.5 | 12.8 | **17.7** |
| NDN-18-80 | PAB-14-17 | 19.6 | 27.5 | 20.5 | **24.0** | 27.5 | 14.5 | **21.0** |
| NDN-18-81 | DRMRIJ 12-48 | 19.8 | 42.5 | 25.1 | **33.8** | 27.5 | 15.6 | **21.6** |
| NDN-18-82 | DRMRSJ-18 | 14.9 | 37.5 | 29.5 | **33.5** | 17.5 | 17.8 | **17.7** |
| NDN-18-83 | DRMRSJ-1 | 19.7 | 25.0 | 27.8 | **26.4** | 22.5 | 18.9 | **20.7** |
| NDN-18-84 | DRMRIJ 12-41 | 19.6 | 32.5 | 23.4 | **28.0** | 27.5 | 16.8 | **22.2** |
| NDN-18-85 | DRMRSJ-20 | 20.0 | 27.5 | 22.2 | **24.9** | 17.5 | 11.7 | **14.6** |
| NDN-18-86 | DRMRIJ 12-50 | 10.9 | 27.5 | 27.2 | **27.4** | 22.5 | 20.5 | **21.5** |
| NDN-18-87 | DRMRIJ 12-44 | 21.1 | 30.0 | 21.1 | **25.6** | 27.5 | 14.5 | **21.0** |
| NDN-18-88 | DRMRIJ 12-40 | 20.2 | 22.5 | 20.5 | **21.5** | 22.5 | 15.6 | **19.1** |
| NDN-18-89 | DRMRIJ 12-52 | 16.0 | 32.5 | 30.0 | **31.3** | 22.5 | 8.4 | **15.5** |
| NDN-18-90 | DRMRSJ-21 | 20.9 | 22.5 | 20.0 | **21.3** | 17.5 | 12.8 | **15.2** |
| NDN-18-91 | PRD-17-3 | 21.1 | 25.0 | 32.2 | **28.6** | 12.5 | 20.0 | **16.3** |
| NDN-18-92 | Rohini | 16.1 | 35.0 | 35.6 | **35.3** | 27.5 | 22.2 | **24.9** |
| NDN-18-93 | DRMR 2035 | 20.2 | 25.0 | 30.0 | **27.5** | 17.5 | 17.8 | **17.7** |
| NDN-18-94 | RMWR-09-1 | 8.2 | 27.5 | 33.4 | **30.5** | 27.5 | 20.5 | **24.0** |
| NDN-18-95 | PRD-17-2 | 20.2 | 20.0 | 24.5 | **22.3** | 17.5 | 21.1 | **19.3** |
| NDN-18-96 | BIOYSR | 14.0 | 30.0 | 26.7 | **28.4** | 22.5 | 18.9 | **20.7** |
| NDN-18-97 | RMWR-09-5 | 19.9 | 25.0 | 21.1 | **23.1** | 17.5 | 13.4 | **15.5** |
| NDN-18-98 | PRD-17-1 | 19.9 | 15.0 | 22.2 | **18.6** | 12.5 | 10.6 | **11.6** |
| **CD(*P*=0.05)** | | **1.6** | **7.3** | **4.6** | | **4.7** | **4.7** | |
| **CV (%)** | | **3.3** | **13.0** | **7.7** | | **10.6** | **9.8** | |

Check: Rohini (SC); Bioysr, DRMR-2035 (RC)

**Table 4.4.2: Reaction of oilseed Brassica germplasm to WR (artificial condition), DM, PM & SR (natural condition) NDN for White Rust**

| Entries | % WR severity on leaf (100 DAS) | | | | Stag Head | % DM severity | % PM severity | % SR incidence | |
|---|---|---|---|---|---|---|---|---|---|
| | MOR | PNT | HSR | Mean | MOR | PNT | MOR | MOR | PNT |
| DRMR-2019 | 35.6 | 20.0 | 38.9 | **31.5** | 9.6 | 37.5 | 14.9 | 7.5 | 2.3 |
| DRMR-2035 | 8.0 | 12.5 | 16.8 | **12.4** | 10.1 | 47.5 | 18.9 | 7.5 | 0.0 |
| DRMRIJ 12-37 | 30.4 | 3.5 | 0.0 | **11.3** | 22.5 | 37.5 | 25.1 | 10.0 | 1.0 |
| DRMRIJ 12-21 | 0.0 | 1.0 | 0.0 | **0.3** | 0.0 | 37.5 | 16.2 | 25.0 | 3.9 |
| DRMR-5206 | 0.0 | 2.0 | 0.0 | **0.7** | 0.0 | 37.5 | 21.1 | 15.0 | 3.7 |
| DRMRIJ 12-27 | 4.2 | 22.5 | 20.0 | **15.6** | 0.0 | 32.5 | 10.9 | 60.0 | 6.0 |
| DRMRIJ 12-14 | 0.0 | 22.5 | 31.1 | **17.9** | 0.0 | 52.5 | 16.0 | 50.0 | 2.5 |
| DRMRSJ-9-1-1 | 37.3 | 27.5 | 38.9 | **34.6** | 24.7 | 42.5 | 16.0 | 20.0 | 3.4 |
| DRMRIJ 12-06 | 2.0 | 2.0 | 15.6 | **6.5** | 0.0 | 42.5 | 8.0 | 60.0 | 7.8 |
| DRMRJA 35 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 42.5 | 10.9 | 15.0 | 7.5 |
| DRMRIJ 12-26 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 27.5 | 14.9 | 5.0 | 4.2 |
| DRMRIJ 12-39 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 32.5 | 26.0 | 10.0 | 0.0 |
| DRMRIJ-16-124-1 | 0.0 | 3.5 | 0.0 | **1.2** | 0.0 | 22.5 | 21.1 | 5.0 | 3.8 |
| DRMRIJ-16-7-1 | 0.0 | 1.0 | 20.0 | **7.0** | 0.0 | 22.5 | 17.1 | 10.0 | 1.5 |
| DRMRIJ-16-99-2 | 1.6 | 20.0 | 31.7 | **17.8** | 0.0 | 27.5 | 20.9 | 30.0 | 7.5 |
| DRMRIJ-16-19-2 | 2.9 | 2.0 | 0.0 | **1.6** | 0.0 | 32.5 | 24.2 | 95.0 | 3.8 |
| DRMRSJ-26 | 2.0 | 22.5 | 0.0 | **8.2** | 0.0 | 22.5 | 18.9 | 5.0 | 0.0 |
| DRMRIJ-16-28-1 | 6.7 | 17.5 | 28.9 | **17.7** | 0.0 | 32.5 | 18.0 | 15.0 | 6.3 |
| DRMRSJ-25 | 0.0 | 22.5 | 0.0 | **7.5** | 0.0 | 17.5 | 12.2 | 10.0 | 2.8 |
| DRMRIJ-16-94-1 | 13.1 | 10.0 | 2.8 | **8.6** | 17.7 | 12.5 | 8.0 | 5.0 | 7.3 |
| DRMRIJ-16-112-1 | 4.0 | 5.0 | 0.0 | **3.0** | 0.0 | 22.5 | 8.0 | 20.0 | 10.1 |
| DRMR 5206 | 2.0 | 20.0 | 0.0 | **7.3** | 0.0 | 27.5 | 9.1 | 5.0 | 7.7 |
| PDZ-5 | 5.1 | 5.0 | 0.0 | **3.4** | 0.0 | 12.5 | 22.9 | 30.0 | 5.3 |
| DRMRIJ-16-274-2 | 0.0 | 22.5 | 0.0 | **7.5** | 23.2 | 32.5 | 24.0 | 10.0 | 12.5 |
| PDZ-4 | 10.0 | 15.0 | 21.1 | **15.4** | 0.0 | 12.5 | 21.1 | 5.0 | 7.3 |
| NPJ-220 | 11.8 | 25.0 | 38.9 | **25.2** | 25.2 | 22.5 | 25.1 | 35.0 | 10.5 |
| NPJ-217 | 37.1 | 25.0 | 41.1 | **34.4** | 38.2 | 32.5 | 22.2 | 15.0 | 3.7 |
| PDZ-3 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 22.5 | 29.3 | 25.0 | 5.1 |
| NPJ-218 | 20.2 | 25.0 | 43.4 | **29.5** | 15.0 | 22.5 | 24.0 | 10.0 | 1.7 |
| PDZ-2 | 3.1 | 2.0 | 14.5 | **6.5** | 0.0 | 22.5 | 26.9 | 5.0 | 2.4 |
| NPJ-219 | 34.2 | 27.5 | 36.7 | **32.8** | 34.6 | 27.5 | 30.0 | 5.0 | 5.8 |
| DRMRIJ-16-131-1 | 6.9 | 5.0 | 35.6 | **15.8** | 0.0 | 22.5 | 30.0 | 5.0 | 13.2 |
| DRMRSJ-22 | 2.9 | 17.5 | 0.0 | **6.8** | 0.0 | 27.5 | 54.0 | 5.0 | 8.8 |
| DRMR 2018-41 | 9.3 | 12.5 | 0.0 | **7.3** | 0.0 | 37.5 | 43.8 | 0.0 | 11.6 |
| DRMRSJ-33 | 34.2 | 22.5 | 33.4 | **30.0** | 38.2 | 7.5 | 26.9 | 5.0 | 2.6 |
| DRMRSJ-42 | 36.7 | 32.5 | 34.5 | **34.6** | 35.8 | 37.5 | 29.1 | 2.5 | 9.8 |
| DRMRSJ-34 | 29.4 | 20.0 | 0.0 | **16.5** | 0.0 | 22.5 | 32.5 | 7.5 | 3.7 |
| DRMR 2018-35 | 12.7 | 12.5 | 14.5 | **13.2** | 16.8 | 32.5 | 36.0 | 7.5 | 15.7 |
| DRMRSJ-31 (18-1-1) | 5.3 | 22.5 | 30.0 | **19.3** | 36.7 | 22.5 | 35.3 | 2.5 | 6.7 |
| DRMR 2018-37 | 2.9 | 25.0 | 0.0 | **9.3** | 0.0 | 32.5 | 34.0 | 2.5 | 5.1 |
| DRMRSJ-32 | 33.8 | 22.5 | 28.9 | **28.4** | 29.3 | 12.5 | 30.9 | 12.5 | 8.9 |
| DRMR 2018-44 | 5.1 | 27.5 | 14.5 | **15.7** | 0.0 | 32.5 | 26.0 | 25.0 | 0.0 |
| RH 1400 | 0.0 | 1.0 | 0.0 | **0.3** | 0.0 | 37.5 | 22.2 | 10.0 | 1.5 |
| PDZ-7 | 0.0 | 5.0 | 0.0 | **1.7** | 0.0 | 27.5 | 28.9 | 20.0 | 5.5 |
| PAB-14-5 | 24.7 | 17.5 | 0.0 | **14.1** | 25.4 | 37.5 | 44.2 | 50.0 | 3.1 |
| RH 1700 | 0.0 | 2.0 | 0.0 | **0.7** | 0.0 | 22.5 | 3.8 | 90.0 | 13.3 |
| RH 1231 | 7.8 | 10.0 | 12.3 | **10.0** | 8.4 | 42.5 | 34.2 | 32.5 | 13.4 |
| RH 1700-2 | 0.0 | 7.5 | 0.0 | **2.5** | 0.0 | 27.5 | 39.1 | 30.0 | 7.2 |
| RH 1235 | 2.7 | 17.5 | 30.0 | **16.7** | 0.0 | 37.5 | 52.0 | 22.5 | 10.5 |
| RH 1400-1 | 0.0 | 5.0 | 0.0 | **1.7** | 0.0 | 37.5 | 47.8 | 15.0 | 1.7 |
| RH 1700-1 | 9.8 | 17.5 | 0.0 | **9.1** | 0.0 | 27.5 | 22.9 | 90.0 | 16.7 |
| PAB-14-17 | 2.0 | 15.0 | 2.8 | **6.6** | 0.0 | 17.5 | 16.0 | 17.5 | 9.3 |
| DRMRIJ 12-48 | 0.0 | 2.0 | 0.0 | **0.7** | 0.0 | 32.5 | 14.9 | 60.0 | 6.9 |
| DRMRSJ-18 | 21.1 | 17.5 | 0.0 | **12.9** | 10.8 | 17.5 | 41.1 | 47.5 | 1.5 |
| DRMRSJ-1 | 2.0 | 17.5 | 0.0 | **6.5** | 0.0 | 17.5 | 26.0 | 17.5 | 1.9 |
| DRMRIJ 12-41 | 0.0 | 5.0 | 0.0 | **1.7** | 0.0 | 32.5 | 30.9 | 20.0 | 7.3 |
| DRMRSJ-20 | 2.9 | 17.5 | 0.0 | **6.8** | 0.0 | 27.5 | 21.1 | 15.0 | 4.9 |
| DRMRIJ 12-50 | 2.9 | 3.5 | 32.2 | **12.9** | 0.0 | 17.5 | 40.7 | 15.0 | 14.5 |
| DRMRIJ 12-44 | 0.0 | 2.0 | 7.8 | **3.3** | 0.0 | 27.5 | 17.1 | 7.5 | 5.8 |
| DRMRIJ 12-40 | 2.0 | 15.0 | 4.5 | **7.2** | 0.0 | 27.5 | 32.0 | 17.5 | 5.1 |
| DRMRIJ 12-52 | 24.1 | 20.0 | 33.4 | **25.8** | 20.2 | 27.5 | 26.9 | 22.5 | 4.0 |
| DRMRSJ-21 | 0.0 | 20.0 | 2.8 | **7.6** | 0.0 | 17.5 | 2.0 | 0.0 | 0.0 |
| PRD-17-3 | 18.0 | 25.0 | 35.6 | **26.2** | 31.0 | 22.5 | 19.8 | 10.0 | 2.1 |
| Rohini | 32.7 | 32.5 | 40.0 | **35.1** | 27.9 | 37.5 | 14.9 | 30.0 | 3.0 |
| DRMR 2035 | 6.4 | 17.5 | 31.1 | **18.3** | 0.0 | 32.5 | 26.0 | 15.0 | 2.2 |
| RMWR-09-1 | 3.1 | 22.5 | 36.7 | **20.8** | 0.0 | 27.5 | 10.9 | 17.5 | 4.4 |
| PRD-17-2 | 26.0 | 7.5 | 10.0 | **14.5** | 12.9 | 27.5 | 33.1 | 7.5 | 2.6 |
| BIOYSR | 35.1 | 22.5 | 0.0 | **19.2** | 28.6 | 37.5 | 21.1 | 10.0 | 2.4 |
| RMWR-09-5 | 0.9 | 17.5 | 0.0 | **6.1** | 0.0 | 32.5 | 16.0 | 7.5 | 3.3 |
| PRD-17-1 | 2.9 | 3.5 | 1.7 | **2.7** | 0.0 | 27.5 | 9.1 | 2.5 | 1.7 |
| **CD(*P*=0.05)** | **4.5** | **5.4** | **5.4** | | **3.1** | **7.1** | **1.2** | **12.5** | **3.7** |
| **CV (%)** | **16.4** | **18.9** | **17.9** | | **16.7** | **12.0** | **2.2** | **26.1** | **33.6** |

**Table 4.5.1: Reaction of oilseed *Brassica* lines against AB (natural condition) in NDN for Sclerotinia rot**

| Code no | Entries | % AB severity (100 DAS) | | | | | | % POD ( 15 days before harvest) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PNT | HSR | LDH | Mean | BPR | SHL | PNT | HSR | LDH | Mean | SHL (100 DAS) |
| NDN-18-99 | NPC 16 | 42.5 | 6.7 | 23.9 | **24.4** | 1.2 | 8.7 | 17.5 | 5.0 | 15.8 | **12.8** | 3.5 |
| NDN-18-100 | NRCYS-5-2 | 42.5 | 40.0 | 41.7 | **41.4** | 0.0 | 25.9 | 27.5 | 33.4 | 26.9 | **29.3** | 12.8 |
| NDN-18-101 | RMWR-09-1 | 52.5 | 33.4 | 45.2 | **43.7** | 2.0 | 26.8 | 27.5 | 30.0 | 27.6 | **28.4** | 14.7 |
| NDN-18-102 | DRMRSJ-9-1-1 | 55.0 | 30.0 | 39.4 | **41.5** | 1.1 | 18.2 | 32.5 | 28.9 | 23.6 | **28.3** | 10.3 |
| NDN-18-103 | DRMRSJ-20 | 47.5 | 23.4 | 36.2 | **35.7** | 2.4 | 16.9 | 22.5 | 20.0 | 23.2 | **21.9** | 8.5 |
| NDN-18-104 | DRMRSJ-31 (18-1-1) | 47.5 | 22.2 | 36.5 | **35.4** | 2.2 | 28.9 | 27.5 | 18.9 | 25.3 | **23.9** | 15.8 |
| NDN-18-105 | DRMRSJ-26 | 47.5 | 21.1 | 26.5 | **31.7** | 0.0 | 25.6 | 22.5 | 17.8 | 21.6 | **20.6** | 14.0 |
| NDN-18-106 | DRMRSJ-25 | 45.0 | 20.5 | 26.5 | **30.7** | 2.1 | 26.0 | 22.5 | 16.8 | 21.3 | **20.2** | 15.9 |
| NDN-18-107 | EC 766609 | 45.0 | 25.1 | 46.0 | **38.7** | 2.8 | 21.8 | 17.5 | 21.1 | 27.0 | **21.9** | 13.3 |
| NDN-18-108 | DRMR 5206 | 50.0 | 18.9 | 33.3 | **34.1** | 2.8 | 26.9 | 32.5 | 16.8 | 23.7 | **24.3** | 16.0 |
| NDN-18-109 | DRMRSJ-22 | 42.5 | 16.8 | 32.0 | **30.4** | 1.5 | 27.5 | 27.5 | 15.6 | 23.5 | **22.2** | 14.7 |
| NDN-18-110 | Rohini | 47.5 | 36.7 | 47.1 | **43.8** | 2.4 | 17.1 | 27.5 | 30.0 | 26.3 | **27.9** | 9.6 |
| NDN-18-111 | DRMR 2035 | 42.5 | 35.6 | 33.3 | **37.1** | 1.5 | 27.7 | 32.5 | 31.7 | 25.4 | **29.9** | 16.0 |
| NDN-18-112 | IC 491013 | 50.0 | 38.9 | 44.2 | **44.4** | 2.4 | 15.5 | 22.5 | 32.2 | 25.7 | **26.8** | 8.8 |
| NDN-18-113 | DRMRSJ-21 | 47.5 | 26.7 | 28.7 | **34.3** | 1.5 | 20.4 | 17.5 | 18.9 | 19.5 | **18.6** | 12.0 |
| **CD(*P*=0.05)** | | **-** | **5.1** | **4.7** | | **1.1** | **0.9** | **7.6** | **3.4** | **1.5** | | **0.9** |
| **CV(%)** | | **11.9** | **7.8** | **5.9** | | **3.5** | **1.9** | **13.8** | **5.7** | **2.4** | | **2.7** |

Check: Rohini, NRCYS-5-2 (SC); NPC-16 (TC)

**Table 4.5.2: Reaction of oilseed Brassica germplasm to WR and SR under NDN for Sclerotinia rot**

| Entries | % WR severity (100 DAS) | | | | | Stag Head | % SR under artificial condition | | | | | | % DM | % PM | SR Lesion Length (cm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PNT | HSR | LDH | Mean | BPR | LDH | LDH | BPR | PNT | HSR | Mean | DOL | PNT | BPR | PNT | HSR | LDH | BPR |
| NPC 16 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 100.0 | 23.6 | 100.0 | 18.9 | **60.6** | 15.0 | 0.0 | 0.7 | 19.7 | 4.0 | 16.5 | 8.0 |
| NRCYS-5-2 | 10.0 | 0.0 | 0.0 | **3.3** | 1.1 | 0.0 | 100.0 | 40.1 | 90.0 | 96.9 | **81.8** | 15.0 | 32.5 | 1.6 | 13.5 | 10.4 | 16.5 | 14.0 |
| RMWR-09-1 | 15.0 | 32.2 | 2.7 | **16.6** | 0.6 | 2.0 | 97.5 | 31.7 | 80.0 | 22.2 | **57.9** | 5.0 | 47.5 | 3.0 | 17.1 | 5.3 | 21.5 | 7.6 |
| MRMRSJ-9-1-1 | 22.5 | 38.9 | 23.8 | **28.4** | 1.2 | 6.7 | 97.5 | 26.2 | 85.0 | 97.6 | **76.6** | 10.0 | 52.5 | 2.8 | 17.1 | 5.2 | 26.6 | 7.2 |
| DRMRSJ-20 | 15.0 | 15.6 | 0.0 | **10.2** | 0.7 | 0.0 | 100.0 | 19.1 | 60.0 | 26.1 | **51.3** | 10.0 | 32.5 | 2.8 | 18.8 | 6.5 | 25.5 | 10.0 |
| DRMRSJ-31(18-1-1) | 17.5 | 30.0 | 11.6 | **19.7** | 0.5 | 8.7 | 97.5 | 47.2 | 90.0 | 28.6 | **65.8** | 25.0 | 25.0 | 2.6 | 16.6 | 5.1 | 24.8 | 18.0 |
| DRMRSJ-26 | 12.5 | 0.0 | 0.0 | **4.2** | 0.0 | 0.0 | 100.0 | 16.8 | 90.0 | 43.6 | **62.6** | 5.0 | 37.5 | 2.6 | 19.8 | 5.7 | 13.9 | 4.8 |
| DRMRSJ-25 | 1.0 | 0.0 | 0.0 | **0.3** | 0.0 | 0.0 | 97.5 | 17.8 | 85.0 | 35.9 | **59.1** | 35.0 | 52.5 | 3.6 | 17.6 | 6.1 | 21.0 | 7.2 |
| EC 766609 | 17.5 | 31.1 | 13.8 | **20.8** | 1.4 | 5.8 | 95.0 | 21.5 | 80.0 | 42.8 | **59.8** | 25.0 | 42.5 | 2.6 | 19.8 | 5.8 | 14.1 | 4.8 |
| DRMR 5206 | 7.5 | 0.0 | 0.0 | **2.5** | 0.0 | 0.0 | 92.5 | 24.1 | 80.0 | 37.9 | **58.6** | 15.0 | 32.5 | 3.0 | 16.7 | 5.3 | 17.5 | 4.2 |
| DRMRSJ-22 | 2.0 | 0.0 | 0.0 | **0.7** | 0.0 | 0.0 | 85.0 | 34.9 | 55.0 | 17.3 | **48.1** | 25.0 | 37.5 | 2.4 | 16.7 | 5.0 | 10.3 | 11.2 |
| Rohini | 20.0 | 45.6 | 26.9 | **30.8** | 1.1 | 6.9 | 95.0 | 30.7 | 55.0 | 80.6 | **65.3** | 5.0 | 42.5 | 2.4 | 11.5 | 6.1 | 24.3 | 4.2 |
| DRMR 2035 | 12.5 | 46.7 | 5.7 | **21.6** | 0.0 | 1.9 | 97.5 | 34.5 | 70.0 | 51.3 | **63.3** | 15.0 | 37.5 | 2.5 | 14.8 | 7.2 | 15.1 | 10.6 |
| IC 491013 | 20.0 | 41.1 | 31.3 | **30.8** | 1.1 | 7.8 | 92.5 | 31.7 | 75.0 | 84.0 | **70.8** | 35.0 | 42.5 | 2.4 | 14.7 | 8.1 | 8.6 | 7.8 |
| DRMRSJ-21 | 5.0 | 1.7 | 2.5 | **3.1** | 0.0 | 4.7 | 90.0 | 35.4 | 85.0 | 25.8 | **59.1** | 55.0 | 32.5 | 1.6 | 13.2 | 6.0 | 10.9 | 14.4 |
| **CD(*P*=0.05)** | **6.0** | **5.5** | **2.8** | | **0.9** | **2.5** | **-** | **3.1** | **-** | **8.8** | | **19.0** | **4.4** | **1.1** | **-** | **-** | **5.1** | **-** |
| **CV (%)** | **21.5** | **13.1** | **11.7** | | **6.9** | **16.8** | **8.4** | **4.1** | **19.1** | **9.1** | | **36.6** | **5.4** | **3.1** | **28.7** | **-** | **14.0** | **-** |

* Data of BPR for WR and PM excluded due to low disease pressure (< 5%)

**Table 4.6.1: Screening of IVT entries of Brassica against Alternaria blight (natural condition)**

| Code No. | Entries | % AB severity (75 DAS) | | % AB severity (100 DAS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MOR | DOL | SHL | PNT | HSR | DOL | LDH | KPR | VAR | Mean | SGN |
| SIVT-18-01 | GSL 1 | 6.9 | 23.7 | 18.5 | 7.5 | 7.8 | 31.8 | 25.3 | 15.2 | 40.0 | **20.9** | 34.7 |
| SIVT-18-02 | RTM 314 | 19.7 | 21.7 | 17.8 | 37.5 | - | 29.9 | 45.7 | 37.6 | 86.7 | **42.5** | 52.0 |
| SIVT-18-03 | HNS 1201 | 6.0 | 27.5 | 26.7 | 12.5 | 38.9 | 36.0 | 24.8 | 18.2 | 40.0 | **28.2** | 51.1 |
| SIVT-18-04 | PT 303 | 5.1 | 17.7 | 16.5 | 37.5 | 35.6 | 25.8 | 37.9 | 16.2 | 46.7 | **30.9** | 53.8 |
| SIVT-18-05 | DLSC 1 | 10.0 | 16.4 | 19.1 | 5.0 | 8.4 | 25.3 | 21.8 | 8.2 | 42.2 | **18.6** | 32.9 |
| SIVT-18-06 | JGS-12-3 | 6.0 | 16.4 | 16.3 | 7.5 | 7.8 | 25.3 | 23.1 | 13.2 | 60.0 | **21.9** | 52.0 |
| SIVT-18-07 | PHR 2 | 12.0 | 14.9 | 16.5 | 27.5 | 17.8 | 23.0 | 31.9 | 19.7 | 42.2 | **25.5** | 32.0 |
| SIVT-18-08 | Rohini | 16.0 | 16.3 | 25.2 | 35.0 | 31.2 | 25.2 | 45.2 | 28.2 | 46.7 | **33.8** | 10.9 |
| SIVT-18-09 | BIOYSR | 18.9 | 14.8 | 25.8 | 30.0 | 32.2 | 22.8 | 32.9 | 30.6 | 46.7 | **31.6** | 32.4 |
| SIVT-18-10 | HNS 1102 | 8.0 | 17.7 | 16.6 | 10.0 | 7.3 | 25.8 | 23.3 | 27.2 | 51.1 | **23.0** | 55.1 |
| SIVT-18-11 | Pusa MH-20 | 14.9 | 17.5 | 26.2 | 32.5 | 23.4 | 25.8 | 33.4 | 24.2 | 64.4 | **32.8** | 32.4 |
| SIVT-18-12 | RCH 2 | 21.0 | 16.3 | 15.7 | 35.0 | 22.2 | 25.3 | 35.9 | 20.0 | 77.8 | **33.1** | 10.2 |
| SIVT-18-13 | DRMRHJ 517 | 20.9 | 24.7 | 17.6 | 27.5 | 21.1 | 31.8 | 26.8 | 18.2 | 60.0 | **29.0** | 32.9 |
| SIVT-18-14 | DRMRHJ 1417 | 19.1 | 22.8 | 16.6 | 30.0 | 26.7 | 30.0 | 43.7 | 17.4 | 73.3 | **33.9** | 33.3 |
| SIVT-18-15 | SVJH- 101 | 18.6 | 23.7 | 16.2 | 25.0 | 30.0 | 31.8 | 41.6 | 17.2 | 82.2 | **34.8** | 32.9 |
| SIVT-18-16 | PHR-3313 | 20.0 | 24.8 | 19.5 | 37.5 | 28.4 | 29.0 | 26.3 | 41.2 | 62.2 | **34.9** | 32.9 |
| SIVT-18-17 | Pusa MH-16 | 10.9 | 23.8 | 15.7 | 25.0 | 31.7 | 29.0 | 27.9 | 19.4 | 68.9 | **31.1** | 32.4 |
| SIVT-18-18 | SVJH- 108 | 17.1 | 19.7 | 15.6 | 30.0 | 32.2 | 24.7 | 38.8 | 31.2 | 77.8 | **35.7** | 32.4 |
| SIVT-18-19 | DRMRHJ 2518 | 14.0 | 23.7 | 24.1 | 30.0 | 27.2 | 29.0 | 36.7 | 16.6 | 73.3 | **33.8** | 10.9 |
| SIVT-18-20 | PHR-3489 | 13.1 | 21.7 | 22.7 | 30.0 | 22.2 | 27.5 | 42.8 | 24.2 | 64.4 | **33.4** | 32.7 |
| SIVT-18-21 | RHH 1801 | 18.0 | 17.7 | 22.5 | 37.5 | 23.4 | 23.0 | 41.2 | 30.4 | 64.4 | **34.6** | 32.9 |
| SIVT-18-22 | Pusa MH-7 (Hybrid) | 21.1 | 19.5 | 25.9 | 22.5 | 26.7 | 24.7 | 37.1 | 40.2 | 68.9 | **35.1** | 10.4 |
| SIVT-18-23 | DRMRHJ 2403 | 10.9 | 16.3 | 19.3 | 32.5 | 25.1 | 22.0 | 42.8 | 29.2 | 64.4 | **33.6** | 32.0 |
| SIVT-18-24 | 8IJ4002 | 20.0 | 19.3 | 25.4 | 37.5 | 28.4 | 24.7 | 44.0 | 33.4 | 91.1 | **40.6** | 11.6 |
| SIVT-18-25 | Pusa MH-5 (Hybrid) | 10.9 | 20.7 | 24.2 | 27.5 | 20.0 | 24.7 | 45.6 | 27.8 | 68.9 | **34.1** | 32.0 |
| SIVT-18-26 | 8IJ0117 | 9.3 | 18.3 | 22.1 | 32.5 | 22.2 | 23.9 | 35.2 | 15.4 | 80.0 | **33.0** | 55.6 |
| SIVT-18-27 | KMR (L) 18-6 | 12.0 | 29.2 | 25.8 | 32.5 | 30.0 | 31.9 | 39.4 | 25.2 | 80.0 | **37.8** | 31.1 |
| SIVT-18-28 | KMR (L) 18-5 | 17.1 | 25.1 | 19.9 | 32.5 | 28.9 | 29.0 | 40.8 | 34.6 | 77.8 | **37.6** | 32.4 |
| SIVT-18-29 | DRMRHJ 503 | 11.1 | 24.9 | 19.5 | 32.5 | 27.2 | 29.0 | 33.3 | 30.0 | 77.8 | **35.6** | 32.0 |
| SIVT-18-30 | RHH 1802 | 10.0 | 19.7 | 18.3 | 32.5 | 25.1 | 24.7 | 31.5 | 29.2 | 64.4 | **32.2** | 30.2 |
| SIVT-18-31 | PYS-2016-15 | 20.0 | 23.7 | 23.5 | 42.5 | 33.4 | 31.8 | 49.1 | 22.2 | 73.3 | **39.4** | 30.2 |
| SIVT-18-32 | GSH-1717 | 3.8 | 21.4 | 14.7 | 7.5 | 7.3 | 27.3 | 19.0 | 0.0 | 42.2 | **16.9** | 11.1 |
| SIVT-18-33 | PYS-2016-8 | 14.9 | 18.4 | 23.8 | 42.5 | 35.6 | 27.0 | 41.8 | 12.4 | 55.6 | **34.1** | 32.2 |
| SIVT-18-34 | AKGS-8217 | 14.0 | 20.7 | 15.8 | 10.0 | 8.4 | 27.3 | 19.3 | 13.6 | 28.9 | **17.6** | 34.7 |
| SIVT-18-35 | YSKM 18-1 | 18.0 | 19.7 | 38.8 | 37.5 | 36.7 | 27.3 | 38.0 | 28.8 | 95.6 | **43.2** | 10.4 |
| SIVT-18-36 | GSH-1699 | 2.9 | 19.4 | 11.1 | 12.5 | 7.8 | 27.3 | 18.0 | 8.2 | 23.3 | **15.5** | 32.2 |
| SIVT-18-37 | GSH-1707 | 6.9 | 23.8 | 15.2 | 10.0 | 6.7 | 31.8 | 19.2 | 16.6 | 24.4 | **17.7** | 50.7 |
| SIVT-18-38 | AKGS-8146 | 20.5 | 25.2 | 14.5 | 10.0 | 5.0 | 31.8 | 20.3 | 29.2 | 57.8 | **24.1** | 33.3 |
| SIVT-18-39 | YSKM 18-2 | 21.4 | 21.6 | 26.3 | 32.5 | 38.9 | 29.2 | 32.9 | 25.4 | 64.4 | **35.7** | 34.2 |
| SIVT-18-40 | 8IJ1004 | 10.9 | 26.1 | 16.2 | 32.5 | 22.2 | 34.0 | 33.8 | 31.2 | 68.9 | **34.1** | 52.9 |
| SIVT-18-41 | KMR (E) 18-1 | 15.8 | 23.8 | 15.2 | 37.5 | 21.1 | 31.8 | 31.7 | 27.4 | 64.4 | **32.7** | 35.1 |
| SIVT-18-42 | DRMRIS 17-7 | 18.0 | 25.2 | 15.5 | 37.5 | 26.7 | 31.8 | 34.3 | 29.7 | 51.1 | **32.4** | 56.0 |
| SIVT-18-43 | PRE 2016-2 | 10.0 | 26.0 | 20.3 | 32.5 | 24.5 | 34.0 | 37.8 | 16.4 | 42.2 | **29.7** | 34.2 |
| SIVT-18-44 | DRMRCI 96 | 12.2 | 23.8 | 20.1 | 32.5 | 21.1 | 31.8 | 34.3 | 18.2 | 42.2 | **28.6** | 11.3 |
| SIVT-18-45 | DRMRHT 13-13-5-4 | 14.0 | 25.3 | 19.8 | 32.5 | 23.4 | 31.8 | 38.0 | 26.8 | 64.4 | **33.8** | 32.9 |
| SIVT-18-46 | RH 1699-5 | 13.1 | 23.7 | 19.3 | 32.5 | 30.0 | 31.8 | 38.0 | 19.7 | 64.4 | **33.7** | 32.0 |
| SIVT-18-47 | KMR (E) 18-2 | 10.9 | 19.7 | 20.9 | 22.5 | 22.2 | 27.3 | 43.9 | 14.2 | 64.4 | **30.8** | 33.3 |
| SIVT-18-48 | RH 1658 | 17.1 | 16.1 | 18.9 | 32.5 | 25.1 | 24.9 | 44.4 | 28.7 | 64.4 | **34.1** | 49.1 |
| SIVT-18-49 | DRMR 2017-26 | 20.5 | 19.5 | 19.3 | 30.0 | 20.0 | 24.9 | 28.3 | 31.4 | 64.4 | **31.2** | 32.9 |
| SIVT-18-50 | PRE 2016-5 | 20.2 | 17.7 | 19.3 | 35.0 | 31.1 | 25.8 | 31.9 | 28.4 | 46.7 | **31.1** | 32.4 |
| SIVT-18-51 | RLC 10# | 20.0 | 19.7 | 18.8 | 32.5 | 21.1 | 27.3 | 25.6 | 22.0 | 64.4 | **30.2** | 54.7 |
| SIVT-18-52 | NPJ-228 | 20.2 | 20.9 | 18.6 | 37.5 | 30.0 | 27.3 | 29.2 | 32.6 | 60.0 | **33.6** | 10.9 |
| SIVT-18-53 | RH 1657 | 12.2 | 19.7 | 18.5 | 37.5 | 32.2 | 27.3 | 25.6 | 22.4 | 46.7 | **30.0** | 34.2 |
| SIVT-18-54 | DRMRQ4-7-23# | 19.1 | 22.6 | 20.3 | 42.5 | 16.8 | 29.4 | 22.1 | 31.3 | 55.6 | **31.1** | 34.7 |
| SIVT-18-55 | RH (OE)1706 | 18.3 | 25.9 | 17.7 | 47.5 | 25.1 | 34.0 | 41.8 | 22.0 | 64.4 | **36.1** | 51.6 |
| SIVT-18-56 | NPJ-227 | 20.7 | 26.1 | 18.2 | 37.5 | 34.5 | 34.0 | 35.3 | 37.6 | 37.8 | **33.5** | 34.2 |
| SIVT-18-57 | RH (OE)1705 | 21.5 | 26.1 | 18.9 | 37.5 | 34.5 | 34.0 | 37.3 | 28.2 | 46.7 | **33.9** | 53.3 |
| SIVT-18-58 | DRMRQ1-16-27# | 20.2 | 26.1 | 19.2 | 42.5 | 22.2 | 34.0 | 32.7 | 28.2 | 64.4 | **34.7** | 34.2 |
| SIVT-18-59 | DRMRCI 111 | 16.0 | 19.7 | 17.1 | 52.5 | 20.5 | 27.3 | 33.8 | 22.0 | 60.0 | **33.3** | 34.7 |
| SIVT-18-60 | PRL-2013-9 | 20.5 | 19.7 | 20.3 | 37.5 | 36.7 | 27.3 | 43.7 | 28.7 | 73.3 | **38.2** | 51.6 |
| SIVT-18-61 | RH 1424 | 12.2 | 21.5 | 18.2 | 42.5 | 25.1 | 29.2 | 44.2 | 20.2 | 64.4 | **34.8** | 53.3 |
| SIVT-18-62 | CAU-Toria 1 | 16.0 | 21.5 | 24.9 | 37.5 | 40.0 | 27.3 | 46.1 | 41.2 | 73.3 | **41.5** | 74.7 |
| SIVT-18-63 | NPJ-225 | 13.1 | 17.7 | 19.5 | 42.5 | 28.9 | 25.8 | 33.0 | 19.7 | 91.1 | **37.2** | 52.9 |
| SIVT-18-64 | DRMR 2017-8 | 14.0 | 16.3 | 18.9 | 37.5 | 30.0 | 24.9 | 34.4 | 13.6 | 68.9 | **32.6** | 32.9 |
| SIVT-18-65 | DRMRHJ1118 (hybrid) | 10.9 | 19.7 | 19.0 | 37.5 | 29.5 | 27.3 | 28.3 | 19.2 | 64.4 | **32.2** | 52.4 |
| SIVT-18-66 | RGN- 444 | 9.1 | 22.6 | 21.5 | 32.5 | 32.2 | 29.4 | 34.4 | 23.2 | 68.9 | **34.6** | 33.3 |
| SIVT-18-67 | DRMRCI 95 | 11.8 | 25.2 | 23.0 | 37.5 | 31.7 | 31.8 | 42.7 | 17.4 | 73.3 | **36.8** | 32.4 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIVT-18-68 | NPJ-226 | 20.5 | 25.3 | 18.4 | 42.5 | 33.4 | 31.8 | 41.9 | 28.6 | 68.9 | **37.9** | 32.9 |
| SIVT-18-69 | DRMRCI 114 | 16.0 | 25.3 | 20.6 | 47.5 | 28.4 | 31.8 | 33.5 | 30.2 | 64.4 | **36.6** | 34.7 |
| SIVT-18-70 | RMT 10-15 | 21.1 | 21.4 | 18.3 | 42.5 | 40.1 | 27.3 | 45.0 | 28.7 | 68.9 | **38.7** | 11.1 |
| SIVT-18-71 | JM-13-5 | 10.9 | 25.3 | 24.4 | 52.5 | 35.6 | 31.8 | 39.8 | 16.4 | 73.3 | **39.1** | 55.1 |
| SIVT-18-72 | RGN- 443 | 17.1 | 22.8 | 19.8 | 47.5 | 34.5 | 29.4 | 43.9 | 27.6 | 68.9 | **38.8** | 48.9 |
| SIVT-18-73 | RH 1584 | 14.0 | 18.4 | 21.1 | 47.5 | 27.8 | 27.0 | 53.2 | 18.6 | 68.9 | **37.7** | 34.2 |
| SIVT-18-74 | NPJ-224 | 18.2 | 20.9 | 22.5 | 32.5 | 31.2 | 27.3 | 52.8 | 27.7 | 73.3 | **38.2** | 35.1 |
| SIVT-18-75 | PHR-3328 | 20.2 | 18.4 | 23.8 | 42.5 | 33.4 | 27.0 | 49.0 | 30.6 | 64.4 | **38.7** | 49.8 |
| SIVT-18-76 | NPJ-223 | 17.1 | 16.3 | 22.5 | 52.5 | 30.0 | 25.3 | 36.9 | 19.7 | 68.9 | **36.5** | 34.2 |
| SIVT-18-77 | KMR 18-3 | 14.0 | 16.3 | 22.0 | 57.5 | 31.2 | 25.3 | 50.3 | 12.6 | 55.6 | **36.3** | 75.1 |
| SIVT-18-78 | PBR 385 | 10.9 | 17.7 | 20.1 | 52.5 | 27.8 | 26.1 | 47.0 | 16.9 | 64.4 | **36.4** | 52.4 |
| SIVT-18-79 | RH 1676 | 13.8 | 19.7 | 20.5 | 37.5 | 28.9 | 27.3 | 46.2 | 23.2 | 73.3 | **36.7** | 35.8 |
| SIVT-18-80 | KMR 18-4 | 21.1 | 19.7 | 21.3 | 32.5 | 32.2 | 34.0 | 38.6 | 29.2 | 77.8 | **37.9** | 34.7 |
| SIVT-18-81 | CS 508 -1 P2# | 16.2 | 21.6 | 19.3 | 37.5 | 31.7 | 29.9 | 49.0 | 23.1 | 68.9 | **37.0** | 32.0 |
| SIVT-18-82 | RLC 8# | 20.4 | 21.6 | 22.5 | 37.5 | 21.1 | 29.9 | 24.3 | 32.2 | 73.3 | **34.4** | 53.8 |
| SIVT-18-83 | LES-59 | 21.1 | 25.2 | 22.7 | 32.5 | 35.6 | 31.8 | 42.0 | 32.6 | 68.9 | **38.0** | 31.8 |
| SIVT-18-84 | CS 15000-1-1-1-1-2 | 14.9 | 22.6 | 23.5 | 32.5 | 31.2 | 30.0 | 40.6 | 30.1 | 64.4 | **36.0** | 54.2 |
| SIVT-18-85 | RCH 3# | 12.0 | 23.7 | 19.7 | 42.5 | 22.2 | 31.8 | 28.2 | 18.2 | 68.9 | **33.1** | 34.4 |
| SIVT-18-86 | PDZ-11# | 20.6 | 23.7 | 22.4 | 37.5 | 20.0 | 31.8 | 36.4 | 26.4 | 73.3 | **35.4** | 10.4 |
| SIVT-18-87 | LES-58 | 14.9 | 19.5 | 21.7 | 32.5 | 32.2 | 27.3 | 36.9 | 15.4 | 73.3 | **34.2** | 33.3 |
| SIVT-18-88 | PDZ-12# | 19.6 | 18.3 | 18.8 | 35.0 | 18.9 | 27.0 | 38.7 | 14.2 | 68.9 | **31.6** | 9.8 |
| SIVT-18-89 | RLC 9# | 15.8 | 25.3 | 20.5 | 32.5 | 30.0 | 31.8 | 33.0 | 14.2 | 73.3 | **33.6** | 32.0 |
| SIVT-18-90 | CS 2009-335 | 14.9 | 25.5 | 19.3 | 32.5 | 33.4 | 33.9 | 41.1 | 14.2 | 68.9 | **34.7** | 32.9 |
| SIVT-18-91 | PT-2015-10 | 8.0 | 22.6 | 40.5 | 42.5 | 35.6 | 30.0 | 42.1 | 12.6 | 93.3 | **42.4** | 52.9 |
| SIVT-18-92 | RGN- 449 | 12.0 | 22.6 | 24.3 | 42.5 | 35.6 | 30.0 | 44.8 | 21.9 | 60.0 | **37.0** | 31.6 |
| SIVT-18-93 | CAU-RM 4 | 14.9 | 27.5 | 23.2 | 27.5 | 26.7 | 36.0 | 42.9 | 29.4 | 82.2 | **38.3** | 32.4 |
| SIVT-18-94 | PT-2013-7 | 9.1 | 27.2 | 38.3 | 37.5 | 41.1 | 34.0 | 36.9 | 16.6 | 91.1 | **42.2** | 51.1 |
| SIVT-18-95 | TM 130 | 13.8 | 25.8 | 25.0 | 32.5 | 30.0 | 34.0 | 36.7 | 19.2 | 68.9 | **35.2** | 52.4 |
| SIVT-18-96 | HUJM 17-8 | 6.0 | 25.8 | 24.3 | 30.0 | 22.2 | 34.0 | 43.4 | 10.6 | 77.8 | **34.6** | 52.0 |
| SIVT-18-97 | TKM 18-2 | 20.5 | 25.8 | 22.5 | 37.5 | 40.0 | 34.0 | 46.7 | 17.4 | 91.1 | **41.3** | 34.2 |
| SIVT-18-98 | SVJH- 106 | 10.9 | 17.7 | 24.0 | 27.5 | 26.7 | 26.1 | 33.0 | 18.2 | 86.7 | **34.6** | 14.7 |
| SIVT-18-99 | TKM 18-1 | 3.8 | 19.7 | 19.8 | 42.5 | 38.9 | 27.3 | 46.8 | 9.8 | 95.6 | **40.1** | 49.3 |
| SIVT-18-100 | PRL-2016-6 | 9.1 | 20.6 | 23.5 | 30.0 | 33.4 | 27.3 | 36.0 | 17.7 | 82.2 | **35.7** | 36.0 |
| SIVT-18-101 | SKM 1626 | 20.2 | 27.0 | 23.5 | 32.5 | 25.1 | 34.0 | 37.8 | 30.2 | 68.9 | **36.0** | 10.4 |
| SIVT-18-102 | Bullet | 21.1 | 23.7 | 21.0 | 27.5 | 29.5 | 31.8 | 38.3 | 29.4 | 73.3 | **35.8** | 32.9 |
| SIVT-18-103 | DRMRIJ 1353 | 21.1 | 27.1 | 22.1 | 37.5 | 30.0 | 34.0 | 47.3 | 33.7 | 73.3 | **39.7** | 29.8 |
| SIVT-18-104 | DTM-184 | 26.8 | 22.7 | 22.5 | 42.5 | 31.7 | 30.0 | 39.8 | 28.9 | 86.7 | **40.3** | 48.0 |
| SIVT-18-105 | SKM 1512 | 12.2 | 25.3 | 20.5 | 37.5 | 35.6 | 31.8 | 38.9 | 17.2 | 68.9 | **35.8** | 30.7 |
| SIVT-18-106 | RMM 10-1-1 | 14.0 | 27.0 | 22.4 | 32.5 | 30.0 | 34.0 | 43.7 | 23.3 | 77.8 | **37.7** | 35.8 |
| SIVT-18-107 | NPJ-222 | 17.1 | 20.9 | 23.0 | 32.5 | 31.2 | 27.3 | 49.0 | 31.2 | 73.3 | **38.2** | 30.2 |
| SIVT-18-108 | DRMR 2017-16 | 19.8 | 17.7 | 20.3 | 37.5 | 31.7 | 26.1 | 52.8 | 15.2 | 77.8 | **37.3** | 34.2 |
| SIVT-18-109 | NPJ-221 | 19.8 | 31.0 | 24.2 | 37.5 | 30.0 | 39.9 | 40.5 | 27.3 | 93.3 | **41.8** | 29.1 |
| SIVT-18-110 | DRMRCI 107 | 20.1 | 30.5 | 22.1 | 25.0 | 22.2 | 37.8 | 36.6 | 39.6 | 68.9 | **36.0** | 31.6 |
| SIVT-18-111 | CS 2009-154 | 20.0 | 29.2 | 23.2 | 27.5 | 25.1 | 36.6 | 43.5 | 28.2 | 68.9 | **36.1** | 11.3 |
| SIVT-18-112 | 8IJ0116 | 20.0 | 28.3 | 20.1 | 22.5 | 27.2 | 36.6 | 38.1 | 21.4 | 55.6 | **31.6** | 33.3 |
| SIVT-18-113 | PR 2016-8 | 17.1 | 30.7 | 22.4 | 27.5 | 26.7 | 39.9 | 39.1 | 21.2 | 68.9 | **35.1** | 10.9 |
| SIVT-18-114 | Anmol | 10.2 | 25.8 | 21.1 | 27.5 | 33.4 | 34.0 | 44.0 | 21.6 | 68.9 | **35.8** | 54.7 |
| SIVT-18-115 | HUJM 17-6 | 18.9 | 25.9 | 20.5 | 30.0 | 31.2 | 34.0 | 35.4 | 29.7 | 64.4 | **35.0** | 75.1 |
| SIVT-18-116 | TM 217 | 16.9 | 22.6 | 21.9 | 25.0 | 30.0 | 30.0 | 37.5 | 26.6 | 68.9 | **34.3** | 51.6 |
| SIVT-18-117 | CS 13000-3-1-1-4-2 | 12.2 | 21.1 | 21.7 | 30.0 | 36.7 | 27.3 | 41.6 | 20.6 | 68.9 | **35.2** | 32.9 |
| SIVT-18-118 | AKMS- 1002 | 18.0 | 17.7 | 22.6 | 37.5 | 27.8 | 26.1 | 41.5 | 30.6 | 68.9 | **36.4** | 72.0 |
| SIVT-18-119 | RB-101 | 11.8 | 16.3 | 22.5 | 32.5 | 35.6 | 25.3 | 42.9 | 22.6 | 68.9 | **35.8** | 40.0 |
| SIVT-18-120 | PR 2016-4 | 10.9 | 20.6 | 23.8 | 32.5 | 32.2 | 27.3 | 38.5 | 20.4 | 64.4 | **34.2** | 32.4 |
| SIVT-18-121 | RH 1584 | 22.2 | 22.6 | 21.9 | 32.5 | 31.7 | 30.0 | 39.8 | 36.6 | 64.4 | **36.7** | 32.0 |
| SIVT-18-122 | DRMRHJ 1403 | 16.0 | 25.2 | 22.6 | 32.5 | 34.5 | 31.8 | 31.9 | 27.4 | 64.4 | **35.0** | 9.8 |
| SIVT-18-123 | RB-102 | 11.8 | 27.0 | 19.1 | 37.5 | 35.6 | 34.0 | 31.8 | 19.6 | 68.9 | **35.2** | 32.9 |
| SIVT-18-124 | CAU-RM 2 | 20.7 | 25.3 | 20.7 | 37.5 | 30.0 | 31.8 | 46.4 | 27.2 | 86.7 | **40.0** | 9.8 |
| SIVT-18-125 | TM 179 | 17.1 | 21.0 | 22.3 | 37.5 | 32.2 | 27.3 | 36.6 | 29.7 | 68.9 | **36.3** | 10.9 |
| SIVT-18-126 | DRMR 2017-27 | 10.9 | 22.6 | 19.3 | 37.5 | 31.2 | 30.0 | 41.3 | 30.8 | 82.2 | **38.9** | 31.1 |
| SIVT-18-127 | 8IJ0117 | 18.9 | 17.7 | 22.7 | 32.5 | 23.4 | 26.1 | 35.5 | 28.8 | 73.3 | **34.6** | 30.7 |
| SIVT-18-128 | RB-100 | 13.1 | 17.7 | 23.2 | 42.5 | 33.4 | 26.1 | 41.4 | 12.6 | 64.4 | **34.8** | 52.0 |
| SIVT-18-129 | DRMRIJ17-92 | 20.4 | 21.1 | 23.6 | 37.5 | 36.7 | 27.3 | 36.9 | 36.2 | 64.4 | **37.5** | 28.4 |
| **CD(*P*=0.05)** | | **1.7** | **2.6** | **2.0** | **3.6** | **4.6** | **2.5** | **4.4** | **3.7** | **4.1** | | **2.6** |
| **CV(%)** | | **3.7** | **4.6** | **3.7** | **5.4** | **7.5** | **3.9** | **5.9** | **14.2** | **3.1** | | **3.6** |

Check: Rohini (SC), PHR-2 (TC-AB), BioYSR (RC-WR), (*B.juncea*), PT 303, GSL-1, DLSC (RC), RTM-314 (SC)

**Table 4.6.2: Screening of IVT entries of Brassica against Alternaria Pod blight (natural condition)**

| Entries | % ABP (15 Days Before Harvesting) | | | | | | % POD (100 DAS) |
|---|---|---|---|---|---|---|---|
| | PNT | HSR | LDH | Mean | SGN | DOL | SHL |
| GSL 1 | 22.5 | 5.0 | 25.3 | **17.6** | 15.3 | 13.5 | 10.4 |
| RTM 314 | 47.5 | - | 31.4 | **39.4** | 52.0 | 11.5 | 10.3 |
| HNS 1201 | 22.5 | 33.4 | 25.4 | **27.1** | 34.7 | 17.5 | 16.3 |
| PT 303 | 32.5 | 30.0 | 29.2 | **30.6** | 50.7 | 17.5 | 10.1 |
| DLSC 1 | 5.0 | 7.3 | 10.1 | **7.5** | 14.2 | 8.8 | 9.8 |
| JGS-12-3 | 5.0 | 6.7 | 25.7 | **12.5** | 33.6 | 8.8 | 10.3 |
| PHR 2 | 5.0 | 12.3 | 26.9 | **14.7** | 11.8 | 6.8 | 7.1 |
| Rohini | 25.0 | 26.7 | 25.3 | **25.7** | 11.3 | 6.8 | 15.7 |
| BIOYSR | 27.5 | 24.5 | 25.7 | **25.9** | 12.4 | 6.8 | 14.5 |
| HNS 1102 | 27.5 | 5.0 | 27.2 | **19.9** | 10.9 | 9.6 | 8.0 |
| Pusa MH-20 | 22.5 | 20.0 | 24.0 | **22.2** | 0.0 | 9.6 | 15.8 |
| RCH 2 | 27.5 | 18.9 | 25.5 | **24.0** | 0.0 | 6.8 | 7.1 |
| DRMRHJ 517 | 22.5 | 17.8 | 22.9 | **21.1** | 0.0 | 14.6 | 7.2 |
| DRMRHJ 1417 | 22.5 | 21.1 | 25.5 | **23.0** | 10.7 | 13.5 | 8.2 |
| SVJH- 101 | 17.5 | 25.1 | 26.3 | **23.0** | 0.0 | 13.5 | 8.0 |
| PHR-3313 | 27.5 | 22.2 | 23.1 | **24.3** | 9.3 | 13.5 | 8.2 |
| Pusa MH-16 | 17.5 | 21.1 | 23.2 | **20.6** | 32.9 | 13.5 | 7.1 |
| SVJH- 108 | 17.5 | 20.0 | 28.0 | **21.8** | 11.1 | 11.1 | 6.9 |
| DRMRHJ 2518 | 17.5 | 17.8 | 24.5 | **19.9** | 11.3 | 14.6 | 14.2 |
| PHR-3489 | 25.0 | 15.6 | 30.8 | **23.8** | 8.7 | 13.5 | 16.1 |
| RHH 1801 | 22.5 | 14.5 | 30.9 | **22.6** | 5.8 | 9.6 | 10.4 |
| Pusa MH-7 (Hybrid) | 25.0 | 16.8 | 27.0 | **22.9** | 12.7 | 11.1 | 14.8 |
| DRMRHJ 2403 | 20.0 | 20.0 | 25.4 | **21.8** | 10.7 | 6.8 | 8.0 |
| 8IJ4002 | 27.5 | 22.2 | 27.4 | **25.7** | 12.2 | 11.6 | 13.0 |
| Pusa MH-5 (Hybrid) | 27.5 | 13.4 | 26.1 | **22.3** | 10.9 | 11.6 | 14.0 |
| 8IJ0117 | 22.5 | 17.8 | 26.0 | **22.1** | 31.6 | 9.6 | 13.3 |
| KMR (L) 18-6 | 25.0 | 20.0 | 25.9 | **23.6** | 0.0 | 18.4 | 16.1 |
| KMR (L) 18-5 | 22.5 | 21.1 | 24.0 | **22.5** | 11.6 | 14.6 | 9.4 |
| DRMRHJ 503 | 27.5 | 16.8 | 23.4 | **22.6** | 12.4 | 14.6 | 7.9 |
| RHH 1802 | 27.5 | 18.9 | 22.7 | **23.0** | 10.4 | 11.1 | 10.0 |
| PYS-2016-15 | 27.5 | 31.1 | 27.6 | **28.7** | 0.0 | 14.6 | 9.8 |
| GSH-1717 | 17.5 | 4.5 | 25.3 | **15.8** | 0.0 | 11.5 | 8.3 |
| PYS-2016-8 | 37.5 | 23.4 | 27.6 | **29.5** | 0.0 | 9.6 | 8.6 |
| AKGS-8217 | 32.5 | 6.7 | 23.6 | **20.9** | 11.6 | 13.5 | 7.2 |
| YSKM 18-1 | 32.5 | 30.0 | 26.0 | **29.5** | 11.6 | 11.1 | 20.3 |
| GSH-1699 | 5.0 | 7.3 | 23.6 | **12.0** | 12.7 | 11.1 | 5.1 |
| GSH-1707 | 17.5 | 5.0 | 22.0 | **14.8** | 10.9 | 14.6 | 9.7 |
| AKGS-8146 | 17.5 | 6.7 | 22.0 | **15.4** | 16.4 | 14.6 | 9.8 |
| YSKM 18-2 | 35.0 | 33.4 | 25.3 | **31.2** | 0.0 | 11.5 | 14.6 |
| 8IJ1004 | 22.5 | 16.8 | 25.9 | **21.7** | 13.3 | 14.6 | 6.9 |
| KMR (E) 18-1 | 22.5 | 14.5 | 23.6 | **20.2** | 0.0 | 13.5 | 7.3 |
| DRMRIS 17-7 | 25.0 | 17.8 | 25.1 | **22.6** | 0.0 | 13.5 | 7.7 |
| PRE 2016-2 | 22.5 | 20.5 | 22.7 | **21.9** | 13.8 | 14.6 | 9.3 |
| DRMRCI 96 | 22.5 | 15.6 | 24.1 | **20.7** | 15.6 | 13.5 | 9.1 |
| DRMRHT 13-13-5-4 | 22.5 | 14.5 | 24.5 | **20.5** | 11.8 | 14.6 | 9.8 |
| RH 1699-5 | 27.5 | 20.0 | 24.1 | **23.9** | 34.7 | 13.5 | 8.9 |
| KMR (E) 18-2 | 17.5 | 16.8 | 26.2 | **20.2** | 10.9 | 11.1 | 9.9 |
| RH 1658 | 22.5 | 13.4 | 28.1 | **21.3** | 11.8 | 8.8 | 10.0 |
| DRMR 2017-26 | 30.0 | 15.6 | 23.1 | **22.9** | 13.6 | 11.1 | 10.2 |
| PRE 2016-5 | 22.5 | 24.5 | 21.9 | **23.0** | 33.3 | 6.8 | 8.9 |
| RLC 10# | 22.5 | 21.1 | 21.5 | **21.7** | 10.9 | 11.1 | 8.9 |
| NPJ-228 | 25.0 | 20.5 | 24.0 | **23.2** | 11.6 | 11.1 | 9.0 |
| RH 1657 | 22.5 | 22.2 | 22.9 | **22.5** | 12.4 | 11.1 | 8.3 |
| DRMRQ4-7-23# | 22.5 | 18.9 | 23.6 | **21.7** | 0.0 | 11.5 | 9.9 |
| RH (OE)1706 | 27.5 | 16.8 | 22.6 | **22.3** | 13.1 | 14.6 | 7.1 |
| NPJ-227 | 32.5 | 22.2 | 25.5 | **26.7** | 0.0 | 14.6 | 8.0 |
| RH (OE)1705 | 22.5 | 24.5 | 23.2 | **23.4** | 47.6 | 14.6 | 9.9 |
| DRMRQ1-16-27# | 27.5 | 17.8 | 21.1 | **22.1** | 35.6 | 14.6 | 9.2 |
| DRMRCI 111 | 25.0 | 13.4 | 23.0 | **20.5** | 33.8 | 11.1 | 8.1 |
| PRL-2013-9 | 20.0 | 23.4 | 25.3 | **22.9** | 31.1 | 11.1 | 9.1 |
| RH 1424 | 20.0 | 15.6 | 23.8 | **19.8** | 33.8 | 11.5 | 9.3 |
| CAU-Toria 1 | 30.0 | 30.0 | 26.9 | **29.0** | 13.3 | 11.1 | 9.5 |
| NPJ-225 | 32.5 | 20.0 | 23.2 | **25.2** | 34.7 | 8.8 | 8.1 |
| DRMR 2017-8 | 27.5 | 24.5 | 21.5 | **24.5** | 34.7 | 6.8 | 8.9 |
| DRMRHJ1118 (hybrid) | 22.5 | 21.1 | 22.5 | **22.0** | 12.4 | 11.1 | 8.7 |
| RGN- 444 | 27.5 | 22.2 | 23.5 | **24.4** | 32.0 | 11.5 | 9.5 |
| DRMRCI 95 | 27.5 | 15.6 | 23.5 | **22.2** | 33.8 | 13.5 | 10.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| NPJ-226 | 25.0 | 18.9 | 25.9 | **23.3** | 38.7 | 13.5 | 9.0 |
| DRMRCI 114 | 30.0 | 16.8 | 23.9 | **23.6** | 10.9 | 13.5 | 9.9 |
| RMT 10-15 | 27.5 | 32.2 | 28.4 | **29.4** | 12.9 | 11.1 | 11.7 |
| JM-13-5 | 30.0 | 20.0 | 25.3 | **25.1** | 37.3 | 13.5 | 11.9 |
| RGN- 443 | 27.5 | 24.5 | 25.7 | **25.9** | 32.4 | 11.5 | 10.9 |
| RH 1584 | 25.0 | 17.8 | 31.5 | **24.8** | 9.8 | 9.6 | 11.8 |
| NPJ-224 | 25.0 | 16.8 | 30.1 | **24.0** | 13.3 | 11.1 | 9.0 |
| PHR-3328 | 25.0 | 23.4 | 25.5 | **24.6** | 33.3 | 9.6 | 8.8 |
| NPJ-223 | 37.5 | 22.2 | 23.2 | **27.6** | 12.9 | 6.8 | 10.0 |
| KMR 18-3 | 25.0 | 18.9 | 29.1 | **24.3** | 50.7 | 6.8 | 12.4 |
| PBR 385 | 27.5 | 20.5 | 25.3 | **24.4** | 51.1 | 8.8 | 11.5 |
| RH 1676 | 27.5 | 17.8 | 24.1 | **23.1** | 35.6 | 11.1 | 12.3 |
| KMR 18-4 | 20.0 | 21.1 | 24.2 | **21.8** | 37.3 | 14.6 | 9.1 |
| CS 508 -1 P2# | 20.0 | 23.4 | 27.1 | **23.5** | 11.6 | 11.5 | 7.9 |
| RLC 8# | 27.5 | 15.6 | 23.5 | **22.2** | 12.9 | 11.5 | 9.9 |
| LES-59 | 22.5 | 20.0 | 23.2 | **21.9** | 12.4 | 13.5 | 15.2 |
| CS 15000-1-1-1-1-2 | 27.5 | 22.2 | 25.2 | **25.0** | 12.2 | 11.5 | 14.7 |
| RCH 3# | 25.0 | 14.5 | 19.9 | **19.8** | 0.0 | 13.5 | 10.1 |
| PDZ-11# | 27.5 | 18.9 | 25.3 | **23.9** | 0.0 | 13.5 | 12.5 |
| LES-58 | 22.5 | 16.8 | 22.8 | **20.7** | 0.0 | 11.1 | 12.9 |
| PDZ-12# | 30.0 | 15.6 | 21.7 | **22.4** | 11.6 | 9.6 | 9.8 |
| RLC 9# | 22.5 | 22.2 | 20.6 | **21.8** | 35.3 | 13.5 | 12.4 |
| CS 2009-335 | 27.5 | 20.5 | 22.3 | **23.4** | 12.0 | 14.6 | 10.4 |
| PT-2015-10 | 37.5 | 28.9 | 25.1 | **30.5** | 14.2 | 11.5 | 20.3 |
| RGN- 449 | 27.5 | 23.4 | 21.8 | **24.2** | 0.0 | 11.5 | 11.4 |
| CAU-RM 4 | 22.5 | 20.0 | 25.7 | **22.7** | 12.7 | 19.8 | 11.1 |
| PT-2013-7 | 27.5 | 35.6 | 27.3 | **30.1** | 12.0 | 19.8 | 21.2 |
| TM 130 | 20.0 | 20.0 | 21.6 | **20.5** | 32.0 | 14.6 | 11.5 |
| HUJM 17-8 | 22.5 | 18.9 | 26.8 | **22.7** | 35.1 | 14.6 | 12.4 |
| TKM 18-2 | 27.5 | 31.7 | 26.7 | **28.6** | 12.0 | 14.6 | 10.0 |
| SVJH- 106 | 17.5 | 17.8 | 21.6 | **19.0** | 13.1 | 8.8 | 12.2 |
| TKM 18-1 | 25.0 | 30.0 | 25.5 | **26.8** | 32.4 | 11.1 | 10.6 |
| PRL-2016-6 | 17.5 | 22.2 | 27.7 | **22.5** | 12.4 | 11.1 | 11.6 |
| SKM 1626 | 27.5 | 20.5 | 24.2 | **24.1** | 12.2 | 19.8 | 11.5 |
| Bullet | 20.0 | 18.9 | 24.8 | **21.2** | 12.0 | 13.5 | 11.6 |
| DRMRIJ 1353 | 27.5 | 17.8 | 24.3 | **23.2** | 32.2 | 19.8 | 10.4 |
| DTM-184 | 27.5 | 21.1 | 21.9 | **23.5** | 11.3 | 11.5 | 11.4 |
| SKM 1512 | 22.5 | 23.4 | 21.6 | **22.5** | 12.0 | 11.5 | 11.4 |
| RMM 10-1-1 | 20.0 | 20.0 | 23.3 | **21.1** | 12.4 | 19.8 | 10.8 |
| NPJ-222 | 20.0 | 22.2 | 27.0 | **23.1** | 0.0 | 11.1 | 11.1 |
| DRMR 2017-16 | 22.5 | 18.9 | 29.7 | **23.7** | 0.0 | 8.8 | 10.3 |
| NPJ-221 | 27.5 | 13.4 | 28.1 | **23.0** | 34.4 | 21.9 | 14.3 |
| DRMRCI 107 | 20.0 | 14.5 | 23.2 | **19.2** | 0.0 | 21.9 | 12.0 |
| CS 2009-154 | 25.0 | 16.8 | 25.8 | **22.5** | 0.0 | 19.8 | 11.9 |
| 8IJ0116 | 22.5 | 20.0 | 23.6 | **22.0** | 0.0 | 19.8 | 9.7 |
| PR 2016-8 | 20.0 | 17.8 | 24.3 | **20.7** | 0.0 | 21.9 | 12.2 |
| Anmol | 27.5 | 18.9 | 26.8 | **24.4** | 35.1 | 21.1 | 11.9 |
| HUJM 17-6 | 22.5 | 21.1 | 25.5 | **23.0** | 35.1 | 14.7 | 9.9 |
| TM 217 | 20.0 | 15.6 | 24.5 | **20.0** | 33.8 | 11.5 | 11.8 |
| CS 13000-3-1-1-4-2 | 20.0 | 16.8 | 22.9 | **19.9** | 33.8 | 11.1 | 11.9 |
| AKMS- 1002 | 27.5 | 20.0 | 25.9 | **24.5** | 33.8 | 8.8 | 11.1 |
| RB-101 | 20.0 | 22.2 | 23.9 | **22.0** | 12.2 | 6.8 | 11.0 |
| PR 2016-4 | 20.0 | 24.5 | 21.4 | **22.0** | 11.8 | 11.1 | 13.1 |
| RH 1584 | 20.0 | 23.4 | 22.6 | **22.0** | 12.0 | 11.5 | 11.8 |
| DRMRHJ 1403 | 17.5 | 20.5 | 22.0 | **20.0** | 0.0 | 11.5 | 12.3 |
| RB-102 | 30.0 | 21.1 | 21.5 | **24.2** | 11.3 | 19.8 | 9.5 |
| CAU-RM 2 | 22.5 | 20.0 | 24.7 | **22.4** | 0.0 | 11.5 | 9.4 |
| TM 179 | 22.5 | 22.2 | 25.7 | **23.5** | 0.0 | 11.1 | 12.9 |
| DRMR 2017-27 | 25.0 | 17.8 | 25.5 | **22.8** | 14.2 | 11.5 | 9.9 |
| 8IJ0117 | 20.0 | 18.9 | 22.6 | **20.5** | 12.0 | 8.8 | 11.8 |
| RB-100 | 25.0 | 23.4 | 25.1 | **24.5** | 12.4 | 8.8 | 12.6 |
| DRMRIJ17-92 | 25.0 | 27.8 | 25.5 | **26.1** | 12.2 | 11.1 | 10.7 |
| **CD(P=0.05)** | **6.8** | **4.5** | **1.9** | | **3.6** | **2.9** | **2.0** |
| **CV(%)** | **14.2** | **8.7** | **3.3** | | **8.8** | **7.1** | **5.2** |

**Table 4.6.3: Screening of IVT entries of oilseed Brassica to WR (natural condition)**

| Entries | % WR severity (75 DAS) | % WR severity (100 DAS) | | | | | Stag head | | |
|---|---|---|---|---|---|---|---|---|---|
| | MOR | PNT | SGN | LDH | HSR | Mean | SGN | LDH | MOR |
| GSL 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| RTM 314 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| HNS 1201 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| PT 303 | 0.0 | 10.0 | 0.0 | 0.0 | 0.0 | **2.5** | 0.0 | 0.0 | 0.0 |
| DLSC 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| JGS-12-3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| PHR 2 | 31.5 | 15.0 | 21.3 | 29.1 | 13.4 | **19.7** | 3.3 | 3.0 | 13.8 |
| Rohini | 39.1 | 22.5 | 27.6 | 22.8 | 42.2 | **28.8** | 0.0 | 2.5 | 28.3 |
| BIOYSR | 0.0 | 2.0 | 7.8 | 3.2 | 40.0 | **13.3** | 0.0 | 3.8 | 0.0 |
| HNS 1102 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| Pusa MH-20 | 32.3 | 17.5 | 26.0 | 5.8 | 22.2 | **17.9** | 3.9 | 2.1 | 20.2 |
| RCH 2 | 2.9 | 20.0 | 15.3 | 19.1 | 21.1 | **18.9** | 0.0 | 3.2 | 0.0 |
| DRMRHJ 517 | 30.7 | 17.5 | 34.0 | 11.1 | 20.0 | **20.7** | 4.0 | 1.4 | 29.3 |
| DRMRHJ 1417 | 2.0 | 20.0 | 13.6 | 8.7 | 30.0 | **18.1** | 0.0 | 0.0 | 0.0 |
| SVJH- 101 | 6.0 | 17.5 | 4.7 | 13.3 | 33.4 | **17.2** | 0.0 | 0.0 | 0.0 |
| PHR-3313 | 10.9 | 12.5 | 10.2 | 10.3 | 31.7 | **16.2** | 0.0 | 0.0 | 12.0 |
| Pusa MH-16 | 34.0 | 22.5 | 39.6 | 12.3 | 35.6 | **27.5** | 3.9 | 0.0 | 37.9 |
| SVJH- 108 | 34.0 | 25.0 | 23.6 | 24.0 | 38.9 | **27.9** | 0.0 | 2.0 | 26.8 |
| DRMRHJ 2518 | 33.8 | 22.5 | 31.8 | 16.5 | 32.2 | **25.7** | 4.0 | 8.7 | 28.7 |
| PHR-3489 | 37.1 | 25.0 | 15.8 | 29.6 | 30.0 | **25.1** | 0.0 | 2.5 | 31.4 |
| RHH 1801 | 35.1 | 27.5 | 10.4 | 17.0 | 28.9 | **20.9** | 0.0 | 2.8 | 28.7 |
| Pusa MH-7 (Hybrid) | 34.2 | 22.5 | 32.9 | 19.4 | 30.0 | **26.2** | 4.0 | 0.0 | 24.3 |
| DRMRHJ 2403 | 26.7 | 20.0 | 9.8 | 31.7 | 40.0 | **25.4** | 0.0 | 4.7 | 21.1 |
| 8IJ4002 | 1.8 | 5.0 | 34.0 | 0.3 | 14.5 | **13.4** | 0.0 | 1.5 | 0.0 |
| Pusa MH-5 (Hybrid) | 41.1 | 22.5 | 32.7 | 12.6 | 15.6 | **20.9** | 4.3 | 2.2 | 49.5 |
| 8IJ0117 | 34.1 | 25.0 | 32.9 | 16.5 | 28.9 | **25.8** | 3.6 | 2.9 | 39.2 |
| KMR (L) 18-6 | 35.0 | 22.5 | 33.3 | 32.3 | 40.0 | **32.0** | 3.4 | 3.3 | 43.9 |
| KMR (L) 18-5 | 19.8 | 20.0 | 0.0 | 30.3 | 42.2 | **23.1** | 0.0 | 3.1 | 16.5 |
| DRMRHJ 503 | 34.0 | 25.0 | 12.2 | 15.4 | 46.7 | **24.8** | 0.0 | 0.0 | 38.8 |
| RHH 1802 | 34.9 | 22.5 | 32.4 | 6.2 | 32.2 | **23.3** | 3.8 | 3.1 | 39.9 |
| PYS-2016-15 | 0.0 | 7.5 | 0.0 | 0.0 | 0.0 | **1.9** | 0.0 | 0.0 | 0.0 |
| GSH-1717 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| PYS-2016-8 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | **0.5** | 0.0 | 0.0 | 0.0 |
| AKGS-8217 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| YSKM 18-1 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | **0.5** | 0.0 | 0.0 | 0.0 |
| GSH-1699 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| GSH-1707 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| AKGS-8146 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.0 | 0.0 | 0.0 |
| YSKM 18-2 | 0.0 | 10.0 | 0.0 | 0.0 | 0.0 | **2.5** | 0.0 | 0.0 | 0.0 |
| 8IJ1004 | 35.8 | 22.5 | 28.0 | 26.0 | 30.0 | **26.6** | 3.5 | 2.1 | 25.4 |
| KMR (E) 18-1 | 33.3 | 25.0 | 26.2 | 10.3 | 32.2 | **23.4** | 3.9 | 5.9 | 30.7 |
| DRMRIS 17-7 | 29.3 | 20.0 | 10.4 | 17.2 | 31.1 | **19.7** | 0.0 | 2.1 | 29.3 |
| PRE 2016-2 | 18.2 | 30.0 | 31.3 | 17.7 | 33.4 | **28.1** | 0.0 | 2.1 | 20.2 |
| DRMRCI 96 | 34.0 | 17.5 | 30.7 | 18.3 | 31.7 | **24.5** | 0.0 | 3.6 | 31.7 |
| DRMRHT 13-13-5-4 | 36.0 | 20.0 | 34.9 | 14.4 | 34.5 | **25.9** | 6.9 | 2.9 | 46.9 |
| RH 1699-5 | 33.8 | 27.5 | 31.1 | 16.1 | 43.4 | **29.5** | 3.9 | 2.5 | 18.3 |
| KMR (E) 18-2 | 34.0 | 25.0 | 30.4 | 11.7 | 27.2 | **23.6** | 11.1 | 0.0 | 12.9 |
| RH 1658 | 12.7 | 25.0 | 0.0 | 16.6 | 30.0 | **17.9** | 0.0 | 6.1 | 19.1 |
| DRMR 2017-26 | 0.0 | 12.5 | 36.9 | 0.0 | 0.0 | **12.4** | 3.8 | 3.5 | 0.0 |
| PRE 2016-5 | 9.1 | 27.5 | 33.8 | 13.6 | 41.1 | **29.0** | 0.0 | 2.1 | 12.7 |
| RLC 10# | 0.0 | 5.0 | 30.9 | 0.0 | 0.0 | **9.0** | 4.0 | 0.0 | 0.0 |
| NPJ-228 | 6.9 | 27.5 | 12.9 | 14.3 | 31.2 | **21.5** | 0.0 | 1.2 | 0.0 |
| RH 1657 | 34.1 | 25.0 | 30.9 | 7.6 | 46.7 | **27.6** | 4.1 | 0.0 | 33.5 |
| DRMRQ4-7-23# | 0.0 | 5.0 | 35.1 | 0.0 | 0.0 | **10.0** | 0.0 | 2.0 | 0.0 |
| RH (OE)1706 | 12.9 | 32.5 | 47.6 | 19.7 | 31.1 | **32.7** | 3.5 | 2.0 | 13.4 |
| NPJ-227 | 21.1 | 30.0 | 42.9 | 12.7 | 38.9 | **31.1** | 0.0 | 9.3 | 27.0 |
| RH (OE)1705 | 32.5 | 25.0 | 40.2 | 6.3 | 36.7 | **27.1** | 10.2 | 2.5 | 39.6 |
| DRMRQ1-16-27# | 2.0 | 2.0 | 32.0 | 0.0 | 1.7 | **8.9** | 3.7 | 0.0 | 0.0 |
| DRMRCI 111 | 34.0 | 22.5 | 0.0 | 25.0 | 34.5 | **20.5** | 3.2 | 3.5 | 30.6 |
| PRL-2013-9 | 17.4 | 30.0 | 46.0 | 23.5 | 30.0 | **32.4** | 11.9 | 2.9 | 0.0 |
| RH 1424 | 38.0 | 25.0 | 47.3 | 28.8 | 32.2 | **33.3** | 10.3 | 0.0 | 39.5 |
| CAU-Toria 1 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 | **3.8** | 0.0 | 0.0 | 0.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NPJ-225 | 34.2 | 22.5 | 36.0 | 11.7 | 20.0 | **22.6** | 3.8 | 1.5 | 30.8 |
| DRMR 2017-8 | 37.1 | 22.5 | 40.9 | 20.6 | 36.7 | **30.2** | 12.1 | 4.8 | 23.5 |
| DRMRHJ1118 (hybrid) | 16.5 | 25.0 | 31.1 | 12.0 | 31.7 | **25.0** | 3.7 | 0.0 | 20.9 |
| RGN- 444 | 35.1 | 27.5 | 33.8 | 23.2 | 36.7 | **30.3** | 11.5 | 3.0 | 33.8 |
| DRMRCI 95 | 32.5 | 20.0 | 7.1 | 14.6 | 33.4 | **18.8** | 0.0 | 2.7 | 41.4 |
| NPJ-226 | 9.8 | 20.0 | 33.3 | 11.5 | 28.9 | **23.4** | 3.9 | 2.0 | 0.0 |
| DRMRCI 114 | 38.0 | 25.0 | 0.0 | 13.2 | 32.2 | **17.6** | 0.0 | 2.1 | 53.6 |
| RMT 10-15 | 0.0 | 7.5 | 0.0 | 0.0 | 0.0 | **1.9** | 0.0 | 0.0 | 0.0 |
| JM-13-5 | 40.2 | 30.0 | 39.3 | 30.3 | 40.0 | **34.9** | 10.5 | 2.0 | 44.7 |
| RGN- 443 | 14.9 | 32.5 | 36.9 | 19.4 | 36.7 | **31.4** | 3.6 | 3.1 | 17.7 |
| RH 1584 | 39.9 | 27.5 | 32.0 | 27.3 | 31.7 | **29.6** | 0.0 | 2.7 | 38.6 |
| NPJ-224 | 16.7 | 20.0 | 0.0 | 24.1 | 34.5 | **19.7** | 0.0 | 0.0 | 32.9 |
| PHR-3328 | 16.0 | 25.0 | 9.8 | 29.7 | 38.9 | **25.8** | 0.0 | 2.6 | 11.3 |
| NPJ-223 | 17.1 | 27.5 | 32.9 | 9.4 | 35.6 | **26.4** | 3.5 | 2.1 | 17.3 |
| KMR 18-3 | 36.9 | 25.0 | 30.9 | 28.4 | 42.2 | **31.6** | 3.6 | 4.2 | 36.7 |
| PBR 385 | 38.2 | 27.5 | 0.0 | 29.9 | 45.6 | **25.8** | 0.0 | 3.5 | 31.4 |
| RH 1676 | 19.8 | 30.0 | 0.0 | 24.4 | 32.2 | **21.6** | 0.0 | 2.6 | 24.0 |
| KMR 18-4 | 6.9 | 22.5 | 29.8 | 19.1 | 36.7 | **27.0** | 3.8 | 3.6 | 0.0 |
| CS 508 -1 P2# | 14.2 | 22.5 | 35.8 | 26.5 | 30.0 | **28.7** | 3.8 | 2.6 | 12.7 |
| RLC 8# | 0.0 | 6.0 | 44.2 | 0.0 | 0.0 | **12.6** | 8.3 | 1.9 | 0.0 |
| LES-59 | 6.9 | 22.5 | 34.2 | 11.6 | 41.1 | **27.4** | 3.5 | 4.5 | 0.0 |
| CS 15000-1-1-1-1-2 | 38.9 | 22.5 | 33.3 | 26.1 | 34.5 | **29.1** | 10.8 | 7.8 | 40.6 |
| RCH 3# | 13.8 | 2.0 | 11.6 | 0.0 | 0.0 | **3.4** | 0.0 | 1.1 | 16.5 |
| PDZ-11# | 2.0 | 7.5 | 11.3 | 6.7 | 0.0 | **6.4** | 0.0 | 1.6 | 0.0 |
| LES-58 | 33.4 | 22.5 | 32.9 | 6.2 | 43.4 | **26.3** | 3.7 | 2.9 | 45.0 |
| PDZ-12# | 0.0 | 10.0 | 30.7 | 0.0 | 0.0 | **10.2** | 0.0 | 0.0 | 0.0 |
| RLC 9# | 0.0 | 15.0 | 30.9 | 0.3 | 36.7 | **20.7** | 3.9 | 3.3 | 0.0 |
| CS 2009-335 | 40.7 | 30.0 | 33.8 | 23.8 | 35.6 | **30.8** | 0.0 | 2.7 | 53.1 |
| PT-2015-10 | 8.0 | 7.5 | 13.8 | 0.0 | 0.0 | **5.3** | 0.0 | 0.0 | 0.0 |
| RGN- 449 | 34.2 | 27.5 | 32.9 | 17.8 | 33.4 | **27.9** | 4.0 | 5.8 | 25.1 |
| CAU-RM 4 | 36.7 | 5.0 | 33.8 | 0.0 | 0.0 | **9.7** | 3.5 | 0.0 | 31.7 |
| PT-2013-7 | 0.0 | 10.0 | 0.0 | 0.0 | 0.0 | **2.5** | 0.0 | 0.0 | 0.0 |
| TM 130 | 33.9 | 20.0 | 33.8 | 17.8 | 31.1 | **25.7** | 3.3 | 4.7 | 20.1 |
| HUJM 17-8 | 0.0 | 17.5 | 44.0 | 7.9 | 2.8 | **18.0** | 4.1 | 2.0 | 0.0 |
| TKM 18-2 | 0.0 | 12.5 | 31.3 | 0.0 | 0.0 | **11.0** | 0.0 | 0.0 | 0.0 |
| SVJH- 106 | 34.0 | 20.0 | 13.3 | 17.2 | 35.6 | **21.5** | 0.0 | 3.1 | 40.6 |
| TKM 18-1 | 0.0 | 15.0 | 47.1 | 0.0 | 0.0 | **15.5** | 11.4 | 0.0 | 0.0 |
| PRL-2016-6 | 6.0 | 25.0 | 47.1 | 24.9 | 36.7 | **33.4** | 10.6 | 1.8 | 7.1 |
| SKM 1626 | 11.1 | 25.0 | 11.3 | 21.2 | 32.2 | **22.4** | 0.0 | 3.8 | 13.4 |
| Bullet | 2.0 | 17.5 | 0.0 | 11.1 | 31.7 | **15.1** | 0.0 | 1.8 | 0.0 |
| DRMRIJ 1353 | 17.1 | 27.5 | 13.8 | 37.8 | 34.5 | **28.4** | 3.3 | 3.8 | 13.8 |
| DTM-184 | 16.0 | 27.5 | 9.3 | 37.8 | 30.0 | **26.1** | 0.0 | 4.9 | 12.4 |
| SKM 1512 | 39.1 | 27.5 | 0.0 | 11.7 | 36.7 | **19.0** | 0.0 | 7.6 | 38.0 |
| RMM 10-1-1 | 34.2 | 17.5 | 0.0 | 20.5 | 35.6 | **18.4** | 0.0 | 4.2 | 23.3 |
| NPJ-222 | 14.9 | 25.0 | 31.3 | 24.5 | 38.9 | **29.9** | 3.7 | 2.9 | 11.8 |
| DRMR 2017-16 | 10.9 | 27.5 | 14.4 | 29.1 | 48.9 | **30.0** | 3.5 | 4.7 | 7.9 |
| NPJ-221 | 18.0 | 20.0 | 10.0 | 13.8 | 32.2 | **19.0** | 3.8 | 1.1 | 20.2 |
| DRMRCI 107 | 7.8 | 17.5 | 32.0 | 19.9 | 33.4 | **25.7** | 3.6 | 1.8 | 0.0 |
| CS 2009-154 | 18.0 | 20.0 | 46.4 | 21.4 | 40.0 | **32.0** | 3.5 | 2.2 | 7.5 |
| 8IJ0116 | 14.9 | 12.5 | 30.0 | 16.8 | 31.2 | **22.6** | 4.0 | 2.5 | 12.3 |
| PR 2016-8 | 15.2 | 22.5 | 29.8 | 26.3 | 42.2 | **30.2** | 1.9 | 4.8 | 7.7 |
| Anmol | 33.3 | 20.0 | 0.0 | 26.5 | 51.1 | **24.4** | 0.0 | 4.8 | 31.7 |
| HUJM 17-6 | 14.9 | 17.5 | 31.6 | 11.3 | 50.0 | **27.6** | 3.6 | 6.0 | 20.2 |
| TM 217 | 8.2 | 15.0 | 32.4 | 13.5 | 36.7 | **24.4** | 3.8 | 0.0 | 0.0 |
| CS 13000-3-1-1-4-2 | 34.9 | 22.5 | 33.8 | 30.0 | 48.9 | **33.8** | 11.4 | 3.2 | 30.5 |
| AKMS- 1002 | 20.0 | 20.0 | 45.3 | 26.4 | 45.6 | **34.3** | 12.3 | 2.4 | 16.5 |
| RB-101 | 34.0 | 20.0 | 40.0 | 30.6 | 51.1 | **35.4** | 6.9 | 2.2 | 25.9 |
| PR 2016-4 | 18.2 | 22.5 | 38.9 | 16.6 | 48.9 | **31.7** | 3.6 | 1.3 | 15.6 |
| RH 1584 | 8.0 | 17.5 | 15.8 | 32.8 | 50.0 | **29.0** | 1.9 | 3.7 | 0.0 |
| DRMRHJ 1403 | 16.7 | 22.5 | 27.6 | 33.4 | 46.7 | **32.5** | 0.0 | 0.0 | 11.8 |
| RB-102 | 18.9 | 22.5 | 0.0 | 17.0 | 38.9 | **19.6** | 3.8 | 2.4 | 16.5 |
| CAU-RM 2 | 3.8 | 17.5 | 33.3 | 31.0 | 32.2 | **28.5** | 3.8 | 3.1 | 0.0 |
| TM 179 | 11.8 | 20.0 | 33.1 | 15.7 | 43.4 | **28.0** | 18.8 | 3.5 | 19.1 |
| DRMR 2017-27 | 37.3 | 20.0 | 32.4 | 22.1 | 46.7 | **30.3** | 12.7 | 6.2 | 34.2 |
| 8IJ0117 | 19.3 | 20.0 | 48.0 | 9.2 | 26.7 | **26.0** | 7.0 | 4.1 | 18.9 |
| RB-100 | 34.9 | 22.5 | 32.0 | 28.9 | 30.0 | **28.4** | 3.8 | 4.7 | 39.8 |
| DRMRIJ17-92 | 4.0 | 20.0 | 36.7 | 6.6 | 50.0 | **28.3** | 3.8 | 2.8 | 0.0 |
| **CD(*P*=0.05)** | **3.3** | **9.5** | **4.9** | **4.1** | **4.3** | | **2.6** | **3.8** | **4.3** |
| **CV (%)** | **7.9** | **26.3** | **10.1** | **10.8** | **7.9** | | **18.9** | **27.7** | **11.4** |

**Table 4.6.4: Screening of IVT entries of oilseed Brassica to DM, PM and SR (natural condition)**

| Entries | % DM | % PM severity (75 DAS) | | | % PM severity (100 DAS) | | | % SR incidence | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PNT | JAG | SKN | Mean | MOR | JAG | Mean | MOR | PNT | SGN | LDH | VAR |
| GSL 1 | 0.0 | 35.0 | 12.5 | **23.8** | 9.1 | 47.5 | 28.3 | 0.0 | 0.0 | 4.0 | 9.6 | 0.0 |
| RTM 314 | 0.0 | 0.0 | 5.0 | **2.5** | 0.0 | 0.0 | 0.0 | 27.5 | 28.9 | 18.6 | 46.6 | 35.0 |
| HNS 1201 | 0.0 | 41.0 | 10.0 | **25.5** | 0.0 | 52.5 | 26.3 | 0.0 | 0.0 | 7.4 | 13.2 | 40.0 |
| PT 303 | 27.5 | 0.0 | - | **0.0** | 0.0 | 0.0 | 0.0 | 20.0 | 21.1 | 20.0 | 48.1 | 40.0 |
| DLSC 1 | 0.0 | 38.0 | 0.0 | **19.0** | 0.0 | 50.0 | 25.0 | 7.5 | 4.6 | 11.5 | 13.5 | 37.5 |
| JGS-12-3 | 0.0 | 34.0 | 7.5 | **20.8** | 0.0 | 46.5 | 23.3 | 5.0 | 3.8 | 7.5 | 6.3 | 10.0 |
| PHR 2 | 27.5 | 51.0 | 75.0 | **63.0** | 8.0 | 52.5 | 30.3 | 2.5 | 0.0 | 0.0 | 16.9 | 7.5 |
| Rohini | 37.5 | 50.5 | 50.0 | **50.3** | 21.1 | 57.5 | 39.3 | 2.5 | 0.0 | 3.7 | 17.2 | 15.0 |
| BIOYSR | 32.5 | 50.5 | 55.0 | **52.8** | 16.7 | 62.5 | 39.6 | 5.0 | 6.9 | 0.0 | 13.5 | 20.0 |
| HNS 1102 | 0.0 | 35.0 | 25.0 | **30.0** | 3.8 | 45.0 | 24.4 | 2.5 | 7.3 | 3.5 | 9.8 | 47.5 |
| Pusa MH-20 | 37.5 | 47.5 | 65.0 | **56.3** | 20.7 | 60.0 | 40.4 | 22.5 | 15.8 | 3.9 | 19.3 | 40.0 |
| RCH 2 | 47.5 | 55.0 | 95.0 | **75.0** | 26.9 | 62.5 | 44.7 | 7.5 | 3.2 | 0.0 | 10.9 | 35.0 |
| DRMRHJ 517 | 37.5 | 51.0 | 55.0 | **53.0** | 30.9 | 60.0 | 45.5 | 2.5 | 4.3 | 4.0 | 0.0 | 40.0 |
| DRMRHJ 1417 | 42.5 | 47.5 | 60.0 | **53.8** | 29.1 | 57.5 | 43.3 | 7.5 | 0.0 | 3.5 | 14.4 | 35.0 |
| SVJH- 101 | 52.5 | 42.5 | 70.0 | **56.3** | 22.2 | 50.0 | 36.1 | 15.0 | 9.0 | 0.0 | 6.5 | 35.0 |
| PHR-3313 | 52.5 | 40.0 | 70.0 | **55.0** | 34.2 | 45.0 | 39.6 | 20.0 | 0.0 | 3.6 | 13.4 | 35.0 |
| Pusa MH-16 | 37.5 | 39.0 | 50.0 | **44.5** | 17.1 | 50.0 | 33.6 | 25.0 | 10.5 | 3.9 | 23.0 | 32.5 |
| SVJH- 108 | 47.5 | 57.5 | 55.0 | **56.3** | 14.0 | 65.0 | 39.5 | 30.0 | 16.5 | 4.3 | 15.3 | 30.0 |
| DRMRHJ 2518 | 0.0 | 70.0 | 80.0 | **75.0** | 21.1 | 75.0 | 48.1 | 7.5 | 9.3 | 0.0 | 11.3 | 35.0 |
| PHR-3489 | 37.5 | 61.0 | 95.0 | **78.0** | 20.0 | 75.0 | 47.5 | 12.5 | 0.0 | 3.7 | 16.4 | 40.0 |
| RHH 1801 | 35.0 | 57.5 | 85.0 | **71.3** | 30.9 | 72.5 | 51.7 | 17.5 | 13.9 | 3.5 | 16.7 | 30.0 |
| Pusa MH-7 (Hybrid) | 30.0 | 57.5 | 75.0 | **66.3** | 34.9 | 72.5 | 53.7 | 17.5 | 8.0 | 0.0 | 5.3 | 30.0 |
| DRMRHJ 2403 | 40.0 | 52.5 | 65.0 | **58.8** | 14.9 | 67.5 | 41.2 | 12.5 | 9.1 | 0.0 | 19.0 | 30.0 |
| 8IJ4002 | 30.0 | 50.0 | - | **50.0** | 34.2 | 67.5 | 50.9 | 17.5 | 22.5 | 3.5 | 42.7 | 35.0 |
| Pusa MH-5 (Hybrid) | 47.5 | 50.0 | 70.0 | **60.0** | 30.9 | 65.0 | 48.0 | 45.0 | 16.0 | 4.3 | 36.3 | 25.0 |
| 8IJ0117 | 52.5 | 43.5 | 45.0 | **44.3** | 26.9 | 62.5 | 44.7 | 22.5 | 23.1 | 0.0 | 6.2 | 12.5 |
| KMR (L) 18-6 | 45.0 | 46.5 | 65.0 | **55.8** | 30.2 | 62.5 | 46.4 | 7.5 | 7.7 | 3.4 | 24.3 | 2.5 |
| KMR (L) 18-5 | 57.5 | 51.5 | 90.0 | **70.8** | 28.9 | 65.0 | 47.0 | 17.5 | 8.7 | 3.8 | 10.5 | 12.5 |
| DRMRHJ 503 | 37.5 | 55.0 | 75.0 | **65.0** | 16.2 | 67.5 | 41.9 | 7.5 | 4.9 | 3.8 | 14.3 | 17.5 |
| RHH 1802 | 35.0 | 50.0 | 75.0 | **62.5** | 26.0 | 65.0 | 45.5 | 12.5 | 16.9 | 7.6 | 13.5 | 20.0 |
| PYS-2016-15 | 0.0 | 37.5 | 35.0 | **36.3** | 10.9 | 55.0 | 33.0 | 27.5 | 15.8 | 3.6 | 49.4 | 30.0 |
| GSH-1717 | 0.0 | 0.0 | 15.0 | **7.5** | 5.1 | 0.0 | 2.6 | 12.5 | 0.0 | 0.0 | 10.9 | 0.0 |
| PYS-2016-8 | 30.0 | 32.5 | 45.0 | **38.8** | 4.0 | 40.0 | 22.0 | 27.5 | 18.3 | 3.5 | 42.2 | 30.0 |
| AKGS-8217 | 0.0 | 0.0 | 15.0 | **7.5** | 3.8 | 0.0 | 1.9 | 12.5 | 3.4 | 4.1 | 14.2 | 0.0 |
| YSKM 18-1 | 20.0 | 32.5 | 15.0 | **23.8** | 16.0 | 42.5 | 29.3 | 57.5 | 22.9 | 3.8 | 47.8 | 25.0 |
| GSH-1699 | 0.0 | 0.0 | 5.0 | **2.5** | 4.2 | 0.0 | 2.1 | 32.5 | 0.0 | 4.0 | 10.1 | 0.0 |
| GSH-1707 | 0.0 | 0.0 | 10.0 | **5.0** | 5.1 | 0.0 | 2.6 | 7.5 | 0.0 | 4.1 | 6.7 | 0.0 |
| AKGS-8146 | 0.0 | 0.0 | 20.0 | **10.0** | 3.6 | 0.0 | 1.8 | 20.0 | 2.2 | 12.1 | 13.5 | 15.0 |
| YSKM 18-2 | 42.5 | 34.0 | 20.0 | **27.0** | 22.2 | 40.0 | 31.1 | 80.0 | 13.0 | 20.0 | 29.2 | 40.0 |
| 8IJ1004 | 25.0 | 40.0 | 65.0 | **52.5** | 26.9 | 55.0 | 41.0 | 25.0 | 9.3 | 0.0 | 20.2 | 15.0 |
| KMR (E) 18-1 | 37.5 | 62.5 | 75.0 | **68.8** | 39.8 | 70.0 | 54.9 | 22.5 | 13.6 | 3.9 | 13.6 | 5.0 |
| DRMRIS 17-7 | 37.5 | 51.0 | 95.0 | **73.0** | 20.0 | 65.0 | 42.5 | 32.5 | 13.1 | 3.8 | 10.0 | 10.0 |
| PRE 2016-2 | 30.0 | 51.5 | 75.0 | **63.3** | 10.9 | 65.0 | 38.0 | 30.0 | 24.5 | 0.0 | 24.7 | 35.0 |
| DRMRCI 96 | 32.5 | 46.5 | 80.0 | **63.3** | 30.9 | 55.0 | 43.0 | 15.0 | 18.9 | 3.4 | 7.9 | 30.0 |
| DRMRHT 13-13-5-4 | 32.5 | 57.5 | 55.0 | **56.3** | 32.2 | 57.5 | 44.9 | 22.5 | 19.3 | 3.5 | 6.1 | 40.0 |
| RH 1699-5 | 42.5 | 50.0 | 50.0 | **50.0** | 34.0 | 60.0 | 47.0 | 7.5 | 9.6 | 0.0 | 22.2 | 35.0 |
| KMR (E) 18-2 | 30.0 | 48.5 | 52.5 | **50.5** | 31.8 | 60.0 | 45.9 | 37.5 | 18.6 | 0.0 | 6.9 | 30.0 |
| RH 1658 | 20.0 | 52.5 | 65.0 | **58.8** | 32.5 | 57.5 | 45.0 | 32.5 | 15.6 | 3.6 | 10.3 | 0.0 |
| DRMR 2017-26 | 37.5 | 58.5 | 55.0 | **56.8** | 10.9 | 62.5 | 36.7 | 42.5 | 19.3 | 3.8 | 7.6 | 10.0 |
| PRE 2016-5 | 47.5 | 51.5 | 55.0 | **53.3** | 17.1 | 62.5 | 39.8 | 60.0 | 17.4 | 0.0 | 15.2 | 30.0 |
| RLC 10# | 32.5 | 40.0 | 65.0 | **52.5** | 20.0 | 57.5 | 38.8 | 15.0 | 9.0 | 4.0 | 5.4 | 30.0 |
| NPJ-228 | 25.0 | 51.0 | 55.0 | **53.0** | 22.2 | 65.0 | 43.6 | 7.5 | 8.0 | 7.3 | 6.8 | 15.0 |
| RH 1657 | 32.5 | 40.0 | 75.0 | **57.5** | 25.1 | 60.0 | 42.6 | 12.5 | 14.5 | 4.1 | 0.0 | 10.0 |
| DRMRQ4-7-23# | 42.5 | 45.0 | 85.0 | **65.0** | 26.9 | 55.0 | 41.0 | 47.5 | 0.0 | 4.0 | 9.5 | 10.0 |
| RH (OE)1706 | 25.0 | 46.0 | 75.0 | **60.5** | 32.2 | 60.0 | 46.1 | 32.5 | 5.1 | 3.5 | 4.5 | 15.0 |
| NPJ-227 | 32.5 | 45.0 | 75.0 | **60.0** | 37.3 | 55.0 | 46.2 | 12.5 | 6.2 | 3.7 | 6.0 | 10.0 |
| RH (OE)1705 | 37.5 | 46.0 | 75.0 | **60.5** | 21.1 | 52.5 | 36.8 | 30.0 | 9.5 | 3.4 | 10.2 | 10.0 |
| DRMRQ1-16-27# | 27.5 | 41.0 | 55.0 | **48.0** | 39.8 | 38.0 | 38.9 | 22.5 | 11.4 | 0.0 | 12.7 | 10.0 |
| DRMRCI 111 | 32.5 | 42.5 | 85.0 | **63.8** | 25.1 | 57.5 | 41.3 | 17.5 | 0.0 | 3.2 | 6.1 | 10.0 |
| PRL-2013-9 | 42.5 | 50.0 | 65.0 | **57.5** | 30.9 | 60.0 | 45.5 | 20.0 | 0.0 | 4.0 | 0.0 | 5.0 |
| RH 1424 | 32.5 | 35.0 | 55.0 | **45.0** | 26.0 | 50.0 | 38.0 | 35.0 | 11.4 | 3.4 | 0.0 | 10.0 |
| CAU-Toria 1 | 0.0 | 34.0 | - | **34.0** | 10.9 | 45.0 | 28.0 | 92.5 | 21.7 | 17.7 | 29.5 | 75.0 |
| NPJ-225 | 32.5 | 36.0 | 55.0 | **45.5** | 18.9 | 45.0 | 32.0 | 17.5 | 4.8 | 0.0 | 5.0 | 25.0 |
| DRMR 2017-8 | 37.5 | 45.0 | 75.0 | **60.0** | 22.2 | 47.5 | 34.9 | 15.0 | 3.0 | 4.0 | 0.0 | 25.0 |
| DRMRHJ1118 (hybrid) | 30.0 | 37.5 | 75.0 | **56.3** | 25.1 | 52.5 | 38.8 | 22.5 | 4.6 | 3.7 | 8.4 | 15.0 |
| RGN- 444 | 25.0 | 36.5 | 80.0 | **58.3** | 16.0 | 55.0 | 35.5 | 7.5 | 0.0 | 3.8 | 10.5 | 25.0 |
| DRMRCI 95 | 30.0 | 35.0 | 90.0 | **62.5** | 34.0 | 52.5 | 43.3 | 25.0 | 20.0 | 0.0 | 18.9 | 5.0 |
| NPJ-226 | 25.0 | 40.0 | 85.0 | **62.5** | 33.1 | 57.5 | 45.3 | 17.5 | 4.1 | 3.9 | 4.3 | 5.0 |
| DRMRCI 114 | 47.5 | 34.5 | 90.0 | **62.3** | 30.9 | 57.5 | 44.2 | 7.5 | 0.0 | 3.7 | 5.8 | 25.0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RMT 10-15 | 20.0 | 38.5 | - | **38.5** | 10.9 | 57.5 | 34.2 | 87.5 | 21.3 | 6.7 | 33.5 | 25.0 |
| JM-13-5 | 30.0 | 47.5 | 75.0 | **61.3** | 26.0 | 60.0 | 43.0 | 15.0 | 0.0 | 3.5 | 10.3 | 30.0 |
| RGN- 443 | 25.0 | 37.5 | 75.0 | **56.3** | 40.9 | 55.0 | 48.0 | 25.0 | 2.9 | 17.9 | 7.7 | 25.0 |
| RH 1584 | 32.5 | 37.0 | 55.0 | **46.0** | 34.3 | 55.0 | 44.6 | 7.5 | 9.5 | 4.0 | 10.5 | 5.0 |
| NPJ-224 | 42.5 | 38.5 | 45.0 | **41.8** | 36.0 | 52.5 | 44.3 | 25.0 | 6.5 | 3.5 | 11.8 | 15.0 |
| PHR-3328 | 27.5 | 40.0 | 100.0 | **70.0** | 36.0 | 55.0 | 45.5 | 22.5 | 8.3 | 3.6 | 10.2 | 25.0 |
| NPJ-223 | 20.0 | 35.0 | 85.0 | **60.0** | 38.0 | 52.5 | 45.3 | 37.5 | 5.7 | 0.0 | 11.5 | 15.0 |
| KMR 18-3 | 37.5 | 34.5 | 75.0 | **54.8** | 37.3 | 45.0 | 41.2 | 22.5 | 4.7 | 0.0 | 0.0 | 25.0 |
| PBR 385 | 52.5 | 38.5 | 85.0 | **61.8** | 36.0 | 47.5 | 41.8 | 10.0 | 2.7 | 3.8 | 11.9 | 25.0 |
| RH 1676 | 42.5 | 42.5 | 90.0 | **66.3** | 28.2 | 52.5 | 40.4 | 7.5 | 10.2 | 3.7 | 10.5 | 20.0 |
| KMR 18-4 | 47.5 | 40.0 | 95.0 | **67.5** | 34.0 | 50.0 | 42.0 | 12.5 | 5.1 | 3.8 | 6.5 | 25.0 |
| CS 508 -1 P2# | 32.5 | 41.0 | 100.0 | **70.5** | 15.1 | 52.5 | 33.8 | 10.0 | 8.4 | 0.0 | 10.1 | 20.0 |
| RLC 8# | 27.5 | 36.5 | 85.0 | **60.8** | 21.1 | 50.0 | 35.6 | 17.5 | 0.0 | 4.2 | 5.0 | 20.0 |
| LES-59 | 25.0 | 39.5 | 65.0 | **52.3** | 30.9 | 50.0 | 40.5 | 27.5 | 11.8 | 3.5 | 9.8 | 25.0 |
| CS 15000-1-1-1-1-2 | 42.5 | 50.0 | 65.0 | **57.5** | 23.8 | 65.0 | 44.4 | 15.0 | 0.0 | 3.6 | 12.9 | 25.0 |
| RCH 3# | 47.5 | 40.0 | 65.0 | **52.5** | 29.1 | 57.5 | 43.3 | 12.5 | 10.1 | 0.0 | 10.2 | 35.0 |
| PDZ-11# | 42.5 | 0.0 | 65.0 | **32.5** | 22.2 | 0.0 | 11.1 | 37.5 | 8.2 | 0.0 | 0.0 | 25.0 |
| LES-58 | 25.0 | 51.0 | 95.0 | **73.0** | 25.1 | 67.5 | 46.3 | 30.0 | 17.0 | 3.7 | 22.6 | 25.0 |
| PDZ-12# | 20.0 | 41.0 | 85.0 | **63.0** | 34.0 | 60.0 | 47.0 | 25.0 | 5.7 | 3.8 | 9.4 | 30.0 |
| RLC 9# | 37.5 | 37.0 | 70.0 | **53.5** | 14.0 | 57.5 | 35.8 | 27.5 | 10.8 | 0.0 | 4.4 | 5.0 |
| CS 2009-335 | 27.5 | 41.0 | 80.0 | **60.5** | 20.0 | 57.5 | 38.8 | 12.5 | 4.0 | 0.0 | 15.5 | 0.0 |
| PT-2015-10 | 32.5 | 37.5 | - | **37.5** | 10.9 | 57.5 | 34.2 | 92.5 | 19.5 | 3.7 | 31.0 | 15.0 |
| RGN- 449 | 42.5 | 36.0 | 85.0 | **60.5** | 30.0 | 52.5 | 41.3 | 25.0 | 0.0 | 4.0 | 6.3 | 10.0 |
| CAU-RM 4 | 25.0 | 42.5 | 65.0 | **53.8** | 34.0 | 50.0 | 42.0 | 22.5 | 5.5 | 7.0 | 4.9 | 25.0 |
| PT-2013-7 | 32.5 | 36.5 | 90.0 | **63.3** | 10.0 | 55.0 | 32.5 | 92.5 | 17.3 | 17.0 | 27.1 | 30.0 |
| TM 130 | 42.5 | 0.0 | 100.0 | **50.0** | 30.0 | 0.0 | 15.0 | 15.0 | 5.9 | 3.3 | 10.9 | 25.0 |
| HUJM 17-8 | 32.5 | 37.5 | 85.0 | **61.3** | 9.1 | 57.5 | 33.3 | 12.5 | 0.0 | 8.2 | 7.1 | 25.0 |
| TKM 18-2 | 32.5 | 36.5 | 40.0 | **38.3** | 16.0 | 57.5 | 36.8 | 92.5 | 19.7 | 0.0 | 26.9 | 75.0 |
| SVJH- 106 | 37.5 | 40.0 | 75.0 | **57.5** | 37.1 | 47.5 | 42.3 | 12.5 | 12.4 | 3.8 | 4.9 | 80.0 |
| TKM 18-1 | 27.5 | 39.5 | 55.0 | **47.3** | 9.1 | 50.0 | 29.6 | 85.0 | 23.8 | 3.8 | 38.9 | 80.0 |
| PRL-2016-6 | 25.0 | 40.5 | 90.0 | **65.3** | 19.8 | 55.0 | 37.4 | 20.0 | 3.8 | 3.5 | 6.5 | 45.0 |
| SKM 1626 | 52.5 | 41.0 | 80.0 | **60.5** | 37.1 | 52.5 | 44.8 | 17.5 | 9.6 | 3.6 | 4.9 | 15.0 |
| Bullet | 32.5 | 37.5 | 75.0 | **56.3** | 16.0 | 50.0 | 33.0 | 7.5 | 13.7 | 7.3 | 7.8 | 20.0 |
| DRMRIJ 1353 | 27.5 | 38.5 | 75.0 | **56.8** | 26.9 | 50.0 | 38.5 | 32.5 | 23.4 | 0.0 | 12.3 | 20.0 |
| DTM-184 | 17.5 | 32.5 | 75.0 | **53.8** | 29.1 | 42.5 | 35.8 | 20.0 | 2.0 | 3.7 | 15.6 | 20.0 |
| SKM 1512 | 37.5 | 35.0 | 65.0 | **50.0** | 42.2 | 42.5 | 42.4 | 22.5 | 11.1 | 3.4 | 16.8 | 20.0 |
| RMM 10-1-1 | 42.5 | 41.0 | 85.0 | **63.0** | 39.1 | 47.5 | 43.3 | 15.0 | 13.0 | 0.0 | 19.7 | 15.0 |
| NPJ-222 | 27.5 | 46.0 | 70.0 | **58.0** | 22.2 | 55.0 | 38.6 | 5.0 | 13.3 | 3.7 | 13.1 | 15.0 |
| DRMR 2017-16 | 37.5 | 32.5 | 80.0 | **56.3** | 24.2 | 42.5 | 33.4 | 27.5 | 0.0 | 3.5 | 7.2 | 20.0 |
| NPJ-221 | 32.5 | 37.0 | 65.0 | **51.0** | 40.0 | 45.0 | 42.5 | 30.0 | 18.4 | 0.0 | 16.8 | 20.0 |
| DRMRCI 107 | 47.5 | 40.0 | 85.0 | **62.5** | 22.2 | 45.0 | 33.6 | 12.5 | 6.5 | 7.2 | 11.5 | 45.0 |
| CS 2009-154 | 37.5 | 48.5 | 85.0 | **66.8** | 32.0 | 55.0 | 43.5 | 7.5 | 0.0 | 0.0 | 8.4 | 25.0 |
| 8IJ0116 | 27.5 | 37.5 | 50.0 | **43.8** | 34.0 | 45.0 | 39.5 | 10.0 | 10.3 | 7.9 | 5.4 | 45.0 |
| PR 2016-8 | 52.5 | 36.0 | 85.0 | **60.5** | 38.0 | 42.5 | 40.3 | 5.0 | 8.9 | 7.5 | 9.1 | 40.0 |
| Anmol | 37.5 | 48.5 | 85.0 | **66.8** | 38.9 | 60.0 | 49.5 | 2.5 | 11.4 | 4.0 | 5.6 | 15.0 |
| HUJM 17-6 | 42.5 | 32.5 | 90.0 | **61.3** | 40.2 | 42.5 | 41.4 | 7.5 | 8.0 | 7.2 | 13.7 | 15.0 |
| TM 217 | 32.5 | 37.0 | 90.0 | **63.5** | 22.2 | 50.0 | 36.1 | 12.5 | 7.4 | 3.8 | 5.1 | 30.0 |
| CS 13000-3-1-1-4-2 | 27.5 | 37.5 | 80.0 | **58.8** | 32.2 | 52.5 | 42.4 | 5.0 | 0.0 | 3.8 | 16.3 | 25.0 |
| AKMS- 1002 | 37.5 | 48.5 | 80.0 | **64.3** | 22.9 | 57.5 | 40.2 | 2.5 | 3.6 | 4.1 | 18.0 | 15.0 |
| RB-101 | 27.5 | 32.5 | 75.0 | **53.8** | 30.2 | 55.0 | 42.6 | 7.5 | 3.6 | 6.9 | 8.2 | 5.0 |
| PR 2016-4 | 20.0 | 34.0 | 90.0 | **62.0** | 32.2 | 55.0 | 43.6 | 10.0 | 7.3 | 7.2 | 5.8 | 15.0 |
| RH 1584 | 42.5 | 35.0 | 65.0 | **50.0** | 16.0 | 55.0 | 35.5 | 7.5 | 10.3 | 3.9 | 5.0 | 10.0 |
| DRMRHJ 1403 | 37.5 | 36.0 | 55.0 | **45.5** | 21.1 | 45.0 | 33.1 | 7.5 | 3.0 | 0.0 | 7.9 | 25.0 |
| RB-102 | 47.5 | 32.5 | 75.0 | **53.8** | 33.1 | 40.0 | 36.6 | 7.5 | 6.7 | 3.8 | 6.2 | 10.0 |
| CAU-RM 2 | 27.5 | 34.5 | 80.0 | **57.3** | 42.2 | 47.5 | 44.9 | 2.5 | 26.4 | 3.8 | 2.4 | 25.0 |
| TM 179 | 22.5 | 40.5 | 90.0 | **65.3** | 32.2 | 45.0 | 38.6 | 0.0 | 10.1 | 18.8 | 10.9 | 15.0 |
| DRMR 2017-27 | 52.5 | 32.5 | 80.0 | **56.3** | 36.2 | 45.0 | 40.6 | 0.0 | 20.1 | 17.9 | 9.1 | 20.0 |
| 8IJ0117 | 32.5 | 35.0 | 75.0 | **55.0** | 22.2 | 47.5 | 34.9 | 5.0 | 16.8 | 7.0 | 4.4 | 20.0 |
| RB-100 | 22.5 | 40.0 | 80.0 | **60.0** | 39.8 | 47.5 | 43.7 | 0.0 | 22.9 | 3.8 | 16.4 | 15.0 |
| DRMRIJ17-92 | 37.5 | 35.0 | 50.0 | **42.5** | 36.0 | 45.0 | 40.5 | 0.0 | 9.6 | 3.8 | 5.6 | 15.0 |
| **CD(*P*=0.05)** | **3.4** | **240.8** | **10.1** | | **1.2** | **310.0** | | **11.0** | **4.6** | **1.4** | **7.9** | **2.5** |
| **CV (%)** | **5.5** | **47.7** | **7.6** | | **2.1** | **44.8** | | **22.2** | **24.9** | **7.2** | **20.5** | **5.5** |

**Table 4.7.1: Disease Reaction of *Albugocandida* isolates on Indian mustard genotypes at PNT, HSR, LDH and BPR**

| Coding | Genotype | Disease Reaction of *A. candida* isolates | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | PNT | | | | HSR | | | BPR |
| | | PNT | HSR | BPR | LDH | HSR | LDH | PNT | BPR |
| WRHD-18-01 | DRMRIJ-12-40 | R | R | R | R | R | R | R | R |
| WRHD-18-02 | DRMRIJ-12-28 | S | R | R | R | R | R | R | R |
| WRHD-18-03 | DRMR-2035 | S | S | R | S | R | R | S | R |
| WRHD-18-04 | DRMR-2019 | S | R | S | S | S | S | S | S |
| WRHD-18-05 | EC- 399301 | S | S | S | S | S | S | S | S |
| WRHD-18-06 | BioYSR | S | S | S | S | R | R | S | S |
| WRHD-18-07 | EC-399299 | S | R | R | R | S | S | S | S |
| WRHD-18-08 | Basanti | S | S | R | S | R | R | R | R |
| WRHD-18-09 | RH-30 | S | S | S | S | S | S | S | S |
| WRHD-18-10 | RLC-3 | S | S | R | S | R | R | R | R |
| WRHD-18-11 | DRMRAB-753 | S | S | S | S | S | S | S | S |

**Table 4.8.1: Epidemiology of downy mildew, white rust and Alternaria blight (PNT)**

| Downy mildew | | | | | | | | White rust | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of sowing | First appearance | DM disease severity (%) at date after sowing | | | | | | First appearance | WR disease severity (%) at date after sowing (DAS) | | | | | | | | | | |
| Varuna | DAS | 15 | 22 | 29 | 36 | 43 | 50 | DAS | 45 | 52 | 59 | 66 | 73 | 80 | 87 | 94 | 101 | 108 | 115 | 122 |
| Oct. 01 | 19 | 0 | 5 | 5 | 10 | 5 | 2 | 45 | 2 | 5 | 10 | 15 | 15 | 15 | 15 | 20 | 20 | 20 | 15 | 5 |
| Oct. 08 | 15 | 5 | 15 | 15 | 10 | 5 | 2 | 50 | 0 | 5 | 10 | 10 | 15 | 20 | 15 | 15 | 15 | 20 | 15 | 10 |
| Oct. 15 | 10 | 15 | 15 | 10 | 5 | 5 | 1 | 52 | 0 | 5 | 5 | 5 | 20 | 10 | 15 | 15 | 20 | 20 | 20 | 35 |
| Oct. 22 | 10 | 10 | 10 | 5 | 5 | 5 | 1 | 45 | 0 | 2 | 5 | 5 | 5 | 5 | 10 | 15 | 15 | 30 | 25 | 30 |
| Oct. 29 | 11 | 15 | 20 | 5 | 5 | 5 | 0 | 45 | 2 | 5 | 5 | 5 | 5 | 5 | 10 | 15 | 15 | 35 | 35 | 35 |
| Nov, 05 | 11 | 15 | 20 | 20 | 5 | 5 | 0 | 53 | 0 | 0 | 5 | 5 | 5 | 5 | 5 | 10 | 10 | 45 | 40 | 40 |
| Nov. 12 | 10 | 15 | 15 | 10 | 5 | 2 | 0 | 46 | 0 | 2 | 2 | 2 | 5 | 5 | 5 | 5 | 5 | 25 | 25 | 20 |
| Nov. 19 | 16 | 0 | 10 | 5 | 2 | 1 | 0 | 54 | 0 | 0 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 15 | 20 | 25 |
| **Kranti** | | | | | | | | | | | | | | | | | | | | |
| Oct. 01 | 19 | 0 | 5 | 5 | 5 | 10 | 15 | 45 | 5 | 5 | 10 | 15 | 15 | 15 | 20 | 20 | 20 | 25 | 20 | 10 |
| Oct. 08 | 15 | 15 | 5 | 5 | 10 | 5 | 5 | 50 | 0 | 5 | 5 | 5 | 10 | 15 | 15 | 15 | 15 | 20 | 15 | 10 |
| Oct.15 | 10 | 15 | 10 | 10 | 5 | 5 | 2 | 52 | 0 | 2 | 5 | 10 | 10 | 10 | 15 | 15 | 20 | 25 | 25 | 35 |
| Oct. 22 | 10 | 10 | 15 | 5 | 5 | 5 | 2 | 45 | 5 | 5 | 5 | 5 | 10 | 10 | 15 | 20 | 25 | 30 | 25 | 30 |
| Oct. 29 | 11 | 15 | 20 | 15 | 5 | 5 | 0 | 45 | 5 | 5 | 5 | 5 | 5 | 5 | 10 | 15 | 15 | 35 | 35 | 40 |
| Nov,05 | 11 | 10 | 20 | 20 | 5 | 5 | 0 | 53 | 0 | 0 | 5 | 5 | 10 | 10 | 10 | 20 | 30 | 45 | 40 | 30 |
| Nov. 12 | 10 | 15 | 15 | 10 | 5 | 2 | 0 | 46 | 0 | 5 | 5 | 5 | 5 | 10 | 10 | 15 | 15 | 25 | 20 | 35 |
| Nov. 19 | 16 | 0 | 10 | 5 | 5 | 1 | 0 | 54 | 0 | 0 | 2 | 5 | 5 | 5 | 5 | 10 | 15 | 20 | 20 | 20 |

| Date of sowing | First appearance | Alternaria blight leaf | | | | | | | | | | First appearance | Alternaria Pod blight | | | | | | | | Yield q/ha | 1000 seed wt. (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AB disease severity (%) at date after sowing (DAS) | | | | | | | | | | | ABP disease severity (%) at date after sowing (DAS) | | | | | | | | | |
| **Varuna** | **DAS** | **59** | **66** | **73** | **80** | **87** | **94** | **101** | **108** | **115** | **122** | **DAS** | **94** | **101** | **108** | **115** | **122** | **129** | **133** | **140** | | |
| Oct. 01 | 67 | 0 | 0 | 5 | 5 | 20 | 25 | 45 | 45 | 50 | 50 | 115 | 0 | 0 | 0 | 5 | 10 | 15 | 35 | 35 | 28.8 | 3.8 |
| Oct. 08 | 60 | 0 | 5 | 5 | 5 | 15 | 20 | 40 | 40 | 45 | 45 | 120 | 0 | 0 | 0 | 0 | 5 | 10 | 30 | 30 | 24.4 | 4.0 |
| Oct.15 | 53 | 5 | 5 | 5 | 5 | 15 | 20 | 45 | 45 | 50 | 50 | 112 | 0 | 0 | 0 | 5 | 10 | 15 | 25 | 25 | 15.5 | 3.1 |
| Oct. 22 | 59 | 5 | 5 | 5 | 10 | 20 | 25 | 35 | 35 | 55 | 70 | 100 | 0 | 2 | 5 | 10 | 15 | 20 | 25 | 25 | 13.3 | 2.6 |
| Oct. 29 | 52 | 5 | 5 | 5 | 10 | 10 | 25 | 35 | 40 | 55 | 65 | 104 | 0 | 5 | 5 | 10 | 10 | 15 | 25 | 30 | 15.5 | 2.7 |
| Nov. 05 | 59 | 5 | 5 | 5 | 5 | 10 | 30 | 35 | 50 | 55 | 65 | 96 | 0 | 5 | 5 | 10 | 10 | 15 | 25 | 30 | 13.3 | 3.4 |
| Nov. 12 | 60 | 0 | 5 | 5 | 5 | 15 | 20 | 25 | 30 | 50 | 50 | 91 | 5 | 5 | 10 | 10 | 15 | 15 | 20 | 20 | 17.7 | 3.9 |
| Nov. 19 | 53 | 5 | 5 | 5 | 5 | 5 | 15 | 15 | 20 | 40 | 55 | 88 | 5 | 10 | 10 | 10 | 15 | 15 | 20 | 20 | 17.7 | 4.1 |
| **Kranti** | | | | | | | | | | | | | | | | | | | | | | |
| Oct. 01 | 67 | 0 | 0 | 5 | 5 | 10 | 10 | 25 | 45 | 45 | 50 | 115 | 0 | 0 | 0 | 5 | 10 | 15 | 30 | 30 | 33.3 | 3.1 |
| Oct. 08 | 60 | 0 | 5 | 5 | 10 | 10 | 15 | 20 | 40 | 40 | 45 | 120 | 0 | 0 | 0 | 0 | 5 | 10 | 25 | 25 | 24.4 | 3.5 |
| Oct.15 | 53 | 5 | 5 | 5 | 5 | 10 | 10 | 20 | 40 | 35 | 45 | 112 | 0 | 0 | 0 | 5 | 10 | 15 | 25 | 25 | 20.0 | 3.1 |
| Oct. 22 | 59 | 5 | 5 | 5 | 5 | 15 | 25 | 35 | 40 | 0 | 65 | 100 | 0 | 2 | 5 | 10 | 15 | 20 | 20 | 20 | 15.5 | 2.5 |
| Oct. 29 | 53 | 5 | 5 | 5 | 5 | 10 | 25 | 30 | 45 | 60 | 60 | 104 | 0 | 5 | 5 | 10 | 10 | 15 | 25 | 25 | 20.0 | 3.0 |
| Nov. 05 | 59 | 2 | 5 | 5 | 5 | 10 | 30 | 30 | 35 | 50 | 55 | 96 | 0 | 5 | 5 | 10 | 10 | 15 | 25 | 20 | 20.0 | 3.0 |
| Nov. 12 | 60 | 0 | 5 | 5 | 5 | 5 | 20 | 20 | 30 | 45 | 50 | 91 | 5 | 5 | 10 | 10 | 15 | 15 | 15 | 15 | 20.0 | 3.4 |
| Nov. 19 | 53 | 5 | 5 | 5 | 5 | 5 | 15 | 15 | 20 | 45 | 50 | 88 | 5 | 10 | 10 | 10 | 15 | 15 | 15 | 10 | 11.1 | 3.6 |

**Table 4.8.2: Epidemiology of Alternaria blight disease (SHL)**

| Date of sowing | First appearance | ABL disease severity (%) | | | | | | | | | | | ABP disease severity (%) | | | | | | | Yield (q/ha) | 1000 seed wt (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Days after sowing | | | | | | | | | | | Days after sowing | | | | | | | | |
| **Varuna** | **DAS** | **40** | **50** | **60** | **70** | **80** | **90** | **100** | **110** | **120** | **130** | **140** | **70** | **80** | **90** | **100** | **110** | **120** | **130** | | |
| **08 Oct.** | 65 | 0.0 | 0.0 | 0 | 8.3 | 10.9 | 13.1 | 17.2 | 20.2 | 22.1 | 24.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.6 | 11.7 | 9.2 | 3.6 |
| **15 Oct.** | 55 | 0.0 | 0.0 | 6.6 | 9.1 | 11.9 | 14.3 | 18.1 | 22.3 | 24.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.7 | 13.8 | 12.5 | 3.6 |
| **22 Oct.** | 51 | 0.0 | 0.0 | 6.7 | 10.8 | 14.7 | 16.6 | 20.9 | 23.6 | 28.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.6 | 9.7 | 0.0 | 15.9 | 3.7 |
| **29 Oct.** | 45 | 0.0 | 6.2 | 7.3 | 11.6 | 15.2 | 17.3 | 21.7 | 29.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.5 | 14.9 | 17.2 | 0.0 | 16.7 | 3.8 |
| **05 Nov.** | 43 | 0.0 | 6.4 | 8.5 | 13.2 | 17.2 | 20.8 | 25.5 | 34.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.5 | 15.3 | 19.8 | 0.0 | 13.3 | 3.7 |
| **12 Nov.** | 41 | 0.0 | 6.9 | 10.2 | 14.1 | 18.9 | 24.2 | 29.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.6 | 9.7 | 11.5 | 23.4 | 0.0 | 8.8 | 3.6 |
| **19 Nov.** | 39 | 3.8 | 6.8 | 11.7 | 17.8 | 24.6 | 28.1 | 36.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.7 | 17.7 | 20.7 | 0.0 | 0.0 | 8.0 | 3.5 |
| **TM 2** | | | | | | | | | | | | | | | | | | | | | |
| **08 Oct.** | 66 | 0.0 | 0.0 | 0.0 | 9.3 | 13.9 | 16.1 | 19.2 | 21.2 | 24.1 | 27.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.6 | 12.7 | 9.5 | 2.9 |
| **15 Oct.** | 59 | 0.0 | 0.0 | 6.2 | 10.4 | 15.3 | 18.3 | 21.2 | 23.3 | 28.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.7 | 14.8 | 10.3 | 3.0 |
| **22 Oct.** | 48 | 0.0 | 0.0 | 6.7 | 11.8 | 16.7 | 19.6 | 23.9 | 25.6 | 30.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.6 | 10.7 | 0.0 | 11.6 | 3.1 |
| **29 Oct.** | 46 | 0.0 | 6.2 | 8.1 | 13.5 | 18.2 | 21.2 | 28.1 | 36.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.5 | 15.9 | 18.2 | 0.0 | 12.5 | 3.1 |
| **05 Nov.** | 43 | 0.0 | 7.4 | 10.3 | 14.2 | 19.2 | 23.2 | 32.5 | 41.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.9 | 16.3 | 19.9 | 0.0 | 10.9 | 3.0 |
| **12 Nov.** | 41 | 0.0 | 7.5 | 12.2 | 15.1 | 22.9 | 33.2 | 39.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.9 | 9.9 | 16.9 | 24.4 | 0.0 | 10.0 | 2.9 |
| **19 Nov.** | 39 | 4.0 | 7.8 | 12.7 | 18.8 | 26.6 | 37.1 | 40.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.9 | 17.2 | 21.7 | 0.0 | 0.0 | 9.1 | 2.8 |

## Table 4.8.3: Epidemiology of Powdery mildew (SKN)

| Date of sowing | Date of PM appearance | Powdery mildew disease severity (%) | | | | | | | | | Yield (q/ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Days after sowing | | | | | | | | | |
| | | 89 | 93 | 96 | 100 | 103 | 107 | 110 | 114 | 117 | |
| **Varuna** | | | | | | | | | | | |
| **01 Oct.** | - | - | - | - | - | - | - | - | - | - | 16.7 |
| **08 Oct.** | - | - | - | - | - | - | - | - | - | - | 16.1 |
| **15 Oct.** | 114 | - | - | - | - | - | - | - | - | - | 14.0 |
| **22 Oct.** | 109 | - | - | - | - | - | - | - | 5 | 12 | 13.3 |
| **29 Oct.** | 102 | - | - | - | - | - | 2.5 | 10 | 30 | 50 | 10.4 |
| **05 Nov.** | 95 | - | - | - | 2.5 | 15 | 30 | 40 | 80 | 85 | 9.7 |
| **12 Nov.** | 90 | - | 1 | 15 | 20 | 35 | 50 | 75 | 90 | 95 | 8.0 |
| **19 Nov.** | 83 | 5 | 15 | 20 | 40 | 70 | 90 | 95 | 98 | - | 6.7 |
| **GM-2** | | | | | | | | | | | |
| **01 Oct.** | - | - | - | - | - | - | - | - | - | - | 17.3 |
| **08 Oct.** | - | - | - | - | - | - | - | - | - | - | 16.7 |
| **15 Oct.** | - | - | - | - | - | - | - | - | - | - | 14.5 |
| **22 Oct.** | 110 | - | - | - | - | - | - | - | 1 | 15 | 13.8 |
| **29 Oct.** | 103 | - | - | - | - | - | 5 | 10 | 15 | 30 | 11.3 |
| **05 Nov.** | 96 | - | - | - | 1 | 5 | 20 | 40 | 60 | - | 10.7 |
| **12 Nov.** | 93 | - | - | 5 | 10 | 18 | 30 | 60 | 80 | - | 10.0 |
| **19 Nov.** | 88 | 2 | 5 | 10 | 25 | 50 | 80 | 85 | - | - | 8.7 |

## Table 4.8.4: Epidemiology of AB, WR,PM,DM and SR (MOR)

| Alternaria blight | | | | | | | | | Alternaria pod blight | | | | | | | Disease appearance | Powdery mildew | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of sowing | Disease appearance | ABL severity % | | | | | | | Disease appearance | ABP severity% | | | | | | | | | | | | | |
| | | Days after sowing | | | | | | | | Days after sowing | | | | | | | PM severity at days after sowing | | | | | | |
| **VARUNA** | **DAS** | **60** | **70** | **80** | **90** | **100** | **110** | **120** | **DAS** | **90** | **100** | **110** | **120** | **130** | **140** | **DAS** | **80** | **90** | **100** | **110** | **120** | **130** |
| **01 Oct.** | **100** | - | - | - | - | 2.2 | 5.3 | 7.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **08 Oct.** | **92** | - | - | - | 1.8 | 3.6 | 8.0 | 10.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **15 Oct.** | **85** | - | - | 1.3 | 3.6 | 6.2 | 8.4 | 11.6 | **110** | - | - | 1.8 | 2.2 | 5.3 | 7.6 | 110 | - | - | - | 8.4 | 10.7 | 25.3 |
| **22 Oct.** | **80** | - | - | 2.2 | 4.9 | 8.9 | 9.3 | 12.4 | **110** | - | - | 2.2 | 3.1 | 7.6 | - | 105 | - | - | 6.2 | 9.8 | 11.1 | 26.2 |
| **29 Oct.** | **75** | - | - | 3.6 | 7.6 | 10.7 | 11.1 | 13.3 | **102** | - | - | 1.8 | 3.1 | 7.6 | - | 98 | - | - | 8.9 | 11.6 | 20.4 | 27.1 |
| **05 Nov.** | **72** | - | 3.6 | 11.1 | 15.1 | 16.4 | 19.1 | 20.2 | **95** | - | 3.1 | 5.3 | 7.1 | 8.4 | - | 96 | - | 9.3 | 12.1 | 35.1 | 41.8 | 43.1 |
| **12 Nov.** | **70** | - | 4.9 | 10.7 | 16.4 | 17.3 | 19.6 | - | **95** | - | 2.2 | 5.3 | 7.1 | 7.6 | - | 87 | 8.4 | 13.3 | 33.3 | 36.4 | 43.1 | 43.8 |
| **19 Nov.** | **70** | - | 6.2 | 10.7 | 19.6 | 20.6 | 21.6 | - | **88** | 2.2 | 5.3 | 7.6 | 8 | 8.4 | - | 83 | 8.9 | 10.7 | 14.7 | 35.1 | 37.3 | 43.8 |
| **ROHINI** | | **60** | **70** | **80** | **90** | **100** | **110** | **120** | | **90** | **100** | **110** | **120** | **130** | **140** | | **80** | **90** | **100** | **110** | **120** | **130** |
| **01 Oct.** | **100** | - | - | - | - | 2.7 | 6.2 | 7.6 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **08 Oct.** | **92** | - | - | - | 2.2 | 4.0 | 7.1 | 8.4 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **15 Oct.** | **85** | - | - | 1.8 | 2.7 | 5.3 | 8.9 | 9.8 | **110** | - | 1.8 | 1.8 | 2.7 | 5.3 | - | 110 | - | - | | 5.3 | 9.3 | 19.1 |
| **22 Oct.** | **80** | - | - | 2.6 | 4.4 | 6.2 | 11.1 | 13.8 | **110** | - | 1.8 | 2.2 | 3.1 | 7.6 | - | 105 | - | - | 11.1 | 16.4 | 26.7 | 33.3 |
| **29 Oct.** | **75** | - | 2.2 | 4.9 | 7.6 | 8.4 | 13.3 | 16.4 | **102** | - | 2.2 | 3.1 | 4 | 7.6 | - | 100 | - | - | 12.4 | 17.3 | 28.4 | 40.4 |
| **05 Nov.** | **72** | - | 4.9 | 8.4 | 9.3 | 13.3 | 18.2 | - | **95** | - | 3.1 | 5.3 | 7.1 | 8.4 | - | 96 | - | 10.2 | 31.1 | 38.2 | 42.2 | |
| **12 Nov.** | **68** | 4.0 | 5.3 | 11.6 | 18.2 | 20.4 | - | - | **95** | - | 2.7 | 5.3 | 7.1 | 7.6 | - | 90 | - | 11.1 | 26.2 | 30.2 | 41.3 | 43.1 |
| **19 Nov.** | **68** | 4.0 | 8.9 | 12.4 | 16.9 | 21.8 | - | - | **88** | 2.7 | 5.3 | 7.6 | 8 | 9.4 | - | 83 | 9.3 | 20.9 | 22.2 | 27.6 | 29.3 | 47.1 |

| White rust | | | | | | | | | | | Staghead | | | | | | | Disease appearance | | %SR incidance | | | | Seed yield (kg/h) | 1000 Seed Wt. (g) | Plant Pop. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of sowing | Disease appearance | WR severity at days of after sowing | | | | | | | | | Disease appearance | Staghead at days after sowing | | | | | | | | Days after sowing | | | | | | |
| VARUNA | DAS | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | DAS | 70 | 80 | 90 | 100 | 110 | 120 | DAS | 80 | 90 | 100 | 110 | 120 | | | |
| 01 Oct. | 90 | - | - | - | - | - | 1.3 | 1.8 | 4.9 | - | - | - | - | - | - | - | - | 83 | 5 | 5 | 10 | 10 | 10 | 3093 | 5.22 | 478 |
| 08 Oct. | 81 | - | - | - | - | 1.8 | 2.7 | 3.6 | 5.3 | 6.2 | - | - | - | - | - | - | - | 91 | - | 5 | 5 | 10 | 15 | 3193 | 5.49 | 442 |
| 15 Oct. | 73 | - | - | - | 3.1 | 4.0 | 5.3 | 8.0 | 9.3 | 12.0 | 100 | - | - | - | 20.0 | 23.5 | 27.8 | 92 | - | 5 | 5 | 10 | 30 | 3200 | 5.12 | 480 |
| 22 Oct. | 71 | - | - | - | 3.6 | 11.1 | 27.3 | 30.7 | 31.6 | 34.2 | 95 | - | - | 14.3 | 20 | 25.0 | 37.5 | 91 | - | 5 | 5 | 20 | 30 | 3052 | 4.84 | 472 |
| 29 Oct. | 65 | - | - | 4.0 | 15.3 | 20.4 | 29.3 | 34.7 | 36.0 | - | 93 | - | - | 22.2 | 33.3 | 39.3 | 42.1 | 91 | - | 5 | 10 | 40 | 40 | 2800 | 4.56 | 477 |
| 05 Nov. | 58 | - | 3.1 | 17.3 | 25.8 | 31.6 | 37.8 | 41.3 | - | - | 84 | - | 33.3 | 42.9 | 48.7 | 49.1 | - | 82 | 5 | 10 | 20 | 40 | 65 | 2503 | 3.93 | 459 |
| 12 Nov. | 50 | 4.4 | 15.1 | 26.2 | 32.7 | 38.2 | 40.4 | 41.8 | - | - | 86 | - | 23.1 | 33.3 | 44.4 | 47.6 | - | 81 | 5 | 15 | 30 | 60 | 60 | 2221 | 3.80 | 468 |
| 19 Nov. | 48 | 6.2 | 16.4 | 28.4 | 34.2 | 39.1 | 41.8 | - | - | - | 79 | 25.0 | 36.0 | 37.5 | 41.2 | 47.8 | - | 80 | 5 | 10 | 35 | 40 | - | 1989 | 2.93 | 476 |
| ROHINI | | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | ROHINI | 70 | 80 | 90 | 100 | 110 | 120 | | 80 | 90 | 100 | 110 | 120 | | | |
| 01 Oct. | 90 | - | - | - | - | - | 1.8 | 2.7 | 5.3 | - | - | - | - | - | - | - | - | 83 | - | 5 | 5 | 10 | 15 | 2933 | 4.82 | 465 |
| 08 Oct. | 81 | - | - | - | - | 1.3 | 2.2 | 3.6 | 5.8 | 8.0 | - | - | - | - | - | - | - | 91 | - | 5 | 5 | 5 | 15 | 3043 | 4.80 | 456 |
| 15 Oct. | 73 | - | - | - | 3.6 | 4.0 | 4.9 | 5.8 | 9.3 | 14.7 | 100 | - | - | - | 20.0 | 28.3 | 30.0 | 100 | - | - | 5 | 15 | 30 | 2789 | 4.54 | 469 |
| 22 Oct. | 71 | - | - | - | 4.0 | 6.2 | 8.9 | 15.6 | 20.9 | 35.1 | 95 | - | - | 20.0 | 25.0 | 41.2 | 42.9 | 102 | - | - | 5 | 10 | 35 | 3133 | 4.34 | 481 |
| 29 Oct. | 65 | - | - | 4.9 | 8.0 | 11.1 | 16.4 | 29.8 | 37.3 | - | 93 | - | - | 33.3 | 38.4 | 38.4 | 38.9 | 88 | 5 | 5 | 15 | 35 | 40 | 2630 | 3.78 | 470 |
| 05 Nov. | 58 | - | 3.6 | 12.4 | 19.6 | 28.4 | 33.3 | 42.2 | - | - | 84 | - | 38.4 | 47.6 | 48.7 | 50.0 | - | 88 | - | 5 | 20 | 35 | 55 | 2312 | 3.68 | 462 |
| 12 Nov. | 50 | 4.9 | 11.6 | 19.1 | 26.7 | 32.4 | 39.1 | 43.1 | - | - | 86 | - | 37.5 | 47.1 | 55.0 | 55.6 | - | 81 | 5 | 10 | 30 | 40 | - | 2093 | 3.60 | 473 |
| 19 Nov. | 48 | 6.7 | 17.3 | 21.8 | 29.3 | 38.2 | 43.6 | - | - | - | 79 | 27.3 | 39.7 | 56.3 | 56.3 | 68.7 | - | 80 | 5 | 10 | 30 | 45 | - | 1860 | 2.60 | 467 |

**Table 4.8.5: Epidemiology of Alternaria blight (DOL)**

| Date of sowing | First appearance of the disease | AB Disease severity (%) Days after sowing | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Varuna | DAS | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 |
| 01 Oct. | 89 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 11.1 | 20.0 | 35.6 | 41.1 | 41.1 |
| 08 Oct. | 82 | 0.0 | 0.0 | 0.0 | 0.0 | 11.1 | 20.0 | 26.6 | 32.2 | 43.3 | 43.3 |
| 15 Oct. | 75 | 0.0 | 0.0 | 0.0 | 4.4 | 13.3 | 28.9 | 38.9 | 42.8 | 48.9 | 48.9 |
| 22 Oct. | 66 | 0.0 | 0.0 | 3.3 | 11.1 | 20.0 | 35.6 | 41.1 | 48.9 | 53.3 | 53.3 |
| 29 Oct. | 59 | 0.0 | 7.7 | 12.2 | 16.6 | 23.3 | 29.9 | 42.8 | 48.9 | 53.3 | 53.3 |
| 05 Nov. | 52 | 3.3 | 7.7 | 13.3 | 21.1 | 30.0 | 36.7 | 45.6 | 48.9 | 53.3 | 53.3 |
| 12 Nov. | 45 | 9.1 | 12.2 | 16.6 | 21.1 | 32.2 | 35.6 | 38.9 | 41.1 | 45.6 | 45.6 |
| 19 Nov. | 38 | 11.1 | 13.3 | 16.7 | 21.1 | 23.3 | 29.9 | 31.4 | 37.7 | 42.8 | 42.8 |
| Rajendra Suflam | | | | | | | | | | | |
| 01 Oct. | 86 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 11.1 | 16.7 | 23.3 | 35.6 | 35.6 |
| 08 Oct. | 80 | 0.0 | 0.0 | 0.0 | 3.3 | 11.1 | 16.7 | 20.2 | 26.6 | 37.7 | 37.7 |
| 15 Oct. | 73 | 0.0 | 0.0 | 0.0 | 4.4 | 12.2 | 21.1 | 30.0 | 36.7 | 45.6 | 45.6 |
| 22 Oct. | 66 | 0.0 | 0.0 | 3.3 | 13.3 | 16.7 | 22.2 | 31.4 | 40.0 | 48.9 | 48.9 |
| 29 Oct. | 59 | 0.0 | 2.2 | 5.5 | 16.7 | 24.4 | 29.9 | 36.7 | 41.1 | 48.9 | 48.9 |
| 05 Nov. | 52 | 0.0 | 4.4 | 7.7 | 9.1 | 12.2 | 16.6 | 21.1 | 29.9 | 38.8 | 38.8 |
| 12 Nov. | 45 | 2.2 | 5.5 | 7.7 | 9.1 | 12.2 | 16.6 | 23.3 | 31.4 | 31.4 | 31.4 |
| 19 Nov. | 38 | 4.4 | 11.1 | 13.3 | 16.6 | 21.1 | 23.3 | 29.9 | 31.4 | 31.4 | 31.4 |

**Table 4.9.1:AB and WR diseases reaction in IDM and farmer's practices**

| Treatment | ABL (%) | | | | | | | | | ABP (%) | | | WR (%) | | | | | | | SH | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DOL | JAG | LDH | MOR | PNT | SHL | SGN | BPR | JAG | LDH | PNT | SGN | HSR | LDH | MOR | PNT | SHL | SGN | BPR | LDH | MOR | SGN |
| IDM | 13.3 | 4.1 | 23.9 | 19.6 | 26.7 | 23.3 | 11.5 | 1.8 | 4.1 | 17.3 | 28.3 | 10.4 | 16.7 | 21.1 | 28.3 | 20.0 | 10.2 | 29.6 | 0.6 | 1.6 | 19.2 | 1.2 |
| Farmer's Practice | 30.0 | 4.9 | 29.2 | 24.3 | 33.3 | 31.8 | 33.0 | 1.8 | 4.8 | 22.5 | 35.0 | 19.6 | 20.3 | 24.2 | 44.0 | 21.7 | 15.2 | 32.0 | 2.2 | 2.1 | 33.5 | 8.0 |
| CD (p=0.05%) | 9.3 | - | - | - | - | - | - | - | - | 1.4 | - | - | - | - | - | - | - | - | - | - | - | - |
| CV % | 9.0 | - | 5.7 | - | 6.8 | - | - | - | - | 1.4 | 17.1 | - | - | 2.6 | - | 9.8 | - | - | - | 4.2 | - | - |

**Table 4.9.2: PM, DM and SR diseases reaction in IDM and farmer's practices**

| Treatment | PM (%) | | | | DM (%) | SR (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | JAG | JAG | MOR | SKN | BPR | PNT | DOL | HSR | BPR | LDH | MOR | PNT | SGN |
| IDM | 65.3 | 53.3 | 20.3 | 58.3 | 1.2 | 11.3 | 3.0 | 2.7 | 6.9 | 11.6 | 10.0 | 11.5 | 1.5 |
| Farmer's Practice | 65.7 | 75.0 | 24.7 | 55.0 | 2.2 | 16.3 | 8.0 | 3.2 | 16.0 | 14.5 | 51.7 | 14.8 | 26.9 |
| CD (p=0.05%) | - | - | - | - | - | 2.7 | 3.4 | - | - | - | - | 3.0 | - |
| CV % | - | - | - | 9.5 | - | 5.1 | 5.9 | - | - | 10.8 | - | 6.1 | - |

**Table 4.9.3: Mustard seed yield under IDM and farmer's practices**

| Treatment | Yield(kg/h) | | | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| | DOL | HSR | LDH | MOR | PNT | SKN | SHL | SGN | BPR | |
| IDM | 1792 | 3059 | 1957 | 2619 | 1620 | 2012 | 1172 | 2417 | 2630 | **2142** |
| Farmer's Practice | 1477 | 2760 | 1860 | 2060 | 1240 | 1859 | 1028 | 1968 | 2200 | **1828** |
| CD (p=0.05%) | 48 | - | - | - | 2.3 | - | - | - | - | - |
| CV % | 0.8 | - | 6.1 | - | 4.3 | 6.7 | - | - | - | - |
| % YIOFP | 21.3 | 10.8 | 5.2 | 27.1 | 30.6 | 8.2 | 14.0 | 22.8 | 19.5 | **17.7** |

# Entomology

# 5. Entomology

The 2018-19 crop season witnessed moderate to high population development of mustard aphid on different Brassica species.

## 5.1 Screening of advanced breeding germplasm against mustard aphid

One hundred forty five strains (IVT) were evaluated against mustard aphid including susceptible/tolerant checks. Aphid pressure was lowat **HSR, PNT and LDH** and moderate to severe at **MOR, KPR, SKN, NDH, DOL and SHL** centres. Out of 145 IVT entries, 33 entries *viz*. DRMR 2017-26, KMR (E) 18-2, RH 1699-5, KMR (E) 18-1, RMM 10 -1- 1, Kranti (NC), Bullet, 8IJ4002, 8IJ0117, Pusa MH-7 (Hybrid), NPJ-224, RGN 73 (Check), SKM 1626, AKMS- 1002, Anmol, RH 1584, PBR 385, NPJ-223, HUJM 17-6, DRMRCI 107, NPJ-226, DRMR 150-35 (Check), 8IJ0117, RB-100, DRMRCI 114, RH 1424, JM-11-9, Pusa Bold (Check), KMR (L) 18-6, RHH 1801, RCH 2, DRMRHJ 517 and RLC 9 were found promising having the AAII ≤ 2 (Table 5.1A). Among the forty six (AVT I and AVT II) entries screened against mustard aphid, seven entries *viz*. RGN 394, RGN 73 (Check), DRMR 2017-15, NRCHB 101 (Check), GSH 1754, RTM 1624 and RMT 314 (Check) were found promising since these recorded AAII ≤ 2 (Table 5.1B).

## 5.2 Assessment of yield losses due to insect pests in Brassica crops

The highest yield losses were observed in BSH 1 (60.9%) at **Kanpur** followed by PM 31 (60.7%) and GDM 4 (60.3%) at **SK Nagar** (Table 5.2). It was followed by 59.4% yield losses in RH 725, 51.9% in PM 31 at **Kanpur** and 54.8% in RH 725 at **SK Nagar**. The highest yield loss among the entries evaluated in other centres was 29.4% in PM 31 at **Hisar**, 35.4% (PM 31) at **Dholi**, 18.7% (PM 31) at **Ludhiana**, 22.7% in RH 725 at **Morena**, 14.8% in RH 725 at **New Delhi** and 12.6% in Varuna at **Pant Nagar.**

## 5.3 Population dynamics of various insect-pests on *Brassica* crops

### A. Incidence of various insect-pests on *Brassica* crops

At **Hisar,** aphid population was observed from 6$^{th}$ to 13$^{th}$ std. week with peak during 10$^{th}$ and 11$^{th}$ std. week. The aphid population was observed till 13$^{th}$ std. week after which it disappeared from the crop. Low to moderate population of painted bug (0.7-2.8 bugs/ mrl) was observed from 44$^{th}$ – 47$^{th}$ std. week on RH 725, T 27, HNS 0901 and BSH 1 under timely sown conditions, while no population of cabbage caterpillar was observed. The activity of coccinellid predators was observed from 9$^{th}$ to 13$^{th}$ std. week (Table 5.3.1A-C). At **Kanpur**, the aphid population generally remained active from 2$^{nd}$ to 12$^{th}$ std. week with peak activity during 7$^{th}$-8$^{th}$ std week. Low to moderate population of painted bug was observed from 45$^{th}$ to 13$^{th}$ std. week. On timely sown crop, low to moderate population of sawfly larvae was also observed from 45-47$^{th}$ std week. The activity of coccinellid predators was moderate to high during 6$^{th}$ and 12$^{th}$ std. week (Table 5.3.2). At **Dholi**, low to moderate population of mustard aphid was recorded. It remained active from 4$^{th}$ to 10$^{th}$ SMW with peak activity during 7$^{th}$-9$^{th}$ SMW (Table 5.3.3). At **Pant Nagar** moderate to high population of mustard aphid was recorded on BSH 1, YST 151, Varuna, GSC 6, *B. carinata, B. nigra, B. alba* and T 27 during 1$^{st}$ to 15$^{th}$ std. week (Table 5.3.4). At **Ludhiana**, the population of mustard aphid remained low both under timely and late sown conditions. Under timely sown conditions first appearance of mustard aphid was recorded during 51$^{st}$ std. week on BSH 1 and remained active till 11$^{th}$ std. week, while under late sown conditions it remained active from 1$^{st}$ to 13$^{th}$ std. week (Table 5.3.5A,B). Very low activity of cabbage caterpillar was recorded both under timely and late sown conditions. Cabbage caterpillar appeared on 6$^{th}$ std. week on DRMR IJ 31 under timely sown conditions and remained active till 8$^{th}$ std. week, while under late sown conditions it remained active from 9$^{th}$ to 12$^{th}$ std. week. At **SK Nagar**, population of mustard aphid was recorded from 51$^{st}$ to 9$^{th}$ std. week in timely and late sown crop

(Table 5.3.6). At **Shillongani** peak population of mustard aphid was recorded in 3rd to 5th std. week, sawfly during 50th to 5th std. week, flea beetle from 49th to 13th std. week and coccinellid predators during 50th and 14th std. week (Table 5.3.7A-D). At Morena, mustard aphid remained active from 50th to 13th std. week, while the activity of coccinellid beetles was observed from 6th to 10th std. week. Some activity of painted bug was also recorded from 47th to 51st std week. Activity of honeybees was recorded from 1st to 10th std. week (Table 5.3.8A-D).

## 5.3 (B) Monitoring of a late mustard aphids on yellow sticky traps

The late aphid population was recorded by seven centres. At **Hisar**, the alate population appeared during 49th std. week, peaked (361.3 aphids/ trap) during 11th std. week and disappeared after 13th std. week. At **S.K. Nagar**, alate mustard aphid population appeared during 50th std. week, reached its peak (5696.2 aphids/ trap) during 8th std. week and disappeared after 12th std. week. At **Ludhiana**, alate aphid appeared as early as 43th std. week and remained active upto 15th std. week with peak (955.8 aphids/ trap) during 8th std. week. At **Pant Nagar**, the alate aphid appeared in 3rd std. week and peaked (248.6 aphids/ trap) during 10th std. week while it disappeared after 12th std. week. At **Kanpur**, it appeared during 5th std. week, peaked (368.3 aphids/ trap) in 8th std. week and disappeared after 11th std. week. At **Morena**, it appeared during 1st std. week, peaked (76.8 aphids/ trap) during 8th std. week and disappeared after 13th std. week. At **Dholi**, its first appearance was recorded during 6th std. week with peak activity (187.0 aphids/ trap) during 10th std. week and disappeared after 11th std. week (Table 5.3.9).

## 5.4 Efficacy of bio-intensive IPM module against mustard aphid

At **New Delhi,** the treatment $T_5$: spray of *Verticillium lecanii* @ 2 g/l followed by its second application after 10 days and $T_6$: dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days recorded significantly lower aphid population and witnessed maximum reduction in population (88.0 and 89.8%, respectively) as compared to other treatments (Table 5.4.1). However, yield differences among treatments were non-significant. At **Shillongani** centre, treatment $T_6$: dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days was the most effective with minimum aphid population of 6.3 aphids/ plant after 5 days of spray followed by $T_1$: azadirachtin 3000 ppm @ 5 ml/lt with aphid population of 16.1 aphids/ plant. Maximum seed yield of 661.1 kg/ha was obtained in treatment $T_6$ followed by $T_1$ (591.6 kg/ha) (Table 5.4.2). At **Hisar**, treatment $T_6$: dimethoate 30 EC @ 1 ml/l followed by its second application was the most effective treatment with minimum aphid population of 12.0 aphids/ plant followed by $T_1$: azadirachtin 3000 ppm @ 5 ml/l followed by its second application. Maximum seed yield of 1646.3 kg/h was obtained in $T_6$ followed by 1540.7 kg/ha in $T_1$ (Table 5.4.3). At **SK Nagar**, $T_6$ was the most effective treatment with complete control after three days of spray. It was followed by $T_1$ (azadirachtin 3000 ppm @ 5 ml/l followed by its second spray) and $T_2$ (azadiracthin followed by spray of *Beauveria bassiana* @ 2 g/l after 10 days) which were at par with each other. However, the maximum seed yield of 2729 kg/h was obtained in $T_6$: dimethoate 30 EC @ 1 ml/lt (Table 5.4.4). At **Pant Nagar,** treatments $T_5$: *Verticillium lecanii* @ 2g/ l and $T_6$: dimethoate 30 EC @ 1 ml/l were effective with maximum seed yield of 1453.1 kg/ha and maximum IBCR of 3.13 obtained in $T_5$ (Table 5.4.5). At **Ludhiana**, treatment $T_6$: dimethoate 30 EC @ 1 ml/l was the most effective with minimum aphid population of 19.6 aphids/ plant (70.7% reduction) after 5 days of spray followed by $T_1$: azadirachtin 3000 ppm @ 5 ml/lt with aphid population of 27.2 aphids/ plant (59.3% reduction). The maximum seed yield of 2033.3 kg/ha was also obtained in $T_6$ followed by 1794.4 kg/ha in $T_1$ (Table 5.4.6). At **Kanpur**, $T_6$ was the most effective treatment with minimum aphid population (11.06 aphids/ plant) followed by $T_4$ (15.16 aphids/plant), $T_2$ (23.16 aphids/plant) and $T_1$ (28.00 aphids/ plant) (Table 5.4.7). At **Dholi**, $T_6$ was the

most effective treatment with minimum aphid population of 2.4 aphids/ plant followed by $T_5$: *Verticillium lecanii* @ 2 g/l (3.6 aphids/ plant). Seed yield in $T_6$ was the maximum (992.0 kg/ha) followed by $T_5$ (978.0 kg/ha) (Table 5.4.8). At **Morena,** $T_1$: azadirachtin 3000 ppm @ 5 ml/lt was the most effective treatment with minimum aphid population of 5.9 aphids/ plant after 3 days of spray followed by $T_6$: dimethoate 30 EC @ 1 ml/l (8.6 aphids/plant). Maximum seed yield (2843 kg/ha) was also obtained in $T_1$ followed by $T_6$ (2752 kg/ha) (Table 5.4.9). Thus, it can be concluded that spray of dimethoate 30 EC @ 1 ml/l and azadirachtin 3000 ppm @ 5 ml/lt are effective in reducing the aphid population under field conditions.

## 5.5 Bioefficacy of newer insecticides against mustard aphid

At **New Delhi**, spray of thiamethoxam 25 WG @ 0.2 g/l was the most effective treatment with minimum aphid population of 0.3 aphids/ plant and provided more than 98.0 reduction in population. However, yield differences among the treatments were non-significant (Table 5.5.1). However, at **Shillongani**, imidacloprid 17.8SL @ 0.25ml/l was the best treatment with minimum aphid population of 5.6 per plant after 7 days of spray and maximum seed yield of 672.9 kg/ha (Table 5.5.2). At **Hisar,** clothianidine 50 WDG @ 0.12 g/l was the most effective treatment with minimum population of 2.7 aphids/ plant followed by thiamethoxam 25 WG @ 0.2 g/l (6.3 aphids/plant). The maximum seed yield of 1728.0 kg/ha was obtained in the treatment clothianidine 50 WDG followed by 1705.7 kg/ha in thiamethoxam 25 WG (Table 5.5.3). At **SK Nagar**, thiamethoxam 25 WG @ 0.2 g/l was the most effective treatment with minimum aphid population of 1.9 aphids/ plant after 3 days of spray. It was followed by dimethoate 30 EC @ 1 ml/l with 1.7 aphids/ plant. Maximum seed yield of 2910 kg/ha was obtained in imidacloprid 17.8 SL @ 0.25 ml/l followed by dimethoate 30 EC @ 1 ml/l (2870 kg/ha) (Table 5.5.4). At **Pant Nagar**, dimethoate 30 EC @ 1 ml/l was the most effective treatment with minimum aphid population of 30.8 aphids/ plant and maximum seed yield of 1448.0 kg/ha (Table 5.5.5). At **Ludhiana**, thiamethoxam 25 WG @ 0.2 g/ l was the most effective treatment with minimum aphid population of 1.3 aphids/ plant after 7 days of spray followed by imidacloprid 17.8 SL @ 0.25 ml/l (1.4 aphids/ plant) and clothianidine 50 WDG @ 0.12 g/l (1.5 aphids/ plant). The maximum seed yield of 2030.6 kg/ha was obtained in the treatment clothianidine 50 WDG @ 0.12g/l followed by thiamethoxam 25 WG @ 0.2 g/l (2022.2 kg/ha) and imidacloprid 17.8 SL @ 0.25 ml/l (2005.6 kg/ha) (Table 5.5.6). At **Kanpur,** spray of imidacloprid 17.8 SL @ 0.25 ml/l resulted in minimum aphid population of 4.45 aphids/ plant after 14 days of application. It was followed by thiamethoxam 25 WG @ 0.2 g/l (5.10 aphids/ plant). The maximum seed yield of 1507 kg/ha was obtained in imidacloprid 17.8SL followed by 1488 kg/ha in thiamethoxam 25 WG (Table 5.5.7). At **Dholi,** clothianidine 50 WDG @ 0.12g/l recorded minimum population of 2.8 aphids/ plant after 10 days of spray followed by dimethoate 30 EC (3.0 aphids/ plant) and thiamethoxam 25 WG (3.6 aphids/ plant). Maximum seed yield of 972.0 kg/ha was obtained in clothianidine 50 WDG followed by thiamethoxam 25 WG (908.0 kg/ha) (Table 5.5.8). At **Morena,** thiamethoxam 25 WG was the most effective treatment with minimum population of 5.1 aphids/ plant after 3 days of spray followed by imidacloprid 17.8 SL (8.3 aphids/ plant). Maximum seed yield was obtained in thiamethoxam 25 WG (2156 kg/ha) followed by clothianidine 50 WDG (2062 kg/ha) and imidacloprid 17.8 SL (2036 kg/ha) (Table 5.5.9).

## 5.6 Survey and surveillance of insect pests and their natural enemies

Survey and surveillance of insect pests was conducted at **SK Nagar, Kanpur, Ludhiana** and **Shillongani** (Table 5.6.1 to 5.6.4). At **SK Nagar**, the mustard aphid was reported from II fortnight of December to II fortnight of March, while the coccinellid predators were reported from I fortnight of February to I fortnight of March. At **Kanpur,** aphid activity was recorded from I fortnight of January

to I fortnight of March, while painted bug remained active from II fortnight of October to I fortnight of November. Low activity of coccinellids was recorded from II fortnight of February to I fortnight of March. Some early activity of sawfly was also recorded from II fortnight of October to I fortnight of November. At **Ludhiana,** low aphid activity was recorded from II fortnight of January to II fortnight of March. However, the population of coccinellids remained low. At **Shillongani,** aphid activity was recorded from II fortnight of November to II fortnight of January, while coccinellid beetles' activity was recorded from I fortnight of November to II fortnight of January. Flea beetle remained active from November to January, sawfly from November to I fortnight of January.

**Table 5.1 (A): Reaction of IVT entries against mustard aphid**

| S. No. | Code No. | Entries | MOR | HSR | KPR | SKN | PNT | NDH | LDH | DOL | SHL | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***Toria*** | | | | | | | | | | | |
| **1** | SBG 18-1 | RMT 10-15 | 3.6 | 3.6 | 2.6 | 3.6 | 0.8 | 3.3 | 1.3 | 2.2 | 2.7 | 2.6 |
| **2** | SBG 18-2 | PT-2015-10 | 3.2 | 3.9 | 2.0 | 3.7 | 0.7 | 3.3 | 1.7 | 2.6 | 2.5 | 2.6 |
| **3** | **SBG 18-3** | **Bhawani (Check)** | 4.6 | 3.8 | 2.7 | 3.7 | 0.8 | 3.3 | 1.5 | 3.4 | 2.4 | 2.9 |
| **4** | SBG 18-4 | TKM 18-2 | 4.0 | 3.6 | 2.4 | 3.6 | 0.8 | 3.2 | 2.0 | 2.8 | 2.1 | 2.7 |
| **5** | SBG 18-5 | CAU-Toria 1 | 4.2 | 3.9 | 2.2 | 3.6 | 0.5 | 3.0 | 1.7 | 2.4 | 2.4 | 2.7 |
| **6** | **SBG 18-6** | **PT 303 (NC)** | 4.2 | 3.7 | 2.3 | 3.6 | 0.8 | 2.8 | 1.9 | 2.4 | 2.1 | 2.6 |
| **7** | SBG 18-7 | PT-2013-7 | 2.6 | 3.7 | 2.9 | 3.5 | 0.7 | 3.2 | 1.8 | 2.4 | 2.6 | 2.6 |
| **8** | SBG 18-8 | TKM 18-1 | 4.4 | 3.8 | 3.0 | 3.6 | 0.7 | 3.2 | 1.6 | 2.4 | 2.4 | 2.8 |
| **9** | **SBG 18-9** | **Panchali (Check)** | 2.2 | 4.0 | 3.1 | 3.6 | 0.6 | 3.2 | 1.8 | 2.4 | 2.4 | 2.6 |
| | **Yellow *sarson*** | | | | | | | | | | | |
| **10** | SBG 18-10 | PYS-2016-15 | 4.6 | 2.2 | 2.6 | 3.3 | 1.1 | 3.0 | 2.3 | 2.2 | 2.4 | 2.6 |
| **11** | SBG 18-11 | YSKM 18-2 | 3.6 | 2.3 | 2.6 | 3.3 | 1.5 | 2.8 | 2.1 | 2.6 | 2.6 | 2.6 |
| **12** | **SBG 18-12** | **NRCYS 05-02 (Check)** | 0.2 | 2.2 | 2.5 | 3.3 | 1.3 | 3.0 | 1.7 | 2.6 | 2.2 | 2.1 |
| **13** | SBG 18-13 | PYS-2016-8 | 1.0 | 2.0 | 2.3 | 3.5 | 1.4 | 3.2 | 1.7 | 2.7 | 2.1 | 2.2 |
| **14** | SBG 18-14 | YSKM 18-1 | 3.4 | 2.1 | 2.6 | 3.4 | 1.5 | 3.2 | 1.7 | 2.7 | 2.4 | 2.6 |
| **15** | **SBG 18-15** | **YSH 401 (Check)** | 5.2 | 2.0 | 2.2 | 3.4 | 1.1 | 3.0 | 1.4 | 2.6 | 2.4 | 2.6 |
| | **Early Mustard** | | | | | | | | | | | |
| **16** | SBG 18-16 | PRE 2016-5 | 3.8 | 1.1 | 1.5 | 3.5 | 1.1 | 2.8 | 1.2 | 2.4 | 2.5 | 2.2 |
| **17** | SBG 18-17 | DRMR 2017-26 | 0.0 | 1.3 | 1.1 | 3.6 | 1.2 | 3.0 | 0.8 | 2.9 | 2.3 | 1.8 |
| **18** | SBG 18-18 | RH 1658 | 3.8 | 0.9 | 1.7 | 3.6 | 1.6 | 2.8 | 0.4 | 2.9 | 1.8 | 2.2 |
| **19** | SBG 18-19 | KMR (E) 18-2 | 1.8 | 1.1 | 0.9 | 3.4 | 1.3 | 3.0 | 0.3 | 3.0 | 0.9 | 1.7 |
| **20** | SBG 18-20 | NPJ-222 | 4.6 | 0.8 | 2.3 | 3.5 | 1.2 | 3.0 | 0.3 | 2.6 | 2.3 | 2.3 |
| **21** | **SBG 18-21** | **PM 27(Check)** | 1.6 | 1.4 | 2.5 | 3.3 | 1.5 | 3.0 | 0.7 | 2.2 | 2.2 | 2.0 |
| **22** | SBG 18-22 | DTM-184 | 2.2 | 1.2 | 2.8 | 3.3 | 1.7 | 3.0 | 0.5 | 2.6 | 2.2 | 2.2 |
| **23** | SBG 18-23 | DRMRIS 17-7 | 3.4 | 1.2 | 2.5 | 3.4 | 1.4 | 3.0 | 0.7 | 2.1 | 2.7 | 2.3 |
| **24** | SBG 18-24 | RH 1699-5 | 0.0 | 1.4 | 1.4 | 3.3 | 1.4 | 2.8 | 0.5 | 2.1 | 2.5 | 1.7 |
| **25** | SBG 18-25 | KMR (E) 18-1 | 0.6 | 1.3 | 2.5 | 3.4 | 1.1 | 2.8 | 0.2 | 3.0 | 2.7 | 2.0 |
| **26** | SBG 18-26 | NPJ-221 | 3.2 | 1.1 | 1.4 | 3.6 | 1.4 | 2.5 | 0.0 | 2.9 | 2.9 | 2.1 |
| **27** | **SBG 18-27** | **Kranti (NC)** | 0.0 | 1.1 | 2.6 | 3.5 | 1.6 | 3.0 | 0.0 | 2.2 | 2.3 | 1.8 |
| **28** | SBG 18-28 | RMM 10 – 1- 1 | 1.4 | 2.0 | 1.3 | 3.2 | 1.5 | 2.7 | 0.3 | 2.6 | 2.9 | 2.0 |
| **29** | SBG 18-29 | DRMRHT 13-13-5-4 | 4.6 | 1.8 | 2.3 | 3.5 | 1.7 | 2.7 | 0.0 | 3.0 | 2.4 | 2.4 |
| **30** | SBG 18-30 | Bullet | 0.2 | 1.2 | 2.2 | 3.2 | 1.7 | 3.0 | 0.0 | 2.4 | 2.8 | 1.9 |
| **31** | SBG 18-31 | DRMRCI 96 | 4.2 | 1.1 | 1.8 | 3.4 | 1.3 | 2.8 | 0.0 | 2.6 | 2.6 | 2.2 |
| **32** | SBG 18-32 | PRE 2016-2 | 3.6 | 1.3 | 1.5 | 3.5 | 1.4 | 2.8 | 0.0 | 2.6 | 2.6 | 2.1 |
| **33** | **SBG 18-33** | **JD 6 (Check)** | 0.2 | 2.6 | 2.5 | 3.6 | 1.6 | 3.0 | 0.3 | 3.0 | 2.6 | 2.2 |
| | **IHT early mustard hybrids** | | | | | | | | | | | |
| **34** | SBG 18-34 | 8IJ0117 | 1.4 | 0.8 | 1.6 | 3.3 | 1.4 | 3.0 | 0.4 | 3.0 | 2.1 | 1.9 |
| **35** | SBG 18-35 | DRMRHJ 503 | 3.6 | 1.7 | 1.9 | 3.4 | 1.3 | 3.0 | 0.8 | 2.2 | 3.1 | 2.3 |
| **36** | SBG 18-36 | Pusa MH-7 (Hybrid) | 2.4 | 1.6 | 1.1 | 3.4 | 1.5 | 2.8 | 0.4 | 2.4 | 2.5 | 2.0 |
| **37** | SBG 18-37 | 8IJ4002 | 2.4 | 1.5 | 1.4 | 3.4 | 1.5 | 2.8 | 0.1 | 2.2 | 2.4 | 2.0 |
| **38** | SBG 18-38 | DRMRHJ 2403 | 1.4 | 1.6 | 1.8 | 3.4 | 1.7 | 3.0 | 0.3 | 2.8 | 2.7 | 2.1 |
| **39** | SBG 18-39 | Pusa MH-5 (Hybrid) | 4.0 | 0.9 | 1.6 | 3.5 | 1.2 | 3.0 | 0.0 | 2.2 | 3.3 | 2.2 |
| **40** | **SBG 18-40** | **PM 25 (Check)** | 3.2 | 1.1 | 2.0 | 3.6 | 2.0 | 2.7 | 0.1 | 2.2 | 2.5 | 2.2 |
| | **Timely Sown, Irrigated** | | | | | | | | | | | |
| **41** | SBG 18-41 | RH 1676 | 2.8 | 2.2 | 2.3 | 3.3 | 1.5 | 3.0 | 0.8 | 2.1 | 1.0 | 2.1 |
| **42** | SBG 18-42 | NPJ-224 | 0.2 | 2.0 | 1.8 | 3.4 | 1.1 | 2.8 | 0.0 | 2.1 | 2.8 | 1.8 |
| **43** | SBG 18-43 | DRMR 2017-16 | 5.0 | 2.1 | 2.8 | 3.6 | 1.5 | 3.0 | 0.6 | 3.0 | 2.8 | 2.7 |
| **44** | SBG 18-44 | KMR 18-4 | 3.4 | 0.7 | 3.0 | 3.5 | 1.2 | 3.0 | 1.1 | 2.9 | 2.8 | 2.4 |
| **45** | SBG 18-45 | AKMS- 1002 | 0.4 | 1.2 | 2.5 | 3.5 | 1.5 | 2.8 | 1.1 | 2.2 | 2.9 | 2.0 |
| **46** | SBG 18-46 | SKM 1626 | 1.4 | 0.8 | 2.0 | 3.5 | 1.2 | 3.0 | 0.6 | 2.6 | 2.8 | 2.0 |
| **47** | **SBG 18-47** | **RGN 73 (Check)** | 0.0 | 1.1 | 2.4 | 3.5 | 1.5 | 2.8 | 0.5 | 2.4 | 2.8 | 1.9 |
| **48** | SBG 18-48 | PHR-3328 | 2.2 | 1.2 | 2.4 | 3.4 | 1.6 | 2.8 | 0.2 | 2.4 | 2.5 | 2.1 |
| **49** | SBG 18-49 | Anmol | 0.2 | 1.4 | 2.4 | 3.3 | 1.6 | 2.8 | 0.0 | 2.2 | 2.4 | 1.8 |
| **50** | SBG 18-50 | PR 2016-8 | 4.6 | 1.1 | 1.9 | 3.5 | 1.1 | 2.7 | 0.3 | 2.2 | 2.6 | 2.2 |
| **51** | SBG 18-51 | RH 1584 | 1.0 | 1.9 | 1.1 | 3.5 | 1.2 | 2.8 | 0.9 | 2.4 | 2.6 | 1.9 |
| **52** | SBG 18-52 | DRMRIJ 1353 | 2.2 | 1.8 | 1.8 | 3.5 | 1.2 | 2.8 | 0.2 | 2.5 | 2.7 | 2.1 |
| **53** | SBG 18-53 | RB-101 | 4.2 | 1.1 | 1.5 | 3.4 | 1.4 | 2.8 | 0.4 | 2.2 | 2.8 | 2.2 |
| **54** | **SBG 18-54** | **Maya (Check)** | 2.2 | 1.3 | 2.5 | 3.5 | 1.2 | 2.8 | 0.3 | 2.2 | 2.7 | 2.1 |
| **55** | SBG 18-55 | PBR 385 | 1.0 | 1.1 | 1.6 | 3.4 | 1.0 | 3.0 | 1.7 | 2.6 | 2.7 | 2.0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **56** | SBG 18-56 | 8IJ0116 | 3.4 | 1.4 | 1.9 | 3.3 | 1.5 | 2.8 | 0.3 | 2.8 | 3.0 | 2.3 |
| **57** | SBG 18-57 | ACN 141 | 0.2 | 1.6 | 3.0 | 3.5 | 1.3 | 3.0 | 1.4 | 2.1 | 2.7 | 2.1 |
| **58** | SBG 18-58 | NPJ-223 | 0.6 | 1.4 | 2.5 | 3.5 | 1.5 | 2.8 | 0.1 | 2.1 | 2.6 | 1.9 |
| **59** | SBG 18-59 | KMR 18-3 | 1.2 | 1.4 | 2.7 | 3.4 | 1.3 | 3.0 | 1.0 | 2.8 | 2.9 | 2.2 |
| **60** | SBG 18-60 | SKM 1512 | 0.4 | 2.8 | 1.7 | 3.4 | 1.2 | 2.8 | 0.9 | 2.4 | 3.0 | 2.1 |
| **61** | **SBG 18-61** | **BIO 902 (Check)** | 3.2 | 1.7 | 2.5 | 3.3 | 1.3 | 3.0 | 0.5 | 3.2 | 2.9 | 2.4 |
| **62** | SBG 18-62 | DRMRCI 107 | 0.0 | 2.5 | 2.1 | 3.6 | 1.1 | 2.8 | 1.0 | 2.4 | 2.9 | 2.0 |
| **63** | SBG 18-63 | HUJM 17-6 | 0.2 | 1.1 | 2.1 | 3.4 | 1.1 | 3.2 | 1.1 | 3.0 | 3.0 | 2.0 |
| **64** | SBG 18-64 | PR 2016-4 | 0.4 | 1.8 | 2.9 | 3.5 | 1.2 | 3.2 | 0.6 | 2.6 | 2.6 | 2.1 |
| **65** | SBG 18-65 | RGN- 443 | 2.4 | 1.7 | 2.3 | 3.6 | 1.5 | 3.2 | 1.4 | 3.2 | 1.0 | 2.3 |
| **66** | SBG 18-66 | TM 217 | 0.0 | 1.5 | 2.9 | 3.5 | 1.3 | 3.2 | 1.1 | 2.9 | 2.9 | 2.1 |
| **67** | SBG 18-67 | JM-13-5 | 3.4 | 1.1 | 2.5 | 3.6 | 1.2 | 3.0 | 1.3 | 3.2 | 2.8 | 2.5 |
| **68** | **SBG 18-68** | **DRMRIJ 31 (Check)** | 2.0 | 1.5 | 2.3 | 3.5 | 1.3 | 3.0 | 0.5 | 2.6 | 2.5 | 2.1 |
| | **IVT Mustard (Rainfed)** | | | | | | | | | | | |
| **69** | SBG 18-69 | NPJ-226 | 3.2 | 1.6 | 2.6 | 3.7 | 1.2 | 3.2 | 0.3 | 2.5 | 2.5 | 1.8 |
| **70** | SBG 18-70 | RH 1584 | 0.2 | 2.0 | 1.7 | 3.8 | 1.2 | 3.0 | 0.8 | 2.2 | 2.7 | 2.7 |
| **71** | SBG 18-71 | DRMRHJ1118(hybrid) | 1.6 | 2.3 | 1.4 | 3.9 | 1.1 | 3.0 | 1.0 | 3.4 | 2.5 | 2.4 |
| **72** | SBG 18-72 | RB-100 | 0.4 | 2.0 | 1.7 | 3.9 | 1.4 | 3.0 | 0.6 | 3.7 | 1.0 | 2.0 |
| **73** | SBG 18-73 | 8IJ0117 | 4.6 | 2.5 | 2.5 | 3.9 | 1.3 | 3.2 | 0.8 | 2.8 | 1.0 | 2.0 |
| **74** | **SBG 18-74** | **DRMR 150-35 (Check)** | 1.0 | 1.8 | 1.3 | 3.9 | 1.4 | 3.0 | 1.1 | 2.2 | 1.9 | 1.9 |
| **75** | SBG 18-75 | TM 179 | 0.6 | 1.5 | 2.0 | 3.9 | 1.5 | 3.0 | 1.2 | 3.4 | 3.0 | 2.1 |
| **76** | SBG 18-76 | DRMRCI 114 | 1.0 | 0.9 | 2.7 | 3.9 | 1.4 | 3.0 | 0.9 | 2.6 | 2.5 | 1.8 |
| **77** | SBG 18-77 | RGN- 444 | 1.0 | 2.4 | 1.4 | 3.8 | 1.1 | 3.0 | 1.6 | 2.4 | 2.9 | 2.2 |
| **78** | SBG 18-78 | RH 1424 | 5.1 | 2.1 | 1.9 | 3.7 | 1.6 | 3.0 | 1.6 | 2.1 | 2.9 | 1.9 |
| **79** | SBG 18-79 | RB-102 | 4.6 | 2.7 | 1.2 | 3.6 | 1.6 | 2.8 | 1.0 | 2.8 | 2.8 | 2.1 |
| **80** | **SBG 18-80** | **PM 26 (Check)** | 4.6 | 2.1 | 1.3 | 3.6 | 1.2 | 2.8 | 0.4 | 2.6 | 2.8 | 2.2 |
| **81** | SBG 18-81 | DRMR 2017-8 | 1.6 | 1.9 | 1.2 | 3.6 | 1.3 | 3.0 | 1.4 | 3.0 | 2.7 | 2.1 |
| **82** | SBG 18-82 | JM-11-9 | 0.8 | 1.1 | 2.7 | 3.6 | 1.5 | 3.0 | 1.0 | 2.4 | 2.2 | 2.0 |
| **83** | SBG 18-83 | NPJ-225 | 1.2 | 1.6 | 2.5 | 3.5 | 1.5 | 3.0 | 0.5 | 3.0 | 2.9 | 2.3 |
| **84** | SBG 18-84 | DRMRCI 95 | 1.0 | 1.8 | 2.5 | 3.5 | 1.3 | 3.0 | 0.7 | 2.8 | 2.8 | 2.1 |
| **85** | **SBG 18-85** | **Pusa Bold (Check)** | 0.0 | 0.9 | 3.2 | 3.5 | 2.0 | 2.8 | 0.3 | 2.6 | 2.6 | 1.9 |
| | **IVT- Mustard Late sown** | | | | | | | | | | | |
| **86** | SBG 18-86 | KMR (L) 18-6 | 0.6 | 0.9 | 2.7 | 3.5 | 1.5 | 3.0 | 1.0 | 2.1 | 2.9 | 2.0 |
| **87** | SBG 18-87 | PRL-2016-6 | 3.2 | 1.1 | 1.6 | 3.6 | 1.2 | 2.8 | 1.1 | 2.7 | 2.6 | 2.2 |
| **88** | SBG 18-88 | RH 1658 | 2.5 | 2.2 | 2.2 | 3.4 | 1.2 | 2.7 | 1.6 | 2.2 | 3.0 | 2.3 |
| **89** | SBG 18-89 | DRMR 2017-27 | 2.0 | 1.5 | 2.5 | 3.5 | 1.6 | 3.0 | 1.2 | 3.1 | 2.9 | 2.4 |
| **90** | SBG 18-90 | TM 130 | 0.4 | 2.2 | 2.7 | 3.5 | 1.6 | 2.8 | 1.6 | 3.2 | 2.9 | 2.3 |
| **91** | **SBG 18-91** | **PM 28 (Check)** | 3.0 | 1.1 | 3.0 | 3.4 | 1.4 | 2.7 | 1.6 | 3.0 | 2.9 | 2.5 |
| **92** | SBG 18-92 | NPJ-228 | 5.0 | 1.4 | 2.0 | 3.6 | 1.3 | 2.7 | 0.7 | 3.0 | 2.7 | 2.5 |
| **93** | SBG 18-93 | SVJH- 106 | 5.4 | 1.0 | 2.4 | 3.5 | 1.1 | 2.8 | 0.3 | 2.2 | 2.5 | 2.4 |
| **94** | SBG 18-94 | DRMRIJ17-92 | 4.2 | 1.6 | 3.4 | 3.5 | 1.4 | 2.8 | 0.2 | 3.2 | 2.9 | 2.6 |
| **95** | SBG 18-95 | RGN- 449 | 0.4 | 1.6 | 2.2 | 3.6 | 1.4 | 3.0 | 0.8 | 3.5 | 2.9 | 2.2 |
| **96** | SBG 18-96 | KMR (L) 18-5 | 0.6 | 2.2 | 2.6 | 3.5 | 1.6 | 2.7 | 0.1 | 3.2 | 2.8 | 2.1 |
| **97** | **SBG 18-97** | **NRCHB 101 (Check)** | 3.5 | 3.0 | 2.6 | 3.6 | 1.4 | 3.0 | 0.7 | 2.6 | 2.7 | 2.6 |
| **98** | SBG 18-98 | DRMRCI 111 | 2.0 | 3.4 | 2.7 | 3.5 | 1.9 | 3.0 | 0.7 | 3.1 | 3.0 | 2.6 |
| **99** | SBG 18-99 | PRL-2013-9 | 0.8 | 2.3 | 2.3 | 3.6 | 1.7 | 3.0 | 0.8 | 2.2 | 2.9 | 2.2 |
| **100** | SBG 18-100 | NPJ-227 | 2.8 | 3.3 | 2.1 | 3.6 | 1.1 | 3.0 | 0.6 | 3.0 | 2.8 | 2.5 |
| **101** | SBG 18-101 | HUJM 17-8 | 0.2 | 2.5 | 2.0 | 3.4 | 1.6 | 3.0 | 1.4 | 2.4 | 2.4 | 2.1 |
| **102** | SBG 18-102 | RH 1657 | 2.0 | 1.0 | 1.7 | 3.5 | 1.6 | 3.0 | 0.5 | 3.2 | 2.9 | 2.2 |
| **103** | SBG 18-103 | DRMRHJ 1403 | 2.8 | 1.1 | 1.9 | 3.6 | 1.3 | 3.0 | 0.3 | 2.2 | 3.0 | 2.1 |
| **104** | **SBG 18-104** | **PM 29 (Check)** | 0.4 | 1.1 | 2.9 | 3.5 | 1.7 | 3.0 | 1.9 | 2.2 | 2.5 | 2.1 |
| | **Hybrid Mustard** | | | | | | | | | | | |
| **105** | SBG 18-105 | DRMRHJ 2518 | 1.0 | 1.7 | 2.5 | 3.3 | 1.0 | 3.0 | 1.8 | 3.2 | 2.7 | 2.2 |
| **106** | SBG 18-106 | RHH 1802 | 1.0 | 1.9 | 2.1 | 3.2 | 1.6 | 3.0 | 0.5 | 3.0 | 2.9 | 2.1 |
| **107** | SBG 18-107 | PHR-1096 | 0.6 | 1.5 | 2.5 | 3.5 | 1.5 | 3.0 | 1.8 | 3.0 | 3.0 | 2.3 |
| **108** | SBG 18-108 | SVJH- 101 | 3.4 | 2.4 | 1.4 | 3.3 | 1.2 | 2.8 | 0.8 | 2.8 | 2.1 | 2.2 |
| **109** | SBG 18-109 | Musa MH-20 | 1.0 | 2.2 | 2.4 | 3.6 | 1.3 | 3.0 | 1.1 | 2.4 | 2.2 | 2.1 |
| **110** | SBG 18-110 | 8IJ1004 | 3.6 | 1.8 | 2.5 | 3.6 | 1.4 | 3.0 | 0.7 | 2.2 | 2.4 | 2.4 |
| **111** | SBG 18-111 | DRMRHJ 1417 | 4.4 | 1.8 | 2.1 | 3.5 | 1.2 | 3.0 | 0.8 | 2.2 | 2.8 | 2.4 |
| **112** | **SBG 18-112** | **NRCHB 506 (Check)** | 0.2 | 1.7 | 2.4 | 3.4 | 1.2 | 3.0 | 1.3 | 3.2 | 2.8 | 2.1 |
| **113** | SBG 18-113 | PHR-3313 | 1.6 | 1.8 | 2.1 | 3.3 | 1.5 | 3.0 | 1.5 | 3.0 | 2.9 | 2.3 |
| **114** | SBG 18-114 | RHH 1801 | 0.2 | 2.1 | 0.9 | 3.4 | 1.3 | 3.0 | 0.0 | 2.2 | 2.8 | 1.8 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **115** | SBG 18-115 | Musa MH-16 | 1.4 | 1.9 | 2.3 | 3.4 | 1.1 | 3.0 | 1.1 | 2.2 | 2.9 | 2.1 |
| **116** | SBG 18-116 | PHR-3489 | 0.8 | 1.7 | 1.8 | 3.5 | 1.5 | 3.0 | 1.1 | 2.4 | 3.0 | 2.1 |
| **117** | SBG 18-117 | RCH 2 | 0.6 | 1.2 | 1.9 | 3.5 | 1.3 | 3.0 | 1.0 | 2.6 | 2.8 | 2.0 |
| **118** | SBG 18-118 | SVJH- 108 | 2.0 | 1.4 | 1.8 | 3.2 | 1.5 | 2.8 | 1.1 | 2.2 | 2.8 | 2.1 |
| **119** | SBG 18-119 | DRMRHJ 517 | 0.2 | 1.3 | 1.7 | 3.4 | 1.6 | 2.8 | 1.4 | 2.8 | 2.8 | 2.0 |
| **120** | **SBG 18-120** | **PM 30 (Check)** | 3.2 | 1.4 | 2.8 | 3.4 | 1.1 | 3.0 | 1.5 | 2.6 | 2.8 | 2.4 |
| | **Quality Mustard : IVT** | | | | | | | | | | | |
| **121** | SBG 18-121 | RLC 10 | 2.4 | 1.1 | 3.0 | 3.5 | 1.3 | 3.0 | 0.4 | 2.8 | 2.4 | 2.2 |
| **122** | SBG 18-122 | RH (OE)1706 | 4.4 | 1.6 | 2.6 | 3.4 | 1.0 | 3.0 | 1.4 | 2.4 | 2.6 | 2.5 |
| **123** | SBG 18-123 | DRMRQ4-7-23 | 4.2 | 1.7 | 3.1 | 3.6 | 1.1 | 3.0 | 2.2 | 3.0 | 2.7 | 2.7 |
| **124** | SBG 18-124 | LES-59 | 1.0 | 1.6 | 2.2 | 3.4 | 1.2 | 2.8 | 1.0 | 2.6 | 2.7 | 2.1 |
| **125** | SBG 18-125 | RLC 9 | 0.6 | 1.2 | 2.3 | 3.4 | 1.5 | 3.0 | 0.8 | 2.8 | 2.8 | 2.0 |
| **126** | SBG 18-126 | PDZ-12 | 1.6 | 2.3 | 2.7 | 3.6 | 1.5 | 3.0 | 0.6 | 3.0 | 1.0 | 2.1 |
| **127** | **SBG 18-127** | **DMH-1 (Check)** | 1.8 | 2.7 | 1.9 | 3.5 | 1.3 | 3.0 | 1.9 | 2.4 | 2.5 | 2.3 |
| **128** | SBG 18-128 | RH (OE)1705 | 1.6 | 2.7 | 2.7 | 3.6 | 2.0 | 3.0 | 0.6 | 2.4 | 2.9 | 2.4 |
| **129** | SBG 18-129 | RLC 8 | 1.4 | 2.4 | 2.1 | 3.6 | 1.8 | 3.0 | 0.7 | 2.6 | 1.0 | 2.1 |
| **130** | SBG 18-130 | DRMRQ1-16-27 | 1.4 | 2.8 | 2.8 | 3.8 | 1.5 | 2.8 | 0.2 | 3.0 | 1.0 | 2.1 |
| **131** | SBG 18-131 | LES-58 | 0.2 | 3.2 | 2.6 | 3.4 | 2.0 | 3.0 | 1.2 | 2.6 | 2.0 | 2.2 |
| **132** | SBG 18-132 | PDZ-11 | 1.0 | 3.2 | 2.6 | 3.6 | 1.4 | 3.0 | 1.9 | 3.2 | 2.9 | 2.5 |
| **133** | SBG 18-133 | RCH 3 | 2.6 | 3.1 | 2.7 | 3.3 | 1.3 | 3.0 | 1.9 | 3.4 | 2.9 | 2.7 |
| **134** | **SBG 18-134** | **PDZ-1 (Check)** | 2.6 | 3.4 | 3.2 | 3.6 | 1.8 | 3.0 | 1.3 | 3.0 | 3.0 | 2.8 |
| | ***Gobhi Sarson* : IVT** | | | | | | | | | | | |
| **135** | SBG 18-135 | HNS 1201 | 3.6 | 2.9 | 1.9 | 3.5 | 1.1 | 3.0 | 1.6 | 3.0 | 2.8 | 2.6 |
| **136** | SBG 18-136 | GSH-1717 | 4.0 | 2.6 | 1.7 | 3.4 | 1.3 | 2.8 | 1.4 | 2.6 | 2.9 | 2.5 |
| **137** | SBG 18-137 | AKGS-8217 | 4.0 | 2.4 | 1.8 | 3.4 | 1.1 | 3.0 | 1.6 | 2.8 | 3.1 | 2.6 |
| **138** | SBG 18-138 | JGS-12-3 | 1.8 | 2.9 | 1.3 | 3.1 | 1.5 | 2.8 | 1.4 | 2.6 | 3.1 | 2.3 |
| **139** | **SBG 18-139** | **GSL 6 (Check)** | 3.8 | 2.5 | 2.8 | 3.5 | 1.0 | 3.0 | 1.6 | 2.2 | 2.8 | 2.6 |
| **140** | SBG 18-140 | HNS 1102 | 3.2 | 2.0 | 1.6 | 3.4 | 1.2 | 3.0 | 2.0 | 2.7 | 2.8 | 2.4 |
| **141** | SBG 18-141 | GSH-1699 | 3.6 | 2.4 | 2.0 | 3.3 | 1.3 | 3.0 | 1.5 | 3.0 | 3.2 | 2.6 |
| **142** | SBG 18-142 | AKGS-8146 | 3.0 | 2.8 | 2.0 | 3.3 | 1.3 | 3.0 | 1.7 | 3.6 | 2.8 | 2.6 |
| **143** | SBG 18-143 | GSH-1707 | 4.0 | 2.9 | 2.3 | 3.4 | 1.6 | 2.7 | 2.1 | 3.2 | 2.9 | 2.8 |
| **144** | **SBG 18-144** | **GSL-1 (NC)** | 4.2 | 2.1 | 1.1 | 3.0 | 1.0 | 3.0 | 1.2 | 2.8 | 2.8 | 2.4 |
| **145** | SBG 18-145 | BSH-1 | 1.0 | 3.0 | 3.0 | 3.8 | 1.0 | 3.2 | 1.5 | 3.0 | 3.1 | 2.5 |
| **Mean** | | | **2.2** | **1.9** | **2.2** | **3.5** | **1.3** | **2.9** | **1.0** | **2.6** | **2.6** | **2.2** |

**Table 5.1 (B): Screening of AVT I and AVT II entries of *Brassica* for resistance against mustard aphid**

| S. No. | Code No. | Entries | MOR | HSR | KPR | SKN | PNT | NDH | LDH | DOL | SHL | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Mustard timely sown AVT-I + AHT -I (Irrigated)** | | | | | | | | | | | |
| 1 | SAG 18-1 | RH 1550 | 2.6 | 1.9 | 3.1 | 3.6 | 1.5 | 2.8 | 1.3 | 3.0 | 2.6 | 2.5 |
| 2 | SAG 18-2 | 7IJ0003 | 3.2 | 2.1 | 2.6 | 3.7 | 0.7 | 3.0 | 1.9 | 2.2 | 1.5 | 2.3 |
| **3** | **SAG 18-3** | **DMH 1( Hybrid Check)** | 4.2 | 1.3 | 3.3 | 3.7 | 0.9 | 3.0 | 0.9 | 2.6 | 1.5 | 2.4 |
| | **AVT-1 (Irrigated) Repeat** | | | | | | | | | | | |
| **4** | SAG 18-4 | RLMCP 626 | 3.4 | 0.6 | 2.6 | 3.7 | 0.7 | 2.8 | 1.4 | 2.6 | * | 2.2 |
| **5** | SAG 18-5 | RH 1326 | 2.4 | 0.8 | 3.1 | 3.8 | 1.1 | 2.8 | 1.3 | 2.2 | 1.3 | 2.1 |
| **6** | **SAG 18-6** | **RH 749 (Check)** | 1.2 | 0.9 | 3.3 | 3.7 | 1.2 | 3.0 | 0.5 | 3.6 | 3.3 | 2.3 |
| **7** | SAG 18-7 | RGN 394 | 0.4 | 1.0 | 3.3 | 3.8 | 0.9 | 3.0 | 1.0 | 2.2 | 2.7 | 2.0 |
| **8** | SAG 18-8 | NPJ 203 | 1.4 | 1.2 | 3.2 | 3.7 | 0.7 | 3.0 | 0.9 | 2.2 | 2.4 | 2.1 |
| **9** | **SAG 18-9** | **RGN 73 (Check)** | 0.6 | 1.0 | 3.6 | 3.6 | 0.4 | 3.2 | 0.7 | 2.4 | 2.9 | 2.0 |
| | **AVT-I Late Sown (Irrigated)** | | | | | | | | | | | |
| **10** | SAG 18-10 | DRMR 2017-15 | 1.8 | 1.1 | 2.8 | 3.5 | 0.7 | 3.0 | 0.2 | 2.2 | 3.1 | 2.0 |
| **11** | SAG 18-11 | RH 1599-41 | 2.2 | 1.3 | 2.9 | 3.5 | 0.8 | 3.0 | 0.2 | 2.6 | 3.4 | 2.2 |
| **12** | **SAG 18-12** | **NRCHB 101 (Check)** | 1.2 | 0.8 | 2.9 | 3.6 | 1.2 | 2.5 | 0.8 | 2.2 | 2.9 | 2.0 |
| **13** | SAG 18-13 | RMWR 09-1 | 1.8 | 1.5 | 3.2 | 3.8 | 1.1 | 3.0 | 1.1 | 2.2 | 3.0 | 2.3 |
| **14** | SAG 18-14 | NPJ 216 | 2.2 | 1.7 | 3.6 | 3.8 | 0.9 | 3.0 | 0.4 | 2.4 | 3.3 | 2.4 |
| **15** | SAG 18-15 | DRMRIC 16-38 | 4.6 | 1.2 | 3.1 | 3.8 | 0.8 | 3.0 | 1.3 | 3.2 | 3.0 | 2.7 |
| **16** | **SAG 18-16** | **PM 28 (Check)** | 2.4 | 1.6 | 2.6 | 3.7 | 0.9 | 3.0 | 0.8 | 2.6 | 2.5 | 2.2 |
| | **AVT I + II (Repeat)** | | | | | | | | | | | |
| **17** | SAG 18-17 | RH 919 | 2.4 | 1.2 | 2.8 | 3.6 | 1.0 | 3.2 | 0.9 | 2.2 | 3.0 | 2.3 |
| **18** | SAG 18-18 | RGN 368 | 3.6 | 1.4 | 3.1 | 3.7 | 0.9 | 3.2 | 1.2 | 2.8 | 3.9 | 2.6 |
| **19** | **SAG 18-19** | **RGN 229 (Check)** | 2.6 | 3.2 | 3.2 | 3.7 | 0.9 | 3.0 | 2.0 | 3.0 | * | 2.7 |
| **20** | SAG 18-20 | PRO 5222 | 3.4 | 1.3 | 2.7 | 3.8 | 1.0 | 2.8 | 0.8 | 2.6 | 1.0 | 2.2 |
| **21** | SAG 18-21 | DRMR 1153-12 | 1.4 | 1.0 | 2.9 | 3.8 | 0.9 | 3.0 | 1.2 | 2.2 | 2.7 | 2.1 |
| **22** | SAG 18-22 | RH 923 | 1.8 | 1.5 | 2.5 | 3.8 | 1.0 | 3.0 | 1.4 | 2.6 | 2.6 | 2.2 |
| **23** | **SAG 18-23** | **RVM 2 (Check)** | 4.0 | 1.6 | 2.8 | 3.8 | 0.8 | 3.0 | 1.5 | 2.6 | 1.5 | 2.4 |
| | **AVT-I Quality Mustard** | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **24** | SAG 18-24 | RLC 3 | 1.6 | 1.5 | 3.5 | 3.9 | 0.9 | 3.0 | 1.7 | 2.7 | 2.6 | 2.4 |
| **25** | SAG 18-25 | 7IJ0002 | 0.0 | 2.4 | 2.5 | 3.8 | 1.5 | 3.0 | 1.5 | 2.7 | 2.6 | 2.2 |
| **26** | SAG 18-26 | LES 54 | 3.8 | 1.4 | 3.0 | 3.6 | 1.3 | 3.0 | 0.8 | 2.6 | 2.9 | 2.5 |
| **27** | **SAG 18-27** | **DMH-1 (Check)** | 3.0 | 1.2 | 1.8 | 3.6 | 0.8 | 2.8 | 0.5 | 2.4 | 3.1 | 2.1 |
| **28** | SAG 18-28 | RLC 7 | 0.6 | 1.2 | 3.3 | 3.8 | 1.3 | 3.0 | 0.7 | 2.9 | 2.8 | 2.2 |
| **29** | SAG 18-29 | RCH 1 | 0.6 | 2.0 | 3.4 | 3.8 | 1.2 | 3.0 | 1.0 | 2.9 | 3.2 | 2.3 |
| **30** | SAG 18-30 | LES 57 | 0.2 | 2.2 | 2.8 | 3.7 | 0.8 | 3.0 | 0.3 | 3.0 | 2.7 | 2.1 |
| **31** | **SAG 18-31** | **PDZ-1 (Check)** | 0.0 | 2.4 | 3.5 | 3.8 | 0.9 | 3.0 | 0.5 | 2.6 | 2.4 | 2.1 |
| | **AVT- I+II Saline/Alkaline Repeat** | | | | | | | | | | | |
| **32** | SAG 18-32 | CS 15000-1-1-1-1-2 | 1.6 | 1.6 | 3.1 | 3.6 | 0.9 | 3.0 | 0.7 | 2.2 | 2.8 | 2.2 |
| **33** | SAG 18-33 | CS 508 -1 P2 | 2.4 | 2.1 | 3.4 | 3.6 | 1.2 | 3.0 | 0.9 | 2.6 | 2.7 | 2.4 |
| 34 | SAG 18-34 | CS 700-2-1-4 | 2.2 | 1.2 | 2.2 | 3.7 | 1.3 | 3.0 | 0.5 | 3.4 | 1.2 | 2.1 |
| **35** | **SAG 18-35** | **CS 54 (Check)** | 1.2 | 1.9 | 2.9 | 3.6 | 0.7 | 2.8 | 1.4 | 2.8 | 3.0 | 2.3 |
| **36** | SAG 18-36 | CS 2009-154 | 2.0 | 0.7 | 3.4 | 3.7 | 0.8 | 2.8 | 1.1 | 2.4 | 3.0 | 2.2 |
| **37** | SAG 18-37 | CS 2009-335 | 3.6 | 0.8 | 3.5 | 3.6 | 0.7 | 3.0 | 1.5 | 2.4 | 2.9 | 2.4 |
| **38** | SAG 18-38 | CS 13000-3-1-1-4-2 | 3.0 | 1.2 | 3.2 | 3.7 | 0.8 | 3.0 | 1.1 | 2.4 | 2.7 | 2.3 |
| **39** | SAG 18-39 | CS 900-1-2-2-1-3 | 2.0 | 1.3 | 2.6 | 3.6 | 0.7 | 3.0 | 0.8 | 2.4 | 3.0 | 2.2 |
| **40** | **SAG 18-40** | **CS 60 (Check)** | 0.8 | 1.3 | 2.4 | 3.7 | 0.9 | 3.0 | 1.1 | 2.4 | 2.9 | 2.1 |
| | ***Gobhi Sarson* : AVT I** | | | | | | | | | | | |
| **41** | SAG 18-41 | AKMS 8141 | 2.2 | 1.5 | 1.5 | 3.5 | 0.6 | 3.0 | 1.9 | 2.2 | 3.0 | 2.2 |
| **42** | SAG 18-42 | GSH 1754 | 0.6 | 1.6 | 2.8 | 3.5 | 0.9 | 2.8 | 2.7 | 2.2 | 1.2 | 2.0 |
| **43** | **SAG 18-43** | **GSL 1 (NC)** | 4.4 | 3.4 | 1.0 | 3.0 | 1.1 | 3.0 | 2.7 | 2.1 | 2.9 | 2.6 |
| | ***Taramira*: AVT I** | | | | | | | | | | | |
| **44** | SAG 18-44 | RTM 1624 | 0.2 | 3.5 | 1.1 | 3.3 | 0.3 | 1.8 | 0.3 | 2.5 | 1.3 | 1.6 |
| **45** | **SAG 18-45** | **RMT 314 (Check)** | 1.0 | 2.3 | 1.3 | 3.2 | 0.3 | 1.8 | 0.4 | 2.4 | 2.7 | 1.7 |
| **46** | SAG 18-46 | BSH-1 | 1.0 | 2.4 | 3.2 | 3.9 | 0.5 | 3.2 | 2.2 | 2.2 | 2.9 | 2.4 |

**Table 5.2: Assessment of avoidable yield losses due to insect pests in *Brassicas***

| **Centre** | **Mustard phid population in unprotected plot** | | **Yield (kg/ha)** | | **Avoidable yield losses (%)** |
|---|---|---|---|---|---|
| | | | **Protected** | **Unprotected** | |
| **Hisar** | | | | | |
| PM-31 | 197.6 | | 1824.6 | 1288.9 | 29.4 |
| RH 725 | 170.9 | | 1906.8 | 1562.3 | 18.1 |
| **CD (p=0.05)** | **NS** | | **71.6** | **139.1** | **-** |
| **Dholi** | | | | | |
| Rajendra Suflam | 37.4 | | 1270.0 | 860.0 | 32.3 |
| PM-31 | 33.4 | | 1215.0 | 785.0 | 35.4 |
| RH-725 | 30.6 | | 1140.0 | 750.0 | 34.2 |
| **CD (p=0.05)** | **-** | | **112.0** | **72.1** | - |
| **Ludhiana** | **Aphids/ plant** | **Cabbage caterpillars/ plant** | | | |
| PM-31 | 22.2 | 16.8 | 2027.1 | 1647.9 | 18.7 |
| RH-725 | 28.0 | 12.9 | 2102.1 | 1795.8 | 14.5 |
| PBR 357 | 30.2 | 11.4 | 2079.2 | 1822.9 | 12.3 |
| **CD (p=0.05)** | **NS** | **NS** | **NS** | **NS** | **-** |
| **S.K.Nagar** | | | | | |
| PM-31 | 287.8 | | 2948.0 | 1158.0 | 60.7 |
| RH-725 | 287.2 | | 3307.0 | 1495.0 | 54.8 |
| GDM-4 | 284.3 | | 2979.0 | 1182.0 | 60.3 |
| **Morena** | | | | | |
| PM-31 | 46.2 | | 3027.0 | 2638.0 | 12.8 |
| RH-725 | 37.5 | | 3841.0 | 2969.0 | 22.7 |
| **Kanpur** | | | | | |
| PM-31 | 51.1 | | 1651.0 | 793.0 | 51.9 |
| RH-725 | 59.5 | | 1587.0 | 644.0 | 59.4 |
| BSH-1 | 146.7 | | 722.0 | 282.0 | 60.9 |
| **CD (p = 0.05)** | **1.1** | | **236.2** | **220.9** | - |
| **New Delhi** | | | | | |
| PM-31 | 11.4 | | 3165.0 | 2985.8 | 5.6 |
| RH-725 | 11.3 | | 3266.7 | 2783.3 | 14.8 |
| **Pant Nagar** | | | | | |
| PM-31 | 52.8 | | 4838.0 | 4632.0 | 4.2 |
| RH-725 | 54.1 | | 4696.0 | 4611.0 | 1.8 |
| Varuna | 53.2 | | 5405.0 | 4725.0 | 12.6 |

**Table 5.3.1(A): Population dynamics of painted bug on *Brassicas* varieties at Hisar**

| Population dynamics of painted bug on *Brassica* varieties | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Std Week | Meteorological observations | | | | | | No. of painted bugs/ m row length (mrl) | | | | | | | |
| | | | | | | | Timely Sown | | | | Late Sown | | | |
| | Temperature (°C) | | RH (%) | | Sunshine hours | Rainfall (mm) | *B. juncea* | *Eruca sativa* | *B. napus* | *B. rapa* | *B. juncea* | *Eruca sativa* | *B. napus* | *B. rapa* |
| | Max. | Min. | Morn. | Even. | | | RH 725 | T 27 | HNS 0901 | BSH 1 | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 |
| **41** | 32.5 | 17.9 | 86.1 | 42.8 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | - | - | - | - |
| **42** | 33.4 | 16.5 | 72.6 | 30.4 | 7.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | - | - | - | - |
| **43** | 31.4 | 14.4 | 84.1 | 36.2 | 7.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | - | - | - | - |
| **44** | 31.0 | 15.4 | 91.6 | 43.8 | 2.1 | 0.0 | 0.7 | 1.2 | 0.8 | 1.1 | - | - | - | - |
| **45** | 27.4 | 10.1 | 89.7 | 41.1 | 3.3 | 0.0 | 1.1 | 2.4 | 1.5 | 2.1 | - | - | - | - |
| **46** | 27.5 | 12.7 | 91.0 | 53.1 | 3.5 | 0.0 | 1.9 | 2.8 | 2.1 | 2.4 | - | - | - | - |
| **47** | 27.4 | 10.9 | 87.4 | 44.2 | 5.8 | 0.0 | 0.5 | 0.9 | 0.7 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **48** | 27.2 | 9.4 | 93.1 | 46.3 | 5.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **49** | 24.9 | 7.5 | 95.9 | 44.9 | 5.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **50** | 21.0 | 7.7 | 90.5 | 57.3 | 3.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Note: Weather data provided by the department of Agricultural Meteorology, CCS HAU, Hisar**

**Table 5.3.1(B): Population dynamics of mustard aphid on *Brassica* varieties at Hisar**

| Population dynamics of mustard aphid on *Brassica* varieties | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Std. Week | Meteorological observations | | | | | | No. of aphids / top 10 cm central twig | | | | | | | |
| | | | | | | | Timely Sown | | | | Late Sown | | | |
| | Temp.(°C) | | RH (%) | | Sunshine hours | Rainfall (mm) | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* |
| | Max. | Min. | Morn. | Even. | | | RH 725 | T 27 | HNS 0901 | BSH 1 | DRMR IJ-31 | T 27 | GSC 6 | BSH 1 |
| **1** | 18.9 | 5.7 | 95 | 66 | 3.3 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 19.3 | 5.6 | 93 | 60 | 4.4 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **3** | 20.4 | 4.9 | 90 | 55 | 5.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **4** | 18.2 | 4.8 | 99 | 63 | 4.6 | 6.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **5** | 17.1 | 5.3 | 96 | 65 | 3.9 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 |
| **6** | 21.0 | 6.9 | 92 | 56 | 5.7 | 0.0 | 0 | 0 | 0 | 0 | 2.1 | 0 | 2.3 | 4.5 |
| **7** | 20.0 | 9.7 | 94 | 66 | 3.1 | 0.0 | 0 | 0 | 0 | 0 | 5.6 | 1.3 | 7.2 | 10.1 |
| **8** | 22.2 | 9.0 | 89 | 50 | 5.6 | 0.0 | 0 | 0 | 0 | 0 | 34.3 | 23.7 | 37.3 | 47.0 |
| **9** | 20.9 | 8.0 | 93 | 53 | 5.8 | 14.8 | harvested | harvested | harvested | harvested | 76.7 | 45.7 | 64.0 | 124.3 |
| **10** | 24.2 | 8.5 | 88 | 38 | 8.2 | 0.0 | | | | | 178.0 | 65.3 | 183.3 | 40.7 |
| **11** | 24.9 | 9.1 | 91 | 48 | 6.1 | 0.0 | | | | | 159.3 | 44.3 | 147.4 | 11.8 |
| **12** | 28.9 | 11.8 | 80 | 42 | 7.2 | 0.0 | | | | | 42.3 | 18.7 | 40.7 | harvested |
| **13** | 32.6 | 13.5 | 81 | 28 | 7.3 | 0.0 | | | | | 8.7 | 2.3 | 9.3 | |

**Note: Weather data provided by the department of Agricultural Meteorology, CCS HAU, Hisar.**

**Table 5.3.1(C): Population dynamics of various predators on *Brassica* varieties at Hisar**

| Population dynamics of predators on *Brassica* varieties | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Std. Week | Meteorological observations | | | | | | Coccinellids (Grubs +Beetles)/ Plant | | | | | | | |
| | | | | | | | Timely Sown | | | | Late Sown | | | |
| | Temp. (°C) | | RH (%) | | Sunshine hours | Rainfall (mm) | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* |
| | Max. | Min. | Morn. | Even. | | | RH 725 | T 27 | HNS 0901 | BSH 1 | DRMR IJ-31 | T 27 | GSC 6 | BSH 1 |
| **1** | 18.9 | 5.7 | 95 | 66 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **2** | 19.3 | 5.6 | 93 | 60 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **3** | 20.4 | 4.9 | 90 | 55 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **4** | 18.2 | 4.8 | 99 | 63 | 4.6 | 6.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **5** | 17.1 | 5.3 | 96 | 65 | 3.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **6** | 21.0 | 6.9 | 92 | 56 | 5.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **7** | 20.0 | 9.7 | 94 | 66 | 3.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **8** | 22.2 | 9.0 | 89 | 50 | 5.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **9** | 20.9 | 8.0 | 93 | 53 | 5.8 | 14.8 | harvested | harvested | harvested | harvested | 0.7 | 0.5 | 0.2 | 0.9 |
| **10** | 24.2 | 8.5 | 88 | 38 | 8.2 | 0.0 | | | | | 1.1 | 1.0 | 1.3 | 1.6 |
| **11** | 24.9 | 9.1 | 91 | 48 | 6.1 | 0.0 | | | | | 1.9 | 1.6 | 2.1 | 1.8 |
| **12** | 28.9 | 11.8 | 80 | 42 | 7.2 | 0.0 | | | | | 3.0 | 3.6 | 3.3 | harvested |
| **13** | 32.6 | 13.5 | 81 | 28 | 7.3 | 0.0 | | | | | 3.6 | 3.8 | 4.1 | |

**Note: Weather data provided by the department of Agricultural Meteorology, CCS HAU, Hisar.**

**Table 5.3.2 (A): Population dynamics of aphids on *Brassica*s at Kanpur**

| Std. Week | Weather Parameters | | | | | | No. of aphids / top 10 cm central twig | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature (°C) | | RH (%) | | Sun shine (hrs) | Rainfall (mm) | Urvashi | | GSC-6 | | BSH-1 | | T 27 | | DRMR IJ 31 | |
| | Max. | Min. | Morn. | Even. | | | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown |
| 43 | 33.1 | 14.2 | 70 | 30 | 9.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 44 | 32.0 | 14.4 | 76 | 36 | 9.2 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 45 | 28.3 | 12.8 | 82 | 44 | 6.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 46 | 29.5 | 10.6 | 84 | 34 | 8.1 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 47 | 28.5 | 11.3 | 80 | 34 | 8.7 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 48 | 26.6 | 11.6 | 90 | 43 | 5.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 49 | 24.8 | 8.8 | 89 | 38 | 6.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50 | 22.8 | 8.3 | 90 | 46 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 51 | 22.5 | 5.3 | 87 | 35 | 7.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 21.1 | 4.6 | 87 | 34 | 7.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 22.4 | 7.3 | 87 | 49 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 21.4 | 7.5 | 87 | 43 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 23.1 | 6.0 | 83 | 39 | 8.0 | 13.5 | 3.3 | 0.0 | 0.0 | 0.0 | 16.4 | 8.5 | 0.0 | 0.0 | 0.3 | 0.0 |
| 4 | 19.6 | 10.6 | 84 | 61 | 3.2 | 13.5 | 15.0 | 16.0 | 7.9 | 12.4 | 23.2 | 28.9 | 0.0 | 2.0 | 11.2 | 12.2 |
| 5 | 21.3 | 8.3 | 85 | 50 | 8.5 | 0.0 | 26.0 | 38.4 | 18.5 | 42.1 | 32.1 | 58.0 | 5.0 | 7.9 | 21.0 | 19.3 |
| 6 | 22.1 | 10.0 | 90 | 55 | 5.1 | 10.5 | 17.0 | 34.2 | 12.0 | 36.6 | 24.6 | 44.7 | 4.0 | 6.0 | 19.0 | 12.6 |
| 7 | 12.3 | 11.6 | 89 | 57 | 5.4 | 1.7 | 52.5 | 68.5 | 39.3 | 72.2 | 69.4 | 145.4 | 12.0 | 9.2 | 62.9 | 33.8 |
| 8 | 26.1 | 12.3 | 87 | 50 | 5.5 | 0.0 | 71.5 | 79.6 | 117.6 | 80.0 | 133.3 | 261.5 | 17.6 | 11.3 | 69.9 | 190.7 |
| 9 | 22.6 | 10.5 | 87 | 52 | 4.5 | 9.1 | 30.2 | 58.3 | 22.5 | 61.4 | 34.8 | 180.0 | 5.0 | 7.4 | 12.0 | 72.3 |
| 10 | 27.4 | 12.0 | 79 | 41 | 9.6 | 0.0 | 6.0 | 46.0 | 4.3 | 32.2 | 0.9 | 151.6 | 0.0 | 5.7 | 3.0 | 54.9 |
| 11 | 29.2 | 13.2 | 80 | 38 | 9.0 | 0.0 | 0.0 | 12.2 | 0.0 | 18.3 | 0.0 | 22.0 | 0.0 | 0.2 | 0.0 | 20.3 |
| 12 | 32.2 | 15.8 | 63 | 39 | 10.2 | 0.0 | 0.0 | 6.3 | 0.0 | 5.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 |
| 13 | 34.5 | 17.3 | 75 | 41 | 10.1 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Table 5.3.2 (B): Population dynamics of painted bug on *Brassica*s at Kanpur**

| Std. Week | Weather Parameters | | | | | | Painted bug /m row length (mrl) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature ($^0$C) | | RH (%) | | Sun shine (hrs) | Rainfall (mm) | Urvashi | | GSC-6 | | BSH-1 | | T 27 | | DRMR IJ 31 | |
| | Min. | Max. | Even. | Morn. | | | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown |
| 43 | 33.1 | 14.2 | 70 | 30 | 9.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 44 | 32.0 | 14.4 | 76 | 36 | 9.2 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 45 | 28.3 | 12.8 | 82 | 44 | 6.5 | 0.0 | 1.2 | - | 1.1 | - | 0.3 | - | 0.3 | - | 1.3 | - |
| 46 | 29.5 | 10.6 | 84 | 34 | 8.1 | 0.0 | 1.6 | - | 2.6 | - | 2.6 | - | 1.3 | - | 1.5 | - |
| 47 | 28.5 | 11.3 | 80 | 34 | 8.7 | 0.0 | 2.0 | - | 2.6 | - | 3.6 | - | 2.6 | - | 3.0 | - |
| 48 | 26.6 | 11.6 | 90 | 43 | 5.3 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 1.0 | 0.0 | 0.3 | 0.0 | 1.6 | 0.0 |
| 49 | 24.8 | 8.8 | 89 | 38 | 6.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50 | 22.8 | 8.3 | 90 | 46 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 51 | 22.5 | 5.3 | 87 | 35 | 7.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 21.1 | 4.6 | 87 | 34 | 7.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 22.4 | 7.3 | 87 | 49 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 21.4 | 7.5 | 87 | 43 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 23.1 | 6.0 | 83 | 39 | 8.0 | 13.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 19.6 | 10.6 | 84 | 61 | 3.2 | 13.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 21.3 | 8.3 | 85 | 50 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 22.1 | 10.0 | 90 | 55 | 5.1 | 10.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 12.3 | 11.6 | 89 | 57 | 5.4 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 26.1 | 12.3 | 87 | 50 | 5.5 | 0.0 | 0.6 | 0.0 | 1.0 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 |
| 9 | 22.6 | 10.5 | 87 | 52 | 4.5 | 9.1 | 1.4 | 0.0 | 2.3 | 0.0 | 1.7 | 0.0 | 2.0 | 0.0 | 2.3 | 0.0 |
| 10 | 27.4 | 12.0 | 79 | 41 | 9.6 | 0.0 | 2.6 | 1.1 | 4.0 | 0.0 | 3.3 | 1.4 | 2.6 | 0.0 | 2.6 | 2.1 |
| 11 | 29.2 | 13.2 | 80 | 38 | 9.0 | 0.0 | 3.9 | 1.4 | 4.2 | 1.2 | 3.6 | 1.9 | 2.6 | 1.2 | 3.3 | 2.0 |
| 12 | 32.2 | 15.8 | 63 | 39 | 10.2 | 0.0 | 4.0 | 1.6 | 4.5 | 2.3 | 5.6 | 3.0 | 3.3 | 1.6 | 4.2 | 2.6 |
| 13 | 34.5 | 17.3 | 75 | 41 | 10.1 | 0.4 | 0.0 | 3.2 | 0.0 | 4.2 | 0.0 | 6.5 | 0.0 | 2.0 | 0.0 | 4.2 |

**Table 5.3.2 (C): Population dynamics of sawfly larvae on *Brassica*s at Kanpur**

| Std. Week | Weather Parameters | | | | | | Sawfly larvae/ plant | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature ($^0$C) | | RH (%) | | Sun shine (hrs) | Rain fall (mm) | Urvashi | | GSC-6 | | BSH-1 | | T 27 | | DRMR IJ 31 | |
| | Min. | Max. | Even. | Morn. | | | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown |
| 43 | 33.1 | 14.2 | 70 | 30 | 9.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 44 | 32.0 | 14.4 | 76 | 36 | 9.2 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 45 | 28.3 | 12.8 | 82 | 44 | 6.5 | 0.0 | 1.6 | - | 1.0 | - | 0.6 | - | 0.0 | - | 2.0 | - |
| 46 | 29.5 | 10.6 | 84 | 34 | 8.1 | 0.0 | 2.3 | - | 2.3 | - | 3.6 | - | 1.3 | - | 2.6 | - |
| 47 | 28.5 | 11.3 | 80 | 34 | 8.7 | 0.0 | 0.6 | - | 1.6 | - | 2.3 | - | 0.6 | - | 2.3 | - |
| 48 | 26.6 | 11.6 | 90 | 43 | 5.3 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 49 | 24.8 | 8.8 | 89 | 38 | 6.9 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 50 | 22.8 | 8.3 | 90 | 46 | 4.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 51 | 22.5 | 5.3 | 87 | 35 | 7.3 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 52 | 21.1 | 4.6 | 87 | 34 | 7.3 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 1 | 22.4 | 7.3 | 87 | 49 | 4.4 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 2 | 21.4 | 7.5 | 87 | 43 | 4.9 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 3 | 23.1 | 6.0 | 83 | 39 | 8.0 | 13.5 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 4 | 19.6 | 10.6 | 84 | 61 | 3.2 | 13.5 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 5 | 21.3 | 8.3 | 85 | 50 | 8.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 6 | 22.1 | 10.0 | 90 | 55 | 5.1 | 10.5 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 7 | 12.3 | 11.6 | 89 | 57 | 5.4 | 1.7 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 8 | 26.1 | 12.3 | 87 | 50 | 5.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 9 | 22.6 | 10.5 | 87 | 52 | 4.5 | 9.1 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 10 | 27.4 | 12.0 | 79 | 41 | 9.6 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 11 | 29.2 | 13.2 | 80 | 38 | 9.0 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 12 | 32.2 | 15.8 | 63 | 39 | 10.2 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 13 | 34.5 | 17.3 | 75 | 41 | 10.1 | 0.4 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |

**Table 5.3.2 (D): Population dynamics of *Coccinella* on *Brassica*s at Kanpur**

| Std. Week | Weather Parameters | | | | | | *Coccinella* (Grubs+Adults)/ Plant | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature ($^0$C) | | RH (%) | | Sun shine (hrs) | Rain fall (mm) | Urvashi | | GSC-6 | | BSH-1 | | T 27 | | DRMR IJ 31 | |
| | Min. | Max. | Even. | Morn. | | | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown |
| 43 | 33.1 | 14.2 | 70 | 30 | 9.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 44 | 32.0 | 14.4 | 76 | 36 | 9.2 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 45 | 28.3 | 12.8 | 82 | 44 | 6.5 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 46 | 29.5 | 10.6 | 84 | 34 | 8.1 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 47 | 28.5 | 11.3 | 80 | 34 | 8.7 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 48 | 26.6 | 11.6 | 90 | 43 | 5.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 49 | 24.8 | 8.8 | 89 | 38 | 6.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50 | 22.8 | 8.3 | 90 | 46 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 51 | 22.5 | 5.3 | 87 | 35 | 7.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 21.1 | 4.6 | 87 | 34 | 7.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 22.4 | 7.3 | 87 | 49 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 21.4 | 7.5 | 87 | 43 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 23.1 | 6.0 | 83 | 39 | 8.0 | 13.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 19.6 | 10.6 | 84 | 61 | 3.2 | 13.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 21.3 | 8.3 | 85 | 50 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 22.1 | 10.0 | 90 | 55 | 5.1 | 10.5 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | 1.3 | 0.0 | 0.0 | 2.0 | 0.6 |
| 7 | 12.3 | 11.6 | 89 | 57 | 5.4 | 1.7 | 2.3 | 1.6 | 1.0 | 0.3 | 3.6 | 2.8 | 1.0 | 1.0 | 2.3 | 2.2 |
| 8 | 26.1 | 12.3 | 87 | 50 | 5.5 | 0.0 | 3.8 | 2.5 | 4.6 | 0.9 | 3.9 | 3.3 | 1.6 | 1.2 | 2.3 | 2.6 |
| 9 | 22.6 | 10.5 | 87 | 52 | 4.5 | 9.1 | 3.6 | 3.2 | 3.2 | 2.2 | 3.2 | 4.2 | 1.6 | 0.0 | 2.6 | 3.7 |
| 10 | 27.4 | 12.0 | 79 | 41 | 9.6 | 0.0 | 2.5 | 2.0 | 2.3 | 2.4 | 0.0 | 4.4 | 0.0 | 0.0 | 1.0 | 2.6 |
| 11 | 29.2 | 13.2 | 80 | 38 | 9.0 | 0.0 | 0.0 | 1.0 | 0.0 | 3.0 | 0.0 | 5.1 | 0.0 | 0.0 | 0.0 | 2.6 |
| 12 | 32.2 | 15.8 | 63 | 39 | 10.2 | 0.0 | 0.0 | 0.3 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.3 |
| 13 | 34.5 | 17.3 | 75 | 41 | 10.1 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Table 5.3.3: Population dynamics of mustard aphid on *Brassica* crops (Late Sown) at Dholi**

| Std. Week | Weather parameters | | | | Rainfall (mm) | Aphid population/10 cm twig on | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature ($^o$C) | | RH (%) | | | DRMR IJ 31 | BSH 1 | GSC 6 | T 27 | Rajendra Suflam |
| | Max. | Min. | Morn. | Even. | | | | | | |
| **4** | 22.8 | 12.2 | 99.4 | 89.7 | - | 4.8 | 5.5 | 2.4 | 3.8 | 2.1 |
| **5** | 23.9 | 7.5 | 100.0 | 73.8 | - | 9.7 | 12.8 | 5.2 | 7.6 | 4.8 |
| **6** | 23.2 | 10.2 | 98.0 | 85.7 | 8.4 | 21.6 | 28.2 | 16.7 | 18.2 | 17.6 |
| **7** | 24.0 | 11.5 | 98.5 | 83.8 | - | 30.8 | 32.4 | 26.2 | 31.4 | 40.2 |
| **8** | 26.1 | 11.9 | 100.0 | 83.0 | - | 42.7 | 44.3 | 33.2 | 39.6 | 73.2 |
| **9** | 24.9 | 11.5 | 99.1 | 90.4 | 22.0 | 11.2 | 8.8 | 48.2 | 51.6 | 93.4 |
| **10** | 27.0 | 10.8 | 99.7 | 83.8 | - | 1.4 | 4.6 | 16.2 | 18.4 | 14.8 |
| **11** | 31.3 | 14.5 | 96.4 | 73.0 | - | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Correlation coefficient (r) DRMR IJ 31** | 0.31 | 0.24 | 0.06 | (-)0.48 | (-)0.03 | | | | | |
| **BSH 1** | 0.43 | 0.29 | 0.08 | (-)0.53 | (-)0.04 | | | | | |
| **GSC 6** | 0.37 | 0.36 | 0.12 | (-)0.59 | (-)0.07 | | | | | |
| **T 27** | 0.26 | 0.17 | 0.08 | (-)0.46 | (-)0.03 | | | | | |
| **Rajendra Suflam** | 0.32 | 0.21 | 0.01 | (-0.53 | (-)0.06 | | | | | |

**Table 5.3.4(A): Population dynamics of mustard aphid on *Brassicas* at Pant Nagar (Timely sown)**

| Std. Week | Temperature | | Rain fall (mm) | R.H. % | | Sun- Shine (Hrs) | Number of aphids/ top 10 cm central twig | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | | Max. | Min. | | BSH1 | YST-151 | Varuna | *B. nigra* | T 27 | GSC 6 | *B. alba* | *B. carinata* |
| 1 | 21.3 | 6.1 | 0.0 | 91.0 | 60.3 | 6.0 | 7.5 | 7.1 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 21.6 | 5.7 | 0.0 | 94.4 | 57.0 | 5.7 | 12.5 | 11.0 | 7.8 | 4.8 | 0.0 | 2.2 | 3.8 | 0.0 |
| 3 | 21.7 | 5.6 | 0.0 | 93.0 | 53.0 | 0.6 | 24.7 | 22.2 | 16.6 | 6.6 | 0.8 | 5.7 | 8.9 | 0.0 |
| 4 | 20.5 | 8.5 | 2.4 | 88.4 | 49.9 | 3.7 | 28.6 | 30.1 | 14.1 | 5.1 | 3.3 | 17.0 | 22.4 | 0.0 |
| 5 | 20.9 | 7.0 | 0.0 | 92.8 | 63.1 | 6.1 | 30.5 | 59.2 | 19.1 | 13.1 | 7.1 | 33.2 | 45.6 | 0.0 |
| 6 | 21.1 | 9.1 | 2.1 | 94.8 | 65.8 | 4.7 | 34.4 | 59.4 | 16.8 | 22.5 | 7.4 | 34.5 | 103.9 | 0.0 |
| 7 | 22.7 | 10.8 | 2.0 | 93.6 | 65.6 | 4.8 | 25.3 | 46.2 | 10.7 | 17.4 | 4.1 | 24.7 | 131.9 | 0.0 |
| 8 | 24.3 | 11.2 | 0.5 | 91.8 | 63.7 | 4.6 | 17. 7 | 34.5 | 6.3 | 11.5 | 2.3 | 17.6 | 141.9 | 11.7 |
| 9 | 21.5 | 9.0 | 0.9 | 92.1 | 68.7 | 5.7 | 4.1 | 15.9 | 2.4 | 5.7 | 0.8 | 10.3 | 92.1 | 25.8 |
| 10 | 25.9 | 8.9 | 0.0 | 88.0 | 50.0 | 9.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.2 | 2.9 | 64.7 | 47.5 |
| 11 | 28.0 | 11.2 | 0.4 | 89.0 | 47.0 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 67.2 |
| 12 | 30.6 | 11.7 | 0.0 | 85.4 | 40.6 | 9.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 72.0 |
| 13 | 32.5 | 15.5 | 0.0 | 84.9 | 49.8 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 45.0 |
| 14 | 33.3 | 18.0 | 0.0 | 70.4 | 43.3 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 21.9 |
| 15 | 35.7 | 17.3 | 0.5 | 74.0 | 31.7 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.7 |

**Table 5.3.4(B): Population dynamics of mustard aphid on *Brassicas* at Pant Nagar (Late sown)**

| Std. Week | Temperature | | Rain fall (mm) | R.H. % | | Sunshine Hours | Number of aphids/ top 10 cm central twig | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | | Max. | Min. | | BSH 1 | YST 151 | Varuna | *B. nigra* | T 27 | GSC 6 | *B. alba* | DRMR IJ 31 |
| 1 | 21.3 | 6.1 | 0.0 | 91.0 | 60.3 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 21.6 | 5.7 | 0.0 | 94.4 | 57.0 | 5.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 21.7 | 5.6 | 0.0 | 93.0 | 53.0 | 0.6 | 7.7 | 6.8 | 6.7 | 0.0 | 1.4 | 0.0 | 0.0 | 11.0 |
| 4 | 20.5 | 8.5 | 2.4 | 88.4 | 49.9 | 3.7 | 17.5 | 17.4 | 17.1 | 17.0 | 3.9 | 12.3 | 72.8 | 24.0 |
| 5 | 20.9 | 7.0 | 0.0 | 92.8 | 63.1 | 6.1 | 40.2 | 37.9 | 35.6 | 44.6 | 6.6 | 24.2 | 132.2 | 49.1 |
| 6 | 21.1 | 9.1 | 2.1 | 94.8 | 65.8 | 4.7 | 64.9 | 60.8 | 46.8 | 64.6 | 14.9 | 44.3 | 192.3 | 65.2 |
| 7 | 22.7 | 10.8 | 2.0 | 93.6 | 65.6 | 4.8 | 81.4 | 95.2 | 65.8 | 107.2 | 48.0 | 80.2 | 251.6 | 87.5 |
| 8 | 24.3 | 11.2 | 0.5 | 91.8 | 63.7 | 4.6 | 71.7 | 95.1 | 61.8 | 128.1 | 6.4 | 105.3 | 120.2 | 91.9 |
| 9 | 21.5 | 9.0 | 0.9 | 92.1 | 68.7 | 5.7 | 47.0 | 69.1 | 44.1 | 93.8 | 3.7 | 83.8 | 123.8 | 74.2 |
| 10 | 25.9 | 8.9 | 0.0 | 88.0 | 50.0 | 9.0 | 30.3 | 54.2 | 32.6 | 73.4 | 2.0 | 62.9 | 89.5 | 56.5 |
| 11 | 28.0 | 11.2 | 0.4 | 89.0 | 47.0 | 6.0 | 18.9 | 35.2 | 18.8 | 51.9 | 0.4 | 42.8 | 64.1 | 40.2 |
| 12 | 30.6 | 11.7 | 0.0 | 85.4 | 40.6 | 9.2 | 0.0 | 0.0 | 0.0 | 36.0 | 0.0 | 28.9 | 34.8 | 0.0 |
| 13 | 32.5 | 15.5 | 0.0 | 84.9 | 49.8 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 33.3 | 18.0 | 0.0 | 70.4 | 43.3 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 35.7 | 17.3 | 0.5 | 74.0 | 31.7 | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Table 5.3.5 (A): Population dynamics of mustard aphid and cabbage caterpillar on *Brassicas* at Ludhiana (Timely sown)**

| SMW* | Weather Parameters | | | | | | No of aphids/ top 10 cm central twig | | | | Cabbage caterpillars/ plant | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temp. ($^0$C) | | R.H. (%) | | Rainfall (mm) | Sunshine (hrs) | BSH 1 | DRMR-IJ 31 | GSC 6 | T27 | BSH 1 | DRMR-IJ 31 | GSC 6 | T27 |
| | Max. | Min. | M | E | | | | | | | | | | |
| 51 | 20.3 | 3.6 | 93.9 | 39.3 | 0.0 | 6.3 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 18.4 | 2.8 | 94.5 | 41.9 | 0.0 | 5.5 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 18.2 | 6.7 | 92.1 | 53.4 | 0.3 | 2.2 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 19.8 | 6.0 | 90.7 | 44.6 | 0.3 | 5.0 | 0.2 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 19.3 | 6.2 | 91.1 | 47.9 | 6.6 | 4.0 | 2.2 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 17.2 | 5.9 | 93.7 | 52.7 | 2.2 | 7.6 | 0.4 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 19.1 | 6.3 | 92.7 | 52.0 | 0.0 | 4.7 | 0.8 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 19.4 | 8.4 | 92.3 | 58.3 | 9.8 | 4.7 | 0.2 | 0.5 | 0.3 | 0.0 | 0.0 | 2.3 | 0.0 | 0.0 |
| 7 | 19.9 | 10.6 | 91.3 | 62.0 | 2.3 | 2.4 | 0.6 | 0.8 | 0.6 | 0.0 | 0.0 | 2.3 | 0.0 | 0.0 |
| 8 | 21.1 | 10.3 | 91.0 | 58.3 | 0.8 | 6.8 | 1.5 | 2.8 | 1.5 | 0.0 | 0.1 | 2.7 | 0.0 | 0.0 |
| 9 | 20.0 | 9.6 | 88.7 | 54.7 | 1.6 | 6.7 | 1.0 | 0.8 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 22.7 | 10.0 | 87.4 | 49.9 | 0.2 | 8.3 | 0.4 | 0.3 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 24.6 | 10.7 | 90.4 | 44.6 | 0.0 | 7.5 | 0.0 | 0.7 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 26.9 | 12.9 | 87.3 | 42.0 | 0.0 | 7.5 | Harvested | 0.0 | 0.0 | 0.0 | Harvested | 0.0 | 0.0 | 0.0 |
| 13 | 31.1 | 14.7 | 87.6 | 38.3 | 0.0 | 10.0 | -- | 0.0 | 0.0 | 0.0 | -- | 0.0 | 0.0 | 0.0 |

*** SMW: Standard Meteorological Week**

**Table 5.3.5(B): Population dynamics of mustard aphid and cabbage caterpillar on *Brassicas* at Ludhiana (late sown)**

| SMW* | Weather Parameters | | | | | | No of aphids/ top 10 cm central twig | | | | Cabbage caterpillars/ plant | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temp. ($^0$C) | | R.H. (%) | | Rainfall (mm) | Sunshine (hrs) | BSH 1 | DRMR-IJ 31 | GSC 6 | T27 | BSH 1 | DRMR-IJ 31 | GSC 6 | T27 |
| | Max. | Min. | M | E | | | | | | | | | | |
| 52 | 18.4 | 2.8 | 94.5 | 41.9 | 0.0 | 5.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 18.2 | 6.7 | 92.1 | 53.4 | 0.3 | 2.2 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 19.8 | 6.0 | 90.7 | 44.6 | 0.3 | 5.0 | 3.9 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 19.3 | 6.2 | 91.1 | 47.9 | 6.6 | 4.0 | 13.1 | 8.2 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 17.2 | 5.9 | 93.7 | 52.7 | 2.2 | 7.6 | 0.5 | 0.2 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 19.1 | 6.3 | 92.7 | 52.0 | 0.0 | 4.7 | 0.2 | 0.3 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 19.4 | 8.4 | 92.3 | 58.3 | 9.8 | 4.7 | 4.9 | 6.4 | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 19.9 | 10.6 | 91.3 | 62.0 | 2.3 | 2.4 | 3.2 | 5.9 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 21.1 | 10.3 | 91.0 | 58.3 | 0.8 | 6.8 | 5.8 | 7.6 | 6.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | 20.0 | 9.6 | 88.7 | 54.7 | 1.6 | 6.7 | 3.5 | 7.0 | 10.2 | 0.0 | 1.5 | 3.1 | 0.0 | 0.0 |
| 10 | 22.7 | 10.0 | 87.4 | 49.9 | 0.2 | 8.3 | 3.6 | 12.4 | 17.4 | 0.0 | 0.0 | 10.3 | 3.7 | 0.5 |
| 11 | 24.6 | 10.7 | 90.4 | 44.6 | 0.0 | 7.5 | 8.4 | 32.4 | 28.3 | 0.0 | 0.0 | 9.5 | 7.2 | 0.7 |
| 12 | 26.9 | 12.9 | 87.3 | 42.0 | 0.0 | 7.5 | 0.8 | 12.6 | 81.1 | 0.0 | 0.0 | 3.0 | 5.1 | 0.0 |
| 13 | 31.1 | 14.7 | 87.6 | 38.3 | 0.0 | 10.0 | 0.0 | 0.0 | 2.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 34.3 | 18.3 | 83.4 | 32.6 | 0.0 | 9.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 35.0 | 19.9 | 70.0 | 31.0 | 0.9 | 7.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

*** SMW: Standard Meteorological Week**

**Table 5.3.6: Population dynamic of various insect pests on *Brassicas* crops at SK Nagar**

| Std. week | Weather Parameters | | | | | | Aphids/ top 10cm central twig | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temp. (°C) | | RH (%) | | Rain fall (mm) | Sun Shine (hrs) | DRMR IJ 31 | | T 27 | | GSC 6 | | BSH 1 | | GDM-4 | |
| | Max. | Min. | Morn | Even | | | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown | Timely sown | Late sown |
| **50** | 27.4 | 9.9 | 54 | 40 | 0.0 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **51** | 25.6 | 6.6 | 42 | 46 | 0.0 | 9.1 | 2.4 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 1.5 | 0.0 | 0.6 | 0.0 |
| **52** | 25.3 | 5.7 | 42 | 40 | 0.0 | 9.6 | 5.8 | 0.0 | 0.0 | 0.0 | 2.4 | 0.0 | 1.7 | 0.0 | 1.7 | 0.0 |
| **1** | 26.7 | 7.2 | 44 | 40 | 0.0 | 9.3 | 19.8 | 0.0 | 0.0 | 0.0 | 15.5 | 0.0 | 18.3 | 0.0 | 5.9 | 0.0 |
| **2** | 27.1 | 7.4 | 40 | 35 | 0.0 | 9.3 | 22.7 | 2.6 | 0.0 | 0.0 | 16.5 | 3.5 | 20.5 | 4.9 | 7.6 | 3.4 |
| **3** | 29.1 | 8.9 | 45 | 26 | 0.0 | 9.4 | 27.8 | 6.2 | 3.0 | 2.7 | 19.7 | 8.5 | 20.6 | 12.7 | 11.6 | 6.1 |
| **4** | 24.0 | 6.9 | 54 | 48 | 0.0 | 9.4 | 62.7 | 57.0 | 34.0 | 34.4 | 69.9 | 53.7 | 70.9 | 65.1 | 57.1 | 58.4 |
| **5** | 23.8 | 9.3 | 60 | 41 | 0.0 | 8.9 | 113.3 | 176.5 | 102.3 | 154.6 | 160.3 | 178.0 | 172.0 | 174.2 | 151.9 | 171.3 |
| **6** | 24.9 | 6.6 | 55 | 46 | 0.0 | 9.2 | 9.2 | 311.8 | 196.6 | 301.2 | 243.5 | 332.4 | 20.2 | 346.9 | 7.3 | 323.3 |
| **7** | 27.7 | 10.2 | 62 | 32 | 0.0 | 9.4 | 0.0 | 419.0 | 86.2 | 440.2 | 74.7 | 417.0 | 0.0 | 407.4 | 0.0 | 412.9 |
| **8** | 29.4 | 12.0 | 63 | 42 | 0.0 | 8.2 | 0.0 | 250.2 | 27.9 | 251.7 | 32.6 | 254.0 | 0.0 | 246.7 | 0.0 | 246.1 |
| **9** | 29.4 | 10.9 | 60 | 49 | 2.2 | 8.2 | 0.0 | 73.5 | 0.0 | 73.1 | 0.0 | 69.9 | 0.0 | 70.2 | 0.0 | 71.1 |
| **10** | 31.4 | 12.9 | 62 | 43 | 0.0 | 8.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **11** | 32.7 | 12.9 | 63 | 39 | 0.0 | 9.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **12** | 34.6 | 14.6 | 64 | 33 | 0.0 | 9.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **13** | 40.2 | 18.7 | 66 | 26 | 0.0 | 9.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Table 5.3.7(A): Population dynamics of mustard sawfly larvae in *Brassicas* at Shillongani**

| Std. Week | Weather parameters | | | | | Sawfly larvae/ plant | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Benoy | | DRMR IJ 31 | | T 27 | | GSC 6 | | BSH 1 | |
| | Temp. (°C) | | RH (%) | | Rain fall (mm) | Timely | Late | Timely | Late | Timely | Late | Timely | Late | Timely | Late |
| | Max | Min | Morn | Even | | | | | | | | | | | |
| 47 | 26.1 | 12.9 | 94 | 75 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 48 | 26.9 | 11.4 | 94 | 74 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 49 | 25.9 | 10.9 | 94 | 67 | 0.0 | 0.0 | - | 0.3 | - | 0.0 | - | 0.7 | - | 0.9 | - |
| 50 | 26.6 | 10.4 | 95 | 65 | 0.0 | 1.3 | - | 0.6 | - | 0.2 | - | 0.8 | - | 1.0 | - |
| 51 | 22.9 | 12.7 | 93 | 81 | 28.2 | 2.1 | 0.0 | 1.2 | 0.0 | 1.2 | 0.0 | 1.3 | 0.0 | 1.8 | 0.0 |
| 52 | 24.0 | 10.9 | 93 | 74 | 0.0 | 2.3 | 0.7 | 1.3 | 0.0 | 1.4 | 0.0 | 1.8 | 0.0 | 2.7 | 1.2 |
| 1 | 24.0 | 7.4 | 94 | 68 | 0.0 | 1.0 | 1.7 | 0.8 | 0.7 | 0.7 | 1.2 | 1.2 | 0.8 | 1.3 | 2.4 |
| 2 | 23.8 | 8.4 | 93 | 74 | 0.2 | 0.8 | 3.2 | 1.2 | 2.1 | 0.0 | 0.7 | 0.8 | 1.5 | 0.3 | 0.8 |
| 3 | 24.4 | 7.6 | 93 | 63 | 0.0 | 0.2 | 2.1 | 0.0 | 2.0 | 0.4 | 0.0 | 0.0 | 2.0 | 0.9 | 1.0 |
| 4 | 25.8 | 8.9 | 92 | 63 | 0.0 | 0.0 | 0.8 | 0.7 | 0.0 | 0.0 | 0.0 | 0.1 | 0.7 | 0.0 | 0.7 |
| 5 | 24.9 | 9.9 | 94 | 58 | 4.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 25.5 | 11.2 | 92 | 54 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 25.6 | 12.1 | 91 | 62 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 24.5 | 13.1 | 93 | 63 | 9.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | 25.0 | 12.2 | 88 | 64 | 25.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 25.5 | 13.3 | 91 | 58 | 22.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 29.9 | 26.2 | 89 | 52 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 28.5 | 15.4 | 90 | 58 | 3.8 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 |
| 13 | 29.4 | 16.7 | 89 | 59 | 40.6 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 |
| 14 | 26.5 | 16.7 | 92 | 75 | 4.8 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 |

**Table 5.3.7(B): Population dynamics of mustard flea beetles in *Brassicas* at Shillongani**

| Std. Week | Weather parameters | | | | | Flea beetles/ plant | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Benoy | | DRMR IJ 31 | | T 27 | | GSC 6 | | BSH 1 | |
| | Temp. ($^0$C) | | RH (%) | | Rain fall (mm) | Timely | Late | Timely | Late | Timely | Late | Timely | Late | Timely | Late |
| | Max | Min | Morn | Even | | | | | | | | | | | |
| 47 | 26.1 | 12.9 | 94 | 75 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 48 | 26.9 | 11.4 | 94 | 74 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 49 | 25.9 | 10.9 | 94 | 67 | 0.0 | 1.1 | - | 1.0 | - | 0.2 | - | 0.0 | - | 0.0 | - |
| 50 | 26.6 | 10.4 | 95 | 65 | 0.0 | 3.2 | - | 2.7 | - | 0.9 | - | 1.7 | - | 1.1 | - |
| 51 | 22.9 | 12.7 | 93 | 81 | 28.2 | 1.2 | 0.0 | 1.1 | 0.0 | 1.7 | 0.0 | 2.3 | 0.0 | 1.6 | 0.0 |
| 52 | 24.0 | 10.9 | 93 | 74 | 0.0 | 4.8 | 0.0 | 3.8 | 0.0 | 2.1 | 0.0 | 1.9 | 0.0 | 2.4 | 0.0 |
| 1 | 24.0 | 7.4 | 94 | 68 | 0.0 | 8.6 | 0.0 | 7.2 | 0.3 | 4.5 | 0.0 | 3.8 | 0.9 | 2.6 | 1.3 |
| 2 | 23.8 | 8.4 | 93 | 74 | 0.2 | 7.3 | 1.0 | 6.3 | 0.1 | 2.8 | 0.7 | 2.8 | 1.3 | 1.8 | 1.0 |
| 3 | 24.4 | 7.6 | 93 | 63 | 0.0 | 6.2 | 1.9 | 5.2 | 1.2 | 1.7 | 1.2 | 3.7 | 1.2 | 3.2 | 0.8 |
| 4 | 25.8 | 8.9 | 92 | 63 | 0.0 | 3.0 | 2.3 | 2.0 | 3.4 | 1.7 | 2.4 | 3.6 | 5.4 | 5.2 | 3.4 |
| 5 | 24.9 | 9.9 | 94 | 58 | 4.0 | 6.2 | 4.7 | 1.8 | 7.3 | 3.8 | 4.1 | 5.6 | 2.7 | 9.4 | 5.9 |
| 6 | 25.5 | 11.2 | 92 | 54 | 3.4 | 9.3 | 9.3 | 5.8 | 6.2 | 5.7 | 3.7 | 8.4 | 3.1 | 10.6 | 3.7 |
| 7 | 25.6 | 12.1 | 91 | 62 | 3.2 | 6.3 | 12.1 | 8.8 | 8.3 | 7.6 | 4.7 | 7.3 | 7.3 | 6.3 | 8.3 |
| 8 | 24.5 | 13.1 | 93 | 63 | 9.2 | 5.1 | 10.3 | 4.1 | 5.4 | 4.1 | 6.8 | 3.7 | 8.4 | 5.4 | 10.3 |
| 9 | 25.0 | 12.2 | 88 | 64 | 25.7 | 2.1 | 7.2 | 0.8 | 2.7 | 2.1 | 7.6 | 1.7 | 6.4 | 2.1 | 8.4 |
| 10 | 25.5 | 13.3 | 91 | 58 | 22.0 | 0.0 | 4.1 | 0.2 | 3.9 | 0.1 | 2.0 | 0.8 | 3.0 | 0.3 | 6.2 |
| 11 | 29.9 | 26.2 | 89 | 52 | 0.0 | 0.0 | 0.7 | 0.0 | 1.7 | 0.0 | 1.8 | 0.0 | 4.1 | 0.0 | 4.0 |
| 12 | 28.5 | 15.4 | 90 | 58 | 3.8 | - | 1.0 | - | 0.7 | - | 0.7 | - | 0.3 | - | 0.2 |
| 13 | 29.4 | 16.7 | 89 | 59 | 40.6 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.1 |
| 14 | 26.5 | 16.7 | 92 | 75 | 4.8 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 |

**Table 5.3.7(C): Population dynamics of mustard aphid in *Brassicas* at Shillongani**

| Std. Week | Weather parameters | | | | | No of aphids/ top 10 cm central twig | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Benoy | | DRMR IJ 31 | | T 27 | | GSC 6 | | BSH 1 | |
| | Temp. ($^0$C) | | RH (%) | | Rain fall (mm) | Timely | Late | Timely | Late | Timely | Late | Timely | Late | Timely | Late |
| | Max | Min | Morn | Even | | | | | | | | | | | |
| 47 | 26.1 | 12.9 | 94 | 75 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 48 | 26.9 | 11.4 | 94 | 74 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 49 | 25.9 | 10.9 | 94 | 67 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 50 | 26.6 | 10.4 | 95 | 65 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 51 | 22.9 | 12.7 | 93 | 81 | 28.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 52 | 24.0 | 10.9 | 93 | 74 | 0.0 | 1.7 | 2.7 | 2.3 | 3.7 | 0.0 | 2.7 | 0.0 | 0.8 | 2.1 | 4.9 |
| 1 | 24.0 | 7.4 | 94 | 68 | 0.0 | 10.2 | 11.7 | 9.4 | 27.6 | 1.7 | 20.0 | 4.6 | 10.4 | 12.3 | 21.6 |
| 2 | 23.8 | 8.4 | 93 | 74 | 0.2 | 16.1 | 52.7 | 13.2 | 56.7 | 5.3 | 27.5 | 8.7 | 37.7 | 17.2 | 72.3 |
| 3 | 24.4 | 7.6 | 93 | 63 | 0.0 | 15.8 | 119.0 | 11.2 | 117.3 | 6.1 | 17.3 | 8.9 | 71.6 | 15.1 | 105.3 |
| 4 | 25.8 | 8.9 | 92 | 63 | 0.0 | 12.3 | 154.1 | 12.1 | 129.2 | 4.5 | 42.1 | 6.4 | 93.2 | 20.3 | 149.3 |
| 5 | 24.9 | 9.9 | 94 | 58 | 4.0 | 9.2 | 137.2 | 9.6 | 108.3 | 3.2 | 21.0 | 5.4 | 70.4 | 14.1 | 143.2 |
| 6 | 25.5 | 11.2 | 92 | 54 | 3.4 | 7.2 | 91.2 | 7.1 | 67.4 | 3.7 | 24.3 | 4.6 | 27.6 | 10.2 | 92.3 |
| 7 | 25.6 | 12.1 | 91 | 62 | 3.2 | 8.1 | 82.0 | 6.2 | 55.0 | 4.2 | 11.4 | 2.0 | 43.4 | 9.1 | 64.4 |
| 8 | 24.5 | 13.1 | 93 | 63 | 9.2 | 10.2 | 81.7 | 9.1 | 63.2 | 5.2 | 14.7 | 3.1 | 41.0 | 4.6 | 57.3 |
| 9 | 25.0 | 12.2 | 88 | 64 | 25.7 | 6.2 | 50.0 | 4.2 | 41.0 | 4.0 | 10.6 | 4.0 | 21.0 | 3.1 | 32.1 |
| 10 | 25.5 | 13.3 | 91 | 58 | 22.0 | 2.0 | 37.1 | 2.1 | 21.3 | 3.1 | 12.3 | 2.1 | 11.3 | 1.1 | 37.4 |
| 11 | 29.9 | 26.2 | 89 | 52 | 0.0 | 1.7 | 17.3 | 1.0 | 7.3 | 1.7 | 7.9 | 0.7 | 14.7 | 0.8 | 12.1 |
| 12 | 28.5 | 15.4 | 90 | 58 | 3.8 | - | 9.3 | - | 0.5 | - | 0.4 | - | 2.3 | - | 2.7 |
| 13 | 29.4 | 16.7 | 89 | 59 | 40.6 | - | 0.4 | - | 0.0 | - | 0.4 | - | 1.1 | - | 0.7 |
| 14 | 26.5 | 16.7 | 92 | 75 | 4.8 | - | 0.1 | - | 0.6 | - | 0.1 | - | 0.1 | - | 0.1 |

**Table 5.3.7(D): Population dynamics of coccinellids (adults+grubs) in *Brassicas* at Shillongani**

| Std. Week | Weather parameters | | | | | Coccinellids (Adults+Grubs)/ plant | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Benoy | | DRMR IJ 31 | | T 27 | | GSC 6 | | BSH 1 | |
| | Temp. ($^0$C) | | RH (%) | | Rain fall (mm) | Timely | Late | Timely | Late | Timely | Late | Timely | Late | Timely | Late |
| | Max | Min | Morn | Even | | | | | | | | | | | |
| 47 | 26.1 | 12.9 | 94 | 75 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 48 | 26.9 | 11.4 | 94 | 74 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 49 | 25.9 | 10.9 | 94 | 67 | 0.0 | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - | 0.0 | - |
| 50 | 26.6 | 10.4 | 95 | 65 | 0.0 | 0.0 | - | 0.0 | - | 0.1 | - | 0.1 | - | 0.0 | - |
| 51 | 22.9 | 12.7 | 93 | 81 | 28.2 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.0 | 0.3 | 0.0 | 0.0 | 0.1 |
| 52 | 24.0 | 10.9 | 93 | 74 | 0.0 | 0.0 | 0.4 | 0.0 | 0.3 | 0.0 | 0.2 | 0.1 | 0.4 | 0.0 | 0.4 |
| 1 | 24.0 | 7.4 | 94 | 68 | 0.0 | 0.1 | 1.4 | 0.2 | 1.1 | 0.1 | 0.4 | 0.1 | 0.6 | 0.2 | 0.9 |
| 2 | 23.8 | 8.4 | 93 | 74 | 0.2 | 0.6 | 1.7 | 1.1 | 0.8 | 0.4 | 1.1 | 0.2 | 0.9 | 0.8 | 1.7 |
| 3 | 24.4 | 7.6 | 93 | 63 | 0.0 | 1.6 | 1.5 | 0.8 | 1.3 | 0.0 | 1.0 | 0.6 | 1.0 | 1.3 | 2.0 |
| 4 | 25.8 | 8.9 | 92 | 63 | 0.0 | 1.0 | 0.7 | 0.8 | 2.0 | 0.6 | 1.7 | 0.2 | 1.1 | 1.1 | 2.1 |
| 5 | 24.9 | 9.9 | 94 | 58 | 4.0 | 0.8 | 2.0 | 1.0 | 2.4 | 1.0 | 0.8 | 0.8 | 1.4 | 2.0 | 2.8 |
| 6 | 25.5 | 11.2 | 92 | 54 | 3.4 | 0.9 | 2.7 | 0.7 | 3.0 | 0.9 | 1.0 | 1.3 | 2.0 | 1.7 | 3.1 |
| 7 | 25.6 | 12.1 | 91 | 62 | 3.2 | 1.0 | 2.1 | 1.2 | 2.1 | 0.7 | 1.1 | 1.0 | 1.2 | 1.5 | 2.3 |
| 8 | 24.5 | 13.1 | 93 | 63 | 9.2 | 1.1 | 1.0 | 1.0 | 1.7 | 0.2 | 0.7 | 0.7 | 0.7 | 0.3 | 2.0 |
| 9 | 25.0 | 12.2 | 88 | 64 | 25.7 | 0.2 | 0.7 | 0.2 | 1.3 | 0.3 | 0.6 | 0.6 | 0.5 | 0.6 | 1.3 |
| 10 | 25.5 | 13.3 | 91 | 58 | 22.0 | 0.4 | 1.1 | 0.5 | 0.9 | 0.2 | 0.5 | 1.0 | 0.8 | 0.5 | 0.8 |
| 11 | 29.9 | 26.2 | 89 | 52 | 0.0 | 0.8 | 1.3 | 0.3 | 1.3 | 0.1 | 0.2 | 0.7 | 1.0 | 1.0 | 1.0 |
| 12 | 28.5 | 15.4 | 90 | 58 | 3.8 | - | 0.7 | - | 0.7 | - | 0.7 | - | 0.8 | - | 0.6 |
| 13 | 29.4 | 16.7 | 89 | 59 | 40.6 | - | 0.8 | - | 0.2 | - | 0.2 | - | 0.6 | - | 0.2 |
| 14 | 26.5 | 16.7 | 92 | 75 | 4.8 | - | 0.2 | - | 0.1 | - | 0.0 | - | 0.1 | - | 0.2 |

**Table 5.3.8 (A) Population dynamics of mustard aphid on *Brassicas* crops at Morena**

| Std. Week | Weather parameters | | | | Rainfall (mm) | Aphid population/ top 10 cm central twig on | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature (°C) | | RH (%) | | | Timely sown | | | | Late sown | | | |
| | Max. | Min. | Morn. | Even. | | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* |
| | | | | | | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 |
| 45 | 30.3 | 15.9 | 67.4 | 39.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 46 | 29.9 | 14.5 | 67.6 | 39.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 47 | 28.5 | 13.1 | 67.8 | 40.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 48 | 28.4 | 11.7 | 62.0 | 36.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 49 | 27.5 | 10.5 | 50.4 | 30.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50 | 22.3 | 8.0 | 53.3 | 35.0 | 0.0 | 1.2 | 2.0 | 0.8 | 3.0 | 3.5 | 2.9 | 0.9 | 3.5 |
| 51 | 21.8 | 6.4 | 40.8 | 32.3 | 0.0 | 1.3 | 0.9 | 0.8 | 1.8 | 1.6 | 0.7 | 0.9 | 0.9 |
| 52 | 22.8 | 5.2 | 51.3 | 30.6 | 0.0 | 1.2 | 0.6 | 0.5 | 0.8 | 1.0 | 0.5 | 0.3 | 0.7 |
| 1 | 22.7 | 5.4 | 55.7 | 33.7 | 0.0 | 2.0 | 2.1 | 1.9 | 2.1 | 2.4 | 2.6 | 2.6 | 2.4 |
| 2 | 22.5 | 6.4 | 53.4 | 30.2 | 0.0 | 1.8 | 2.6 | 2.6 | 2.4 | 2.6 | 2.6 | 1.7 | 2.4 |
| 3 | 22.4 | 6.9 | 58.8 | 32.7 | 0.0 | 2.4 | 2.9 | 2.6 | 2.8 | 3.1 | 2.8 | 3.1 | 3.4 |
| 4 | 23.2 | 7.0 | 75.7 | 54.8 | 21.5 | 2.1 | 2.6 | 2.4 | 2.4 | 2.9 | 2.6 | 2.4 | 2.9 |
| 5 | 22.3 | 7.4 | 66.8 | 35.6 | 0.0 | 0.1 | 0.1 | 0.2 | 0.4 | 0.8 | 0.2 | 1.2 | 1.2 |
| 6 | 24.1 | 9.2 | 83.7 | 42.5 | 7.0 | 1.5 | 1.9 | 2.8 | 2.0 | 3.2 | 2.9 | 3.6 | 3.1 |
| 7 | 24.5 | 10.7 | 71.8 | 34.2 | 0.0 | 1.4 | 1.6 | 2.6 | 2.9 | 2.4 | 2.8 | 2.6 | 3.2 |
| 8 | 28.1 | 9.0 | 68.3 | 34.5 | 0.0 | 2.9 | 2.9 | 3.0 | 2.0 | 2.9 | 1.6 | 2.8 | 3.6 |
| 9 | 24.4 | 9.8 | 68.5 | 44.0 | 21.5 | 2.6 | 2.6 | 3.0 | 2.1 | 3.4 | 2.1 | 3.0 | 3.2 |
| 10 | 26.6 | 11.4 | 58.7 | 28.3 | 0.0 | 1.4 | 2.8 | 2.8 | 2.4 | 2.2 | 3.1 | 2.6 | 2.4 |
| 11 | 29.5 | 12.2 | 44.1 | 27.1 | 0.0 | 0.2 | 0.6 | 1.0 | 1.3 | 1.2 | 1.8 | 1.4 | 2.1 |
| 12 | 31.6 | 13.8 | 39.7 | 23.6 | 0.0 | 0.2 | 0.2 | 0.6 | 0.8 | 0.4 | 0.2 | 1.2 | 0.2 |
| 13 | 34.0 | 15.1 | 41.8 | 25.0 | 0.0 | 0.2 | 0.8 | 0.4 | 1.5 | 0.8 | 0.8 | 0.8 | 1.2 |

**Note: - Weather data provided by Gramin Mausam Krishi Sewa, ZARS, Morena M.P**

**Table 5.3.8 (B) Population dynamics of painted bug on *Brassicas* crops at Morena**

| Std. Week | Weather parameters | | | | Rainfall (mm) | Number of painted bugs/ metre row length (mrl) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature (°C) | | RH (%) | | | Timely sown | | | | Late sown | | | |
| | Max. | Min. | Morn. | Even. | | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* |
| | | | | | | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 |
| 45 | 30.3 | 15.9 | 67.4 | 39.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 46 | 29.9 | 14.5 | 67.6 | 39.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 47 | 28.5 | 13.1 | 67.8 | 40.4 | 0.0 | 0.2 | 0.2 | 0.5 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 48 | 28.4 | 11.7 | 62.0 | 36.0 | 0.0 | 0.8 | 1.0 | 1.0 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 49 | 27.5 | 10.5 | 50.4 | 30.1 | 0.0 | 0.4 | 0.6 | 0.2 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50 | 22.3 | 8.0 | 53.3 | 35.0 | 0.0 | 0.2 | 0.2 | 0.4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 51 | 21.8 | 6.4 | 40.8 | 32.3 | 0.0 | 0.4 | 0.2 | 0.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 22.8 | 5.2 | 51.3 | 30.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 22.7 | 5.4 | 55.7 | 33.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 22.5 | 6.4 | 53.4 | 30.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 22.4 | 6.9 | 58.8 | 32.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 23.2 | 7.0 | 75.7 | 54.8 | 21.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 22.3 | 7.4 | 66.8 | 35.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 24.1 | 9.2 | 83.7 | 42.5 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | 24.5 | 10.7 | 71.8 | 34.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 28.1 | 9.0 | 68.3 | 34.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | 24.4 | 9.8 | 68.5 | 44.0 | 21.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 26.6 | 11.4 | 58.7 | 28.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 29.5 | 12.2 | 44.1 | 27.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 31.6 | 13.8 | 39.7 | 23.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Note: - Weather data provided by Gramin Mausam Krishi Sewa, ZARS, Morena M.P**

**Table 5.3.8 (C): Population dynamic of Coccinellids on *Brassicas* crops at Morena**

| Std. Week | Weather parameters | | | | Rainfall (mm) | Number of cocinellids (Adults+Grubs)/ plant | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature (°C) | | RH (%) | | | Timely sown | | | | Late sown | | | |
| | Max. | Min. | Morn. | Even. | | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* |
| | | | | | | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 |
| 1 | 22.7 | 5.4 | 55.7 | 33.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 22.5 | 6.4 | 53.4 | 30.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 22.4 | 6.9 | 58.8 | 32.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 23.2 | 7.0 | 75.7 | 54.8 | 21.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | 22.3 | 7.4 | 66.8 | 35.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 24.1 | 9.2 | 83.7 | 42.5 | 7.0 | 0.1 | 0.1 | 0.4 | 0.2 | 0.1 | 0.8 | 1.4 | 1.2 |
| 7 | 24.5 | 10.7 | 71.8 | 34.2 | 0.0 | 0.6 | 0.4 | 1.2 | 1.4 | 0.7 | 1.2 | 0.6 | 2.4 |
| 8 | 28.1 | 9.0 | 68.3 | 34.5 | 0.0 | 0.4 | 0.4 | 0.8 | 0.4 | 0.2 | 0.6 | 0.6 | 1.4 |
| 9 | 24.4 | 9.8 | 68.5 | 44.0 | 21.5 | 1.2 | 0.2 | 0.3 | 2.4 | 1.8 | 0.8 | 2.4 | 2.8 |
| 10 | 26.6 | 11.4 | 58.7 | 28.3 | 0.0 | 0.0 | 1.8 | 0.4 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| 11 | 29.5 | 12.2 | 44.1 | 27.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 31.6 | 13.8 | 39.7 | 23.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 34.0 | 15.1 | 41.8 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Note: - Weather data provided by Gramin Mausam Krishi Sewa, ZARS, Morena M.P**

**Table 5.3.8 (D): Activity of honey bees on *Brassicas* at Morena**

| Std. Week | Weather parameters | | | | Rainfall (mm) | Number of honey bee visits/ min/ plant | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature (°C) | | RH (%) | | | Timely sown | | | | Late sown | | | |
| | Max. | Min. | Morn. | Even. | | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* | *B. juncea* | *E. sativa* | *B. napus* | *B. rapa* |
| | | | | | | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 | DRMR IJ 31 | T 27 | GSC 6 | BSH 1 |
| 1 | 22.7 | 5.4 | 55.7 | 33.7 | 0.0 | 0.2 | 0.4 | 0.8 | 1.4 | 1.4 | 0.5 | 0.6 | 0.6 |
| 2 | 22.5 | 6.4 | 53.4 | 30.2 | 0.0 | 0.8 | 0.4 | 0.5 | 0.6 | 0.5 | 0.8 | 0.8 | 0.8 |
| 3 | 22.4 | 6.9 | 58.8 | 32.7 | 0.0 | 1.4 | 0.8 | 0.8 | 0.6 | 0.8 | 0.8 | 1.1 | 1.2 |
| 4 | 23.2 | 7.0 | 75.7 | 54.8 | 21.5 | 0.8 | 0.8 | 0.5 | 1.0 | 0.6 | 1.0 | 0.8 | 1.0 |
| 5 | 22.3 | 7.4 | 66.8 | 35.6 | 0.0 | 0.8 | 0.4 | 0.9 | 0.5 | 0.8 | 0.6 | 0.8 | 0.8 |
| 6 | 24.1 | 9.2 | 83.7 | 42.5 | 7.0 | 1.0 | 0.4 | 0.6 | 0.9 | 1.1 | 1.2 | 0.4 | 1.1 |
| 7 | 24.5 | 10.7 | 71.8 | 34.2 | 0.0 | 1.2 | 0.4 | 0.3 | 0.3 | 1.2 | 1.2 | 0.9 | 1.2 |
| 8 | 28.1 | 9.0 | 68.3 | 34.5 | 0.0 | 0.5 | 0.0 | 0.3 | 0.0 | 0.6 | 0.8 | 0.9 | 0.5 |
| 9 | 24.4 | 9.8 | 68.5 | 44.0 | 21.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.8 | 0.6 | 0.4 |
| 10 | 26.6 | 11.4 | 58.7 | 28.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.4 | 0.6 | 0.6 |
| 11 | 29.5 | 12.2 | 44.1 | 27.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 31.6 | 13.8 | 39.7 | 23.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 34.0 | 15.1 | 41.8 | 25.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Note: - Weather data provided by Gramin Mausam Krishi Sewa , ZARS, Morena M.P**

**Table 5.3.9: Monitoring of alate mustard aphid on sticky traps**

| Std. week | Mean mustard aphid (alate) population per trap | | | | | | |
|---|---|---|---|---|---|---|---|
| | HSR | SKN | LDH | PNT | KPR | MOR | DOL |
| 40 | - | - | 0.0 | - | - | 0.0 | 0.0 |
| 41 | - | - | 0.0 | - | - | 0.0 | 0.0 |
| 42 | - | - | 0.0 | - | - | 0.0 | 0.0 |
| 43 | - | - | 8.0 | - | 0.0 | 0.0 | 0.0 |
| 44 | - | - | 15.4 | - | 0.0 | 0.0 | 0.0 |
| 45 | - | - | 16.0 | - | 0.0 | 0.0 | 0.0 |
| 46 | - | - | 11.8 | - | 0.0 | 0.0 | 0.0 |
| 47 | - | - | 9.2 | - | 0.0 | 0.0 | 0.0 |
| 48 | - | - | 8.4 | - | 0.0 | 0.0 | 0.0 |
| 49 | 10.0 | 0.0 | 8.4 | - | 0.0 | 0.0 | 0.0 |
| 50 | 9.3 | 1.0 | 9.0 | - | 0.0 | 0.0 | 0.0 |
| 51 | 12.3 | 1.8 | 12.4 | - | 0.0 | 0.0 | 0.0 |
| 52 | 8.7 | 4.4 | 15.6 | - | 0.0 | 0.0 | 0.0 |
| 1 | 10.0 | 13.6 | 11.0 | - | 0.0 | 1.18 | 0.0 |
| 2 | 12.7 | 15.6 | 13.2 | - | 0.0 | 1.17 | 0.0 |
| 3 | 18.3 | 151.8 | 12.6 | 15.80 | 0.0 | 1.1 | 0.0 |
| 4 | 12.3 | 394.8 | 74.6 | 28.80 | 0.0 | 0.2 | 0.0 |
| 5 | 3.0 | 719.2 | 571.0 | 49.80 | 13.2 | 0.2 | 0.0 |
| 6 | 9.0 | 1726.2 | 637.4 | 129.2 | 142.1 | 0.2 | 9.2 |
| 7 | 12.7 | 5113.2 | 707.8 | 239.0 | 169.0 | 15.8 | 45.6 |
| 8 | 24.0 | 5696.2 | 955.8 | 182.0 | 368.3 | 76.8 | 121.0 |
| 9 | 42.7 | 3849.4 | 749.2 | 213.4 | 106.5 | 67.5 | 136.2 |
| 10 | 81.7 | 2552.4 | 844.4 | 248.6 | 95.0 | 19.2 | 187.0 |
| 11 | 361.3 | 447.2 | 398.4 | 234.0 | 6.3 | 75.7 | 36.2 |
| 12 | 210.0 | 21.6 | 284.6 | 184.2 | 0.0 | 42.2 | 0.0 |
| 13 | 49.3 | 0.0 | 167.4 | - | 0.0 | 12.5 | 0.0 |
| 14 | - | - | 89.4 | - | - | 0.0 | 0.0 |
| 15 | - | - | 8.4 | - | - | 0.0 | 0.0 |
| 16 | - | - | 0.0 | - | - | 0.0 | 0.0 |
| 17. | - | - | 0.0 | - | - | 0.0 | - |

**Table 5.4.1: Efficacy of bio-intensive IPM module against mustard aphid at New Delhi during 2018-19**

| Treatment | No. of aphids/10 cm twig before spray | No. of aphids/10 cm twig after spray | Reduction (%) | Yield (kg/ha) | ICBR |
|---|---|---|---|---|---|
| $T_1$: Azadirachtin 3000 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis | 11.8 | 5.9 | 50.2 | 3520.8 | 1.0 |
| $T_2$: Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application | 12.3 | 6.3 | 48.2 | 3391.7 | 0.8 |
| $T_3$: *Beauveria bassiana* followed by its second application after 10 days | 10.9 | 3.5 | 68.0 | 3437.5 | 0.9 |
| $T_4$: Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application | 13.3 | 8.1 | 39.4 | 3495.8 | 1.0 |
| $T_5$: *Verticillium laecanii* @ 2g/l followed by its second application after 10 days | 12.4 | 1.5 | 88.0 | 3537.5 | 1.1 |
| $T_6$: Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days | 10.8 | 1.1 | 89.8 | 3275.0 | 0.6 |
| $T_7$: Control (Water spray) | 19.0 | 16.2 | 14.2 | 2929.2 | 0.0 |
| **F-probability** | **<0.001** | **<0.001** | **<0.001** | **0.330** | |
| **LSD (P = 0.05)** | **0.6** | **0.1** | **2.9** | **NS** | |

**Table 5.4.2: Efficacy of biointensive IPM module against mustard aphid at Shillongani during 2018-19**

| Treatments | Mean aphid population (1st spray) | | Mean aphid population (2nd spray, 10 days after 1st spraying) | | Yield (kg/ha) |
|---|---|---|---|---|---|
| | 1 DBS* | 5 DAS** | 1 DBS | 5 DAS | |
| $T_1$: Azadirachtin 3000 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis | 70.2 | 16.1 | 25.2 | 10.7 | 591.6 |
| $T_2$: Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application | 66.4 | 23.0 | 30.8 | 18.8 | 463.8 |
| $T_3$: *Beauveria bassiana* followed by its second application after 10 days | 62.5 | 25.0 | 32.6 | 18.3 | 477.7 |
| $T_4$: Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application | 63.8 | 24.2 | 33.5 | 20.1 | 479.1 |
| $T_5$: *Verticillium laecanii* @ 2g/l followed by its second application after 10 days | 67.4 | 30.2 | 40.5 | 24.5 | 459.7 |
| $T_6$: Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days | 62.9 | 6.3 | 10.5 | 0.8 | 661.1 |
| $T_7$: Control (Water spray) | 62.8 | 106.6 | 119.7 | 136.6 | 400.0 |
| **SEm(±)** | **2.7** | **2.7** | **2.1** | **2.5** | **21.6** |
| **$CD_{0.05}$** | **5.3** | **5.3** | **4.3** | **5.0** | **42.7** |
| **CV(%)** | **15.4** | **21.9** | **15.5** | **20.5** | **-** |

*DBS: Days before spray; DAS: Days after spray

**Table 5.4.3: Efficacy of biointensive IPM module against mustard aphid at Hisar during 2018-19**

| Treatments | Aphid population/10 cm top twig | | | | | Yield (Kg/ha) | IBCR |
|---|---|---|---|---|---|---|---|
| | 1st Spray | | | 2nd Spray | | | |
| | BS | 5 DAS | 10 DAS | 5 DAS | 10 DAS | | |
| $T_1$: Azadirachtin 3000 ppm @ 5 ml/L. followed by its second application after 10 days | 59.7 | 18.3 | 27.3 | 8.3 | 3.0 | 1540.7 | 2.2 |
| $T_2$: Azadirachtin 3000 ppm@5ml/L followed by second spray of *Beauveria bassiana* @ 2g/l after 10 days | 61.7 | 17.3 | 28.0 | 18.0 | 11.3 | 1496.0 | 2.4 |
| $T_3$: *Beauveria bassiana* @ 2g/l followed by its second application after 10 days | 70.0 | 30.7 | 37.3 | 20.0 | 14.0 | 1485.3 | 3.1 |
| $T_4$: Azadirachtin followed by second application of *Verticillium lecanii* @ 2g/l after 10 days | 60.3 | 19.0 | 26.3 | 14.3 | 8.0 | 1519.0 | 2.6 |
| $T_5$: *Verticillium laecanii* @ 2g/l followed by its second application after 10 days | 41.7 | 27.7 | 35.0 | 16.7 | 9.7 | 1514.7 | 3.4 |
| $T_6$: Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days | 46.3 | 12.0 | 23.0 | 3.7 | 1.3 | 1646.3 | 10.5 |
| $T_7$: Control (water spray) | 52.3 | 96.0 | 121.3 | 150.7 | 73.3 | 1197.0 | - |
| **CD (p=0.05)** | **N.S.** | **7.1** | **16.9** | **11.8** | **7.9** | **52.8** | |

NS=Non-significant; DAS- Days after spray; MSP of mustard: Rs 4200 per quintal

**Table 5.4.4: Efficacy of biointensive IPM module against mustard aphid at SK Nagar during 2018-19**

| Treatment | Aphid population/ top 10 cm central twig | | | | | | Yield (kg/ha) | IBCR |
|---|---|---|---|---|---|---|---|---|
| | 1st spray | | | 2nd spray | | | | |
| | Before spray | 3DAS | 7DAS | Before spray | 3DAS | 7DAS | | |
| $T_1$: Azadirachtin 3000 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis | 11.7 | 22.5 | 148.9 | 159.8 | 182.2 | 205.1 | 1188 | 4.6 |
| $T_2$: Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application | 11.9 | 22.2 | 148.7 | 161.2 | 180.7 | 204.0 | 1799 | 9.9 |
| $T_3$: *Beauveria bassiana* followed by its second application after 10 days | 12.4 | 26.5 | 155.3 | 165.1 | 185.8 | 215.0 | 794 | 2.0 |
| $T_4$: Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application | 12.0 | 23.0 | 153.7 | 162.5 | 183.3 | 208.7 | 939 | 3.0 |
| $T_5$: *Verticillium laecanii* @ 2g/l followed by its second application after 10 days | 12.1 | 24.8 | 154.2 | 162.4 | 184.0 | 211.1 | 926 | 3.2 |
| $T_6$: Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days | 11.5 | 0.0 | 11.1 | 32.4 | 0.0 | 9.9 | 2729 | 23.7 |
| $T_7$: Control (Water spray) | 12.6 | 25.8 | 160.2 | 167.8 | 208.8 | 280.4 | 563 | 0.0 |
| **C.D. at 5%** | **NS** | **1.4** | **3.3** | **1.7** | **5.9** | **10.2** | **307** | |

*DAS: Days after spray

**Table 5.4.5: Efficacy of biointensive IPM module against mustard aphid at Pant Nagar during 2018-19**

| Name of Treatment | Aphid before spray | No of aphids/ 10 cm central twig | | | Yield (Kg/ha) | IBCR |
|---|---|---|---|---|---|---|
| | | 3DAS | 7DAS | 10DAS | | |
| $T_1$ Azadirachtin 3000 ppm (CIB registered formulation) @ 5 ml/l | 77.6 | 52.8 | 34.5 | 17.1 | 1251.5 | -0.3 |
| $T_2$ Azadirachtin followed by application of *Beauveria bassiana* @ 2g/l | 79.2 | 50.2 | 27.8 | 11.6 | 1324.6 | 0.6 |
| $T_3$ *Beauveria bassiana*@ 2g/l | 78.0 | 44.0 | 19.1 | 5.3 | 1306.3 | 0.8 |
| $T_4$ Azadirachtin followed by application of *Verticillium laecanii* @ 2g/l | 73.8 | 39.9 | 20.1 | 5.1 | 1349.2 | 0.9 |
| $T_5$ *Verticillium laecanii* @ 2g/l | 81.8 | 41.4 | 19.4 | 12.2 | 1453.1 | 3.1 |
| $T_6$ Dimethoate 30 EC @ 1 ml/l | 74.8 | 41.1 | 17.4 | 6.5 | 1280.9 | 1.7 |
| $T_7$ Control | 73.5 | 72.6 | 84.0 | 101.6 | 1185.7 | -- |
| **CD at 5%** | | **9.8** | **5.9** | **9.7** | | |

**Table 5.4.6: Efficacy of bio-intensive IPM module against mustard aphid at Ludhiana during 2018-19**

| Treatment | Aphid population/ plant | | Reduction over control (%) | Yield (kg/ ha) | IBCR |
|---|---|---|---|---|---|
| | Before spray | 5 days after spray | | | |
| $T_1$: Azadirachtin 3000 ppm @ 5 ml/ l followed by its second spray after 10 days and further third spray on need basis | 48.9 | 27.2 | 59.3 | 1794.4 | 8.1 |
| $T_2$: Azadirachtin followed by application of *Beauveria bassiana* @ 2g/l after 10 days of azadirachtin application | 50.6 | 33.7 | 49.6 | 1688.9 | 7.0 |
| $T_3$: *Beauveria bassiana* followed by its second application after 10 days | 53.6 | 40.9 | 38.8 | 1577.8 | 5.2 |
| $T_4$: Azadirachtin followed by application of *Verticillium lecanii* @ 2g/l after 10 days of azadirachtin application | 50.7 | 37.6 | 43.8 | 1652.8 | 6.1 |
| $T_5$: *Verticillium lecanii* @ 2g/l followed by its second application after 10 days | 43.5 | 36.3 | 45.7 | 1544.4 | 4.0 |
| $T_6$: Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days | 49.1 | 19.6 | 70.7 | 2033.3 | 37.6 |
| $T_7$: Control (Water spray) | 45.9 | 66.9 | -- | 1427.8 | 0.0 |
| **CD (p=0.05)** | **NS** | **9.7** | **--** | **326.4** | **--** |

**Table 5.4.7: Efficacy of bio-intensive IPM module against mustard aphid at Kanpur during 2018-19**

| Treatments | Mustard aphid population/ top 10 cm central twig | | | | Yield (kg/ha) | IBCR |
|---|---|---|---|---|---|---|
| | I[st] spray | | II[nd] spray | | | |
| | Before spray | After 5 days | Before spray | After 5 days | | |
| $T_1$: Azadirachtin 3000 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis | 58.00(7.61) | 28.00(5.33) | 24.86(5.03) | 12.63(3.60) | 1238 | 6.1 |
| $T_2$: Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application | 60.03(7.73) | 23.16(4.85) | 20.83(4.59) | 9.16(3.10) | 1452 | 10.2 |
| $T_3$: *Beauveria bassiana* followed by its second application after 10 days | 59.86(7.73) | 34.70(5.86) | 31.56(5.65) | 16.13(4.05) | 1164 | 9.4 |
| $T_4$: Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application | 60.56(7.76) | 15.16(3.92) | 18.60(4.37) | 6.73(2.68) | 1507 | 10.9 |
| $T_5$: *Verticillium laecanii* @ 2g/l followed by its second application after 10 days | 58.90(7.60) | 32.96(5.78) | 27.53(5.29) | 15.46(3.98) | 1270 | 10.6 |
| $T_6$: Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days | 61.30(7.89) | 11.06(3.39) | 10.30(3.28) | 4.43(2.21) | 1825 | 56.5 |
| $T_7$: Control (Water spray) | 60.50(7.76) | 96.03(9.80) | 173.37(13.19) | 202.70(14.24) | 608 | - |
| **CD(0.05)** | **NS** | **0.9** | **0.7** | **0.9** | **423.7** | |

*Figures in parentheses are square root transformed values.

**Table 5.4.8: Efficacy of bio-intensive IPM module against mustard aphid at Dholi during 2018-19**

| Treatments | Aphid population before spray | Mustard aphid population/10 cm twig (10 days after spray) | Yield (kg/ha) | IBCR |
|---|---|---|---|---|
| $T_1$: Azadirachtin 3000 ppm@5ml/l followed by its second application after 10 days | 26.3 | 7.6 | 814.0 | 7.2 |
| $T_2$: Azadirachtin followed by application of *Beauveria bassiana* @2g/l after 10 days of Azadirachtin application | 21.4 | 5.8 | 892.0 | 7.8 |
| $T_3$: *Beauveria bassiana* followed by its second application after 10 days | 31.2 | 9.2 | 764.0 | 7.3 |
| $T_4$: Azadirachtin followed by application of *Verticillium lecanii*@ 2g/l after 10 days of Azadirachtin application | 25.6 | 6.1 | 856.0 | 8.5 |
| $T_5$: *Verticillium lecanii* @ 2g/l followed by its second application after 10 days | 23.7 | 3.6 | 978.0 | 8.3 |
| $T_6$: Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days | 21.8 | 2.4 | 992.0 | 8.9 |
| $T_7$: Untreated control (water spray) | 56.2 | 102.8 | 656.0 | - |
| **CD at 5%** | **3.4** | **-** | **98.6** | **-** |

**Table 5.4.9: Efficacy of bio-intensive IPM module against mustard aphid at Morena during 2018-19**

| Treatments | Number of aphids/ 10 cm top central twig | | | | Yield (kg/ha) | IBCR |
|---|---|---|---|---|---|---|
| | 24hrs Before spray | 3 DAS | 7 DAS | 10 DAS | | |
| $T_1$: Azadirachtin 3000 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis | 28.4 | 5.9 | 13.06 | 24.06 | 2843 | 5.4 |
| $T_2$: Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application | 32.1 | 26.2 | 35.6 | 42.9 | 2581 | 1.9 |
| $T_3$: *Beauveria bassiana* followed by its second application after 10 days | 30.1 | 34.4 | 42.8 | 59.5 | 2636 | 3.2 |
| $T_4$: Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application | 34.5 | 26.7 | 30.1 | 35.2 | 2498 | 1.5 |
| $T_5$: *Verticillium laecanii* @ 2g/l followed by its second application after 10 days | 37.1 | 47.5 | 56.2 | 60.2 | 2659 | 3.4 |
| $T_6$: Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days | 30.2 | 8.6 | 18.5 | 24.1 | 2752 | 4.9 |
| $T_7$: Control (Water spray) | 32.1 | 43.0 | 61.2 | 68.5 | 2339 | - |
| **CD at 0.5%** | **NS** | **2.6** | **3.7** | **8.7** | - | |

**Table 5.5.1: Bioefficacy of newer insecticides against mustard aphid at New Delhi during 2018-19**

| Treatment | No. of aphids/10 cm before spray | No. of aphids/10 cm after spray | Reduction (%) | Yield (kg/ha) | ICBR |
|---|---|---|---|---|---|
| $T_1$: Imidacloprid 17.8 SL @ 0.25 ml/l | 10.9 | 0.8 | 93.1 | 3229.2 | 0.5 |
| $T_2$: Thiamethoxam 25 WG @ 0.2 g/l | 16.8 | 0.3 | 98.4 | 3333.3 | 0.7 |
| $T_3$: Acetamaprid 20 SP @ 0.1 g/l | 12.5 | 0.7 | 94.3 | 3270.8 | 0.6 |
| $T_4$: Dimethoate 30 EC @ 1 ml/l | 10.8 | 1.1 | 89.8 | 3275.0 | 0.6 |
| $T_5$: Clothianidine 50 WDG @ 0.12 g/l | 10.4 | 0.7 | 93.8 | 3070.8 | 0.2 |
| $T_6$: Control (Water spray) | 19.0 | 16.3 | 14.2 | 2929.2 | 0.0 |
| **F-probability** | **<0.001** | **<0.001** | **<0.001** | **0.335** | |
| **LSD (P = 0.05)** | **2.0** | **0.1** | **2.9** | **NS** | |

NS = Non-significant at P = 0.05

**Table 5.5.2: Bioefficacy of newer insecticides against mustard aphid at Shillongani during 2018-19**

| Treatments | Mean Aphid population/ plant | | | | Yield (kg/ha) | IBCR |
|---|---|---|---|---|---|---|
| | 1 DBS* | 7 DAS** | 14 DAS | 21 DAS | | |
| Imidacloprid 17.8SL@0.25 ml/l | 68.0 | 5.6 | 6.0 | 16.9 | 672.9 | 0.8 |
| Thiamethoxam 25 WG @ 0.2g/l | 79.8 | 20.1 | 25.5 | 41.4 | 597.7 | 0.6 |
| Acetamaprid 20SP @0.1g/l | 92.1 | 18.1 | 21.6 | 41.0 | 558.8 | 0.5 |
| Dimethoate 30 EC @1ml/l | 92.7 | 18.7 | 16.9 | 35.7 | 564.5 | 0.5 |
| Clothianidine 50WDG @ 0.12 g/l | 83.9 | 20.1 | 23.0 | 34.0 | 558.3 | 0.4 |
| Control (water spray) | 89.3 | 119.5 | 159.5 | 184.1 | 379.1 | - |
| **SEm(+)** | **3.5** | **2.2** | **2.4** | **2.4** | **19.6** | **-** |
| **CD (p=0.05)** | **7.0** | **4.4** | **4.8** | **4.7** | **38.8** | **-** |
| **CV(%)** | **18.8** | **19.3** | **18.6** | **15.6** | | **-** |

: *** DBS= Days before spraying **DAS= Days after spraying**

**Table 5.5.3 (A): Bioefficacy of newer insecticides against mustard aphid at Hisar during 2018-19**

| Treatments | Aphids/10 cm top twig | | | | | Yield (Kg/ha) | IBCR |
|---|---|---|---|---|---|---|---|
| | 1st Spray | | | 2nd Spray | | | |
| | BS | 7 DAS | 14 DAS | 7 DAS | 14 DAS | | |
| $T_1$ : Imidacloprid 17.8 SL @ 0.25 ml/l | 47.7 | 8.0 | 23.0 | 1.7 | 0.0 | 1696.7 | 20.2 |
| $T_2$: Thiamethoxam 25 WG @ 0.2 g/l | 64.3 | 6.3 | 24.7 | 1.3 | 0.0 | 1705.7 | 15.4 |
| $T_3$: Acetamaprid 20 SP @ 0.1 g/l | 72.0 | 11.3 | 33.3 | 3.0 | 0.0 | 1642.0 | 19.9 |
| $T_4$: Dimethoate 30 EC @ 1 ml/l | 52.0 | 12.7 | 27.0 | 2.7 | 0.0 | 1638.3 | 12.1 |
| $T_5$: Clothianidine 50 WDG @ 0.12 g/l | 66.7 | 2.7 | 14.3 | 1.0 | 0.0 | 1728.0 | 5.0 |
| $T_6$: Control (water spray) | 49.7 | 118.0 | 166.3 | 99.3 | 39.0 | 1119.0 | |
| **CD (p=0.05)** | **N.S.** | **22.9** | **36.4** | **6.1** | | **93.3** | |

NS=Non-significant; DAS- Days after spray

**Table 5.5.3 (B): Effect of newer insecticides on activity of ladybird beetle in mustard at Hisar during 2018-19**

| Treatments | No of ladybird beetles adults and nymphs/plant | | | | |
|---|---|---|---|---|---|
| | 1st Spray | | | 2nd Spray | |
| | BS | 7 DAS | 14 DAS | 7 DAS | 14 DAS |
| $T_1$: Imidacloprid 17.8 SL @ 0.25 ml/l | 0.0 | 0.0 | 0.5 | 1.3 | 2.5 |
| $T_2$: Thiamethoxam 25 WG @ 0.2 g/l | 0.0 | 0.0 | 0.6 | 1.3 | 2.0 |
| $T_3$: Acetamaprid 20 SP @ 0.1 g/l | 0.0 | 0.0 | 0.1 | 1.4 | 2.4 |
| $T_4$: Dimethoate 30 EC @ 1 ml/l | 0.0 | 0.0 | 0.3 | 1.2 | 2.5 |
| $T_5$: Clothianidine 50 WDG @ 0.12 g/l | 0.0 | 0.0 | 0.4 | 1.5 | 2.5 |
| $T_6$: Control (water spray) | 0.0 | 0.0 | 0.5 | 1.5 | 3.3 |
| **CD (p=0.05)** | **N.S.** | **N.S.** | **N.S.** | **N.S.** | **N.S.** |

**Table 5.5.4: Bioefficacy of newer insecticides against mustard aphid at SK Nagar during 2018-19**

| Treat-ment no. | Treatments | Aphid population/ top 10 cm central twig | | | | | | Yield (kg/ ha) | IBCR |
|---|---|---|---|---|---|---|---|---|---|
| | | 1st spray | | | 2nd spray | | | | |
| | | Before spray | 3DAS | 7DAS | Before spray | 3DAS | 7DAS | | |
| $T_1$ | Imidaclorpid 17.8 SL @ 0.25 ml/l | 10.7 | 2.1 | 2.6 | 8.1 | 0.3 | 0.3 | 2910 | 29.9 |
| $T_2$ | Thiomethoxam 25 WG @ 0.20 g/l | 10.0 | 1.9 | 2.6 | 6.9 | 0.3 | 0.3 | 2287 | 22.3 |
| $T_3$ | Acetamiprid 20 SP @ 0.1 g/l | 9.9 | 4.6 | 21.2 | 25.8 | 0.3 | 0.5 | 1959 | 18.4 |
| $T_4$ | Dimethoate 30 EC @ 1 ml/l | 10.9 | 1.7 | 2.9 | 8.4 | 0.2 | 0.3 | 2870 | 26.8 |
| $T_5$ | Clothionidin 25 EC @ 0.2 g/l | 10.9 | 5.6 | 23.2 | 27.1 | 0.3 | 0.5 | 1806 | 13.4 |
| $T_6$ | Control (water spray) | 11.0 | 13.2 | 99.5 | 123.7 | 2.8 | 3.4 | 425 | 0.0 |
| | **C.D. at 5%** | **0.8** | **0.7** | **4.3** | **3.8** | **0.1** | **0.1** | **168** | |
| | **C.V.%** | **4.1** | **8.6** | **9.2** | **6.2** | **10.4** | **3.5** | **14.2** | |

**Table 5.5.5: Bioefficacy of newer insecticides against mustard aphid at Pant Nagar Nagar during 2018-19**

| Treatment | Aphid before spray | No of aphids/ 10 cm central twig | | | Yield (Kg/ha) | IBCR |
|---|---|---|---|---|---|---|
| | | 3DAS | 7DAS | 10DAS | | |
| $T_1$ Imidacloprid 17.8 SL @ 0.25 ml/l | 76.4 | 37.8 | 30.5 | 5.5 | 1139 | 2.4 |
| $T_2$ Thiamethoxam 25 WG @ 0.2g/l | 62.0 | 37.8 | 17.9 | 4.5 | 1360 | 11.6 |
| $T_3$ Acetamaprid 20 SP@ 0.1g/l | 97.9 | 41.5 | 20.2 | 7.5 | 1131 | -3.1 |
| $T_4$ Dimethoate 30 EC @ 1 ml/l | 66.5 | 30.8 | 14.0 | 3.2 | 1448 | 15.6 |
| $T_5$ Clothianidine 50WDG @ 0.12g/l | 67.7 | 30.8 | 12.8 | 2.9 | 960 | -5.8 |
| $T_6$ Control | 94.2 | 42.6 | 32.1 | 11.5 | 1158 | - |
| **CD at 5%** | | **7.2** | **3.1** | **2.8** | | |

**Table 5.5.6: Bioefficacy of newer insecticides against mustard aphid at Ludhiana during 2018-19**

| Treatment | No of aphids/ top 10 cm central twig | | | | | Yield (kg/ha) | IBCR |
|---|---|---|---|---|---|---|---|
| | BS* | 3DAS | 7DAS | 10DAS | 14DAS | | |
| $T_1$ Imidacloprid 17.8 SL @ 0.25 ml/l | 47.1 | 15.5 | 1.4 | 1.2 | 10.9 | 2005.6 | 41.6 |
| $T_2$ Thiamethoxam 25WG @0.2 g/l | 54.1 | 14.9 | 1.3 | 1.4 | 9.5 | 2022.2 | 38.9 |
| $T_3$ Acetamaprid 20SP @0.1 g/l | 49.7 | 23.5 | 13.1 | 14.3 | 19.4 | 1733.3 | 17.3 |
| $T_4$ Dimethoate 30EC @ 1 ml/l | 46.8 | 27.1 | 16.7 | 19.3 | 26.2 | 1647.2 | 7.8 |
| $T_5$ Clothianidine 50WDG@0.12g/l | 47.9 | 17.4 | 1.5 | 1.2 | 6.9 | 2030.6 | 21.3 |
| $T_6$ Control | 41.9 | 51.4 | 71.1 | 77.5 | 88.4 | 1547.2 | 0.0 |
| **CD (p=0.05)** | **NS** | **12.3** | **9.9** | **9.4** | **10.4** | | |

* BS: Before spray, DAS: Days after spray

**Table 5.5.7: Bioefficacy of newer insecticides against mustard aphid at Kanpur during 2018-19**

| Treatments | Mustard aphid population/ top 10 cm central twig | | | | Yield (kg/ha) | IBCR |
|---|---|---|---|---|---|---|
| | Before first spray | After 7 days | After 14 days | After 21 days | | |
| $T_1$ Imidacloprid 17.8 SL @ 0.25 ml/l | 60.07 (7.74) | 11.70 (3.42) | 4.45(2.07) | 6.98(2.63) | 1507 | 72.5 |
| $T_2$ Thiamethoxam 25WG @0.2 g/l | 62.40 (7.90) | 12.65 (3.55) | 5.10(2.24) | 8.70(2.94) | 1488 | 57.1 |
| $T_3$ Acetamaprid 20SP @0.1 g/l | 66.32 (8.14) | 15.70 (3.96) | 7.25(2.67) | 10.40(3.01) | 1319 | 60.3 |
| $T_4$ Dimethoate 30EC @ 1 ml/l | 68.25 (8.26) | 13.37 (3.65) | 5.50(2.31) | 7.53(2.73) | 1428 | 48.3 |
| $T_5$ Clothianidine 50WDG@0.12g/l | 60.10 (7.74) | 16.72 (4.08) | 10.22(3.16) | 12.86(3.56) | 1289 | 16.1 |
| $T_6$ Control | 60.52 (7.78) | 133.75 (11.53) | 159.17(12.50) | 211.90(14.54) | 674 | - |
| **CD (0.05)** | **NS** | **0.7** | **0.8** | **0.6** | **221.6** | |
| **CV %** | **3.4** | **9.7** | **13.7** | **8.1** | **11.5** | |

* Figures in parentheses are square root transformed values

**Table 5.5.8: Bioefficacy of newer insecticides against mustard aphid at Dholi during 2018-19**

| Treatments | Aphid population before spray | Mustard aphid population/10 cm twig (10 days after spray) | Yield (kg/ha) | IBCR |
|---|---|---|---|---|
| $T_1$ Imidacloprid 17.8 SL @ 0.25 ml/l | 24.2 | 7.4 | 830.0 | 7.9 |
| $T_2$ Thiamethoxam 25WG @0.2 g/l | 15.2 | 3.6 | 908.0 | 8.1 |
| $T_3$ Acetamaprid 20SP @0.1 g/l | 13.2 | 3.1 | 770.0 | 7.2 |
| $T_4$ Dimethoate 30EC @ 1 ml/l | 10.0 | 2.8 | 972.0 | 8.4 |
| $T_5$ Clothianidine 50WDG@0.12g/l | 10.3 | 3.0 | 855.0 | 8.2 |
| $T_6$ Control | 36.4 | 55.4 | 628.0 | - |
| **CD at 5%** | **3.4** | - | **98.6** | - |

**Table 5.5.9: Bioefficacy of newer insecticides against mustard aphid at Morena during 2018-19**

| Treatments | Number of aphids/10 cm central twig | | | | Yield (kg/ha) | IBCR |
|---|---|---|---|---|---|---|
| | 24hrs Before spray | 3 DAS | 7 DAS | 10 DAS | | |
| $T_1$ Imidacloprid 17.8 SL @ 0.25 ml/l | 22.5 | 8.3 | 15.4 | 33.4 | 2036 | 3.4 |
| $T_2$ Thiamethoxam 25WG @0.2 g/l | 24.6 | 5.1 | 12.9 | 21.6 | 2156 | 3.7 |
| $T_3$ Acetamaprid 20SP @0.1 g/l | 30.2 | 15.3 | 21.2 | 29.5 | 1961 | 2.7 |
| $T_4$ Dimethoate 30EC @ 1 ml/l | 26.2 | 18.5 | 32.1 | 38.9 | 2003 | 2.9 |
| $T_5$ Clothianidine 50WDG@0.12g/l | 24.7 | 17.3 | 25.2 | 24.9 | 2062 | 3.8 |
| $T_6$ Control | 28.9 | 38.7 | 43.6 | 51.8 | 1743 | - |
| **CD at 0.5%** | **NS** | **1.5** | **2.1** | **4.9** | - | |

**Table: 5.6.1: Survey and surveillance of insect pests and their natural enemies in Rapeseed-mustard at SK Nagar**

| Visited village | Location | Month | Fortnight | Pest incidence (Aphids/10cm top twig) | Coccinelid beetles/plant |
|---|---|---|---|---|---|
| Nadotra | 1 | December | I | 0.0 | 0.0 |
| Fatepura | 1 | | II | 0.8 | 0.0 |
| Dhaneri | 1 | January | I | 7.8 | 0.0 |
| Vagharol | 1 | | II | 13.8 | 0.0 |
| | | February | I | 22.5 | 2.6 |
| | | | II | 43.8 | 4.7 |
| | | March | I | 17.8 | 2.9 |
| | | | II | 6.8 | 0.0 |
| | | April | I | 0.0 | 0.0 |
| | | | II | 0.0 | 0.0 |

**Table 5.6.2: Survey of insect-pests and their natural enemies at farmers' fields at Kanpur**

| Insect | District | Time interval | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Loca-tions | Oct | Nov | | Dec | | Jan | | Feb | | Mar | |
| | | | II$^{nd}$ | I$^{st*}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ | I$^{st}$ | II$^{nd}$ |
| Painted bug/m row | Basti | 1. | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | 2. | 0.0 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Farukhabad | 1. | 3.6 | 4.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Varanasi | 1. | 1.3 | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | 2. | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Allahabad | 1. | 1.3 | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Jhansi | 1. | 4.2 | 5.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | 2. | 2.9 | 4.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Etawa | 1. | 1.0 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Kanpur | 1. | 3.6 | 3.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Table 5.6.2 (Contd): Survey of insect-pests and their natural enemies at farmers' fields at Kanpur**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aphids/10 cm top twig | Basti | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.2 | 14.3 | 67.3 | 214.3 | 52.2 | 0.0 |
| | | 2. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 | 7.2 | 58.2 | 195.1 | 31.3 | 0.0 |
| | Farukhabad | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.6 | 28.2 | 72.3 | 236.2 | 117.0 | 0.0 |
| | Varanasi | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.3 | 11.0 | 54.4 | 190.3 | 24.6 | 0.0 |
| | | 2. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.9 | 42.6 | 183.7 | 633.0 | 0.0 |
| | Allahabad | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 11.4 | 39.3 | 164.5 | 44.3 | 0.0 |
| | Jhansi | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 | 9.7 | 17.6 | 32.2 | 0.0 | 0.0 |
| | | 2. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.7 | 11.3 | 27.4 | 0.0 | 0.0 |
| | Etawa | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.6 | 15.6 | 63.3 | 110.0 | 32.6 | 0.0 |
| | Kanpur | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.6 | 13.3 | 117.6 | 176.6 | 61.0 | 0.0 |
| Sawfly larvae/ Plant | Basti | 1. | 2.6 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | 2. | 2.3 | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Farukhabad | 1. | 0.3 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Varanasi | 1. | 3.4 | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | 2. | 2.2 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Allahabad | 1. | 1.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Jhansi | 1. | 3.6 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | | 2. | 2.6 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Etawa | 1. | 1.4 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Kanpur | 1. | 2.3 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Coccinella*/plant | Basti | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 6.4 | 3.3 | 0.0 |
| | | 2. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.6 | 1.2 | 0.0 |
| | Farukhabad | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 5.4 | 5.6 | 0.0 |
| | Varanasi | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 4.3 | 2.2 | 0.0 |
| | | 2. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 4.6 | 0.0 |
| | Allahabad | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.2 | 1.0 | 0.0 |
| | Jhansi | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
| | | 2. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| | Etawa | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.6 | 3.3 | 0.0 |
| | Kanpur | 1. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 3.2 | 3.6 | 0.0 |

**Table 5.6.3: Survey of insect-pests at farmers' fields at Ludhiana**

| Month | Fortnight | Mustard aphids/10cm top twig) | Cabbage caterpillar (Larvae/plant | *Coccinella*/plant (Grubs+Adults) |
|---|---|---|---|---|
| Dec | **II** | 0.0 | 0.0 | 0.0 |
| Jan | **I** | 0.0 | 0.0 | 0.0 |
| | **II** | 1.8 | 0.0 | 0.0 |
| Feb | **I** | 2.1 | 0.0 | 0.0 |
| | **II** | 7.4 | 2.4 | 0.0 |
| Mar | **I** | 13.1 | 5.2 | 0.1 |
| | **II** | 26.4 | 1.2 | 0.1 |
| Apr | **I** | 0.0 | 0.0 | 0.0 |

**Table 5.6.4(A): Survey of insect-pests at farmers' fields at Shillongani**

| Insect pests | Location (L) | 1st Fortnight Nov | 2nd Fortnight Nov | 1st Fortnight Dec | 2nd Fortnight Dec | 1st Fortnight Jan | 2nd Fortnight Jan |
|---|---|---|---|---|---|---|---|
| Mustard aphid (no./10cm twig) | L – 1 | 0.0 | 0.0 | 14.5 | 21.5 | 23.3 | 20.2 |
| | L – 2 | 0.0 | 0.0 | 19.5 | 17.8 | 24.2 | 7.2 |
| | L – 3 | 0.0 | 0.0 | 11.6 | 26.7 | 24.3 | 12.8 |
| | L – 4 | 0.0 | 0.7 | 17.6 | 29.5 | 32.7 | 14.8 |
| | L – 5 | 0.0 | 0.3 | 25.8 | 42.6 | 31.6 | - |
| | L – 6 | 0.0 | 0.1 | 37.6 | 48.7 | 53.2 | - |
| | L – 7 | 0.0 | 0.0 | 51.3 | 63.4 | 58.7 | - |
| | L – 8 | 0.0 | 0.0 | 18.2 | 29.4 | 34.6 | - |
| | L – 9 | 0.0 | 8.6 | 53.6 | 64.1 | 53.4 | 22.0 |
| | L – 10 | 0.0 | 11.3 | 42.5 | 54.2 | 43.8 | 18.0 |
| Mustard Sawfly (no./plant) | L – 1 | 0.0 | 1.6 | 2.4 | 0.1 | 0.1 | 0.0 |
| | L – 2 | 0.3 | 1.1 | 2.7 | 0.4 | 0.0 | 0.0 |
| | L – 3 | 0.0 | 2.1 | 1.6 | 1.0 | 0.0 | 0.0 |
| | L – 4 | 0.3 | 2.8 | 1.1 | 1.2 | 0.3 | 0.0 |
| | L – 5 | 0.4 | 0.9 | 1.3 | 0.7 | 0.6 | - |
| | L – 6 | 0.0 | 2.3 | 2.0 | 0.9 | 0.7 | - |
| | L – 7 | 0.0 | 1.4 | 1.7 | 1.0 | 0.0 | - |
| | L – 8 | 0.2 | 0.8 | 1.2 | 1.3 | 0.0 | - |
| | L – 9 | 1.0 | 0.9 | 1.0 | 0.0 | 0.2 | 0.8 |
| | L -10 | 0.0 | 2.0 | 1.3 | 0.3 | 0.0 | 0.0 |
| Flea beetle (no./plant) | L – 1 | 0.0 | 3.0 | 5.2 | 3.1 | 2.7 | 1.1 |
| | L – 2 | 0.0 | 6.3 | 4.5 | 5.6 | 4.3 | 0.7 |
| | L – 3 | 0.0 | 4.1 | 3.1 | 4.1 | 5.6 | 0.1 |
| | L - 4 | 0.4 | 3.1 | 2.7 | 2.1 | 6.8 | 1.0 |
| | L – 5 | 0.2 | 2.7 | 1.3 | 2.4 | 1.4 | - |
| | L – 6 | 0.7 | 4.1 | 3.1 | 2.7 | 3.7 | - |
| | L – 7 | 1.0 | 3.2 | 3.3 | 2.3 | 4.2 | - |
| | L – 8 | 0.0 | 1.4 | 1.7 | 1.8 | 3.2 | - |
| | L – 9 | 0.0 | 1.7 | 1.3 | 1.2 | 2.7 | 0.7 |
| | L -10 | 0.1 | 1.0 | 0.7 | 1.0 | 2.1 | 0.1 |

NB: Population of Tabacco Caterpillar (*Spodoptera litura*), Diamond Back Moth (*Plutella xylostella*) and Leaf Webber (*Crocidolomia binotalis*) were noticed in the farmers' fields but their number was negligible for documentation.

**Table 5.6.4(B): Survey of natural enemies at farmers' fields at Shillongani**

| Natural enemies | Location (L) | 1st Fortnight of Nov | 2nd Fortnight of Nov | 1st Fortnight of Dec | 2nd Fortnight of Dec | 1st Fortnight of Jan | 2nd Fortnight of Jan |
|---|---|---|---|---|---|---|---|
| Coccinellids (no./plant) | L – 1 | 0.0 | 0.2 | 3.1 | 2.2 | 2.1 | 1.8 |
| | L – 2 | 0.0 | 0.4 | 2.1 | 2.7 | 1.7 | 0.7 |
| | L – 3 | 0.2 | 1.7 | 2.4 | 3.1 | 2.8 | 0.8 |
| | L – 4 | 0.1 | 1.0 | 3.7 | 3.4 | 2.7 | 1.3 |
| | L – 5 | 0.2 | 2.5 | 3.1 | 3.4 | 2.7 | - |
| | L – 6 | 0.0 | 3.1 | 4.1 | 3.7 | 2.0 | - |
| | L – 7 | 0.0 | 2.4 | 2.7 | 3.2 | 1.7 | - |
| | L – 8 | 0.3 | 3.7 | .3.1 | 2.2 | 1.6 | - |
| | L – 9 | 0.0 | 2.2 | 2.0 | 1.7 | 1.2 | 0.7 |
| | L – 10 | 0.0 | 2.0 | 1.7 | 2.1 | 1.7 | 0.4 |
| | | | | | | | |
| Tachanid fly (no./$m^2$) | L – 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 |
| | L – 2 | 0.0 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 |
| | L – 3 | 0.0 | 0.0 | 0.4 | 0.2 | 1.2 | 0.1 |
| | L – 4 | 0.0 | 0.0 | 1.4 | 1.3 | 0.4 | 0.2 |
| | L – 5 | 0.0 | 0.1 | 0.0 | 1.1 | 1.4 | - |
| | L – 6 | 0.0 | 0.2 | 1.0 | 0.0 | 1.0 | - |
| | L – 7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | - |
| | L – 8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | - |
| | L – 9 | 0.1 | 0.0 | 0.0 | 0.0 | 1.0 | 0.2 |
| | L – 10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 |

Population of Spider, *Oxyopes* spp. was noticed in the farmers' fields but its number was negligible for documentation.

# Plant Physiology

# 6. Plant Physiology

## 6.1 Screening of genotypes from different agroclimatic zones at seedling stage

Thirty seven genotypes of Indian mustard (*B. juncea*) procured from different agro-climatic zones were tested for high-temperature tolerance at seedling stage under both laboratory and field conditions. Test genotypes were evaluated in laboratory as per the standard protocol. For field planting 100 seeds of each genotype were sown in 2 m row length at Dholi, Kanpur and Ludhiana with 3 replications. The field experiment was continued for 30 days. Seedling mortality and dry matter recorded varied significantly within the genotypes at the three locations. Higher seedling mortality indicated more susceptibility of the genotypes to high temperature and vice-versa (Table 6.1.1 to 6.1.3)

Summarizing, seedling mortality ≤20% and DW/10 seedlings ≥ 40mg rated genotypes tolerant under controlled conditions. Five genotypes namely DRMR2059, PM 25(NC), PM29 (LR), Bullet and RH749 (ZC) at Kanpur and Ludhiana, PM 25(NC) and Bullet at Hisar, Kanpur and Ludhiana while DRMR 2059 at 3 locations (Mumbai, Kanpur and Ludhiana) showed thermo tolerance. In the field sown trial, DRMR2059, PM 25(NC), PM 29(LR), KMR (E) 18-2 and RH1699-5 were rated tolerant at Kanpur and Ludhiana, RH1658 at Dholi and Ludhiana with seedling mortality ≤20% and dry matter per 10 seedlings ≥4.0g. Only DRMR2300 was highly tolerant and DRMR 2059 moderately tolerant at Dholi, Kanpur and Ludhiana. JD-6(ZC) was moderately tolerant at Kanpur and Ludhiana under controlled condition. PM 25(NC) and PM29 (LR) showed tolerance to high temperature at seedling stage both under laboratory and field conditions.

## 6.2 Evaluation of genotypes under low light stress condition

Seven genotypes of Indian mustard were sown in paired rows at row spacing of 30 cm in the field with 3 replications under RBD. Treatments comprised i) shading with nets which cuts 30% natural light and ii) no shading (control). Shading was given for 30 days commencing from mid-December to mid-January following all the recommended practices for raising a healthy crop. Significant differences existed in the genotypes for studied traits and shading reduced physiological traits and seed yield significantly at three locations (Table 6.2.1 to 6.2.6).

Lesser reduction in the physiological traits and seed yield (≤20%) identified RH749 and NRCHB 101 at Hisar and Kanpur while DRMR541-44 and Kranti at Hisar and Ludhiana as promising genotypes under low light stress

## 6.3 Screening of genotypes for drought tolerance

Thirty three genotypes of *B. juncea* were evaluated for drought tolerance under field conditions at Dholi, Hisar, Kanpur and Ludhiana. The test genotypes were sown in 5 rows with 2.5 m row length at 30 cm row spacing after pre-sowing irrigation. Treatments were replicated 3 times under RBD factorial design. Main treatment consisted of i) two post sowing irrigations at 35 and 65 DAS (IR) and ii) no post sowing irrigation (RF). Analysis of variance revealed significant genotypic differences for RWC, SPAD values, canopy temperature, yield components and seed yield (Table 6.3.1 to 6.3.12).

Overall, TM179, LES54, NPJ210, RGN444 and RH1584 at Dholi and Ludhiana, RB100 and NPJ226 at Dholi and Hisar, only one genotype NPJ216 at Kanpur and Ludhiana, NPJ214, RH1555, NPJ225, RGN73 (ZC), RB102, PM29, PM30 and DRMRCI114 at Dholi, Hisar and Ludhiana were tolerant to moisture stress. Only one genotype DRMRCI70 was rated highly tolerant to drought at 4 locations (Dholi, Hisar, Kanpur and Ludhiana). These genotypes maintained higher RWC, SPAD values and lesser decline in siliqua on main shoot, seeds/siliqua and seed weight with DSI≤1.2. Genotype RH749 (ZC) showed seed yield reduction ≤30% and was rated moderately drought tolerant at 3 locations (Dholi, Hisar and Ludhiana).

## 6.4 Screening of genotypes for high-temperature tolerance at the terminal stage.

Thirty mustard genotypes were sown in the field at two dates i.e. optimum/normal sowing (NS) in the third week of October and late sown in the last week of November (LS).Late sown (LS) crop faced high temperature ($\geq 30^0$C) at seed filling stage. Genotypes were sown in paired rows in RBD. The percent reduction was computed under late sown over normal sown. Environmental differences due to planting dates (NS and LS) significantly influenced canopy temperature, canopy temperature depression, membrane stability, yield attributes like number of seeds per siliqua, seed weight and seed yield. However, environment x genotypes (ExG) interaction effects were non-significant for seeds per siliqua at 2 locations (Dholi and Hisar) and for CTD and MSI only at Hisar (Table 6.4.1 to 6.4.6)

Two genotypes (RH749 and DRMRIC16-38) at Dholi, Hisar and Ludhiana, RH919 at Dholi, Hisar and Kanpur while DRMR2059 at 4 locations (Dholi, Hisar, Kanpur and Ludhiana) showed yield reduction≤20% and HSI≥0.6 and were considered highly tolerant to terminal heat stress with relatively lesser depression in membrane stability, seed weight and seeds/siliqua.

## 6.5 Screening of genotypes for salinity tolerance at seedling stage

Counted seeds of five mustard genotypes were sown in the plastic tray using distilled water as control and 12dS/m saline solution to identify salinity tolerant genotypes. The experiment was conducted under ambient conditions and percent decrease in germination, seedling length, dry weight and seedling vigor II were used to assess salinity tolerance (Table 6.5.1 to 6.5.4)
Overall, genotype RH1607 at Hisar and Kanpur while CS58 at Kanpur and Ludhiana showed tolerance to salinity.

## 6.6 Effect of plant growth regulating substances on yield under rainfed conditions

Foliar application of salicylic acid @100 and 200ppm and brassinolide @10 and 20ppm were given at initiation of flowering and at 50% flowering at 3 locations under rainfed conditions. Local variety RH 725 (Hisar), Vaibhav (Kanpur) and PBR97 (Ludhiana) were selected to test the efficacy of growth regulating substances. Non-significant differences were recorded for SPAD and seed weight only at Hisar. However significant differences existed for seed weight at 2 locations (Kanpur and Ludhiana) while for seeds per siliqua and seed yield at Hisar, Kanpur and Ludhiana (Table 6.6).

Overall, foliar application of brassinolide @ 20ppm and salicylic acid @200ppm at Hisar, Kanpur and Ludhiana improved seed yield under rainfed conditions.

## Table 6.1.1 Screening of genotypes from different for high temperature tolerance under controlled conditions

| Code | Genotypes | Seedling mortality (%) | | | | | DW/10seedlings(mg) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hisar | Kanpur | Ludhiana | Mumbai | Average | Hisar | Kanpur | Ludhiana | Mumbai | Average |
| Phy-18-1-1 | KMR (E) 18-1 | 33.9 | 42.5 | 38.9 | 37.9 | **38.3** | 61.9 | 33.3 | 32.8 | 46.6 | **43.7** |
| Phy-18-1-2 | DRMRCI 96 | 48.8 | 41.3 | 43.0 | 10.7 | **36.0** | 39.8 | 32.5 | 33.5 | 65.9 | **42.9** |
| Phy-18-1-3 | DRMRHT 13-13-5-4 | 69.6 | 51.8 | 49.9 | 28.7 | **50.0** | 27.7 | 36.6 | 35.0 | 62.1 | **40.3** |
| Phy-18-1-4 | PRE 2016-2 | 21.8 | 41.7 | 39.7 | 32.8 | **34.0** | 32.4 | 34.5 | 33.2 | 37.4 | **34.4** |
| Phy-18-1-5 | NPJ-222 | 61.3 | 41.0 | 50.0 | 43.1 | **48.9** | 29.8 | 35.0 | 37.0 | 50.9 | **38.2** |
| Phy-18-1-6 | RMM 10 – 1- 1 | 21.8 | 45.5 | 48.5 | 59.6 | **43.9** | 43.0 | 36.3 | 37.3 | 47.5 | **41.0** |
| Phy-18-1-7 | DRMR 2059 | 21.3 | 18.5 | 19.2 | 10.3 | **17.3** | 55.9 | 45.7 | 40.2 | 63.7 | **51.4** |
| Phy-18-1-8 | RGN 73 (ZC) | 31.6 | 69.3 | 58.2 | 52.3 | **52.8** | 38.3 | 36.5 | 35.4 | 64.6 | **43.7** |
| Phy-18-1-9 | PM 28 Check | 43.8 | 63.0 | 49.8 | 38.9 | **48.9** | 42.3 | 37.0 | 36.8 | 55.0 | **42.8** |
| Phy-18-1-10 | LES 57 | 22.3 | 49.5 | 51.2 | 50.0 | **43.3** | 56.3 | 32.7 | 29.8 | 50.2 | **42.2** |
| Phy-18-1-11 | RLC 3# | 31.8 | 64.0 | 56.0 | 29.1 | **45.2** | 52.9 | 39.4 | 42.0 | 37.8 | **43.0** |
| Phy-18-1-12 | Pusa Mustard 29 (LR) | 45.8 | 19.4 | 15.8 | 46.0 | **31.8** | 41.4 | 45.7 | 47.3 | 36.7 | **42.8** |
| Phy-18-1-13 | KMR (E) 18-2 | 31.2 | 50.8 | 48.9 | 30.3 | **40.3** | 42.0 | 40.8 | 38.9 | 49.4 | **42.8** |
| Phy-18-1-14 | DRMR 2017-26 | 31.3 | 40.4 | 35.9 | 22.0 | **32.4** | 41.6 | 29.9 | 31.2 | 48.2 | **37.7** |
| Phy-18-1-15 | DRMRIS 17-7 | 36.7 | 45.7 | 46.0 | 17.7 | **36.5** | 47.3 | 38.8 | 40.2 | 42.5 | **42.2** |
| Phy-18-1-16 | RH 1699-5 | 35.0 | 61.5 | 58.2 | 29.3 | **46.0** | 41.6 | 39.5 | 38.3 | 47.4 | **41.7** |
| Phy-18-1-17 | PRE 2016-5 | 19.4 | 62.6 | 52.3 | 32.2 | **41.6** | 56.9 | 38.8 | 35.6 | 30.5 | **40.4** |
| Phy-18-1-18 | RH 1658 | 48.3 | 52.3 | 43.9 | 40.4 | **46.2** | 45.6 | 42.3 | 40.2 | 56.0 | **46.0** |
| Phy-18-1-19 | NPJ-221 | 56.8 | 63.5 | 56.9 | 39.0 | **54.1** | 43.1 | 38.0 | 37.2 | 47.4 | **41.4** |
| Phy-18-1-20 | Bullet | 18.3 | 18.5 | 19.5 | 46.9 | **25.8** | 55.6 | 47.7 | 45.3 | 42.4 | **47.7** |
| Phy-18-1-21 | DRMR 15-9 | 31.6 | 45.6 | 44.6 | 36.0 | **39.4** | 37.3 | 32.8 | 31.2 | 50.9 | **38.1** |
| Phy-18-1-22 | DTM-184 | 48.8 | 44.6 | 42.3 | 17.7 | **38.4** | 51.8 | 30.6 | 29.2 | 62.3 | **43.5** |
| Phy-18-1-23 | DRMR 2300 | 41.3 | 43.7 | 41.0 | 19.9 | **36.5** | 44.3 | 29.8 | 25.8 | 64.1 | **41.0** |
| Phy-18-1-24 | DRMR 4005 | 48.8 | 46.6 | 45.3 | 24.2 | **41.2** | 36.5 | 41.5 | 39.5 | 56.7 | **43.6** |
| Phy-18-1-25 | DRMR 1191-2 | 36.3 | 42.3 | 39.5 | 47.8 | **41.5** | 56.8 | 40.0 | 39.0 | 56.3 | **48.0** |
| Phy-18-1-26 | DRMR 4009 | 53.8 | 41.7 | 38.3 | 17.9 | **37.9** | 50.8 | 38.3 | 35.6 | 46.9 | **42.9** |
| Phy-18-1-27 | DRMR 1616-47 | 56.5 | 54.0 | 46.2 | 19.5 | **44.1** | 39.3 | 35.6 | 32.1 | 65.7 | **43.2** |
| Phy-18-1-28 | DRMR 4057 | 44.1 | 42.6 | 39.9 | 27.7 | **38.6** | 34.8 | 40.8 | 41.8 | 48.9 | **41.6** |
| Phy-18-1-29 | Pusa Mustard 25 (NC) | 17.6 | 19.5 | 19.1 | 35.7 | **23.0** | 58.3 | 46.8 | 48.2 | 44.0 | **49.3** |
| Phy-18-1-30 | Pusa Mustard 30 (LR) | 19.2 | 42.6 | 39.9 | 39.6 | **35.3** | 62.0 | 34.4 | 36.2 | 50.8 | **45.9** |
| Phy-18-1-31 | JD 6 (ZC) | 41.7 | 28.3 | 25.1 | 25.8 | **30.2** | 35.8 | 41.2 | 43.9 | 43.6 | **41.1** |
| Phy-18-1-32 | RLC 7 | 26.3 | 25.1 | 22.6 | 52.6 | **31.7** | 43.8 | 44.4 | 42.5 | 28.4 | **39.8** |
| Phy-18-1-33 | LES 54# | 15.3 | 47.7 | 45.2 | 31.9 | **35.0** | 57.3 | 37.0 | 36.4 | 35.9 | **41.7** |
| Phy-18-1-34 | Kranti (NC) | 26.7 | 50.8 | 45.9 | 53.7 | **44.3** | 47.8 | 40.7 | 39.2 | 40.5 | **42.0** |
| Phy-18-1-35 | RH 749 (ZC) | 49.5 | 17.7 | 15.4 | 40.4 | **30.7** | 33.3 | 45.6 | 43.1 | 58.7 | **45.2** |
| Phy-18-1-36 | 71J0002 | 54.4 | 60.6 | 55.2 | 36.9 | **51.8** | 33.3 | 38.7 | 32.9 | 27.7 | **33.1** |
| Phy-18-1-37 | RCH 1## | 40.2 | 61.5 | 56.8 | 70.4 | **57.2** | 51.4 | 39.0 | 41.2 | 31.6 | **40.8** |
| | **Mean** | **37.4** | **44.8** | **41.7** | **35.0** | | **45.1** | **38.3** | **37.4** | **48.5** | |
| | CD(p=0.05) | 14.0 | 1.8 | 1.3 | 4.08 | | 5.4 | 1.6 | 1.5 | 5.1 | |

**Table 6.1.2 Screening of genotypes from different agroclimatic zones for high temperature at seedling stage under field conditions**

| Code | Genotypes | Seedling mortality(%) | | | | DW/10seedlings (g) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | Kanpur | Ludhiana | Average | Dholi | Kanpur | Ludhiana | Average |
| Phy-18-1-1 | KMR (E) 18-1 | 34.9 | 54.8 | 28.4 | **39.4** | 8.5 | 3.3 | 6.0 | **5.9** |
| Phy-18-1-2 | DRMRCI 96 | 33.6 | 30.6 | 26.1 | **30.1** | 3.3 | 4.2 | 7.4 | **5.0** |
| Phy-18-1-3 | DRMRHT 13-13-5-4 | 24.6 | 30.0 | 14.0 | **22.9** | 5.2 | 4.5 | 9.1 | **6.3** |
| Phy-18-1-4 | PRE 2016-2 | 29.6 | 38.8 | 20.1 | **29.5** | 7.3 | 4.0 | 5.8 | **5.7** |
| Phy-18-1-5 | NPJ-222 | 24.3 | 30.6 | 19.7 | **24.9** | 4.7 | 3.3 | 6.0 | **4.7** |
| Phy-18-1-6 | RMM 10 – 1- 1 | 25.2 | 60.2 | 26.1 | **37.2** | 3.9 | 2.4 | 5.3 | **3.9** |
| Phy-18-1-7 | DRMR 2059 | 24.6 | 14.9 | 12.9 | **17.5** | 5.2 | 4.5 | 8.3 | **6.0** |
| Phy-18-1-8 | RGN 73 (ZC) | 34.9 | 42.8 | 25.0 | **34.2** | 8.9 | 3.5 | 6.6 | **6.3** |
| Phy-18-1-9 | PM 28 Check | 24.3 | 25.0 | 23.0 | **24.1** | 5.9 | 3.1 | 5.2 | **4.7** |
| Phy-18-1-10 | LES 57 | 32.2 | 48.5 | 14.6 | **31.8** | 4.1 | 3.6 | 6.3 | **4.7** |
| Phy-18-1-11 | RLC 3# | 40.6 | 38.7 | 26.2 | **35.2** | 6.5 | 4.0 | 6.3 | **5.6** |
| Phy-18-1-12 | Pusa Mustard 29 (LR) | 30.3 | 14.8 | 12.1 | **19.1** | 5.7 | 4.7 | 4.2 | **4.9** |
| Phy-18-1-13 | KMR (E) 18-2 | 32.6 | 16.0 | 17.6 | **22.1** | 8.5 | 4.7 | 5.2 | **6.1** |
| Phy-18-1-14 | DRMR 2017-26 | 21.6 | 32.6 | 16.9 | **23.7** | 8.6 | 4.6 | 4.3 | **5.8** |
| Phy-18-1-15 | DRMRIS 17-7 | 18.3 | 32.2 | 21.0 | **23.8** | 10.9 | 3.5 | 3.9 | **6.1** |
| Phy-18-1-16 | RH 1699-5 | 28.6 | 16.6 | 16.6 | **20.6** | 6.6 | 4.6 | 6.5 | **5.9** |
| Phy-18-1-17 | PRE 2016-5 | 29.3 | 30.4 | 15.1 | **24.9** | 7.4 | 2.8 | 5.9 | **5.4** |
| Phy-18-1-18 | RH 1658 | 19.8 | 36.8 | 19.6 | **25.4** | 9.7 | 3.9 | 7.1 | **6.9** |
| Phy-18-1-19 | NPJ-221 | 29.8 | 36.5 | 15.9 | **27.4** | 5.8 | 2.8 | 9.1 | **5.9** |
| Phy-18-1-20 | Bullet | 29.7 | 68.0 | 11.8 | **36.5** | 8.4 | 2.6 | 7.9 | **6.3** |
| Phy-18-1-21 | DRMR 15-9 | 25.2 | 36.2 | 14.9 | **25.4** | 4.9 | 2.2 | 7.3 | **4.8** |
| Phy-18-1-22 | DTM-184 | 31.6 | 62.0 | 16.7 | **36.8** | 7.6 | 2.2 | 4.9 | **4.9** |
| Phy-18-1-23 | DRMR 2300 | 19.9 | 16.5 | 18.2 | **18.2** | 9.2 | 4.5 | 7.2 | **7.0** |
| Phy-18-1-24 | DRMR 4005 | 20.0 | 26.6 | 17.2 | **21.3** | 8.6 | 2.8 | 7.0 | **6.1** |
| Phy-18-1-25 | DRMR 1191-2 | 27.4 | 26.5 | 14.9 | **22.9** | 6.8 | 4.7 | 6.3 | **5.9** |
| Phy-18-1-26 | DRMR 4009 | 26.5 | 24.4 | 16.4 | **22.4** | 4.9 | 2.7 | 8.4 | **5.3** |
| Phy-18-1-27 | DRMR 1616-47 | 33.3 | 28.4 | 13.0 | **24.9** | 6.8 | 3.1 | 9.8 | **6.6** |
| Phy-18-1-28 | DRMR 4057 | 25.9 | 24.4 | 17.1 | **22.5** | 8.1 | 3.4 | 5.7 | **5.7** |
| Phy-18-1-29 | Pusa Mustard 25 (NC) | 27.6 | 15.8 | 16.0 | **19.8** | 5.8 | 4.7 | 6.0 | **5.5** |
| Phy-18-1-30 | Pusa Mustard 30 (LR) | 33.7 | 26.5 | 25.9 | **28.7** | 4.5 | 4.0 | 8.2 | **5.6** |
| Phy-18-1-31 | JD 6 (ZC) | 34.8 | 50.2 | 14.4 | **33.1** | 3.8 | 2.8 | 4.9 | **3.8** |
| Phy-18-1-32 | RLC 7 | 33.6 | 62.3 | 10.8 | **35.6** | 7.2 | 2.7 | 5.6 | **5.2** |
| Phy-18-1-33 | LES 54# | 33.5 | 34.0 | 17.9 | **28.5** | 6.9 | 2.9 | 5.8 | **5.2** |
| Phy-18-1-34 | Kranti (NC) | 32.5 | 28.8 | 20.8 | **27.4** | 4.6 | 3.4 | 7.3 | **5.1** |
| Phy-18-1-35 | RH 749 (ZC) | 40.4 | 14.6 | 14.5 | **23.2** | 4.2 | 4.6 | 8.3 | **5.7** |
| Phy-18-1-36 | 71J0002 | 34.2 | 56.6 | 15.7 | **35.5** | 6.6 | 3.8 | 6.6 | **5.7** |
| Phy-18-1-37 | RCH 1## | 33.6 | 68.0 | 23.4 | **41.7** | 6.9 | 3.8 | 8.5 | **6.4** |
| | **Mean** | **29.3** | **35.2** | **18.1** | | **6.6** | **3.5** | **6.6** | |
| | CD(p=0.05) | 3.12 | 4.7 | 4.2 | | 1.04 | 0.50 | 1.33 | |

**Table 6.1.3 Effect of high temperature at seedling stage on SPAD and RWC under field conditions**

| Code | Genotypes | SPAD | | | | RWC(%) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | Kanpur | Ludhiana | Average | Dholi | Kanpur | Ludhiana | Average |
| Phy-18-1-1 | KMR (E) 18-1 | 39.7 | 41.3 | 35.8 | **38.9** | 74.3 | 75.3 | 71.2 | **73.6** |
| Phy-18-1-2 | DRMRCI 96 | 39.2 | 39.3 | 34.5 | **37.7** | 75.2 | 74.9 | 79.9 | **76.7** |
| Phy-18-1-3 | DRMRHT 13-13-5-4 | 45.2 | 35.7 | 35.3 | **38.7** | 81.6 | 77.6 | 67.1 | **75.4** |
| Phy-18-1-4 | PRE 2016-2 | 41.7 | 40.6 | 34.1 | **38.8** | 76.3 | 73.8 | 73.0 | **74.4** |
| Phy-18-1-5 | NPJ-222 | 45.9 | 35.5 | 36.4 | **39.3** | 82.9 | 76.3 | 71.1 | **76.8** |
| Phy-18-1-6 | RMM 10 – 1- 1 | 45.1 | 32.6 | 35.0 | **37.6** | 80.7 | 72.8 | 70.1 | **74.5** |
| Phy-18-1-7 | DRMR 2059 | 46.2 | 41.7 | 34.6 | **40.8** | 82.8 | 78.0 | 72.7 | **77.8** |
| Phy-18-1-8 | RGN 73 (ZC) | 36.1 | 34.6 | 38.4 | **36.4** | 71.6 | 73.5 | 72.3 | **72.5** |
| Phy-18-1-9 | PM 28 Check | 46.8 | 40.8 | 34.6 | **40.7** | 81.3 | 74.6 | 70.7 | **75.5** |
| Phy-18-1-10 | LES 57 | 41.7 | 38.3 | 36.1 | **38.7** | 72.1 | 72.3 | 66.3 | **70.2** |
| Phy-18-1-11 | RLC 3# | 31.3 | 34.7 | 37.2 | **34.4** | 65.6 | 71.9 | 60.2 | **65.9** |
| Phy-18-1-12 | Pusa Mustard 29 (LR) | 40.1 | 41.6 | 36.1 | **39.3** | 75.3 | 76.7 | 68.9 | **73.6** |
| Phy-18-1-13 | KMR (E) 18-2 | 37.2 | 42.0 | 35.7 | **38.3** | 77.2 | 78.0 | 72.6 | **75.9** |
| Phy-18-1-14 | DRMR 2017-26 | 44.7 | 33.3 | 35.5 | **37.8** | 88.7 | 65.4 | 64.9 | **73.0** |
| Phy-18-1-15 | DRMRIS 17-7 | 48.3 | 36.6 | 35.2 | **40.0** | 91.6 | 64.3 | 63.5 | **73.1** |
| Phy-18-1-16 | RH 1699-5 | 42.8 | 41.8 | 36.8 | **40.5** | 78.1 | 76.7 | 65.1 | **73.3** |
| Phy-18-1-17 | PRE 2016-5 | 33.3 | 36.7 | 34.1 | **34.7** | 76.4 | 68.7 | 76.8 | **74.0** |
| Phy-18-1-18 | RH 1658 | 47.4 | 34.6 | 34.9 | **39.0** | 90.3 | 66.6 | 89.5 | **82.1** |
| Phy-18-1-19 | NPJ-221 | 40.8 | 36.7 | 33.9 | **37.1** | 75.4 | 71.5 | 53.4 | **66.8** |
| Phy-18-1-20 | Bullet | 40.6 | 41.5 | 34.5 | **38.9** | 76.2 | 77.3 | 73.1 | **75.5** |
| Phy-18-1-21 | DRMR 15-9 | 44.7 | 34.4 | 35.2 | **38.1** | 79.8 | 74.7 | 84.7 | **79.7** |
| Phy-18-1-22 | DTM-184 | 39.3 | 31.4 | 34.3 | **35.0** | 74.3 | 76.6 | 75.3 | **75.4** |
| Phy-18-1-23 | DRMR 2300 | 46.5 | 41.5 | 36.3 | **41.4** | 89.9 | 77.5 | 82.6 | **83.3** |
| Phy-18-1-24 | DRMR 4005 | 45.2 | 34.7 | 36.2 | **38.7** | 89.5 | 64.6 | 90.6 | **81.6** |
| Phy-18-1-25 | DRMR 1191-2 | 42.5 | 41.8 | 35.9 | **40.1** | 77.2 | 77.0 | 55.0 | **69.7** |
| Phy-18-1-26 | DRMR 4009 | 44.8 | 40.8 | 35.4 | **40.3** | 79.5 | 77.6 | 58.6 | **71.9** |
| Phy-18-1-27 | DRMR 1616-47 | 37.9 | 36.6 | 33.5 | **36.0** | 77.2 | 65.5 | 72.7 | **71.8** |
| Phy-18-1-28 | DRMR 4057 | 44.6 | 32.8 | 33.7 | **37.0** | 83.6 | 68.6 | 58.3 | **70.2** |
| Phy-18-1-29 | Pusa Mustard 25 (NC) | 42.3 | 41.9 | 36.2 | **40.1** | 78.8 | 76.5 | 61.3 | **72.2** |
| Phy-18-1-30 | Pusa Mustard 30 (LR) | 35.3 | 33.3 | 34.9 | **34.5** | 76.3 | 73.6 | 49.2 | **66.4** |
| Phy-18-1-31 | JD 6 (ZC) | 37.3 | 36.6 | 34.4 | **36.1** | 78.5 | 67.7 | 52.3 | **66.2** |
| Phy-18-1-32 | RLC 7 | 36.3 | 37.7 | 35.1 | **36.4** | 77.6 | 71.5 | 60.7 | **69.9** |
| Phy-18-1-33 | LES 54# | 35.6 | 37.3 | 34.1 | **35.7** | 76.2 | 73.3 | 86.6 | **78.7** |
| Phy-18-1-34 | Kranti (NC) | 35.1 | 39.2 | 36.2 | **36.8** | 76.7 | 72.4 | 66.9 | **72.0** |
| Phy-18-1-35 | RH 749 (ZC) | 34.8 | 42.0 | 35.6 | **37.5** | 67.3 | 76.7 | 56.8 | **66.9** |
| Phy-18-1-36 | 71J0002 | 39.6 | 38.6 | 36.5 | **38.2** | 73.8 | 72.9 | 72.2 | **73.0** |
| Phy-18-1-37 | RCH 1## | 38.2 | 32.8 | 33.9 | **35.0** | 75.6 | 73.2 | 58.1 | **69.0** |
| | **Mean** | **40.9** | **37.6** | **35.3** | | **78.5** | **73.1** | **68.7** | |
| | CD(p=0.05) | 1.17 | 2.8 | 0.73 | | 1.61 | 1.8 | 9.5 | |

**Table 6.2.1 Effect of low light stress on photosynthesis at two stages of crop growth**

| Photosynthesis (umol/m2/s) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | Genotypes | 10 days of shading | | | | | | 10 days after removal of nets | | | | | | | |
| | | Kanpur | | | Ludhiana | | | Hisar | | | Kanpur | | | Ludhiana | |
| | | C | S | Red(%) | C | S | Red(%) | C | S | Red(%) | C | S | Red(%) | C | S | Red(%) |
| Phy-1 | RH 749 | 20.3 | 19.8 | 2.5 | 25.8 | 24.1 | 6.6 | 8.1 | 5.5 | 32.4 | 21.7 | 20.1 | 7.4 | 26.4 | 24.5 | 7.2 |
| Phy-2 | DRMRHT 13-13-5-4 | 21.5 | 19 | 11.6 | 27.3 | 25.4 | 7.0 | 8.3 | 4.7 | 43.0 | 20 | 17.2 | 14.0 | 26.1 | 23.8 | 8.8 |
| Phy-3 | DRMRHT 13-13-5-6 | 19.6 | 18.6 | 5.1 | 18.9 | 17.5 | 7.4 | 7.7 | 4.4 | 43.0 | 19.4 | 17.2 | 11.3 | 19.5 | 17.6 | 9.7 |
| Phy-4 | DRMR 541-44 | 20.6 | 18.4 | 10.6 | 24.9 | 22.8 | 8.4 | 7.7 | 5.2 | 32.5 | 19.8 | 17.7 | 10.6 | 23.3 | 19.7 | 15.5 |
| Phy-5 | KRANTI | 18.9 | 18 | 4.8 | 19.2 | 19.1 | 0.5 | 7.0 | 3.7 | 47.8 | 19.5 | 16.7 | 14.4 | 21.1 | 19.7 | 6.6 |
| Phy-6 | NRCHB 101 | 20.7 | 18.8 | 9.2 | 21.3 | 19.4 | 8.9 | 8.0 | 5.1 | 36.8 | 21.5 | 19.9 | 7.4 | 22.4 | 20.8 | 7.1 |
| Phy-7 | VARUNA | 19.9 | 19.3 | 3 | 19.5 | 19.1 | 2.1 | 9.3 | 4.9 | 46.9 | 20 | 17.4 | 13.0 | 20.5 | 18.1 | 11.7 |
| | Mean | 20.2 | 18.8 | | 22.4 | 21.1 | | 8.0 | 4.8 | | 20.3 | 15.1 | | 22.8 | 20.6 | |
| | CD(p=0.05) | S=0.3 | | | S=0.423 | | | S=NS | | | S=0.6 | | | S=0.741 | | |
| | | G=0.6 | | | G=0.562 | | | G=1.21 | | | G=1.1 | | | G=1.23 | | |
| | | SxG=0.9 | | | GxS=0.99 | | | SxG=NS | | | SxG=NS | | | GxS= 1.0 | | |

**Table 6.2.2 Effect of low light stress on chlorophyll content at 10 days after removal of nets**

| Code | Genotypes | Chlorophyll conent (mg/g FW) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hisar** | | | | | | | | |
| | | Chla | | | Chlb | | | Total chlorophyll | | |
| | | C | S | Red(%) | C | S | Red(%) | C | S | Red(%) |
| Phy-1 | RH 749 | 1.69 | 1.55 | 8.1 | 0.32 | 0.29 | 8.3 | 2.00 | 0.87 | 56.6 |
| Phy-2 | DRMRHT 13-13-5-4 | 1.75 | 1.57 | 9.9 | 0.39 | 0.29 | 25.6 | 2.14 | 0.94 | 56.0 |
| Phy-3 | DRMRHT 13-13-5-6 | 1.58 | 1.04 | 34.1 | 0.37 | 0.23 | 37.6 | 1.95 | 0.85 | 56.4 |
| Phy-4 | DRMR 541-44 | 1.49 | 1.20 | 19.5 | 0.34 | 0.18 | 46.8 | 1.82 | 0.78 | 57.1 |
| Phy-5 | KRANTI | 1.74 | 1.37 | 21.3 | 0.39 | 0.24 | 36.8 | 2.12 | 0.92 | 56.8 |
| Phy-6 | NRCHB 101 | 1.85 | 1.46 | 20.7 | 0.39 | 0.34 | 11.9 | 2.23 | 0.99 | 55.8 |
| Phy-7 | VARUNA | 1.90 | 1.74 | 8.7 | 0.36 | 0.30 | 15.6 | 2.26 | 0.97 | 56.9 |
| | **Mean** | **1.71** | **1.42** | | **0.36** | **0.27** | | **2.08** | **0.90** | |
| | CD(p=0.05) | S=0.296 | | | S=NS | | | S=0.346 | | |
| | | G=0.156 | | | G=0.037 | | | G=0.185 | | |
| | | SxG=NS | | | SxG=NS | | | SxG=NS | | |

| Code | Genotypes | Ludhiana | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Chla | | | chlb | | | Total chlorophyll | | |
| | | C | S | Red(%) | C | S | Red(%) | C | S | Red(%) |
| Phy-1 | RH 749 | 1.62 | 1.48 | 8.6 | 0.38 | 0.32 | 15.8 | 2.00 | 1.80 | 10.0 |
| Phy-2 | DRMRHT 13-13-5-4 | 1.58 | 1.39 | 12.0 | 0.43 | 0.29 | 32.6 | 2.01 | 1.68 | 16.4 |
| Phy-3 | DRMRHT 13-13-5-6 | 1.38 | 1.35 | 2.2 | 0.30 | 0.29 | 4.0 | 1.67 | 1.65 | 1.2 |
| Phy-4 | DRMR 541-44 | 1.36 | 1.21 | 11.3 | 0.32 | 0.29 | 9.4 | 1.65 | 1.53 | 7.1 |
| Phy-5 | KRANTI | 1.60 | 1.58 | 1.0 | 0.38 | 0.35 | 7.9 | 1.96 | 1.94 | 1.0 |
| Phy-6 | NRCHB 101 | 1.65 | 1.49 | 9.6 | 0.36 | 0.34 | 5.6 | 1.99 | 1.85 | 7.1 |
| Phy-7 | VARUNA | 1.45 | 1.44 | 0.3 | 0.32 | 0.31 | 3.1 | 1.76 | 1.75 | 0.6 |
| | **Mean** | **1.52** | **1.42** | | **0.36** | **0.31** | | **1.86** | **1.74** | |
| | CD(p=0.05) | S=0.028 | | | S=0.012 | | | S=0.021 | | |
| | | G=0.068 | | | G=0.021 | | | G=0.108 | | |
| | | SxG=0.097 | | | SxG=0.042 | | | SxG=0.133 | | |
| | C=Control | | S= 30% Shading | | | | | | | |

## Table 6.2.3 Effect of low light stress on SPAD 10 days after removal of nets at 3 locations

| Code | Genotypes | SPAD | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | C | S | Red(%) | C | S | Red(%) | C | S | Red(%) |
| Phy-1 | RH 749 | 46.7 | 46.1 | 1.3 | 48.3 | 45.8 | 5.2 | 43.2 | 43.0 | 0.5 |
| Phy-2 | DRMRHT 13-13-5-4 | 44.3 | 36.6 | 17.4 | 45.8 | 42 | 8.3 | 41.1 | 40.2 | 2.2 |
| Phy-3 | DRMRHT 13-13-5-6 | 42.2 | 37.3 | 11.6 | 44.6 | 38.3 | 14.1 | 41.9 | 40.2 | 4.1 |
| Phy-4 | DRMR 541-44 | 41.9 | 39.7 | 5.3 | 47.8 | 42.4 | 11.3 | 40.4 | 39.6 | 1.8 |
| Phy-5 | KRANTI | 44.5 | 38.4 | 13.8 | 39.9 | 37.8 | 5.3 | 42.4 | 39.6 | 6.5 |
| Phy-6 | NRCHB 101 | 42.0 | 36.4 | 13.3 | 47.4 | 44.4 | 6.3 | 43.7 | 41.8 | 4.4 |
| Phy-7 | VARUNA | 39.0 | 35.8 | 8.3 | 47.6 | 41.6 | 12.6 | 47.7 | 44.0 | 7.9 |
| | **Mean** | **43.0** | **38.6** | | **45.9** | **41.8** | | **42.9** | **41.2** | |
| | CD(p=0.05) | S=2.46 | | | S=0.7 | | | S=0.660 | | |
| | | G=1.31 | | | G=1.3 | | | G=1.61 | | |
| | | SxG=NS | | | SxG=1.9 | | | SxG=2.28 | | |
| | C=Control | | S= 30% Shading | | | | | | | |

## Table 6.2.4 Effect of low light stress on specific leaf weight (SLW) at Kanpur and Ludhiana

| Code | Genotypes | SLW (mg/cm2) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Kanpur | | | Ludhiana | | |
| | | C | S | Red(%) | C | S | Red(%) |
| Phy-1 | RH 749 | 6.9 | 6.0 | 13.0 | 4.8 | 3.1 | 34.1 |
| Phy-2 | DRMRHT 13-13-5-4 | 6.5 | 5.0 | 23.1 | 3.7 | 3.1 | 15.3 |
| Phy-3 | DRMRHT 13-13-5-6 | 6.3 | 5.0 | 20.6 | 2.9 | 1.9 | 37.1 |
| Phy-4 | DRMR 541-44 | 7.0 | 5.5 | 21.4 | 2.4 | 2.2 | 8.3 |
| Phy-5 | KRANTI | 6.2 | 4.8 | 22.6 | 2.3 | 2.0 | 13.0 |
| Phy-6 | NRCHB 101 | 6.6 | 5.5 | 16.7 | 3.2 | 1.9 | 40.6 |
| Phy-7 | VARUNA | 6.6 | 5.1 | 22.7 | 3.2 | 2.3 | 29.7 |
| | **Mean** | **6.6** | **5.3** | | **3.2** | **2.3** | |
| | CD(p=0.05) | S=0.2 | | | S=0.349 | | |
| | | G=0.4 | | | G=0.855 | | |
| | | SxG=NS | | | SxG=1.29 | | |
| | C=Control | | S= 30% Shading | | | | |

## Table 6.2.5 Effect of low light stress on 1000 seed weight at 3 locations

| Code | Genotypes | Seed weight(g) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | C | S | Red(%) | C | S | Red(%) | C | S | Red(%) |
| Phy-1 | RH 749 | 4.9 | 4.6 | 5.9 | 4.8 | 4.6 | 4.6 | 5.4 | 5.3 | 1.7 |
| Phy-2 | DRMRHT 13-13-5-4 | 6.8 | 6.0 | 11.5 | 4.4 | 3.4 | 22.7 | 4.0 | 3.8 | 5.0 |
| Phy-3 | DRMRHT 13-13-5-6 | 5.3 | 4.7 | 11.4 | 4.2 | 3.0 | 29.0 | 3.8 | 3.7 | 2.5 |
| Phy-4 | DRMR 541-44 | 4.9 | 4.2 | 13.4 | 4.2 | 3.8 | 10.0 | 4.7 | 4.5 | 4.3 |
| Phy-5 | KRANTI | 6.6 | 5.6 | 14.0 | 4.8 | 3.5 | 27.9 | 4.7 | 4.0 | 14.2 |
| Phy-6 | NRCHB 101 | 5.1 | 4.4 | 14.1 | 4.7 | 4.2 | 10.6 | 5.4 | 4.9 | 7.8 |
| Phy-7 | VARUNA | 4.8 | 4.0 | 17.1 | 4.1 | 3.4 | 17.1 | 5.4 | 4.9 | 8.9 |
| | **Mean** | **5.5** | **4.9** | | **4.46** | **3.69** | | **4.8** | **4.5** | |
| | CD(p=0.05) | S=0.463 | | | S=0.06 | | | S=0.142 | | |
| | | G=0.247 | | | G=0.12 | | | G=0.349 | | |
| | | SxG=NS | | | SxG=0.16 | | | SxG=0.494 | | |
| | C=Control | | S= 30% Shading | | | | | | | |

## Table 6.2.6 Effect of low light stress on seed yield at 3 locations

| Code | Genotypes | Seed yield | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Hisar(g/plant) | | | Kanpur(g/plant) | | | Ludhiana (kg/ha) | | |
| | | C | S | Red(%) | C | S | Red(%) | C | S | Red(%) |
| Phy-1 | RH 749 | 26.9 | 25.9 | 4.0 | 18.7 | 15.3 | 18.2 | 1093 | 760 | 30.5 |
| Phy-2 | DRMRHT 13-13-5-4 | 19.2 | 16.3 | 15.1 | 11.7 | 7.7 | 34.2 | 838 | 449 | 46.4 |
| Phy-3 | DRMRHT 13-13-5-6 | 24.9 | 21.3 | 14.6 | 11.1 | 5.6 | 49.5 | 1029 | 229 | 77.8 |
| Phy-4 | DRMR 541-44 | 27.1 | 24.1 | 11.0 | 16.6 | 11.4 | 31.3 | 1629 | 1322 | 18.8 |
| Phy-5 | KRANTI | 24.6 | 20.4 | 17.2 | 9.8 | 5.9 | 39.8 | 1160 | 1120 | 3.4 |
| Phy-6 | NRCHB 101 | 18.1 | 15.8 | 12.8 | 14.0 | 12.6 | 10.0 | 1996 | 698 | 65.0 |
| Phy-7 | VARUNA | 26.0 | 20.1 | 22.6 | 11.8 | 7.5 | 36.4 | 1218 | 596 | 51.1 |
| | **Mean** | **23.8** | **20.5** | | **13.4** | **9.4** | | **1280** | **739** | |
| | CD(p=0.05) | S=1.47 | | | S=0.5 | | | S=74.5 | | |
| | | G=0.785 | | | G=1.0 | | | G=182.6 | | |
| | | SxG=NS | | | SxG=1.4 | | | SxG=258.2 | | |
| | | | | | | | | | | |
| | C=Control | | S= 30% Shading | | | | | | | |

## Table 6.3.1 Effect of moisture stress on SPAD at 4 locations

| Code | Genotypes | SPAD | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) |
| Phy-18-1 | NPJ 214 | 43.9 | 37.6 | 14.4 | 35.5 | 35.3 | 0.6 | 45.7 | 38.2 | 16.4 | 47.8 | 45.1 | 5.6 |
| Phy-18-2 | LES 54 | 42.6 | 35.2 | 17.4 | 37.1 | 29.0 | 21.8 | 49.9 | 39.7 | 20.4 | 45.9 | 43.7 | 4.8 |
| Phy-18-3 | NPJ210 | 48.5 | 45.2 | 6.8 | 39.4 | 38.1 | 3.3 | 50.3 | 48.5 | 3.6 | 48.0 | 46.1 | 4.0 |
| Phy-18-4 | RB-100 | 40.7 | 31.4 | 22.9 | 39.6 | 38.4 | 3.0 | 42.7 | 37.5 | 12.2 | 44.2 | 41.7 | 5.7 |
| Phy-18-5 | 8IJ0117 | 41.8 | 33.8 | 19.1 | 43.6 | 39.2 | 10.1 | 48.2 | 44.3 | 8.1 | 47.3 | 44.1 | 6.8 |
| Phy-18-6 | RGN- 444 | 49.3 | 46.1 | 6.5 | 37.1 | 31.0 | 16.5 | 46.9 | 40.4 | 13.9 | 40.9 | 40.4 | 1.2 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 39.2 | 29.8 | 24.0 | 37.1 | 30.4 | 18.1 | 47.4 | 39.2 | 17.3 | 47.3 | 41.4 | 12.5 |
| Phy-18-8 | DRMRCI 95 | 49.9 | 46.8 | 6.2 | 37.0 | 31.2 | 15.6 | 48.7 | 40.0 | 17.9 | 46.4 | 44.6 | 3.9 |
| Phy-18-9 | NPJ-225 | 42.1 | 35.0 | 16.9 | 35.4 | 33.4 | 5.8 | 47.2 | 41.3 | 12.5 | 43.8 | 40.9 | 6.6 |
| Phy-18-10 | DRMR 2017-8 | 43.8 | 37.6 | 14.2 | 37.1 | 28.8 | 22.5 | 45.5 | 40.4 | 11.2 | 46.5 | 45.8 | 1.5 |
| Phy-18-11 | NPJ-226 | 41.6 | 33.4 | 19.7 | 33.1 | 30.1 | 9.0 | 50.7 | 41.0 | 19.1 | 47.3 | 46.4 | 1.9 |
| Phy-18-12 | RH 1424 | 42.5 | 33.8 | 20.5 | 44.1 | 36.8 | 16.6 | 50.5 | 39.9 | 21.0 | 47.3 | 46.9 | 0.8 |
| Phy-18-13 | RH 1584 | 41.0 | 32.7 | 20.2 | 32.1 | 24.7 | 23.1 | 50.3 | 48.2 | 4.2 | 46.4 | 44.2 | 4.7 |
| Phy-18-14 | PM-29 | 40.5 | 31.1 | 23.2 | 35.7 | 34.9 | 2.2 | 46.5 | 41.7 | 10.3 | 45.7 | 40.4 | 11.6 |
| Phy-18-15 | PM-30 | 38.7 | 29.5 | 23.8 | 37.9 | 37.2 | 1.9 | 50.5 | 43.2 | 14.5 | 48.4 | 45.6 | 5.8 |
| Phy-18-16 | RB-102 | 39.8 | 29.7 | 25.4 | 37.3 | 31.5 | 15.5 | 51.4 | 42.8 | 16.7 | 46.9 | 44.6 | 4.9 |
| Phy-18-17 | TM 179 | 51.2 | 49.5 | 3.3 | 42.4 | 38.3 | 9.7 | 50.5 | 41.6 | 17.6 | 44.4 | 43.6 | 1.8 |
| Phy-18-18 | PDZ 9 | 43.0 | 38.6 | 10.2 | 33.7 | 30.7 | 8.8 | 51.6 | 39.9 | 22.7 | 47.2 | 44.1 | 6.6 |
| Phy-18-19 | RH 1555 | 41.1 | 34.2 | 16.8 | 33.1 | 32.6 | 1.5 | 50.3 | 45.4 | 9.7 | 48.0 | 45.6 | 5.0 |
| Phy-18-20 | NPJ 211 | 41.7 | 33.9 | 18.7 | 37.1 | 34.3 | 7.5 | 46.4 | 41.2 | 11.2 | 49.6 | 45.7 | 7.9 |
| Phy-18-21 | LES 57 | 42.9 | 34.5 | 19.6 | 40.7 | 39.1 | 4.0 | 50.7 | 48.8 | 3.7 | 47.8 | 47.2 | 1.3 |
| Phy-18-22 | NPJ 212 | 43.1 | 35.8 | 16.9 | 37.3 | 36.0 | 3.6 | 51.7 | 44.2 | 14.5 | 45.6 | 44.7 | 2.0 |
| Phy-18-23 | NPJ216 | 37.0 | 28.1 | 24.1 | 33.4 | 30.3 | 9.1 | 51.4 | 49.2 | 4.3 | 47.5 | 39.4 | 17.1 |
| Phy-18-24 | RLC 7 | 38.4 | 28.9 | 24.7 | 43.5 | 37.7 | 13.2 | 51.7 | 42.4 | 18.0 | 44.6 | 40.1 | 10.1 |
| Phy-18-25 | DRMR 541-44 | 37.5 | 33.5 | 10.7 | 44.8 | 38.7 | 13.5 | 51.7 | 41.7 | 19.3 | 43.6 | 42.3 | 3.0 |
| Phy-18-26 | RH 749 (ZC) | 48.7 | 45.5 | 6.6 | 27.5 | 26.3 | 4.4 | 50.6 | 41.7 | 17.6 | 49.3 | 46.4 | 5.9 |
| Phy-18-27 | DRMRCI 114 | 41.6 | 34.8 | 16.3 | 48.4 | 46.0 | 4.9 | 50.5 | 43.4 | 14.1 | 44.4 | 43.0 | 3.2 |
| Phy-18-28 | RGN229 | 40.4 | 31.2 | 22.8 | 38.8 | 38.2 | 1.6 | 48.8 | 40.7 | 16.6 | 47.6 | 40.8 | 14.3 |
| Phy-18-29 | DRMR CI70 | 50.6 | 48.5 | 4.2 | 39.0 | 37.3 | 4.5 | 50.5 | 49.0 | 3.0 | 46.2 | 44.5 | 3.7 |
| Phy-18-30 | Kranti (NC) | 47.1 | 44.5 | 5.5 | 29.1 | 25.8 | 11.3 | 50.6 | 41.7 | 17.6 | 45.4 | 43.6 | 4.0 |
| Phy-18-31 | RGN 73 (ZC) | 50.9 | 49.2 | 3.3 | 29.7 | 29.3 | 1.6 | 51.6 | 45.8 | 11.2 | 42.8 | 41.6 | 2.8 |
| Phy-18-32 | RCH 1## | 41.2 | 33.9 | 17.7 | 38.8 | 35.0 | 9.9 | 48.8 | 40.5 | 17.0 | 42.0 | 41.6 | 1.0 |
| Phy-18-33 | RLC 3# | 41.9 | 34.2 | 18.4 | 45.1 | 37.0 | 17.9 | 50.4 | 41.8 | 17.1 | 43.9 | 39.5 | 10.0 |
| | **Mean** | **43.2** | **36.6** | | **37.6** | **34.0** | | **49.4** | **42.5** | | **46.1** | **43.5** | |
| | CD(p=0.05) | I=0.13 | | | I=4.53 | | | I=0.4 | | | I=0.614 | | |
| | | G=0.47 | | | G=1.117 | | | G=1.5 | | | G=2.56 | | |
| | | IxG=0.93 | | | IxG=NS | | | IxG=2.1 | | | IxG=3.63 | | |
| | | IR=Irrigated | RF=Rainfed | | | | | | | | | | |

## Table 6.3.2 Effect of moisture stress on relative water content (RWC %) in Indian mustard genotypes

| Code | Genotypes | RWC(%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) |
| Phy-18-1 | NPJ 214 | 78.9 | 68.3 | 13.4 | 60.0 | 56.2 | 6.4 | 69.6 | 63.7 | 8.5 | 76.1 | 57.6 | 24.3 |
| Phy-18-2 | LES 54 | 77.7 | 67.5 | 13.1 | 76.3 | 63.2 | 17.2 | 74.2 | 65.4 | 11.9 | 72.8 | 70.0 | 3.8 |
| Phy-18-3 | NPJ210 | 82.8 | 73.2 | 11.6 | 73.3 | 55.4 | 24.4 | 73.0 | 71.7 | 1.8 | 71.3 | 65.8 | 7.6 |
| Phy-18-4 | RB-100 | 74.5 | 64.9 | 12.9 | 69.5 | 57.3 | 17.6 | 68.8 | 61.3 | 10.9 | 87.6 | 63.6 | 27.5 |
| Phy-18-5 | 8IJ0117 | 74.6 | 64.8 | 13.1 | 70.9 | 51.4 | 27.5 | 70.5 | 60.6 | 14.0 | 80.7 | 72.4 | 10.3 |
| Phy-18-6 | RGN- 444 | 84.1 | 74.4 | 11.5 | 70.6 | 60.2 | 14.7 | 69.6 | 62.2 | 10.6 | 73.0 | 53.2 | 27.2 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 73.1 | 62.2 | 14.9 | 73.5 | 54.6 | 25.8 | 71.2 | 63.3 | 11.1 | 83.0 | 65.0 | 21.7 |
| Phy-18-8 | DRMRCI 95 | 84.7 | 75.1 | 11.3 | 70.2 | 56.2 | 20.0 | 74.3 | 64.4 | 13.3 | 77.1 | 63.6 | 17.6 |
| Phy-18-9 | NPJ-225 | 77.8 | 66.4 | 14.7 | 72.3 | 64.4 | 11.0 | 71.9 | 65.5 | 8.9 | 79.9 | 67.3 | 15.8 |
| Phy-18-10 | DRMR 2017-8 | 80.6 | 68.7 | 14.8 | 74.1 | 61.9 | 16.4 | 75.7 | 71.5 | 5.5 | 82.4 | 68.8 | 16.5 |
| Phy-18-11 | NPJ-226 | 75.2 | 65.5 | 12.9 | 70.5 | 55.0 | 21.9 | 70.4 | 61.0 | 13.4 | 77.8 | 60.3 | 22.5 |
| Phy-18-12 | RH 1424 | 76.5 | 66.6 | 12.9 | 63.7 | 55.2 | 13.4 | 75.6 | 62.5 | 17.3 | 72.8 | 57.8 | 20.6 |
| Phy-18-13 | RH 1584 | 74.9 | 64.9 | 13.4 | 72.3 | 55.6 | 23.1 | 72.2 | 67.6 | 6.4 | 79.6 | 58.0 | 27.2 |
| Phy-18-14 | PM-29 | 74.3 | 64.1 | 13.7 | 62.7 | 57.5 | 8.2 | 69.6 | 61.9 | 11.1 | 81.0 | 73.0 | 9.8 |
| Phy-18-15 | PM-30 | 72.4 | 61.7 | 14.8 | 71.4 | 51.7 | 27.5 | 72.2 | 67.6 | 6.4 | 72.0 | 64.4 | 10.5 |
| Phy-18-16 | RB-102 | 73.9 | 62.2 | 15.8 | 74.4 | 57.9 | 22.1 | 80.0 | 70.5 | 11.9 | 77.0 | 63.1 | 18.1 |
| Phy-18-17 | TM 179 | 87.3 | 77.9 | 10.8 | 74.7 | 57.1 | 23.5 | 72.9 | 66.6 | 8.6 | 77.2 | 69.8 | 9.5 |
| Phy-18-18 | PDZ 9 | 79.4 | 68.8 | 13.4 | 64.0 | 56.1 | 12.4 | 73.3 | 67.0 | 8.6 | 84.5 | 82.5 | 2.4 |
| Phy-18-19 | RH 1555 | 75.8 | 65.6 | 13.5 | 59.9 | 51.9 | 13.3 | 71.7 | 65.5 | 8.6 | 81.3 | 76.6 | 5.9 |
| Phy-18-20 | NPJ 211 | 76.6 | 66.3 | 13.4 | 79.1 | 65.0 | 17.8 | 71.5 | 63.7 | 10.9 | 78.5 | 77.6 | 1.1 |
| Phy-18-21 | LES 57 | 77.4 | 67.5 | 12.8 | 73.5 | 54.3 | 26.0 | 73.5 | 71.2 | 3.1 | 85.9 | 78.2 | 9.0 |
| Phy-18-22 | NPJ 212 | 77.8 | 68.2 | 12.3 | 77.2 | 56.2 | 27.1 | 74.3 | 64.2 | 13.6 | 89.0 | 81.3 | 8.6 |
| Phy-18-23 | NPJ216 | 71.4 | 58.9 | 17.5 | 67.9 | 52.0 | 23.4 | 72.5 | 71.8 | 1.0 | 82.5 | 76.0 | 7.9 |
| Phy-18-24 | RLC 7 | 72.3 | 60.6 | 16.2 | 78.4 | 63.3 | 19.3 | 73.3 | 70.5 | 3.8 | 78.1 | 77.0 | 1.5 |
| Phy-18-25 | DRMR 541-44 | 75.4 | 64.6 | 14.3 | 74.4 | 66.3 | 10.9 | 69.5 | 62.6 | 9.9 | 81.1 | 77.6 | 4.4 |
| Phy-18-26 | RH 749 (ZC) | 83.9 | 74.9 | 10.7 | 81.6 | 63.6 | 22.1 | 71.7 | 65.6 | 8.5 | 86.3 | 73.1 | 15.3 |
| Phy-18-27 | DRMRCI 114 | 75.9 | 65.1 | 14.2 | 62.8 | 56.0 | 10.8 | 70.2 | 64.4 | 8.3 | 81.6 | 76.9 | 5.8 |
| Phy-18-28 | RGN229 | 74.5 | 63.8 | 14.4 | 71.2 | 56.6 | 20.5 | 71.8 | 60.7 | 15.5 | 77.9 | 76.9 | 1.3 |
| Phy-18-29 | DRMR CI70 | 85.4 | 75.2 | 11.9 | 79.6 | 61.7 | 22.5 | 72.7 | 71.8 | 1.2 | 84.2 | 74.5 | 11.4 |
| Phy-18-30 | Kranti (NC) | 82.2 | 73.8 | 10.2 | 84.1 | 62.9 | 25.2 | 70.3 | 61.7 | 12.2 | 70.6 | 67.5 | 4.3 |
| Phy-18-31 | RGN 73 (ZC) | 86.5 | 76.5 | 11.6 | 68.0 | 61.6 | 9.4 | 69.9 | 60.6 | 13.3 | 74.5 | 70.4 | 5.5 |
| Phy-18-32 | RCH 1## | 75.2 | 64.4 | 14.4 | 59.9 | 52.2 | 12.7 | 69.7 | 61.8 | 11.3 | 73.0 | 63.8 | 12.6 |
| Phy-18-33 | RLC 3# | 75.9 | 65.5 | 13.7 | 74.5 | 51.4 | 31.0 | 68.5 | 60.9 | 11.1 | 78.2 | 72.8 | 6.9 |
| | **Mean** | **77.8** | **67.5** | | **71.4** | **57.6** | | **72.0** | **65.1** | | **79.0** | **69.6** | |
| | CD(p=0.05) | I=0.10 | | | I=9.41 | | | I=0.4 | | | I=2.54 | | |
| | | G=0.53 | | | G=2.32 | | | G=1.6 | | | G=10.6 | | |
| | | IxG=0.73 | | | IxG=NS | | | IxG=2.3 | | | IxG=15.03 | | |
| | | IR=Irrigated | RF=Rainfed | | | | | | | | | | |

**Table 6.3.3 Effect of moisture stress on canopy temperature (0C) at Hisar and Ludhiana**

| Code | Genotypes | Canopy temperature (0C) | | | |
|---|---|---|---|---|---|
| | | Hisar | | Ludhiana | |
| | | IR | RF | IR | RF |
| Phy-18-1 | NPJ 214 | 29.7 | 29.6 | 15.9 | 16.8 |
| Phy-18-2 | LES 54 | 28.6 | 28.6 | 16.7 | 16.4 |
| Phy-18-3 | NPJ210 | 29.1 | 33.3 | 15.4 | 15.3 |
| Phy-18-4 | RB-100 | 28.1 | 30.7 | 16.3 | 17.1 |
| Phy-18-5 | 8IJ0117 | 27.7 | 30.3 | 15.8 | 16.5 |
| Phy-18-6 | RGN- 444 | 27.5 | 29.6 | 16.3 | 15.3 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 27.7 | 30.4 | 14.9 | 15.1 |
| Phy-18-8 | DRMRCI 95 | 28.4 | 30.3 | 16.6 | 14.6 |
| Phy-18-9 | NPJ-225 | 29.1 | 28.8 | 15.7 | 14.5 |
| Phy-18-10 | DRMR 2017-8 | 28.4 | 31.2 | 17.1 | 16.0 |
| Phy-18-11 | NPJ-226 | 29.2 | 32.0 | 16.6 | 15.7 |
| Phy-18-12 | RH 1424 | 28.2 | 30.0 | 15.2 | 15.9 |
| Phy-18-13 | RH 1584 | 27.2 | 30.0 | 15.8 | 14.9 |
| Phy-18-14 | PM-29 | 30.6 | 30.5 | 16.1 | 15.1 |
| Phy-18-15 | PM-30 | 27.7 | 29.7 | 15.3 | 15.3 |
| Phy-18-16 | RB-102 | 27.8 | 29.8 | 15.4 | 15.3 |
| Phy-18-17 | TM 179 | 26.8 | 29.5 | 14.9 | 15.7 |
| Phy-18-18 | PDZ 9 | 28.5 | 29.9 | 15.3 | 15.5 |
| Phy-18-19 | RH 1555 | 29.2 | 29.0 | 15.2 | 17.5 |
| Phy-18-20 | NPJ 211 | 29.2 | 29.1 | 16.0 | 15.3 |
| Phy-18-21 | LES 57 | 30.3 | 30.0 | 16.1 | 17.2 |
| Phy-18-22 | NPJ 212 | 29.1 | 29.7 | 16.1 | 16.1 |
| Phy-18-23 | NPJ216 | 29.8 | 29.8 | 15.7 | 15.1 |
| Phy-18-24 | RLC 7 | 27.9 | 29.4 | 17.6 | 14.8 |
| Phy-18-25 | DRMR 541-44 | 27.4 | 29.2 | 14.3 | 15.9 |
| Phy-18-26 | RH 749 (ZC) | 28.3 | 28.8 | 16.7 | 14.4 |
| Phy-18-27 | DRMRCI 114 | 27.8 | 29.0 | 16.3 | 14.3 |
| Phy-18-28 | RGN229 | 28.9 | 29.0 | 15.5 | 14.8 |
| Phy-18-29 | DRMR CI70 | 27.1 | 28.3 | 15.6 | 15.0 |
| Phy-18-30 | Kranti (NC) | 29.5 | 30.0 | 15.3 | 15.2 |
| Phy-18-31 | RGN 73 (ZC) | 30.4 | 29.7 | 16.9 | 15.9 |
| Phy-18-32 | RCH 1## | 28.3 | 28.5 | 15.4 | 15.3 |
| Phy-18-33 | RLC 3# | 27.9 | 32.1 | 16.7 | 14.6 |
| | **Mean** | **28.5** | **29.9** | **15.9** | **15.5** |
| | CD(p=0.05) | I=0.781 | | I=0.168 | |
| | | G=0.192 | | G=0.706 | |
| | | IxG=1.104 | | IxG=0.998 | |
| | | | IR=Irrigated | RF=Rainfed | |

## Table 6.3.4 Effect of moisture stress on total chlorophyll content in siliqua wall in indian mustard genotypes

| Code | Genotypes | Total chlorophyll in siliqua wall (mg/gFW) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Ludhiana | | | Chlorophyll stability index | |
| | | IR | RF | Red(%) | IR | RF | Red(%) | Dholi | Ludhiana |
| Phy-18-1 | NPJ 214 | 1.40 | 1.20 | 13.4 | 0.56 | 0.22 | 61.4 | 0.86 | 0.39 |
| Phy-18-2 | LES 54 | 1.40 | 1.20 | 10.1 | 0.42 | 0.26 | 38.7 | 0.86 | 0.61 |
| Phy-18-3 | NPJ210 | 1.80 | 1.70 | 5.0 | 0.31 | 0.21 | 30.8 | 0.94 | 0.69 |
| Phy-18-4 | RB-100 | 1.00 | 0.90 | 8.1 | 0.42 | 0.27 | 36.1 | 0.90 | 0.64 |
| Phy-18-5 | 8IJ0117 | 1.30 | 1.10 | 11.1 | 0.22 | 0.14 | 33.5 | 0.85 | 0.67 |
| Phy-18-6 | RGN- 444 | 1.90 | 1.80 | 4.7 | 0.31 | 0.12 | 62.7 | 0.95 | 0.37 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 0.90 | 0.70 | 12.9 | 0.23 | 0.20 | 14.3 | 0.78 | 0.86 |
| Phy-18-8 | DRMRCI 95 | 2.00 | 1.90 | 4.6 | 0.25 | 0.24 | 4.8 | 0.95 | 0.95 |
| Phy-18-9 | NPJ-225 | 1.50 | 1.20 | 14.5 | 0.23 | 0.13 | 42.5 | 0.80 | 0.58 |
| Phy-18-10 | DRMR 2017-8 | 1.60 | 1.50 | 8.2 | 0.33 | 0.10 | 69.0 | 0.94 | 0.31 |
| Phy-18-11 | NPJ-226 | 1.10 | 1.00 | 11.6 | 0.27 | 0.23 | 12.8 | 0.91 | 0.87 |
| Phy-18-12 | RH 1424 | 1.30 | 1.10 | 12.6 | 0.28 | 0.10 | 63.3 | 0.85 | 0.37 |
| Phy-18-13 | RH 1584 | 1.00 | 0.90 | 11.5 | 0.26 | 0.17 | 35.4 | 0.90 | 0.65 |
| Phy-18-14 | PM-29 | 0.90 | 0.80 | 12.0 | 0.32 | 0.07 | 78.1 | 0.89 | 0.22 |
| Phy-18-15 | PM-30 | 0.90 | 0.80 | 13.8 | 0.30 | 0.11 | 64.6 | 0.89 | 0.35 |
| Phy-18-16 | RB-102 | 0.90 | 0.80 | 14.6 | 0.28 | 0.13 | 55.0 | 0.89 | 0.45 |
| Phy-18-17 | TM 179 | 2.30 | 2.20 | 3.9 | 0.29 | 0.08 | 72.4 | 0.96 | 0.28 |
| Phy-18-18 | PDZ 9 | 1.40 | 1.20 | 11.0 | 0.43 | 0.13 | 70.1 | 0.86 | 0.30 |
| Phy-18-19 | RH 1555 | 1.20 | 1.10 | 10.3 | 0.33 | 0.13 | 59.9 | 0.92 | 0.40 |
| Phy-18-20 | NPJ 211 | 1.30 | 1.10 | 14.4 | 0.21 | 0.11 | 50.5 | 0.85 | 0.50 |
| Phy-18-21 | LES 57 | 1.30 | 1.10 | 16.8 | 0.34 | 0.24 | 30.5 | 0.85 | 0.69 |
| Phy-18-22 | NPJ 212 | 1.40 | 1.10 | 20.3 | 0.44 | 0.33 | 23.4 | 0.79 | 0.77 |
| Phy-18-23 | NPJ216 | 0.80 | 0.70 | 16.5 | 0.42 | 0.28 | 34.7 | 0.88 | 0.65 |
| Phy-18-24 | RLC 7 | 0.80 | 0.70 | 14.6 | 0.76 | 0.40 | 47.5 | 0.88 | 0.53 |
| Phy-18-25 | DRMR 541-44 | 1.10 | 1.00 | 12.4 | 0.36 | 0.27 | 25.3 | 0.91 | 0.75 |
| Phy-18-26 | RH 749 (ZC) | 1.90 | 1.80 | 4.9 | 0.32 | 0.26 | 21.1 | 0.95 | 0.79 |
| Phy-18-27 | DRMRCI 114 | 1.20 | 1.10 | 13.2 | 0.40 | 0.24 | 39.4 | 0.92 | 0.61 |
| Phy-18-28 | RGN229 | 1.20 | 1.00 | 12.7 | 0.32 | 0.24 | 24.2 | 0.83 | 0.76 |
| Phy-18-29 | DRMR CI70 | 2.10 | 2.00 | 4.2 | 0.26 | 0.25 | 6.8 | 0.95 | 0.93 |
| Phy-18-30 | Kranti (NC) | 1.80 | 1.70 | 5.0 | 0.34 | 0.19 | 42.4 | 0.94 | 0.58 |
| Phy-18-31 | RGN 73 (ZC) | 2.20 | 2.10 | 4.1 | 0.33 | 0.23 | 30.8 | 0.95 | 0.69 |
| Phy-18-32 | RCH 1## | 1.10 | 0.90 | 14.5 | 0.44 | 0.38 | 13.9 | 0.82 | 0.86 |
| Phy-18-33 | RLC 3# | 1.80 | 1.60 | 8.5 | 0.35 | 0.24 | 30.5 | 0.89 | 0.69 |
| | **Mean** | **1.4** | **1.2** | | **0.34** | **0.20** | | **0.89** | **0.60** |
| | CD(p=0.05) | I=0.13 | | | I=0.0189 | | | | |
| | | G=0.20 | | | G=0.079 | | | | |
| | | IxG=NS | | | IxG=0.011 | | | | |
| | | IR=Irrigated | RF=Rainfed | | | | | | |

## Table 6.3.5 Effect of moisture stress on siliquae on main shoot at 4 locations

| Code | Genotypes | Siliquae on main shoot | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) |
| Phy-18-1 | NPJ 214 | 37.8 | 31.8 | 15.9 | 48.9 | 48.3 | 1.2 | 50.2 | 43.3 | 13.7 | 36.6 | 34.8 | 4.9 |
| Phy-18-2 | LES 54 | 36.7 | 31.7 | 13.6 | 67.0 | 55.5 | 17.2 | 59.1 | 54.0 | 8.6 | 48.6 | 44.4 | 8.6 |
| Phy-18-3 | NPJ210 | 40.9 | 39.1 | 4.4 | 61.0 | 46.2 | 24.3 | 58.0 | 55.0 | 5.2 | 39.1 | 37.3 | 4.6 |
| Phy-18-4 | RB-100 | 35.4 | 30.6 | 13.6 | 60.2 | 47.5 | 21.1 | 53.0 | 38.0 | 28.3 | 40.1 | 34.3 | 14.5 |
| Phy-18-5 | 8IJ0117 | 36.3 | 31.1 | 14.3 | 58.5 | 41.8 | 28.5 | 49.0 | 46.0 | 6.1 | 35.6 | 34.7 | 2.5 |
| Phy-18-6 | RGN- 444 | 42.1 | 40.4 | 4.0 | 50.5 | 48.3 | 4.3 | 56.0 | 43.0 | 23.2 | 42.9 | 40.6 | 5.4 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 34.7 | 29.1 | 16.1 | 55.0 | 40.0 | 27.4 | 53.2 | 43.2 | 18.8 | 47.3 | 38.9 | 17.8 |
| Phy-18-8 | DRMRCI 95 | 42.7 | 40.9 | 4.2 | 58.0 | 51.0 | 12.1 | 44.0 | 36.3 | 17.5 | 35.5 | 30.2 | 14.9 |
| Phy-18-9 | NPJ-225 | 37.4 | 31.9 | 14.7 | 58.2 | 57.7 | 0.9 | 57.7 | 51.2 | 11.3 | 44.2 | 38.6 | 12.7 |
| Phy-18-10 | DRMR 2017-8 | 38.2 | 32.4 | 15.2 | 52.5 | 51.0 | 2.9 | 43.3 | 37.2 | 14.1 | 42.5 | 30.6 | 28.0 |
| Phy-18-11 | NPJ-226 | 36.3 | 30.1 | 17.1 | 52.7 | 51.4 | 2.4 | 51.0 | 39.5 | 22.5 | 36.3 | 31.5 | 13.2 |
| Phy-18-12 | RH 1424 | 37.1 | 31.1 | 16.2 | 50.8 | 49.0 | 3.6 | 59.2 | 31.7 | 46.5 | 39.1 | 27.3 | 30.2 |
| Phy-18-13 | RH 1584 | 35.6 | 30.6 | 14.0 | 56.3 | 42.8 | 24.0 | 48.4 | 46.2 | 4.5 | 39.1 | 30.6 | 21.7 |
| Phy-18-14 | PM-29 | 35.1 | 30.5 | 13.1 | 60.2 | 59.7 | 0.8 | 56.6 | 52.2 | 7.8 | 41.3 | 35.7 | 13.6 |
| Phy-18-15 | PM-30 | 34.2 | 30.1 | 12.0 | 59.7 | 48.7 | 18.4 | 53.5 | 39.7 | 25.8 | 36.1 | 31.1 | 13.9 |
| Phy-18-16 | RB-102 | 34.9 | 30.8 | 11.7 | 45.0 | 43.2 | 4.1 | 46.2 | 39.5 | 14.5 | 47.0 | 38.1 | 18.9 |
| Phy-18-17 | TM 179 | 44.2 | 42.5 | 3.8 | 53.3 | 52.8 | 0.9 | 56.0 | 38.0 | 32.1 | 38.7 | 28.6 | 26.1 |
| Phy-18-18 | PDZ 9 | 38.6 | 32.9 | 14.8 | 60.0 | 44.7 | 25.6 | 47.0 | 43.0 | 8.5 | 42.1 | 40.1 | 4.8 |
| Phy-18-19 | RH 1555 | 36.1 | 31.5 | 12.7 | 43.5 | 43.3 | 0.5 | 61.0 | 49.5 | 18.9 | 42.7 | 33.9 | 20.6 |
| Phy-18-20 | NPJ 211 | 37.2 | 31.7 | 14.8 | 54.2 | 46.5 | 14.2 | 39.0 | 38.0 | 2.6 | 45.2 | 35.9 | 20.6 |
| Phy-18-21 | LES 57 | 37.7 | 33.1 | 12.2 | 58.7 | 45.0 | 23.3 | 53.3 | 50.7 | 4.9 | 38.9 | 38.3 | 1.5 |
| Phy-18-22 | NPJ 212 | 38.2 | 34.2 | 10.5 | 45.7 | 43.3 | 5.1 | 54.4 | 46.6 | 14.3 | 39.6 | 33.5 | 15.4 |
| Phy-18-23 | NPJ216 | 33.9 | 29.9 | 11.8 | 48.3 | 45.0 | 6.9 | 56.0 | 53.0 | 5.4 | 39.7 | 36.5 | 8.1 |
| Phy-18-24 | RLC 7 | 34.2 | 30.6 | 10.5 | 53.3 | 41.8 | 21.6 | 41.5 | 38.2 | 8.0 | 36.8 | 35.7 | 3.0 |
| Phy-18-25 | DRMR 541-44 | 35.3 | 31.5 | 10.8 | 55.3 | 45.2 | 18.4 | 41.0 | 38.0 | 7.3 | 44.6 | 34.1 | 23.5 |
| Phy-18-26 | RH 749 (ZC) | 41.8 | 40.0 | 4.3 | 58.3 | 54.0 | 7.4 | 55.3 | 41.2 | 25.5 | 37.4 | 31.1 | 16.8 |
| Phy-18-27 | DRMRCI 114 | 35.6 | 31.3 | 12.1 | 59.3 | 52.7 | 11.2 | 46.3 | 37.2 | 19.7 | 35.9 | 29.7 | 17.3 |
| Phy-18-28 | RGN229 | 35.1 | 31.2 | 11.1 | 60.7 | 57.3 | 5.5 | 58.2 | 41.0 | 29.6 | 47.1 | 30.4 | 35.5 |
| Phy-18-29 | DRMR CI70 | 43.1 | 41.3 | 4.2 | 48.5 | 48.3 | 0.5 | 54.0 | 51.0 | 5.6 | 37.7 | 36.9 | 2.1 |
| Phy-18-30 | Kranti (NC) | 40.6 | 38.7 | 4.7 | 46.0 | 42.7 | 7.3 | 58.8 | 53.0 | 9.9 | 41.7 | 39.0 | 6.5 |
| Phy-18-31 | RGN 73 (ZC) | 43.9 | 42.2 | 3.9 | 51.0 | 46.3 | 9.2 | 56.0 | 55.0 | 1.8 | 41.4 | 33.6 | 18.8 |
| Phy-18-32 | RCH 1## | 37.2 | 34.2 | 8.1 | 64.7 | 56.2 | 13.1 | 59.0 | 43.7 | 25.9 | 53.1 | 50.1 | 5.6 |
| Phy-18-33 | RLC 3# | 37.8 | 34.9 | 7.7 | 53.3 | 40.8 | 23.5 | 41.5 | 38.2 | 8.0 | 48.2 | 46.2 | 4.1 |
| | **Mean** | **37.8** | **33.8** | | **54.8** | **48.1** | | **52.0** | **43.9** | | **41.3** | **35.5** | |
| | CD(p=0.05) | I=0.7 | | | I=1.509 | | | I=1.0 | | | I=0.66 | | |
| | | G=2.11 | | | G=6.131 | | | G=4.2 | | | G=2.76 | | |
| | | IxG=2.76 | | | IxG=8.671 | | | IxG=6.0 | | | IxG=3.90 | | |
| | | IR=Irrigated | RF=Rainfed | | | | | | | | | | |

## Table 6.3.6 Effect of moisture stress on seeds per siliqua at 4 locations in Indian mustard genotypes

| Code | Genotypes | Seeds/siliqua | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) |
| Phy-18-1 | NPJ 214 | 10.5 | 9.6 | 8.6 | 13.9 | 13.4 | 0.8 | 17.1 | 16.2 | 5.3 | 13.6 | 11.1 | 18.4 |
| Phy-18-2 | LES 54 | 10.2 | 9.4 | 7.8 | 15.1 | 13.5 | 10.9 | 17.4 | 16.1 | 7.5 | 13.9 | 12.3 | 11.5 |
| Phy-18-3 | NPJ210 | 12.4 | 11.5 | 7.3 | 15.1 | 14.5 | 5.2 | 16.8 | 16.0 | 4.8 | 12.4 | 12.0 | 3.2 |
| Phy-18-4 | RB-100 | 9.6 | 8.2 | 14.6 | 14.5 | 13.6 | 4.5 | 17.1 | 13.4 | 21.6 | 14.1 | 11.1 | 21.3 |
| Phy-18-5 | 8IJ0117 | 9.7 | 8.5 | 12.4 | 16.2 | 13.9 | 16.8 | 15.8 | 14.4 | 8.9 | 13.9 | 13.9 | 0.0 |
| Phy-18-6 | RGN- 444 | 12.8 | 12.0 | 6.3 | 14.3 | 14.1 | 1.2 | 15.8 | 15.2 | 3.8 | 13.6 | 12.9 | 5.1 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 9.4 | 8.4 | 10.6 | 12.7 | 11.3 | 16.4 | 15.8 | 14.9 | 5.7 | 13.1 | 12.4 | 5.3 |
| Phy-18-8 | DRMRCI 95 | 13.1 | 12.3 | 6.1 | 15.1 | 14.4 | 7.3 | 16.8 | 13.9 | 17.3 | 13.1 | 12.5 | 4.6 |
| Phy-18-9 | NPJ-225 | 10.3 | 9.2 | 10.7 | 14.8 | 14.8 | 0.1 | 16.8 | 15.9 | 5.4 | 11.9 | 11.5 | 3.4 |
| Phy-18-10 | DRMR 2017-8 | 10.7 | 9.9 | 7.5 | 14.9 | 13.1 | 9.2 | 16.3 | 14.9 | 8.6 | 13.5 | 13.3 | 1.5 |
| Phy-18-11 | NPJ-226 | 9.8 | 8.9 | 9.2 | 12.9 | 12.4 | 1.6 | 15.7 | 14.9 | 5.1 | 13.4 | 13.0 | 3.0 |
| Phy-18-12 | RH 1424 | 10.1 | 9.2 | 8.9 | 14.2 | 13.5 | 1.6 | 16.5 | 12.9 | 21.8 | 12.3 | 11.6 | 5.7 |
| Phy-18-13 | RH 1584 | 9.9 | 9.0 | 9.1 | 14.0 | 11.9 | 12.1 | 15.9 | 14.9 | 6.3 | 14.5 | 12.9 | 11.0 |
| Phy-18-14 | PM-29 | 9.6 | 8.4 | 12.5 | 13.2 | 12.7 | 3.0 | 17.1 | 16.8 | 1.8 | 12.3 | 11.8 | 4.1 |
| Phy-18-15 | PM-30 | 9.3 | 8.3 | 10.8 | 13.9 | 13.2 | 5.7 | 17.1 | 16.8 | 1.8 | 13.6 | 12.3 | 9.6 |
| Phy-18-16 | RB-102 | 9.4 | 8.3 | 11.7 | 14.0 | 13.8 | 1.8 | 16.2 | 14.8 | 8.6 | 13.4 | 12.8 | 4.5 |
| Phy-18-17 | TM 179 | 14.5 | 13.9 | 4.1 | 13.3 | 12.4 | 5.4 | 15.6 | 14.3 | 8.3 | 13.8 | 10.6 | 23.2 |
| Phy-18-18 | PDZ 9 | 10.9 | 9.9 | 9.2 | 14.0 | 12.9 | 9.9 | 16.9 | 13.5 | 20.1 | 13.9 | 13.0 | 6.5 |
| Phy-18-19 | RH 1555 | 9.8 | 8.8 | 10.2 | 13.2 | 13.1 | 1.0 | 16.9 | 15.8 | 6.5 | 12.5 | 12.5 | 0.0 |
| Phy-18-20 | NPJ 211 | 10.0 | 9.0 | 10.0 | 13.5 | 12.3 | 8.3 | 17.0 | 15.8 | 7.1 | 14.4 | 12.6 | 12.5 |
| Phy-18-21 | LES 57 | 10.6 | 9.4 | 11.3 | 15.6 | 11.8 | 23.9 | 17.0 | 16.6 | 2.4 | 13.4 | 11.6 | 13.4 |
| Phy-18-22 | NPJ 212 | 10.7 | 9.7 | 9.3 | 14.5 | 12.1 | 17.0 | 16.2 | 14.3 | 11.7 | 12.1 | 10.7 | 11.6 |
| Phy-18-23 | NPJ216 | 9.1 | 8.0 | 12.1 | 13.6 | 12.5 | 10.8 | 17.1 | 16.4 | 4.1 | 13.8 | 11.1 | 19.6 |
| Phy-18-24 | RLC 7 | 9.3 | 8.1 | 12.9 | 12.8 | 12.3 | 3.3 | 15.3 | 13.6 | 11.1 | 13.7 | 13.2 | 3.6 |
| Phy-18-25 | DRMR 541-44 | 9.7 | 8.6 | 11.3 | 13.6 | 12.5 | 7.9 | 14.1 | 13.6 | 3.5 | 14.5 | 13.9 | 4.1 |
| Phy-18-26 | RH 749 (ZC) | 12.5 | 11.5 | 8.0 | 12.9 | 11.6 | 8.7 | 15.7 | 15.0 | 4.5 | 13.2 | 12.6 | 4.5 |
| Phy-18-27 | DRMRCI 114 | 9.9 | 8.9 | 10.1 | 13.4 | 11.8 | 10.1 | 17.4 | 16.2 | 6.9 | 11.7 | 11.2 | 4.3 |
| Phy-18-28 | RGN229 | 9.5 | 8.4 | 11.6 | 14.4 | 13.3 | 11.3 | 16.3 | 14.6 | 10.4 | 11.9 | 11.8 | 0.8 |
| Phy-18-29 | DRMR CI70 | 13.6 | 12.9 | 5.1 | 15.4 | 14.7 | 3.4 | 16.8 | 16.2 | 3.6 | 13.8 | 13.6 | 1.4 |
| Phy-18-30 | Kranti (NC) | 11.8 | 10.9 | 7.6 | 13.9 | 12.7 | 7.1 | 17.1 | 16.9 | 1.2 | 14.7 | 13.2 | 10.2 |
| Phy-18-31 | RGN 73 (ZC) | 13.9 | 13.2 | 5.0 | 14.0 | 13.7 | 1.4 | 16.9 | 14.4 | 14.8 | 15.4 | 13.0 | 15.6 |
| Phy-18-32 | RCH 1## | 9.6 | 8.3 | 13.5 | 14.5 | 13.8 | 4.2 | 16.9 | 15.3 | 9.5 | 15.5 | 14.4 | 7.1 |
| Phy-18-33 | RLC 3# | 9.7 | 8.4 | 13.4 | 14.8 | 12.6 | 16.6 | 16.0 | 14.2 | 11.3 | 15.8 | 13.6 | 13.9 |
| | **Mean** | **10.7** | **9.7** | | **14.1** | **13.0** | | **16.4** | **15.4** | | **13.5** | **12.4** | |
| | CD(p=0.05) | I=0.26 | | | I=0.808 | | | I=0.1 | | | I=0.174 | | |
| | | G=1.05 | | | G=0.199 | | | G=0.6 | | | G=0.184 | | |
| | | IxG=1.48 | | | IxG=1.143 | | | IxG=0.8 | | | IxG=1.15 | | |
| | | IR=Irrigated | RF=Rainfed | | | | | | | | | | |

## Table 6.3.7 Effect of moisture stress on 1000 seed weight in Indian mustard genotypes

| Code | Genotypes | Seed weight (g) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) |
| Phy-18-1 | NPJ 214 | 4.7 | 4.1 | 12.8 | 4.7 | 4.7 | 1.5 | 4.8 | 4.1 | 14.9 | 5.5 | 5.3 | 3.6 |
| Phy-18-2 | LES 54 | 4.6 | 4.0 | 13.0 | 3.8 | 3.4 | 10.6 | 4.4 | 3.2 | 27.5 | 4.6 | 3.8 | 17.4 |
| Phy-18-3 | NPJ210 | 5.3 | 4.7 | 11.3 | 4.4 | 4.2 | 4.2 | 4.9 | 4.7 | 4.0 | 4.6 | 4.3 | 6.5 |
| Phy-18-4 | RB-100 | 4.1 | 3.5 | 14.6 | 4.5 | 4.3 | 5.7 | 4.3 | 4.1 | 4.2 | 4.8 | 4.8 | 0.0 |
| Phy-18-5 | 8IJ0117 | 4.4 | 3.6 | 18.2 | 5.4 | 3.9 | 28.4 | 4.7 | 4.3 | 7.3 | 5.7 | 5.3 | 7.0 |
| Phy-18-6 | RGN- 444 | 5.4 | 4.9 | 9.3 | 5.2 | 4.8 | 8.2 | 4.8 | 3.3 | 32.2 | 6.0 | 5.4 | 10.0 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 4.9 | 3.9 | 20.4 | 5.5 | 3.4 | 38.5 | 4.0 | 3.3 | 16.2 | 4.5 | 4.1 | 8.9 |
| Phy-18-8 | DRMRCI 95 | 5.5 | 5.0 | 9.1 | 6.3 | 5.4 | 14.7 | 4.7 | 4.3 | 8.5 | 5.8 | 5.2 | 10.3 |
| Phy-18-9 | NPJ-225 | 5.0 | 4.1 | 18.0 | 5.2 | 5.2 | 1.1 | 5.1 | 4.4 | 13.7 | 5.2 | 5.1 | 1.9 |
| Phy-18-10 | DRMR 2017-8 | 5.1 | 4.4 | 13.7 | 4.9 | 4.1 | 15.9 | 4.4 | 4.2 | 5.9 | 6.1 | 5.6 | 8.2 |
| Phy-18-11 | NPJ-226 | 4.0 | 3.3 | 17.5 | 4.9 | 4.7 | 3.6 | 4.5 | 2.6 | 42.6 | 5.7 | 5.4 | 5.3 |
| Phy-18-12 | RH 1424 | 4.2 | 3.4 | 19.0 | 5.8 | 4.4 | 25.2 | 4.2 | 2.7 | 36.2 | 5.0 | 4.3 | 14.0 |
| Phy-18-13 | RH 1584 | 4.3 | 3.4 | 20.9 | 6.2 | 4.4 | 29.6 | 4.6 | 4.4 | 2.6 | 5.0 | 4.8 | 4.0 |
| Phy-18-14 | PM-29 | 4.2 | 3.3 | 21.4 | 6.2 | 6.0 | 3.4 | 4.5 | 4.3 | 5.3 | 5.0 | 4.7 | 6.0 |
| Phy-18-15 | PM-30 | 3.7 | 2.9 | 21.6 | 6.1 | 5.6 | 8.1 | 5.5 | 4.5 | 18.3 | 6.1 | 4.6 | 24.6 |
| Phy-18-16 | RB-102 | 3.8 | 3.1 | 18.4 | 4.0 | 3.6 | 9.8 | 4.3 | 4.1 | 6.0 | 5.2 | 5.0 | 3.8 |
| Phy-18-17 | TM 179 | 5.7 | 5.3 | 7.0 | 6.2 | 6.0 | 3.2 | 5.3 | 4.3 | 18.5 | 6.1 | 5.0 | 18.0 |
| Phy-18-18 | PDZ 9 | 4.8 | 4.1 | 14.6 | 5.4 | 3.9 | 28.3 | 5.3 | 2.7 | 50.2 | 4.1 | 3.4 | 17.1 |
| Phy-18-19 | RH 1555 | 4.3 | 3.7 | 14.0 | 5.7 | 5.7 | 0.7 | 4.6 | 4.1 | 11.6 | 5.3 | 5.2 | 1.9 |
| Phy-18-20 | NPJ 211 | 4.4 | 3.7 | 15.9 | 6.4 | 5.8 | 9.5 | 5.2 | 4.3 | 16.9 | 5.9 | 5.9 | 0.0 |
| Phy-18-21 | LES 57 | 4.5 | 3.8 | 15.6 | 6.9 | 4.6 | 33.2 | 5.0 | 4.7 | 5.2 | 5.2 | 4.4 | 15.4 |
| Phy-18-22 | NPJ 212 | 4.5 | 3.9 | 13.3 | 5.6 | 5.0 | 10.3 | 5.0 | 4.3 | 14.4 | 5.5 | 4.7 | 14.5 |
| Phy-18-23 | NPJ216 | 3.6 | 3.0 | 16.7 | 5.7 | 4.3 | 24.2 | 5.0 | 4.8 | 3.2 | 4.2 | 4.0 | 4.8 |
| Phy-18-24 | RLC 7 | 3.8 | 2.9 | 23.7 | 5.0 | 2.9 | 42.6 | 4.1 | 3.1 | 24.4 | 4.5 | 3.6 | 20.0 |
| Phy-18-25 | DRMR 541-44 | 3.9 | 3.3 | 15.4 | 6.5 | 3.9 | 39.2 | 4.4 | 3.6 | 18.6 | 4.9 | 4.5 | 8.2 |
| Phy-18-26 | RH 749 (ZC) | 5.1 | 4.6 | 9.8 | 6.5 | 5.9 | 9.5 | 5.1 | 4.7 | 7.4 | 5.8 | 5.1 | 12.1 |
| Phy-18-27 | DRMRCI 114 | 4.3 | 3.7 | 14.0 | 4.9 | 4.8 | 1.6 | 4.6 | 4.3 | 5.7 | 5.1 | 4.9 | 3.9 |
| Phy-18-28 | RGN229 | 4.1 | 3.3 | 19.5 | 5.3 | 5.1 | 3.1 | 4.3 | 4.2 | 3.7 | 4.9 | 4.8 | 2.0 |
| Phy-18-29 | DRMR CI70 | 5.6 | 5.1 | 8.9 | 6.0 | 4.5 | 25.4 | 5.0 | 4.8 | 4.4 | 4.9 | 4.9 | 0.0 |
| Phy-18-30 | Kranti (NC) | 5.3 | 4.5 | 15.1 | 5.6 | 4.4 | 20.8 | 4.2 | 3.5 | 15.7 | 4.2 | 4.1 | 2.4 |
| Phy-18-31 | RGN 73 (ZC) | 5.7 | 5.2 | 8.8 | 4.8 | 4.8 | 0.2 | 4.6 | 3.6 | 21.1 | 4.8 | 4.7 | 2.1 |
| Phy-18-32 | RCH 1## | 4.2 | 3.4 | 19.0 | 4.2 | 3.1 | 26.0 | 4.1 | 3.5 | 14.2 | 3.6 | 3.1 | 13.9 |
| Phy-18-33 | RLC 3# | 4.4 | 3.5 | 20.5 | 5.1 | 2.7 | 47.0 | 4.2 | 3.6 | 14.4 | 3.6 | 3.5 | 2.8 |
| | **Mean** | **4.6** | **3.9** | | **5.4** | **4.5** | | **4.6** | **4.0** | | **5.1** | **4.7** | |
| | CD(p=0.05) | I=0.046 | | | I=0.806 | | | I=0.06 | | | I=0.101 | | |
| | | G=0.169 | | | G=0.198 | | | G=0.23 | | | G=.378 | | |
| | | IxG=0.234 | | | IxG=1.140 | | | IxG=0.33 | | | IxG=.534 | | |
| | | IR=Irrigated | RF=Rainfed | | | | | | | | | | |

## Table 6.3.8 Effect of moisture stress on biological yield at 4 locations in Indian mustard genotypes

| Code | Genotypes | Bilogical yield | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi (kg/ha) | | | Hisar (g/plant) | | | Kanpur(g/plant) | | | Ludhiana(kg/ha) | | |
| | | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) |
| Phy-18-1 | NPJ 214 | 3267 | 2997 | 8.2 | 143.3 | 137.5 | 4.1 | 130.0 | 125.0 | 3.8 | 6000 | 5467 | 8.9 |
| Phy-18-2 | LES 54 | 3232 | 2963 | 8.3 | 200.2 | 152.0 | 24.1 | 148.3 | 113.3 | 23.6 | 7778 | 6444 | 17.2 |
| Phy-18-3 | NPJ210 | 3723 | 3453 | 7.2 | 134.3 | 89.0 | 33.8 | 140.3 | 131.7 | 6.1 | 6889 | 6133 | 11.0 |
| Phy-18-4 | RB-100 | 3003 | 2739 | 8.8 | 122.0 | 76.7 | 37.2 | 100.0 | 46.7 | 53.3 | 8311 | 6933 | 16.6 |
| Phy-18-5 | 8IJ0117 | 3032 | 2765 | 8.8 | 101.5 | 64.8 | 36.1 | 95.0 | 70.0 | 26.3 | 6622 | 5333 | 19.5 |
| Phy-18-6 | RGN- 444 | 3765 | 3504 | 6.9 | 125.0 | 111.0 | 11.2 | 100.0 | 51.7 | 48.3 | 8008 | 7289 | 9.0 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 2843 | 2549 | 10.3 | 167.8 | 105.9 | 36.9 | 150.0 | 66.7 | 55.5 | 8267 | 7564 | 8.5 |
| Phy-18-8 | DRMRCI 95 | 3795 | 3549 | 6.5 | 120.2 | 77.5 | 35.5 | 85.0 | 38.3 | 54.9 | 5858 | 5556 | 5.2 |
| Phy-18-9 | NPJ-225 | 3195 | 2883 | 9.8 | 97.0 | 94.3 | 2.8 | 103.3 | 76.7 | 25.8 | 6489 | 5778 | 11.0 |
| Phy-18-10 | DRMR 2017-8 | 3251 | 2944 | 9.4 | 110.0 | 90.8 | 17.4 | 104.0 | 50.0 | 51.9 | 9067 | 8107 | 10.6 |
| Phy-18-11 | NPJ-226 | 3024 | 2757 | 8.8 | 107.0 | 80.3 | 24.9 | 114.7 | 38.3 | 66.6 | 7378 | 5689 | 22.9 |
| Phy-18-12 | RH 1424 | 3061 | 2808 | 8.3 | 128.2 | 83.9 | 34.6 | 150.0 | 38.3 | 74.5 | 6267 | 4809 | 23.3 |
| Phy-18-13 | RH 1584 | 2995 | 2781 | 7.1 | 150.7 | 82.3 | 45.4 | 160.0 | 116.7 | 27.1 | 6978 | 6880 | 1.4 |
| Phy-18-14 | PM-29 | 2973 | 2749 | 7.5 | 128.2 | 121.2 | 5.5 | 128.3 | 83.3 | 35.1 | 7067 | 5982 | 15.4 |
| Phy-18-15 | PM-30 | 2875 | 2549 | 11.3 | 151.2 | 135.8 | 10.1 | 113.3 | 76.7 | 32.3 | 7200 | 6782 | 5.8 |
| Phy-18-16 | RB-102 | 2925 | 2576 | 11.9 | 109.2 | 92.5 | 15.3 | 120.7 | 76.7 | 36.5 | 7911 | 7067 | 10.7 |
| Phy-18-17 | TM 179 | 4680 | 4408 | 5.8 | 83.3 | 76.7 | 8.0 | 98.3 | 60.0 | 39.0 | 7022 | 6111 | 13.0 |
| Phy-18-18 | PDZ 9 | 3275 | 2955 | 9.8 | 133.3 | 99.2 | 25.6 | 138.0 | 53.3 | 61.4 | 7022 | 4933 | 29.7 |
| Phy-18-19 | RH 1555 | 3021 | 2728 | 9.7 | 98.3 | 95.2 | 3.2 | 123.3 | 85.0 | 31.1 | 6667 | 5920 | 11.2 |
| Phy-18-20 | NPJ 211 | 3053 | 2667 | 12.7 | 109.2 | 77.5 | 29.0 | 120.0 | 83.3 | 30.6 | 7511 | 5556 | 26.0 |
| Phy-18-21 | LES 57 | 3072 | 2757 | 10.2 | 180.5 | 104.8 | 42.0 | 141.7 | 133.3 | 5.9 | 7022 | 5956 | 15.2 |
| Phy-18-22 | NPJ 212 | 3107 | 2840 | 8.6 | 114.5 | 83.5 | 27.1 | 100.0 | 81.7 | 18.3 | 6267 | 5644 | 9.9 |
| Phy-18-23 | NPJ216 | 2728 | 2363 | 13.4 | 113.2 | 81.7 | 27.8 | 136.7 | 125.0 | 8.6 | 5289 | 4889 | 7.6 |
| Phy-18-24 | RLC 7 | 2779 | 2379 | 14.4 | 116.7 | 93.5 | 19.9 | 146.7 | 108.3 | 26.2 | 6222 | 6044 | 2.9 |
| Phy-18-25 | DRMR 541-44 | 3011 | 2688 | 10.7 | 102.7 | 96.7 | 5.8 | 130.0 | 70.0 | 46.2 | 8311 | 8178 | 1.6 |
| Phy-18-26 | RH 749 (ZC) | 3736 | 3472 | 7.1 | 85.8 | 81.7 | 4.9 | 112.2 | 90.0 | 19.8 | 8311 | 7022 | 15.5 |
| Phy-18-27 | DRMRCI 114 | 3043 | 2723 | 10.5 | 108.3 | 88.3 | 18.5 | 115.7 | 78.3 | 32.3 | 8044 | 7067 | 12.1 |
| Phy-18-28 | RGN229 | 2976 | 2669 | 10.3 | 127.3 | 92.2 | 27.6 | 108.3 | 93.3 | 13.9 | 7422 | 7067 | 4.8 |
| Phy-18-29 | DRMR CI70 | 3867 | 3629 | 6.1 | 109.7 | 95.8 | 12.6 | 146.7 | 133.3 | 9.1 | 7267 | 5800 | 20.2 |
| Phy-18-30 | Kranti (NC) | 3683 | 3416 | 7.2 | 83.2 | 80.2 | 3.6 | 125.0 | 93.3 | 25.4 | 7360 | 6578 | 10.6 |
| Phy-18-31 | RGN 73 (ZC) | 4000 | 3765 | 5.9 | 110.0 | 107.3 | 2.4 | 123.3 | 50.0 | 59.4 | 9333 | 7622 | 18.3 |
| Phy-18-32 | RCH 1## | 3005 | 2685 | 10.6 | 176.7 | 127.0 | 28.1 | 70.0 | 55.0 | 21.4 | 9945 | 9200 | 7.5 |
| Phy-18-33 | RLC 3# | 3029 | 2659 | 12.2 | 172.0 | 106.5 | 38.1 | 116.0 | 95.0 | 18.1 | 6489 | 6222 | 4.1 |
| | **Mean** | **3243** | **2951** | | **124.9** | **96.5** | | **120.6** | **81.5** | | **7321** | **6413** | |
| | CD(p=0.05) | I=52.7 | | | I=19.03 | | | I=1.5 | | | I=33.5 | | |
| | | G=133.6 | | | G=4.668 | | | G=6.0 | | | G=158.6 | | |
| | | IxG=189.3 | | | IxG=26.91 | | | IxG=8.5 | | | IxG=190.0 | | |
| | | IR=Irrigated | RF=Rainfed | | | | | | | | | | |

## Table 6.3.9 Effect of moisture stress on Seed yield at 4 locations in Indian mustard genotypes

| Code | Genotypes | Seed Yield | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi (kg/ha) | | | Hisar (g/plant) | | | Kanpur(g/plant) | | | Ludhiana (kg/ha) | | |
| | | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) | IR | RF | Red(%) |
| Phy-18-1 | NPJ 214 | 941 | 760 | 19.3 | 29.2 | 28.4 | 2.6 | 30.6 | 23.9 | 21.9 | 1359 | 1202 | 11.6 |
| Phy-18-2 | LES 54 | 920 | 747 | 18.8 | 27.7 | 19.1 | 30.9 | 35.7 | 27.1 | 24.1 | 1676 | 1412 | 15.8 |
| Phy-18-3 | NPJ210 | 1080 | 928 | 14.1 | 28.6 | 18.5 | 35.3 | 35.4 | 30.9 | 12.7 | 1762 | 1681 | 4.6 |
| Phy-18-4 | RB-100 | 824 | 701 | 14.9 | 21.5 | 20.1 | 6.8 | 19.6 | 7.8 | 60.2 | 1988 | 1412 | 29.0 |
| Phy-18-5 | 8IJ0117 | 851 | 680 | 20.1 | 32.6 | 18.0 | 44.8 | 21.4 | 14.9 | 30.4 | 1644 | 1242 | 24.5 |
| Phy-18-6 | RGN- 444 | 1157 | 1008 | 12.9 | 31.1 | 24.6 | 20.9 | 19.1 | 8.8 | 53.9 | 2102 | 2047 | 2.6 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 779 | 533 | 31.5 | 38.8 | 21.3 | 45.2 | 34 | 12.7 | 62.6 | 2108 | 1821 | 13.6 |
| Phy-18-8 | DRMRCI 95 | 1216 | 1069 | 12.1 | 27.8 | 16.8 | 39.6 | 19.1 | 7.5 | 60.7 | 1442 | 1091 | 24.3 |
| Phy-18-9 | NPJ-225 | 920 | 741 | 19.4 | 25.1 | 24.8 | 1.0 | 19.2 | 12.7 | 33.9 | 1545 | 1346 | 12.9 |
| Phy-18-10 | DRMR 2017-8 | 971 | 816 | 15.9 | 32.4 | 17.4 | 46.3 | 18.3 | 7.3 | 60.1 | 2220 | 1669 | 24.8 |
| Phy-18-11 | NPJ-226 | 848 | 696 | 17.9 | 24.9 | 21.3 | 14.4 | 18 | 5.2 | 71.1 | 1743 | 1347 | 22.7 |
| Phy-18-12 | RH 1424 | 885 | 701 | 20.8 | 26.3 | 15.8 | 40.2 | 31.4 | 5.4 | 82.8 | 1385 | 1137 | 17.9 |
| Phy-18-13 | RH 1584 | 827 | 667 | 19.4 | 43.6 | 22.4 | 48.6 | 36.9 | 21.5 | 41.7 | 1616 | 1589 | 1.7 |
| Phy-18-14 | PM-29 | 813 | 659 | 19.0 | 28.4 | 27.5 | 2.9 | 24 | 14.2 | 40.8 | 1378 | 1258 | 8.7 |
| Phy-18-15 | PM-30 | 765 | 613 | 19.9 | 24.8 | 22.0 | 11.5 | 20.9 | 12.3 | 41.1 | 1648 | 1421 | 13.8 |
| Phy-18-16 | RB-102 | 797 | 635 | 20.4 | 23.4 | 22.3 | 4.9 | 24.7 | 14.7 | 40.5 | 1756 | 1687 | 3.9 |
| Phy-18-17 | TM 179 | 1371 | 1259 | 8.2 | 25.3 | 14.3 | 43.8 | 20.8 | 9.6 | 53.8 | 1356 | 1298 | 4.3 |
| Phy-18-18 | PDZ 9 | 984 | 832 | 15.4 | 32.2 | 22.1 | 31.4 | 32.3 | 9.0 | 74.0 | 1737 | 1196 | 31.1 |
| Phy-18-19 | RH 1555 | 840 | 688 | 18.1 | 23.4 | 22.4 | 4.1 | 27.5 | 13.7 | 50.2 | 1612 | 1412 | 12.4 |
| Phy-18-20 | NPJ 211 | 856 | 675 | 21.2 | 23.5 | 21.2 | 9.8 | 27.1 | 14.6 | 46.1 | 1892 | 1214 | 35.8 |
| Phy-18-21 | LES 57 | 875 | 669 | 23.5 | 31.1 | 16.3 | 47.7 | 35.2 | 30.5 | 13.4 | 1593 | 1223 | 23.2 |
| Phy-18-22 | NPJ 212 | 883 | 683 | 22.7 | 29.8 | 18.1 | 39.2 | 22.3 | 14.7 | 34.1 | 1356 | 1058 | 22.0 |
| Phy-18-23 | NPJ216 | 560 | 427 | 23.8 | 33.6 | 20.9 | 37.9 | 33.7 | 28.5 | 15.4 | 1157 | 1050 | 9.2 |
| Phy-18-24 | RLC 7 | 608 | 464 | 23.7 | 30.0 | 20.1 | 33.1 | 32.3 | 22.1 | 31.6 | 1533 | 1358 | 11.4 |
| Phy-18-25 | DRMR 541-44 | 832 | 643 | 22.8 | 28.6 | 21.1 | 26.4 | 22.1 | 10.3 | 53.4 | 1990 | 1947 | 2.2 |
| Phy-18-26 | RH 749 (ZC) | 1091 | 939 | 13.9 | 23.7 | 16.8 | 28.9 | 28.6 | 20.6 | 28.0 | 2033 | 1472 | 27.6 |
| Phy-18-27 | DRMRCI 114 | 851 | 680 | 20.1 | 23.7 | 19.5 | 17.6 | 25.1 | 14.6 | 41.8 | 1711 | 1498 | 12.4 |
| Phy-18-28 | RGN229 | 813 | 643 | 21.0 | 32.6 | 23.3 | 28.4 | 26.1 | 18.7 | 28.4 | 1540 | 1493 | 3.1 |
| Phy-18-29 | DRMR CI70 | 1349 | 1232 | 8.7 | 27.7 | 24.8 | 10.2 | 34.2 | 30.2 | 11.7 | 1723 | 1612 | 6.4 |
| Phy-18-30 | Kranti (NC) | 1069 | 917 | 14.2 | 29.7 | 18.5 | 37.7 | 28.1 | 17.3 | 38.4 | 1876 | 1660 | 11.5 |
| Phy-18-31 | RGN 73 (ZC) | 1357 | 1245 | 8.3 | 26.1 | 25.8 | 1.2 | 23.2 | 7.9 | 65.9 | 2105 | 1924 | 8.6 |
| Phy-18-32 | RCH 1## | 829 | 661 | 20.3 | 31.5 | 19.8 | 37.3 | 13.7 | 7.8 | 43.1 | 2447 | 1908 | 22.0 |
| Phy-18-33 | RLC 3# | 845 | 664 | 21.5 | 30.8 | 16.3 | 47.0 | 24.8 | 17.2 | 30.6 | 1731 | 1421 | 17.9 |
| | **Mean** | **928** | **766** | | **28.8** | **20.7** | | **26.2** | **15.6** | | **1720** | **1458** | |
| | CD(p=0.05) | I=15.2 | | | I=5.09 | | | I=0.4 | | | I=39.9 | | |
| | | G=46.4 | | | G=1.253 | | | G=1.6 | | | G=167.0 | | |
| | | IxG=65.6 | | | IxG=7.19 | | | IxG=2.3 | | | IxG=236.2 | | |
| | | IR=Irrigated | RF=Rainfed | | | | | | | | | | |

## Table 6.3.10 Effect of moisture stress on harvest index at 4 locations in Indian mustard genotypes

| Code | Genotypes | Harvest index(%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | Hisar | | Kanpur | | Ludhiana | |
| | | IR | RF | IR | RF | IR | RF | IR | RF |
| Phy-18-1 | NPJ 214 | 28.8 | 25.4 | 21.1 | 20.6 | 23.5 | 19.1 | 22.6 | 21.6 |
| Phy-18-2 | LES 54 | 28.5 | 25.2 | 14.2 | 12.8 | 24.1 | 23.9 | 22.2 | 21.9 |
| Phy-18-3 | NPJ210 | 29.0 | 26.9 | 22.0 | 21.0 | 25.2 | 23.4 | 27.8 | 25.6 |
| Phy-18-4 | RB-100 | 27.4 | 25.6 | 17.7 | 26.4 | 19.6 | 16.7 | 24.1 | 20.5 |
| Phy-18-5 | 8IJ0117 | 28.1 | 24.6 | 32.1 | 34.0 | 22.6 | 21.3 | 24.7 | 24.6 |
| Phy-18-6 | RGN- 444 | 30.7 | 28.8 | 24.8 | 22.2 | 19.1 | 17.0 | 27.9 | 26.1 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 27.4 | 20.9 | 23.2 | 20.6 | 22.7 | 19.1 | 26.1 | 24.1 |
| Phy-18-8 | DRMRCI 95 | 32.0 | 30.1 | 24.6 | 21.9 | 22.7 | 19.7 | 24.4 | 21.5 |
| Phy-18-9 | NPJ-225 | 28.8 | 25.7 | 25.8 | 26.1 | 18.6 | 16.5 | 23.8 | 23.7 |
| Phy-18-10 | DRMR 2017-8 | 29.9 | 27.7 | 29.5 | 19.2 | 17.6 | 14.6 | 24.8 | 22.8 |
| Phy-18-11 | NPJ-226 | 28.0 | 25.2 | 23.0 | 26.5 | 15.7 | 13.6 | 23.5 | 23.4 |
| Phy-18-12 | RH 1424 | 28.9 | 25.0 | 20.6 | 18.9 | 20.9 | 14.2 | 22.8 | 22.1 |
| Phy-18-13 | RH 1584 | 27.6 | 24.0 | 29.0 | 27.2 | 23 | 18.5 | 23.5 | 23.1 |
| Phy-18-14 | PM-29 | 27.4 | 24.0 | 22.2 | 23.6 | 18.7 | 17.1 | 20.5 | 19.3 |
| Phy-18-15 | PM-30 | 26.6 | 24.1 | 16.6 | 16.4 | 18.4 | 16.0 | 22.6 | 20.9 |
| Phy-18-16 | RB-102 | 27.3 | 24.6 | 22.9 | 24.0 | 20.5 | 19.2 | 23.8 | 22.4 |
| Phy-18-17 | TM 179 | 29.3 | 28.6 | 33.1 | 18.8 | 21.2 | 16.0 | 23.9 | 18.6 |
| Phy-18-18 | PDZ 9 | 30.0 | 28.2 | 24.5 | 22.2 | 23.4 | 16.9 | 24.4 | 24.3 |
| Phy-18-19 | RH 1555 | 27.8 | 25.2 | 25.1 | 23.8 | 22.3 | 16.1 | 23.7 | 23.7 |
| Phy-18-20 | NPJ 211 | 28.0 | 25.3 | 21.5 | 27.3 | 22.5 | 17.5 | 24.9 | 21.7 |
| Phy-18-21 | LES 57 | 28.5 | 24.3 | 17.2 | 16.0 | 24.8 | 22.9 | 23.2 | 20.4 |
| Phy-18-22 | NPJ 212 | 28.4 | 24.0 | 25.2 | 21.9 | 22.3 | 18.0 | 21.5 | 18.8 |
| Phy-18-23 | NPJ216 | 20.5 | 18.1 | 29.9 | 25.6 | 24.8 | 22.8 | 22.4 | 21.7 |
| Phy-18-24 | RLC 7 | 21.9 | 19.5 | 25.9 | 21.5 | 22.0 | 20.4 | 25.3 | 21.5 |
| Phy-18-25 | DRMR 541-44 | 27.6 | 23.9 | 28.0 | 21.8 | 17.0 | 14.7 | 24.1 | 24.1 |
| Phy-18-26 | RH 749 (ZC) | 29.2 | 27.0 | 28.4 | 20.9 | 25.5 | 22.9 | 24.2 | 20.3 |
| Phy-18-27 | DRMRCI 114 | 28.0 | 25.0 | 21.9 | 22.1 | 21.7 | 18.7 | 22.4 | 21.5 |
| Phy-18-28 | RGN229 | 27.3 | 24.1 | 26.3 | 25.8 | 24.2 | 20.0 | 22.5 | 20.9 |
| Phy-18-29 | DRMR CI70 | 34.9 | 33.9 | 26.0 | 25.9 | 23.3 | 22.7 | 28.6 | 23.6 |
| Phy-18-30 | Kranti (NC) | 29.0 | 26.9 | 36.0 | 23.3 | 22.4 | 18.6 | 25.6 | 25.1 |
| Phy-18-31 | RGN 73 (ZC) | 33.9 | 33.1 | 24.1 | 24.0 | 18.8 | 15.8 | 24.1 | 22.9 |
| Phy-18-32 | RCH 1## | 27.6 | 24.6 | 17.8 | 15.8 | 19.6 | 14.1 | 24.4 | 21.3 |
| Phy-18-33 | RLC 3# | 27.9 | 25.0 | 17.9 | 15.4 | 21.3 | 18.1 | 22.4 | 21.5 |
| | **Mean** | **28.4** | **25.6** | **24.2** | **22.2** | **21.5** | **18.3** | **24.0** | **22.3** |
| | CD(p=0.05) | I=0.23 | | I=5.42 | | I=0.4 | | I=0.506 | |
| | | G=0.79 | | G=1.336 | | G=1.5 | | G=2.12 | |
| | | IxG=NS | | IxG=NS | | IxG=2.2 | | IxG=2.99 | |
| | | | IR=Irrigated | RF=Rainfed | | | | | |

## Table 6.3.11 Effect of moisture stress on oil content at Hisar and Ludhiana

| Code | Genotypes | Oil content (%) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Hisar | | | Ludhiana | | |
| | | IR | RF | Red(%) | IR | RF | Red(%) |
| Phy-18-1 | NPJ 214 | 40.0 | 39.9 | 0.3 | 39.4 | 38.0 | 3.6 |
| Phy-18-2 | LES 54 | 39.8 | 38.8 | 2.5 | 39.1 | 36.6 | 6.3 |
| Phy-18-3 | NPJ210 | 38.8 | 38.7 | 0.2 | 39.3 | 39.2 | 0.3 |
| Phy-18-4 | RB-100 | 39.7 | 39.3 | 1.0 | 40.7 | 40.2 | 1.3 |
| Phy-18-5 | 8IJ0117 | 39.7 | 38.8 | 2.2 | 40.2 | 40.1 | 0.3 |
| Phy-18-6 | RGN- 444 | 39.2 | 39.0 | 0.5 | 41.0 | 40.4 | 1.5 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 39.6 | 38.4 | 3.0 | 40.9 | 40.6 | 0.7 |
| Phy-18-8 | DRMRCI 95 | 39.8 | 39.7 | 0.3 | 39.9 | 38.8 | 2.8 |
| Phy-18-9 | NPJ-225 | 39.1 | 39.0 | 0.2 | 40.0 | 40.0 | 0.0 |
| Phy-18-10 | DRMR 2017-8 | 39.8 | 39.7 | 0.3 | 41.4 | 40.9 | 1.1 |
| Phy-18-11 | NPJ-226 | 39.7 | 38.9 | 2.1 | 40.3 | 39.6 | 1.7 |
| Phy-18-12 | RH 1424 | 39.3 | 39.1 | 0.7 | 40.5 | 39.9 | 1.5 |
| Phy-18-13 | RH 1584 | 39.7 | 38.5 | 3.0 | 40.9 | 40.6 | 0.7 |
| Phy-18-14 | PM-29 | 39.8 | 39.6 | 0.4 | 38.9 | 38.0 | 2.3 |
| Phy-18-15 | PM-30 | 39.3 | 39.0 | 0.8 | 38.7 | 37.2 | 3.9 |
| Phy-18-16 | RB-102 | 40.4 | 39.8 | 1.6 | 40.6 | 39.9 | 1.7 |
| Phy-18-17 | TM 179 | 40.1 | 39.4 | 1.8 | 40.0 | 39.2 | 2.0 |
| Phy-18-18 | PDZ 9 | 39.3 | 39.0 | 0.8 | 40.6 | 40.2 | 1.0 |
| Phy-18-19 | RH 1555 | 39.4 | 39.3 | 0.1 | 40.0 | 38.5 | 3.8 |
| Phy-18-20 | NPJ 211 | 41.0 | 39.6 | 3.5 | 40.0 | 38.4 | 4.1 |
| Phy-18-21 | LES 57 | 39.4 | 38.4 | 2.3 | 39.1 | 37.3 | 4.5 |
| Phy-18-22 | NPJ 212 | 39.8 | 39.7 | 0.3 | 40.7 | 40.4 | 0.7 |
| Phy-18-23 | NPJ216 | 39.8 | 39.5 | 0.8 | 39.4 | 38.9 | 1.1 |
| Phy-18-24 | RLC 7 | 39.9 | 39.7 | 0.5 | 39.2 | 38.9 | 0.7 |
| Phy-18-25 | DRMR 541-44 | 39.9 | 38.8 | 2.8 | 40.4 | 38.9 | 3.7 |
| Phy-18-26 | RH 749 (ZC) | 39.3 | 39.2 | 0.4 | 40.4 | 38.7 | 4.3 |
| Phy-18-27 | DRMRCI 114 | 39.7 | 39.5 | 0.5 | 40.4 | 40.3 | 0.4 |
| Phy-18-28 | RGN229 | 39.8 | 39.1 | 1.6 | 40.1 | 39.5 | 1.6 |
| Phy-18-29 | DRMR CI70 | 39.2 | 39.1 | 0.1 | 40.6 | 40.3 | 0.7 |
| Phy-18-30 | Kranti (NC) | 39.2 | 38.8 | 0.6 | 40.8 | 38.7 | 5.0 |
| Phy-18-31 | RGN 73 (ZC) | 39.0 | 38.9 | 0.5 | 40.6 | 40.4 | 0.4 |
| Phy-18-32 | RCH 1## | 39.8 | 39.7 | 0.4 | 40.1 | 38.7 | 3.4 |
| Phy-18-33 | RLC 3# | 39.5 | 39.2 | | 40.7 | 39.7 | 2.4 |
| | **Mean** | **39.6** | **39.2** | | **40.1** | **39.3** | |
| | CD(p=0.05) | I=0.424 | | | | I=0.112 | |
| | | G=0.104 | | | | G=0.961 | |
| | | IxG=0.600 | | | | IxG=1.36 | |
| | IR=Irrigated | RF=Rainfed | | | | | |

## Table 6.3.12 Effect of moisture stress on drought susceptibility index (DSI) in indian mustard genotypes

| Code | Genotypes | Drought susceptibility index(DSI) | | | |
|---|---|---|---|---|---|
| | | Dholi | Hisar | Kanpur | Ludhiana |
| Phy-18-1 | NPJ 214 | 1.07 | 0.09 | 0.54 | 0.76 |
| Phy-18-2 | LES 54 | 1.05 | 1.05 | 0.58 | 1.04 |
| Phy-18-3 | NPJ210 | 0.78 | 1.20 | 0.31 | 0.30 |
| Phy-18-4 | RB-100 | 0.83 | 0.23 | 1.49 | 1.01 |
| Phy-18-5 | 8IJ0117 | 1.12 | 1.53 | 0.75 | 1.62 |
| Phy-18-6 | RGN- 444 | 0.72 | 0.71 | 1.33 | 0.17 |
| Phy-18-7 | DRMRHJ1118 (Hybrid) | 1.75 | 1.54 | 1.55 | 0.90 |
| Phy-18-8 | DRMRCI 95 | 0.67 | 1.35 | 1.50 | 1.61 |
| Phy-18-9 | NPJ-225 | 1.08 | 0.03 | 0.84 | 0.85 |
| Phy-18-10 | DRMR 2017-8 | 0.89 | 1.58 | 1.49 | 1.64 |
| Phy-18-11 | NPJ-226 | 1.00 | 0.49 | 1.76 | 1.50 |
| Phy-18-12 | RH 1424 | 1.16 | 1.37 | 2.05 | 1.18 |
| Phy-18-13 | RH 1584 | 1.08 | 1.66 | 1.03 | 0.11 |
| Phy-18-14 | PM-29 | 1.06 | 0.10 | 1.01 | 0.58 |
| Phy-18-15 | PM-30 | 1.10 | 0.39 | 1.02 | 0.91 |
| Phy-18-16 | RB-102 | 1.13 | 0.17 | 1.00 | 0.26 |
| Phy-18-17 | TM 179 | 0.45 | 1.49 | 1.33 | 0.28 |
| Phy-18-18 | PDZ 9 | 0.86 | 1.07 | 1.79 | 2.06 |
| Phy-18-19 | RH 1555 | 1.01 | 0.14 | 1.24 | 0.82 |
| Phy-18-20 | NPJ 211 | 1.18 | 0.33 | 1.14 | 2.37 |
| Phy-18-21 | LES 57 | 1.30 | 1.63 | 0.33 | 1.53 |
| Phy-18-22 | NPJ 212 | 1.26 | 1.34 | 0.84 | 1.45 |
| Phy-18-23 | NPJ216 | 1.32 | 1.29 | 0.38 | 0.61 |
| Phy-18-24 | RLC 7 | 1.32 | 1.13 | 0.78 | 0.75 |
| Phy-18-25 | DRMR 541-44 | 1.26 | 0.90 | 1.32 | 0.14 |
| Phy-18-26 | RH 749 (ZC) | 0.77 | 0.98 | 0.69 | 1.82 |
| Phy-18-27 | DRMRCI 114 | 1.12 | 0.60 | 1.04 | 0.82 |
| Phy-18-28 | RGN229 | 1.17 | 0.97 | 0.70 | 0.20 |
| Phy-18-29 | DRMR CI70 | 0.48 | 0.35 | 0.29 | 0.43 |
| Phy-18-30 | Kranti (NC) | 0.79 | 1.29 | 0.95 | 0.76 |
| Phy-18-31 | RGN 73 (ZC) | 0.46 | 0.04 | 1.63 | 0.57 |
| Phy-18-32 | RCH 1## | 1.13 | 1.27 | 1.07 | 1.45 |
| Phy-18-33 | RLC 3# | 1.19 | 1.60 | 0.76 | 1.18 |
| | **Mean** | **1.02** | **0.91** | **1.05** | **0.96** |

**Table 6.4.1 Effect of terminal heat stress on canopy temperature and canopy temperature depression in Indian mustard genotypes**

| Code | Genotypes | Canopy temperature (0C) | | | | Canopy temperature depression (0C) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Hisar | | Ludhiana | | Hisar | | Ludhiana | |
| | | NS | LS | NS | LS | NS | LS | NS | LS |
| Phy-18-1 | NPJ 213 | 26.5 | 26.9 | 19.9 | 20.2 | -5.8 | -5.0 | -2.7 | -4.6 |
| Phy-18-2 | DRMR 15-9 | 26.2 | 26.6 | 20.3 | 20.0 | -6.1 | -5.3 | -2.6 | -3.7 |
| Phy-18-3 | DRMR1191-2 | 25.3 | 25.8 | 20.8 | 21.7 | -7.0 | -6.2 | -2.1 | -3.2 |
| Phy-18-4 | DRMR 1C192 | 26.4 | 26.9 | 19.1 | 20.2 | -5.9 | -5.1 | -3.7 | -3.4 |
| Phy-18-5 | DRMR 2017-15 | 26.3 | 29.2 | 19.7 | 20.4 | -5.5 | -4.7 | -2.1 | -3.2 |
| Phy-18-6 | LES57 | 26.8 | 27.4 | 20.1 | 20.1 | -5.5 | -4.7 | -3.1 | -3.6 |
| Phy-18-7 | Raj Vijay Mustard 2 (LR) | 26.3 | 25.4 | 19.2 | 19.9 | -6.0 | -5.2 | -2.4 | -5.4 |
| Phy-18-8 | DRMRHT 13-13-5-4 | 27.1 | 28.6 | 20.9 | 18.6 | -5.2 | -4.4 | -2.7 | -5.0 |
| Phy-18-9 | PRO 5222 | 27.6 | 27.3 | 19.2 | 19.7 | -4.7 | -3.7 | -3.7 | -3.9 |
| Phy-18-10 | RGN 368 | 27.4 | 27.2 | 19.2 | 21.6 | -4.9 | -3.9 | -2.8 | -2.0 |
| Phy-18-11 | JD 6 (ZC) | 27.3 | 28.0 | 19.5 | 20.7 | -5.0 | -4.0 | -2.8 | -2.9 |
| Phy-18-12 | NRCHB 101 (ZC) | 26.4 | 27.2 | 19.5 | 18.8 | -5.9 | -4.9 | -2.9 | -4.8 |
| Phy-18-13 | NPJ 210 | 29.0 | 27.8 | 19.9 | 20.6 | -3.3 | -2.3 | -2.6 | -3.0 |
| Phy-18-14 | DRMR 2300 | 28.7 | 27.4 | 18.7 | 21.0 | -3.6 | -2.6 | -2.7 | -2.6 |
| Phy-18-15 | DRMR1616-47 | 27.6 | 26.3 | 20.2 | 17.7 | -4.7 | -3.7 | -2.2 | -5.9 |
| Phy-18-16 | RH 749 (ZC) | 27.6 | 26.4 | 19.3 | 19.8 | -4.7 | -3.7 | -2.2 | -3.8 |
| Phy-18-17 | DRMRIC16-38 | 26.6 | 25.4 | 18.8 | 17.7 | -5.7 | -4.7 | -2.9 | -5.9 |
| Phy-18-18 | RLC 7 | 28.0 | 29.2 | 19.3 | 19.4 | -4.3 | -3.9 | -2.8 | -4.2 |
| Phy-18-19 | RLC 3 | 27.7 | 29.2 | 18.8 | 19.4 | -4.6 | -4.2 | -3.0 | -4.2 |
| Phy-18-20 | RH 1599-41 | 28.1 | 29.3 | 19.4 | 18.0 | -4.2 | -3.8 | -2.6 | -5.6 |
| Phy-18-21 | RH 923# | 26.6 | 27.7 | 19.2 | 17.4 | -5.5 | -5.1 | -2.7 | -6.2 |
| Phy-18-22 | DRMR 1153-12 | 26.9 | 28.7 | 19.1 | 18.6 | -5.4 | -5.0 | -2.2 | -5.0 |
| Phy-18-23 | PM-26 (ZC) | 27.8 | 26.6 | 19.1 | 17.5 | -4.5 | -4.1 | -2.4 | -6.1 |
| Phy-18-24 | Kranti (NC) | 27.2 | 26.0 | 19.8 | 18.9 | -5.1 | -4.7 | -2.3 | -4.7 |
| Phy-18-25 | Pusa Bold (ZC) | 27.0 | 25.8 | 19.4 | 19.2 | -5.3 | -4.0 | -2.7 | -4.9 |
| Phy-18-26 | DRMR 2059 | 27.3 | 26.1 | 19.8 | 18.4 | -5.0 | -3.7 | -1.9 | -5.2 |
| Phy-18-27 | RH 919 | 27.7 | 26.5 | 19.6 | 17.6 | -4.6 | -3.3 | -2.3 | -6.0 |
| Phy-18-28 | RMWR 09-1 | 26.4 | 27.6 | 19.4 | 18.3 | -5.9 | -4.6 | -2.7 | -5.3 |
| Phy-18-29 | NPJ 216 | 27.0 | 28.2 | 19.4 | 16.7 | -5.3 | -4.0 | -2.7 | -6.8 |
| Phy-18-30 | LES 54 | 27.5 | 28.7 | 19.3 | 16.9 | -4.8 | -3.5 | -2.2 | -6.7 |
| | **Mean** | **27.1** | **27.3** | **19.5** | **19.1** | **-5.1** | **-4.3** | **-2.6** | **-4.6** |
| | CD(p=0.05) | E=0.929 | | E=0.256 | | E=0.397 | | E=0.411 | |
| | | G=NS | | G=0.993 | | G=0.102 | | G=0.901 | |
| | | ExG=1.314 | | ExG=1.41 | | ExG=NS | | ExG=2.25 | |
| | | NS=Normal sown | | LS=Late sown | | | | | |

## Table 6.4.2 Effect of terminal heat stress on membrane stability at Dholi, Hisar, Kanpur and Ludhiana

| Code | Genotypes | Membrane stability index (MSI) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | NS | LS | Red(%) | NS | LS | Red(%) | NS | LS | Red(%) | NS | LS | Red(%) |
| Phy-18-1 | NPJ 213 | 45.4 | 35.2 | 22.5 | 80.0 | 78.0 | 2.5 | 55.2 | 41.8 | 24.3 | 84.6 | 82.2 | 2.8 |
| Phy-18-2 | DRMR 15-9 | 54.6 | 49.7 | 9.0 | 67.0 | 46.0 | 31.3 | 57.3 | 50.6 | 11.7 | 85.8 | 79.2 | 7.6 |
| Phy-18-3 | DRMR1191-2 | 54.3 | 48.8 | 10.1 | 46.0 | 38.0 | 17.4 | 55.5 | 45.3 | 18.4 | 84.2 | 83.8 | 0.5 |
| Phy-18-4 | DRMR 1C192 | 44.7 | 33.6 | 24.8 | 86.0 | 54.0 | 37.2 | 61.4 | 51.2 | 16.6 | 86.6 | 71.3 | 17.7 |
| Phy-18-5 | DRMR 2017-15 | 49.7 | 41.4 | 16.7 | 74.0 | 64.0 | 13.5 | 60.2 | 51.3 | 14.8 | 83.0 | 69.8 | 15.8 |
| Phy-18-6 | LES57 | 53.7 | 49.1 | 8.6 | 69.0 | 54.0 | 21.7 | 58.3 | 50.6 | 13.2 | 86.6 | 69.0 | 20.3 |
| Phy-18-7 | Raj Vijay Mustard 2 (LR) | 52.1 | 46.6 | 10.6 | 71.0 | 45.0 | 36.6 | 59.1 | 51.3 | 13.2 | 80.6 | 80.2 | 0.6 |
| Phy-18-8 | DRMRHT 13-13-5-4 | 38.6 | 28.5 | 26.2 | 80.0 | 64.0 | 20.0 | 63.3 | 55.1 | 13.0 | 76.6 | 42.7 | 44.3 |
| Phy-18-9 | PRO 5222 | 37.1 | 25.4 | 31.5 | 76.0 | 50.0 | 34.2 | 61.6 | 55.5 | 16.4 | 81.9 | 76.4 | 6.8 |
| Phy-18-10 | RGN 368 | 47.9 | 33.2 | 30.7 | 60.0 | 59.0 | 1.7 | 60.3 | 48.7 | 19.2 | 83.5 | 81.5 | 2.4 |
| Phy-18-11 | JD 6 (ZC) | 46.1 | 32.5 | 29.5 | 65.0 | 64.0 | 1.5 | 54.4 | 43.7 | 19.7 | 84.5 | 82.3 | 2.6 |
| Phy-18-12 | NRCHB 101 (ZC) | 46.8 | 31.8 | 32.1 | 61.0 | 46.0 | 24.6 | 61.6 | 51.8 | 15.9 | 86.6 | 83.6 | 3.5 |
| Phy-18-13 | NPJ 210 | 56.2 | 51.1 | 9.1 | 67.0 | 66.0 | 1.5 | 59.6 | 54.7 | 8.2 | 84.3 | 81.6 | 3.1 |
| Phy-18-14 | DRMR 2300 | 46.5 | 27.3 | 41.3 | 65.0 | 62.0 | 4.6 | 60.5 | 52.2 | 13.7 | 82.9 | 77.1 | 6.9 |
| Phy-18-15 | DRMR1616-47 | 52.1 | 41.6 | 20.2 | 67.0 | 61.0 | 9.0 | 54.8 | 41.5 | 24.3 | 82.0 | 76.9 | 6.2 |
| Phy-18-16 | RH 749 (ZC) | 48.2 | 35.4 | 26.6 | 78.0 | 67.0 | 14.1 | 55.0 | 45.3 | 17.6 | 81.5 | 78.2 | 4.1 |
| Phy-18-17 | DRMRIC16-38 | 45.4 | 34.1 | 24.9 | 82.0 | 78.0 | 4.9 | 64.4 | 52.6 | 18.3 | 80.6 | 75.9 | 5.9 |
| Phy-18-18 | RLC 7 | 50.6 | 42.7 | 15.6 | 76.0 | 62.0 | 18.4 | 50.5 | 39.7 | 21.4 | 83.7 | 82.1 | 1.9 |
| Phy-18-19 | RLC 3 | 40.4 | 21.9 | 45.8 | 63.0 | 45.0 | 28.6 | 65.8 | 44.3 | 32.7 | 79.3 | 68.3 | 13.8 |
| Phy-18-20 | RH 1599-41 | 39.5 | 21.1 | 46.6 | 67.0 | 65.0 | 3.0 | 58.8 | 47.7 | 18.9 | 82.4 | 80.3 | 2.5 |
| Phy-18-21 | RH 923# | 41.7 | 25.8 | 38.1 | 72.0 | 71.0 | 1.4 | 56.2 | 45.3 | 19.4 | 83.2 | 80.6 | 3.0 |
| Phy-18-22 | DRMR 1153-12 | 53.4 | 47.2 | 11.6 | 74.0 | 61.0 | 17.6 | 66.0 | 48.7 | 26.2 | 75.3 | 68.4 | 9.1 |
| Phy-18-23 | PM-26 (ZC) | 46.9 | 34.6 | 26.2 | 68.0 | 67.0 | 1.5 | 65.6 | 47.3 | 27.9 | 78.9 | 77.8 | 1.4 |
| Phy-18-24 | Kranti (NC) | 47.1 | 31.4 | 33.3 | 76.0 | 71.0 | 6.6 | 60.1 | 55.2 | 8.2 | 84.3 | 67.9 | 19.4 |
| Phy-18-25 | Pusa Bold (ZC) | 46.7 | 30.5 | 34.7 | 60.0 | 45.0 | 25.0 | 58.0 | 51.3 | 11.6 | 80.0 | 73.8 | 7.7 |
| Phy-18-26 | DRMR 2059 | 48.3 | 38.4 | 20.5 | 65.0 | 61.0 | 6.2 | 61.3 | 55.1 | 10.1 | 80.0 | 73.2 | 8.5 |
| Phy-18-27 | RH 919 | 43.8 | 25.8 | 41.1 | 75.0 | 71.0 | 5.3 | 61.2 | 52.3 | 14.5 | 82.3 | 79.0 | 4.0 |
| Phy-18-28 | RMWR 09-1 | 45.1 | 27.0 | 40.1 | 67.0 | 47.0 | 29.9 | 63.3 | 50.5 | 20.2 | 74.8 | 73.7 | 1.5 |
| Phy-18-29 | NPJ 216 | 40.4 | 21.4 | 47.0 | 65.0 | 65.0 | 0.0 | 65.2 | 51.4 | 21.2 | 78.2 | 62.8 | 19.7 |
| Phy-18-30 | LES 54 | 42.6 | 23.7 | 44.4 | 80.0 | 55.0 | 31.3 | 64.1 | 48.4 | 24.5 | 74.0 | 57.8 | 21.9 |
| | **Mean** | **46.9** | **34.6** | | **70.0** | **59.0** | | **60.1** | **49.2** | | **81.7** | **74.6** | |
| | CD(p=0.05) | E=0.313 | | | E=10.9 | | | E=0.7 | | | E=1.04 | | |
| | | G=0.727 | | | G=2.8 | | | G=2.8 | | | G=4.05 | | |
| | | ExG=1.02 | | | ExG=NS | | | ExG=3.9 | | | ExG=5.73 | | |
| | | NS=Normal sown | | LS=Late sown | | | | | | | | | |

## Table 6.4.3 Effect of terminal heat stress on seed per siliqua at 4 locations

| Code | Genotypes | Seeds/siliqua | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | NS | LS | Red(%) | NS | LS | Red(%) | NS | LS | Red(%) | NS | LS | Red(%) |
| Phy-18-1 | NPJ 213 | 10.3 | 8.1 | 21.4 | 14.4 | 14.1 | 1.9 | 16.6 | 13.3 | 19.9 | 12.7 | 12.6 | 0.8 |
| Phy-18-2 | DRMR 15-9 | 14.9 | 13.6 | 8.7 | 14.3 | 13.7 | 4.3 | 15.3 | 14.8 | 3.3 | 13.6 | 13.5 | 0.7 |
| Phy-18-3 | DRMR1191-2 | 14.7 | 13.1 | 10.9 | 13.1 | 12.5 | 4.1 | 15.3 | 14.1 | 7.8 | 12.6 | 12.1 | 4.0 |
| Phy-18-4 | DRMR 1C192 | 12.5 | 10.4 | 16.8 | 13.8 | 13.6 | 1.4 | 16.4 | 13.6 | 17.1 | 13.5 | 12.5 | 7.4 |
| Phy-18-5 | DRMR 2017-15 | 13.6 | 11.1 | 18.4 | 14.0 | 11.8 | 15.9 | 15.6 | 14.1 | 9.6 | 13.4 | 12.2 | 9.0 |
| Phy-18-6 | LES57 | 15.0 | 13.4 | 10.7 | 12.2 | 11.6 | 4.4 | 15.7 | 14.8 | 5.7 | 12.5 | 12.0 | 4.3 |
| Phy-18-7 | Raj Vijay Mustard 2 (LR) | 14.8 | 13.2 | 10.8 | 13.1 | 13.1 | 0.2 | 15.6 | 14.6 | 6.4 | 11.5 | 11.1 | 3.5 |
| Phy-18-8 | DRMRHT 13-13-5-4 | 9.6 | 7.3 | 24 | 15.2 | 14.4 | 5.7 | 14.8 | 13.7 | 7.4 | 14.0 | 13.4 | 4.0 |
| Phy-18-9 | PRO 5222 | 12.4 | 10.2 | 17.7 | 14.4 | 13.8 | 4.7 | 15.2 | 13.3 | 12.5 | 13.8 | 12.0 | 13.0 |
| Phy-18-10 | RGN 368 | 11.8 | 9.7 | 17.8 | 12.8 | 12.2 | 4.5 | 14.2 | 12.9 | 9.2 | 13.4 | 12.3 | 8.2 |
| Phy-18-11 | JD 6 (ZC) | 12.9 | 9.9 | 23.3 | 13.9 | 13.8 | 1.1 | 16.8 | 14.1 | 16.1 | 10.6 | 10.5 | 1.3 |
| Phy-18-12 | NRCHB 101 (ZC) | 12.5 | 9.6 | 23.2 | 14.7 | 14.6 | 0.9 | 16.3 | 13.9 | 14.7 | 14.1 | 14.0 | 0.7 |
| Phy-18-13 | NPJ 210 | 14.7 | 13.2 | 10.2 | 15.2 | 15.1 | 1.1 | 14.1 | 12.9 | 8.5 | 15.2 | 13.3 | 12.5 |
| Phy-18-14 | DRMR 2300 | 12.0 | 9.1 | 24.2 | 14.7 | 14.3 | 2.9 | 14.6 | 13.1 | 10.3 | 14.6 | 13.1 | 10.1 |
| Phy-18-15 | DRMR1616-47 | 11.6 | 9.3 | 19.8 | 14.4 | 14.0 | 3.0 | 15.2 | 12.8 | 15.8 | 13.5 | 11.4 | 15.3 |
| Phy-18-16 | RH 749 (ZC) | 12.7 | 9.0 | 29.1 | 14.6 | 14.3 | 1.6 | 15.1 | 14.8 | 2.0 | 13.2 | 12.2 | 7.6 |
| Phy-18-17 | DRMRIC16-38 | 12.1 | 8.7 | 28.1 | 15.4 | 15.4 | 0.3 | 16.3 | 14.8 | 9.2 | 14.7 | 13.1 | 11.1 |
| Phy-18-18 | RLC 7 | 13.4 | 11.5 | 14.2 | 16.4 | 16.0 | 2.0 | 16.6 | 14.2 | 14.5 | 15.4 | 14.9 | 3.5 |
| Phy-18-19 | RLC 3 | 9.6 | 7.5 | 21.9 | 15.1 | 13.9 | 7.8 | 15.6 | 12.6 | 19.2 | 16.0 | 14.7 | 8.1 |
| Phy-18-20 | RH 1599-41 | 9.5 | 7.3 | 23.2 | 15.0 | 14.4 | 4.0 | 14.8 | 12.7 | 14.2 | 15.7 | 12.5 | 20.4 |
| Phy-18-21 | RH 923# | 11.1 | 8.6 | 22.5 | 13.9 | 13.4 | 3.3 | 15.6 | 12.7 | 18.6 | 13.7 | 13.0 | 4.6 |
| Phy-18-22 | DRMR 1153-12 | 13.6 | 9.4 | 30.9 | 12.7 | 12.1 | 4.7 | 13.4 | 12.3 | 8.2 | 12.5 | 12.3 | 1.3 |
| Phy-18-23 | PM-26 (ZC) | 11.8 | 8.5 | 28 | 12.9 | 12.8 | 0.6 | 16.8 | 14.9 | 11.3 | 14.7 | 13.0 | 11.4 |
| Phy-18-24 | Kranti (NC) | 11.2 | 8.1 | 27.7 | 13.8 | 13.8 | 0.1 | 13.6 | 12.9 | 5.1 | 15.1 | 11.2 | 26.0 |
| Phy-18-25 | Pusa Bold (ZC) | 11.7 | 7.6 | 35 | 13.7 | 13.4 | 2.4 | 15.0 | 14.8 | 1.3 | 12.7 | 12.0 | 5.5 |
| Phy-18-26 | DRMR 2059 | 12.5 | 9.4 | 24.8 | 12.4 | 12.0 | 3.2 | 15.5 | 14.9 | 3.9 | 12.1 | 11.3 | 6.6 |
| Phy-18-27 | RH 919 | 11.4 | 8.8 | 22.8 | 14.3 | 13.9 | 2.8 | 15.4 | 14.8 | 3.9 | 15.1 | 12.7 | 16.1 |
| Phy-18-28 | RMWR 09-1 | 12.9 | 8.3 | 35.7 | 14.2 | 13.8 | 2.6 | 15.6 | 13.9 | 10.9 | 12.4 | 11.5 | 7.2 |
| Phy-18-29 | NPJ 216 | 9.4 | 6.7 | 28.7 | 13.4 | 12.9 | 4.0 | 14.4 | 13.6 | 5.6 | 15.6 | 14.7 | 5.8 |
| Phy-18-30 | LES 54 | 11.5 | 7.5 | 34.8 | 15.6 | 14.9 | 4.4 | 14.2 | 12.4 | 12.7 | 15.7 | 12.2 | 22.7 |
| | **Mean** | **12.3** | **9.6** | | **14.1** | **13.6** | | **15.3** | **13.7** | | **13.8** | **12.6** | |
| | CD(p=0.05) | E=0.26 | | | E=0.971 | | | E=0.2 | | | E=0.264 | | |
| | | G=1.23 | | | G=0.251 | | | G=0.7 | | | G=1.02 | | |
| | | ExG=NS | | | ExG=NS | | | ExG=1.0 | | | ExG=1.45 | | |
| | | NS=Normal sown | | LS=Late sown | | | | | | | | | |

## Table 6.4.4 Effect of terminal heat stress on 1000 seed weight in Indian mustard genotypes

| Code | Genotypes | Seed weight (g) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi | | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | NS | LS | Red(%) | NS | LS | Red(%) | NS | LS | Red(%) | NS | LS | Red(%) |
| Phy-18-1 | NPJ 213 | 4.6 | 3.3 | 28.3 | 5.1 | 3.9 | 23.0 | 4.9 | 3.6 | 27.9 | 5.1 | 5.0 | 1.8 |
| Phy-18-2 | DRMR 15-9 | 6.1 | 5.6 | 8.2 | 4.6 | 3.3 | 27.8 | 4.9 | 4.8 | 2.4 | 4.4 | 3.7 | 17.5 |
| Phy-18-3 | DRMR1191-2 | 5.8 | 5.3 | 8.6 | 5.6 | 4.3 | 22.9 | 5.3 | 4.0 | 25.8 | 5.1 | 4.9 | 3.7 |
| Phy-18-4 | DRMR 1C192 | 4.4 | 3.1 | 29.5 | 6.0 | 4.6 | 23.8 | 5.1 | 3.7 | 28.2 | 4.6 | 4.4 | 4.3 |
| Phy-18-5 | DRMR 2017-15 | 5.5 | 4.0 | 27.3 | 5.5 | 4.2 | 23.0 | 5.0 | 3.8 | 24.3 | 4.8 | 4.6 | 4.2 |
| Phy-18-6 | LES57 | 5.9 | 5.4 | 8.5 | 5.3 | 4.0 | 25.2 | 5.4 | 3.1 | 43.0 | 5.6 | 5.2 | 6.6 |
| Phy-18-7 | Raj Vijay Mustard 2 (LR) | 5.7 | 5.2 | 8.8 | 4.9 | 3.8 | 22.6 | 5.0 | 4.8 | 4.0 | 5.1 | 4.2 | 18.9 |
| Phy-18-8 | DRMRHT 13-13-5-4 | 4.1 | 2.5 | 39.0 | 4.7 | 3.2 | 32.1 | 4.5 | 3.4 | 23.7 | 4.8 | 4.7 | 2.1 |
| Phy-18-9 | PRO 5222 | 5.6 | 3.2 | 42.9 | 4.5 | 3.2 | 28.8 | 4.0 | 3.6 | 9.1 | 5.3 | 3.7 | 30.4 |
| Phy-18-10 | RGN 368 | 4.7 | 3.4 | 27.7 | 5.8 | 4.1 | 29.7 | 4.5 | 3.6 | 19.9 | 4.8 | 3.9 | 18.8 |
| Phy-18-11 | JD 6 (ZC) | 5.3 | 3.2 | 39.6 | 4.6 | 3.7 | 20.2 | 4.0 | 3.4 | 13.1 | 4.8 | 4.4 | 8.3 |
| Phy-18-12 | NRCHB 101 (ZC) | 5.1 | 4.4 | 13.7 | 5.8 | 4.4 | 23.8 | 5.0 | 3.3 | 33.5 | 5.5 | 4.4 | 21.1 |
| Phy-18-13 | NPJ 210 | 5.7 | 5.1 | 10.5 | 4.6 | 4.3 | 7.2 | 5.3 | 3.9 | 26.4 | 5.4 | 4.6 | 15.1 |
| Phy-18-14 | DRMR 2300 | 4.8 | 3.4 | 29.2 | 5.2 | 4.4 | 14.9 | 5.4 | 4.7 | 13.4 | 4.9 | 4.3 | 12.0 |
| Phy-18-15 | DRMR1616-47 | 4.6 | 3.5 | 23.9 | 5.2 | 4.2 | 18.8 | 5.5 | 4.0 | 27.5 | 5.0 | 4.6 | 9.3 |
| Phy-18-16 | RH 749 (ZC) | 4.3 | 3.3 | 23.3 | 6.4 | 5.0 | 22.4 | 5.2 | 2.9 | 44.6 | 5.7 | 5.4 | 5.3 |
| Phy-18-17 | DRMRIC16-38 | 4.2 | 3.4 | 19.0 | 4.7 | 4.4 | 5.3 | 3.9 | 2.9 | 26.7 | 5.8 | 5.3 | 9.0 |
| Phy-18-18 | RLC 7 | 5.4 | 3.9 | 27.8 | 3.5 | 3.5 | 0.0 | 3.7 | 3.2 | 12.0 | 4.1 | 3.5 | 14.6 |
| Phy-18-19 | RLC 3 | 4.1 | 2.7 | 34.1 | 3.1 | 2.2 | 29.0 | 3.1 | 3.0 | 4.5 | 3.9 | 3.4 | 11.9 |
| Phy-18-20 | RH 1599-41 | 4.2 | 2.9 | 31.0 | 4.7 | 4.7 | 0.0 | 3.2 | 3.1 | 4.3 | 4.7 | 3.4 | 29.2 |
| Phy-18-21 | RH 923# | 4.1 | 2.7 | 34.1 | 5.4 | 5.1 | 6.9 | 3.2 | 3.0 | 7.5 | 5.4 | 4.6 | 14.8 |
| Phy-18-22 | DRMR 1153-12 | 5.5 | 4.7 | 14.5 | 5.1 | 4.5 | 11.1 | 4.1 | 3.4 | 18.4 | 4.6 | 4.4 | 3.5 |
| Phy-18-23 | PM-26 (ZC) | 4.4 | 3.2 | 27.3 | 3.6 | 3.5 | 2.0 | 4.5 | 3.0 | 34.2 | 4.0 | 3.8 | 5.0 |
| Phy-18-24 | Kranti (NC) | 4.3 | 3.3 | 23.3 | 4.1 | 3.5 | 12.8 | 5.2 | 4.8 | 7.3 | 4.0 | 3.6 | 10.0 |
| Phy-18-25 | Pusa Bold (ZC) | 4.4 | 3.3 | 25.0 | 6.0 | 4.7 | 20.6 | 5.0 | 4.8 | 3.6 | 6.7 | 3.4 | 48.3 |
| Phy-18-26 | DRMR 2059 | 5.3 | 4.6 | 13.2 | 5.3 | 4.2 | 22.1 | 5.1 | 4.8 | 5.8 | 6.3 | 5.2 | 17.6 |
| Phy-18-27 | RH 919 | 4.3 | 3.5 | 18.6 | 6.3 | 4.8 | 23.1 | 5.2 | 4.8 | 6.6 | 5.3 | 4.5 | 15.1 |
| Phy-18-28 | RMWR 09-1 | 5.6 | 4.0 | 28.6 | 4.4 | 3.5 | 20.3 | 5.3 | 3.6 | 31.1 | 4.9 | 4.2 | 14.0 |
| Phy-18-29 | NPJ 216 | 4.0 | 2.5 | 37.5 | 5.5 | 4.1 | 25.4 | 4.3 | 3.9 | 8.8 | 4.5 | 4.4 | 2.2 |
| Phy-18-30 | LES 54 | 4.1 | 2.7 | 34.1 | 4.8 | 3.3 | 30.1 | 4.5 | 4.1 | 8.1 | 4.2 | 3.8 | 8.9 |
| | **Mean** | **4.9** | **3.7** | | **5.0** | **4.0** | | **4.6** | **3.8** | | **5.0** | **4.3** | |
| | CD(p=0.05) | E=0.113 | | | E=0.417 | | | E= 0.06 | | | E=0.075 | | |
| | | G=0.379 | | | G=0.108 | | | G= 0.22 | | | G=0.291 | | |
| | | ExG=0.443 | | | ExG=0.589 | | | ExG=0.30 | | | ExG=0.411 | | |
| | | NS=Normal sown | | LS=Late sown | | | | | | | | | |

## Table 6.4.5 Effect of terminal heat stress on seed yield in Indian mustard genotypes at Dholi, Hisar, Kanpur and Ludhiana

| Code | Genotypes | Seed yield | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dholi (kg/ha) | | | Hisar(g/plant) | | | Kanpur(g/plant) | | | Ludhiana(kg/ha) | | |
| | | NS | LS | Red(%) | NS | LS | Red(%) | NS | LS | Red(%) | NS | LS | Red(%) |
| Phy-18-1 | NPJ 213 | 990 | 750 | 24.2 | 21.8 | 18.3 | 15.7 | 30.8 | 11.3 | 63.3 | 1722 | 1708 | 0.8 |
| Phy-18-2 | DRMR 15-9 | 1180 | 1073 | 9.0 | 23.5 | 16.5 | 29.9 | 27.9 | 22.8 | 18.3 | 2431 | 1389 | 42.9 |
| Phy-18-3 | DRMR1191-2 | 1170 | 1053 | 10.0 | 26.9 | 20.8 | 22.5 | 25.8 | 13.4 | 48.1 | 2511 | 1744 | 30.5 |
| Phy-18-4 | DRMR 1C192 | 963 | 790 | 18.0 | 22.3 | 17.3 | 22.5 | 34.6 | 10.5 | 69.6 | 1656 | 1553 | 6.2 |
| Phy-18-5 | DRMR 2017-15 | 1180 | 1030 | 12.7 | 18.3 | 15.8 | 14.0 | 24.8 | 16.2 | 34.7 | 2059 | 1500 | 27.1 |
| Phy-18-6 | LES57 | 1163 | 1053 | 9.5 | 22.6 | 17.1 | 24.1 | 24.0 | 15.8 | 34.2 | 1850 | 1521 | 17.8 |
| Phy-18-7 | Raj Vijay Mustard 2 (LR) | 1153 | 1043 | 9.5 | 21.6 | 16.3 | 24.5 | 25.6 | 21.1 | 17.8 | 1981 | 1055 | 46.7 |
| Phy-18-8 | DRMRHT 13-13-5-4 | 673 | 380 | 43.6 | 24.0 | 16.0 | 33.5 | 22.6 | 17.6 | 22.1 | 2000 | 1522 | 23.9 |
| Phy-18-9 | PRO 5222 | 860 | 597 | 30.6 | 16.6 | 11.6 | 29.9 | 25.5 | 8.3 | 67.5 | 3039 | 1289 | 57.6 |
| Phy-18-10 | RGN 368 | 823 | 577 | 30.0 | 17.5 | 13.8 | 21.4 | 17.1 | 8.5 | 50.3 | 1974 | 1709 | 13.4 |
| Phy-18-11 | JD 6 (ZC) | 1020 | 803 | 21.2 | 17.8 | 14.9 | 16.0 | 34.9 | 15.7 | 55.0 | 1444 | 1233 | 14.6 |
| Phy-18-12 | NRCHB 101 (ZC) | 1043 | 767 | 26.5 | 17.5 | 14.1 | 19.4 | 22.8 | 9.4 | 58.8 | 1783 | 1433 | 19.6 |
| Phy-18-13 | NPJ 210 | 1197 | 1083 | 9.5 | 22.2 | 21.5 | 3.1 | 23.3 | 11.0 | 52.8 | 2183 | 1193 | 45.3 |
| Phy-18-14 | DRMR 2300 | 940 | 793 | 15.6 | 17.4 | 15.8 | 9.1 | 24.0 | 18.3 | 23.8 | 2190 | 998 | 54.4 |
| Phy-18-15 | DRMR1616-47 | 917 | 763 | 16.7 | 17.5 | 16.3 | 6.7 | 35.0 | 11.4 | 67.4 | 2398 | 982 | 59.0 |
| Phy-18-16 | RH 749 (ZC) | 773 | 643 | 16.8 | 17.8 | 16.1 | 9.1 | 20.0 | 11.0 | 45.0 | 2274 | 1896 | 16.7 |
| Phy-18-17 | DRMRIC16-38 | 763 | 630 | 17.5 | 18.7 | 18.0 | 3.6 | 17.6 | 11.3 | 35.8 | 2167 | 1906 | 12.0 |
| Phy-18-18 | RLC 7 | 987 | 823 | 16.6 | 15.0 | 14.5 | 3.3 | 20.6 | 14.3 | 30.6 | 2292 | 1111 | 51.5 |
| Phy-18-19 | RLC 3 | 630 | 373 | 40.7 | 15.9 | 12.0 | 24.4 | 21.7 | 11.0 | 49.3 | 2217 | 1197 | 46.0 |
| Phy-18-20 | RH 1599-41 | 573 | 353 | 38.4 | 14.5 | 14.3 | 1.2 | 21.9 | 15.9 | 27.4 | 2182 | 972 | 55.4 |
| Phy-18-21 | RH 923# | 747 | 440 | 41.1 | 14.6 | 14.6 | 0.0 | 21.4 | 9.8 | 54.2 | 2043 | 1450 | 29.0 |
| Phy-18-22 | DRMR 1153-12 | 913 | 797 | 12.8 | 14.7 | 13.0 | 11.4 | 30.7 | 13.4 | 56.4 | 1941 | 1538 | 20.8 |
| Phy-18-23 | PM-26 (ZC) | 777 | 603 | 22.3 | 14.0 | 13.7 | 2.2 | 24.4 | 13.9 | 43.0 | 2109 | 1430 | 32.2 |
| Phy-18-24 | Kranti (NC) | 817 | 547 | 33.1 | 14.8 | 14.6 | 1.8 | 27.6 | 16.4 | 40.6 | 1566 | 1422 | 9.2 |
| Phy-18-25 | Pusa Bold (ZC) | 787 | 590 | 25.0 | 18.3 | 17.0 | 6.8 | 29.9 | 25.7 | 14.0 | 1789 | 1000 | 44.1 |
| Phy-18-26 | DRMR 2059 | 937 | 783 | 16.4 | 17.2 | 14.8 | 13.6 | 30.6 | 25.3 | 17.3 | 1998 | 1667 | 16.6 |
| Phy-18-27 | RH 919 | 797 | 640 | 19.7 | 17.6 | 15.0 | 14.4 | 25.4 | 22.3 | 12.2 | 1989 | 1439 | 27.7 |
| Phy-18-28 | RMWR 09-1 | 890 | 793 | 10.9 | 23.1 | 21.7 | 6.1 | 23.4 | 16.8 | 28.2 | 2413 | 1233 | 48.9 |
| Phy-18-29 | NPJ 216 | 530 | 320 | 39.6 | 19.3 | 16.5 | 14.6 | 19.3 | 14.4 | 25.4 | 1678 | 1233 | 26.5 |
| Phy-18-30 | LES 54 | 657 | 460 | 29.9 | 29.3 | 20.8 | 28.9 | 35.0 | 24.4 | 30.3 | 1572 | 1486 | 5.5 |
| | **Mean** | **895** | **712** | | **19.1** | **16.1** | | **25.6** | **15.3** | | **2048** | **1394** | |
| | CD(p=0.05) | E=11.4 | | | E=2.744 | | | E=0.4 | | | E=44.1 | | |
| | | G=32.3 | | | G=0.708 | | | G=1.4 | | | G=170.9 | | |
| | | ExG=40.8 | | | ExG=3.88 | | | ExG=2.0 | | | ExG=241.7 | | |
| | | NS=Normal sown | | LS=Late sown | | | | | | | | | |

## Table 6.4.6 Effect of terminal heat stress on heat stability index at 4 locations

| Code | Genotypes | Heat stability index (HSI) | | | |
|---|---|---|---|---|---|
| | | Dholi | Hisar | Kanpur | Ludhiana |
| Phy-18-1 | NPJ 213 | 1.15 | 0.84 | 1.56 | 0.99 |
| Phy-18-2 | DRMR 15-9 | 0.43 | 0.70 | 0.45 | 0.57 |
| Phy-18-3 | DRMR1191-2 | 0.47 | 0.77 | 1.18 | 0.69 |
| Phy-18-4 | DRMR 1C192 | 0.86 | 0.77 | 1.71 | 0.94 |
| Phy-18-5 | DRMR 2017-15 | 0.61 | 0.86 | 0.85 | 0.73 |
| Phy-18-6 | LES57 | 0.45 | 0.76 | 0.84 | 0.82 |
| Phy-18-7 | Raj Vijay Mustard 2 (LR) | 0.45 | 0.76 | 0.43 | 0.53 |
| Phy-18-8 | DRMRHT 13-13-5-4 | 2.07 | 0.67 | 0.54 | 0.76 |
| Phy-18-9 | PRO 5222 | 1.46 | 0.70 | 1.66 | 0.42 |
| Phy-18-10 | RGN 368 | 1.43 | 0.79 | 1.24 | 0.87 |
| Phy-18-11 | JD 6 (ZC) | 1.01 | 0.84 | 1.36 | 0.85 |
| Phy-18-12 | NRCHB 101 (ZC) | 1.26 | 0.81 | 1.45 | 0.80 |
| Phy-18-13 | NPJ 210 | 0.45 | 0.97 | 1.30 | 0.55 |
| Phy-18-14 | DRMR 2300 | 0.74 | 0.91 | 0.58 | 0.46 |
| Phy-18-15 | DRMR1616-47 | 0.80 | 0.93 | 1.66 | 0.41 |
| Phy-18-16 | RH 749 (ZC) | 0.80 | 0.91 | 1.11 | 0.83 |
| Phy-18-17 | DRMRIC16-38 | 0.83 | 0.96 | 0.88 | 0.88 |
| Phy-18-18 | RLC 7 | 0.79 | 0.97 | 0.75 | 0.48 |
| Phy-18-19 | RLC 3 | 1.94 | 0.76 | 1.81 | 0.54 |
| Phy-18-20 | RH 1599-41 | 1.83 | 0.99 | 0.67 | 0.45 |
| Phy-18-21 | RH 923# | 1.96 | 1.00 | 1.34 | 0.71 |
| Phy-18-22 | DRMR 1153-12 | 0.61 | 0.89 | 1.39 | 0.79 |
| Phy-18-23 | PM-26 (ZC) | 1.06 | 0.98 | 1.06 | 0.68 |
| Phy-18-24 | Kranti (NC) | 1.57 | 0.98 | 1.00 | 0.91 |
| Phy-18-25 | Pusa Bold (ZC) | 1.19 | 0.93 | 0.35 | 0.56 |
| Phy-18-26 | DRMR 2059 | 0.78 | 0.86 | 0.63 | 0.83 |
| Phy-18-27 | RH 919 | 0.94 | 0.86 | 0.73 | 0.72 |
| Phy-18-28 | RMWR 09-1 | 0.52 | 0.94 | 0.69 | 0.51 |
| Phy-18-29 | NPJ 216 | 1.89 | 0.85 | 0.63 | 0.74 |
| Phy-18-30 | LES 54 | 1.43 | 0.71 | 0.75 | 0.95 |
| | **Mean** | **1.06** | **0.86** | **1.02** | **0.70** |

## Table 6.5.1 Effect of salinity on germination in Indian mustard genotypes

| Code | Genotypes | Germination (%) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | C | S | Red (%) | C | S | Red (%) | C | S | Red (%) |
| Phy-1 | RH-1607 | 95.8 | 91.7 | 4.4 | 94.0 | 78.0 | 17.0 | 75.8 | 40.0 | 47.3 |
| Phy-2 | PDZ-4 | 87.5 | 75.0 | 14.3 | 84.0 | 70.0 | 16.7 | 75.0 | 21.7 | 71.1 |
| Phy-3 | NPJ 196 | 95.8 | 83.3 | 13.0 | 100.0 | 76.0 | 24.0 | 76.7 | 16.0 | 79.1 |
| Phy-4 | CS 58 | 91.7 | 75.0 | 18.2 | 98.0 | 74.0 | 25.4 | 70.0 | 52.2 | 25.4 |
| Phy-5 | Giriraj | 100.0 | 100.0 | 0.0 | 100.0 | 78.0 | 22.0 | 85.8 | 29.2 | 66.0 |
| | **Mean** | **94.2** | **85.0** | | **95.2** | **75.2** | | **76.7** | **31.8** | |
| | CD(p=0.05) | T=0.51 | | | T=3.0 | | | T=2.84 | | |
| | | G=0.08 | | | G=4.8 | | | G=4.5 | | |
| | | TxG=0.113 | | | TxG=NS | | | TxG=6.36 | | |
| | | | | | | | | | | |
| | | C=Control | | S= Salinity @12ds/m | | | | | | |

## Table 6.5.2 Seedling length as influenced by salinity at 3 locations

| **Code** | **Genotypes** | **Seedling length (cm)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Hisar** | | | **Kanpur** | | | **Ludhiana** | | |
| | | **C** | **S** | **Red (%)** | **C** | **S** | **Red (%)** | **C** | **S** | **Red (%)** |
| Phy-1 | RH-1607 | 7.2 | 6.0 | 17.6 | 21.1 | 18.4 | 12.8 | 12.06 | 7.49 | 37.9 |
| Phy-2 | PDZ-4 | 7.9 | 6.4 | 19.7 | 21.1 | 18.0 | 14.7 | 12.65 | 8.55 | 32.4 |
| Phy-3 | NPJ 196 | 5.4 | 4.6 | 15.2 | 23.5 | 15.1 | 35.7 | 12.20 | 7.83 | 35.8 |
| Phy-4 | CS 58 | 5.4 | 4.9 | 9.7 | 23.1 | 17.3 | 25.1 | 12.12 | 9.45 | 22.0 |
| Phy-5 | Giriraj | 6.6 | 5.9 | 10.8 | 24.9 | 16.5 | 33.7 | 13.13 | 8.92 | 32.1 |
| | **Mean** | **6.5** | **5.5** | | **22.7** | **17.1** | | **12.43** | **8.45** | |
| | CD(p=0.05) | T=NS | | | T=1.0 | | | T=0.557 | | |
| | | G=0.47 | | | G=NS | | | G=0.881 | | |
| | | TxG=0.665 | | | TxG=2.3 | | | TxG=1.03 | | |
| | | | | | | | | | | |
| | | C=Control | | S= Salinity @12ds/m | | | | | | |

## Table 6.5.3 Dry matter as influenced by salinity in Indian mustard genotypes

| Code | Genotypes | DW/10 seedlings | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | C | S | Red (%) | C | S | Red (%) | C | S | Red (%) |
| Phy-1 | RH-1607 | 0.109 | 0.062 | 42.9 | 0.855 | 0.700 | 18.1 | 0.277 | 0.259 | 6.4 |
| Phy-2 | PDZ-4 | 0.119 | 0.068 | 42.7 | 0.800 | 0.658 | 17.8 | 0.356 | 0.331 | 7.0 |
| Phy-3 | NPJ 196 | 0.081 | 0.044 | 46.4 | 0.735 | 0.528 | 28.2 | 0.278 | 0.185 | 33.3 |
| Phy-4 | CS 58 | 0.082 | 0.034 | 58.2 | 0.725 | 0.563 | 22.3 | 0.191 | 0.181 | 5.3 |
| Phy-5 | Giriraj | 0.099 | 0.058 | 41.1 | 0.855 | 0.525 | 38.6 | 0.287 | 0.140 | 51.2 |
| | **Mean** | **0.098** | **0.0532** | | **0.794** | **0.595** | | **0.277** | **0.219** | |
| | CD(p=0.05) | T=0.051 | | | T=0.015 | | | T=0.0189 | | |
| | | G=0.08 | | | G=0.024 | | | G=0.0299 | | |
| | | TxG=0.113 | | | TxG=0.034 | | | TxG=0.0423 | | |
| | | C=Control | | S= Salinity @12ds/m | | | | | | |

## Table 6.5.4 Seedling vigour index as influenced by salinity at Hisar, Kanpur, and Ludhiana

| Code | Genotypes | Vigour index(SVII) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Hisar | | | Kanpur | | | Ludhiana | | |
| | | C | S | Red (%) | C | S | Red (%) | C | S | Red (%) |
| Phy-1 | RH-1607 | 1.04 | 0.57 | 45.3 | 8.03 | 5.53 | 31.2 | 2.10 | 1.03 | 50.8 |
| Phy-2 | PDZ-4 | 1.04 | 0.51 | 50.9 | 6.72 | 4.55 | 32.3 | 2.68 | 0.71 | 73.4 |
| Phy-3 | NPJ 196 | 0.78 | 0.36 | 53.4 | 7.35 | 3.91 | 46.8 | 2.14 | 0.30 | 86.2 |
| Phy-4 | CS 58 | 0.75 | 0.26 | 65.8 | 7.10 | 4.23 | 40.5 | 1.33 | 0.94 | 29.4 |
| Phy-5 | Giriraj | 9.91 | 0.58 | 94.1 | 8.75 | 4.05 | 53.7 | 2.45 | 0.39 | 84.3 |
| | **Mean** | **2.70** | **0.46** | | **7.59** | **4.44** | | **2.14** | **0.67** | |
| | CD(p=0.05) | T=NS | | | T=0.245 | | | T=0.153 | | |
| | | G=NS | | | G=0.387 | | | G=0.242 | | |
| | | TxG=0.24 | | | TxG=0.548 | | | TxG=0.342 | | |
| | | | | | | | | | | |
| | | C=Control | | S= Salinity @12ds/m | | | | | | |

## Table 6.6 Effect of plant growth regulating subustances on yield under rain fed condition

| Code | Treatment | SPAD | | | Seeds/siliqua | | Seed weight (g) | | | Seed Yield | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Kanpur | Ludhiana | Hisar | Kanpur | Ludhiana | Hisar | Kanpur | Ludhiana | Hisar(kg/ha) | Kanpur(g/plant) | Ludhiana (kg/ha) |
| 1 | Control | 39.9 | 44.6 | 13.9 | 12.7 | 10.6 | 6.4 | 4.6 | 3.5 | 2229 | 14.7 | 1171 |
| 2 | Water spray | x | 42.3 | 13.7 | x | 12.7 | 6.5 | x | 4.1 | 2903 | x | 1255 |
| 3 | SA @100ppm | 41.8 | 49.5 | 13.6 | 13.6 | 12.1 | 6.6 | 4.8 | 4.4 | 2543 | 15.4 | 1388 |
| 4 | SA @200 ppm | 45.6 | 46.0 | 13.8 | 14.3 | 13.1 | 6.6 | 5.3 | 4.8 | 2894 | 17.4 | 1276 |
| 5 | BR @10ppm | 43.7 | 46.6 | 14.4 | 13.2 | 12.5 | 6.8 | 5.1 | 4.5 | 2371 | 15.7 | 1274 |
| 6 | BR @20 ppm | 46.6 | 43.5 | 14.7 | 14.1 | 12.8 | 6.9 | 5.5 | 4.2 | 3007 | 18.2 | 1317 |
| | **Mean** | **43.5** | **45.4** | **14.0** | **13.6** | **12.3** | **6.6** | **5.1** | **4.3** | **2658** | **16.3** | **1280** |
| | CD(p=0.05) | 1.02 | 2.8 | NS | 0.33 | 1.1 | NS | 0.52 | 0.3 | 145 | 0.43 | 114 |

# Biochemistry

# 7. Biochemistry

**7.1 Evaluation of important breeding materials for nutritional quality index (NQI) of oil.**

**Parameters:** Oil content, Fatty acid profiling, ω6/ω3, Oil stability index, SFA: MUFA: PUFA
**Centres:** Bharatpur, Ludhiana, Kangra, Pantnagar, Hisar and Kanpur
KRANTI (National Check), RH-749 (Zonal Check) andPDZ-1(Quality check)

### 7.1.1 Oil content

Entries of IVT/AVT quality trials were analysed for oil content at Bharatpur, Kanpur, Kangra, Pantnagar, Hisar and Ludhiana.
The mean values of five centers (Bharatpur, Pantnagar, Ludhiana, Hisar and Kangra) showed maximum oil content (40.88%) in DRMRQ1-16-27 and minimum oil content (35.73%) in LES-59 (Table 1).

### 7.1.2 Oil Stability Index of Quality

**Oil stability index** which is the ratio of MUFA: PUFA was analyzed at five centres (Bharatpur, Kanpur, Kangra, Pantnagar, and Hisar). On the basis of mean estimates, it ranged from 0.65 in RH-749to 1.31 in RLC-7 (Table 2).

### 7.1.3 Fatty Acid Profiling

Entries of IVT/AVT quality trials were analysed for fatty acid profile at Bharatpur, Kanpur, Kangra, Pantnagar, Hisar and Ludhiana. RLC-8, RCH-3, LES-59, LES-58, RLC-7, DRMRQ4-7-23, LES-57, LES-54,PDZ-11, PDZ-12 and RLC-9 had < 2 % erucic acid content. **Palmitic acid:** Mean values ranged from 2.89% (RH-749) to 4..61 % (PDZ-11). **Stearic acid**: 0.83 % (Kranti) to 1.52% (LES-59). **Oleic acid:**9.88 % (RH-749) to 42.25 % (PDZ-1). **Linoleic acid:**15.33 % (RH-749) to 40.86 % (PDZ-11). **Linolenic acid:** 10.25 % (LES-58) to 16.82 % (RLC-3). **Eicosanoic acid**: 4.37 % (RCH-3) to 8.35 % (RH-749). **ω6:ω3 ratio** ranged from 0.98 (RH-749) to 3.78 (LES-58). The **SFA: MUFA: PUFA** ratio ranged between 1:07:10 (PDZ-11) to 1:24:13 (RH-749). (Table 3- 11)

**7.2. Nutritional Profiling of important quality breeding materials**

**Parameters:** Seed meal-protein content, methionine, tryptophan
**Centres:** Bharatpur, Kanpur, Kangra, Pantnagar, Hisar, Ludhiana
KRANTI (National Check), RH-749 (Zonal Check) and PDZ-1(Quality check)
**Total Protein:**32.59 (7IJ0002) to 35.92% (LES-58). **Methionine:**1.34 (LES-57) to 1.68 (LES-59) g/100g protein. **Tryptophan:**1.15 (RLC-3) to 1.40 (RH-749) g/100g protein (Table 12-14).

**7.3. Evaluation of important breeding materials for antioxidant properties in seed meal**

**Parameters:** Total antioxidant activity, Total Phenolic content
**Centres:** Bharatpur, Kanpur, Kangra, Pantnagar, Hissar, Ludhiana
Entries of IVT/AVT quality trials were evaluated for antioxidant activity at Kanpur, Bharatpur, Ludhiana, Kangra, Hisar and Pantnagar.
**Total antioxidant capacity** ranged from 16.14 (LES-59) to 24.81 (RH (OE) 1706) mg/g AAE.
**Total phenolcontent** ranged from 3..47% (PM-29) to 5.16% (DRMRQ1-16-27) (Table 15-16).

### 7.4. Estimation of anti-nutritional factors in quality breeding materials

**Parameters:** Total Glucosinolates and Phytic acid

**Centres:** Bharatpur, Kanpur, Kangra, Pantnagar, Hisar, Ludhiana

Entries of IVT/AVT quality trials were evaluated at Bharatpur, Ludhiana, Kangra, Kanpur, Pantnagar, and Hisar.

**Total Glucosinolate** mean values for five centres (Bharatpur, Pantnagar, Kangra, Kanpur, Hisar) were <30 µmol/g in RLC-8, RCH-3,RLC-10, RLC-7, RCH-1, DRMRQ4-7-23, PDZ-11, PDZ-12, DRMRQ1-16-27, PDZ-1, 7IJ0002, RLC-3and RLC-9 genotypes.

**Phytic acid content** mean values were < 2% in RCH-3,PM-29, RCH-1, DRMRQ1-16-27 (Table 17-18).

### 7.5 Estimation of β-carotene in rapeseed /mustard

Centres: Bharatpur, Kanpur, Kangra, Pantnagar, Hisar, Ludhiana

**β-carotene content** of Entries of IVT/AVT quality trials were evaluated at Bharatpur, Ludhiana, Kangra, Pantnagar, and Hisar. RLC-10, RH(OE)1705, PM-29, Kranti, 7IJ0002 recorded >5 ppm β – Carotene (Table 19). Tocopherol content evaluated at Bharatpur, Ludhiana, Kangra, Pantnagar, and Hisarwas>160 mg/100 g seed in 7IJ0002, PDZ-1, Kranti, DRMRQ1-16-27and DRMRQ4-7-23.

**Table 1: Oil Content (%)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean * |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | **39.74** | 40.21 | 39.6 | 38.72 | 38.9 | 41.88 | 39.43 |
| 2. | BIOCHEM-18-2 | RCH-3 | **39.69** | 41.79 | 40 | 39.46 | 38.8 | 41.14 | 39.95 |
| 3. | BIOCHEM-18-3 | RLC-10 | **40.16** | 40.54 | 40.03 | 39.61 | 39.8 | 43.13 | 40.03 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | **37.55** | 38.2 | 37.77 | 36.42 | 38.7 | 40.12 | 37.73 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | **35.73** | 38.87 | 39.47 | 31.52 | 38.5 | 40.3 | 36.82 |
| 6. | BIOCHEM-18-6 | LES-59 | **33.98** | 35.76 | 37.67 | 32.45 | 38.8 | 40.35 | 35.73 |
| 7. | BIOCHEM-18-7 | LES-58 | **35.01** | 36.46 | 37.77 | 31.47 | 39.8 | 39.16 | 36.10 |
| 8. | BIOCHEM-18-8 | RLC-7 | **39.80** | 40.47 | 39.53 | 40.41 | 39.9 | 44.69 | 40.02 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | **40.14** | 39.35 | 38.83 | 39.59 | 41.4 | 41.55 | 39.86 |
| 10. | BIOCHEM-18-10 | RCH-1 | **39.89** | 41.43 | 40.4 | 40.08 | 39.7 | 44.17 | 40.30 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | **42.11** | 40.47 | 40.13 | 41.18 | 40 | 42.63 | 40.78 |
| 12. | BIOCHEM-18-12 | LES-57 | **35.73** | 36.1 | 37.37 | 34.42 | 39.5 | 44.03 | 36.62 |
| 13. | BIOCHEM-18-13 | LES-54 | **33.70** | 37.11 | 38.13 | 32.74 | 39.8 | 41.81 | 36.30 |
| 14. | BIOCHEM-18-14 | PDZ-11 | **36.25** | 39.19 | 38.8 | 34.37 | 39.8 | 45.22 | 37.68 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | **40.10** | 38.03 | 36.7 | 40.40 | 38.9 | 44.05 | 38.83 |
| 16. | BIOCHEM-18-16 | PDZ-12 | **36.22** | 38.41 | 39.43 | 33.76 | 38.9 | 41.83 | 37.34 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | **42.40** | 40.53 | 38.97 | 42.28 | 40.2 | 44.64 | 40.88 |
| 18. | BIOCHEM-18-18 | RLC-9 | **39.47** | 41.14 | 39.77 | 39.62 | 39.7 | 44.19 | 39.94 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | **40.21** | 41.3 | 40.07 | 41.33 | 38.7 | 44.19 | 40.32 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | **41.15** | 40.68 | 40.07 | 39.67 | 39.7 | 44.14 | 40.25 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | **39.56** | 39.4 | 38.57 | 37.58 | 39.5 | 43.51 | 38.92 |
| 22. | BIOCHEM-18-22 | RLC-3 | **40.32** | 38.53 | 37.93 | 39.85 | 39.8 | 43.53 | 39.29 |

**(* Mean is excluding Kanpur centre)**

**Table 2: Oil Stability Index (OSI)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | HSR | KPR | Mean* |
|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 1.07 | 1.12 | 1.14 | 1.11 | 1.12 | **0.93** |
| 2. | BIOCHEM-18-2 | RCH-3 | 1.12 | 1.2 | 1.19 | 1.2 | 1.2 | **1.18** |
| 3. | BIOCHEM-18-3 | RLC-10 | 0.95 | 0.94 | 0.99 | 0.95 | 0.94 | **0.95** |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 1.09 | 1.18 | 1.11 | 1.17 | 1.18 | **1.15** |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 0.92 | 0.94 | 1 | 0.95 | 0.94 | **0.95** |
| 6. | BIOCHEM-18-6 | LES-59 | 0.99 | 1.05 | 1.06 | 1.06 | 1.05 | **1.04** |
| 7. | BIOCHEM-18-7 | LES-58 | 0.91 | 1.02 | 1.04 | 1.02 | 1.02 | **1.00** |
| 8. | BIOCHEM-18-8 | RLC-7 | 1.22 | 1.34 | 1.32 | 1.35 | 1.34 | **1.31** |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 0.57 | 0.67 | 0.69 | 0.67 | 0.67 | **0.65** |
| 10. | BIOCHEM-18-10 | RCH-1 | 1.04 | 1.24 | 1.19 | 1.24 | 1.24 | **1.19** |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 1.03 | 1.13 | 1.15 | 1.17 | 1.13 | **1.12** |
| 12. | BIOCHEM-18-12 | LES-57 | 1.03 | 1.13 | 1.13 | 1.12 | 1.13 | **1.11** |
| 13. | BIOCHEM-18-13 | LES-54 | 0.88 | 0.93 | 0.96 | 0.93 | 0.93 | **0.93** |
| 14. | BIOCHEM-18-14 | PDZ-11 | 0.71 | 0.84 | 0.91 | 0.86 | 0.84 | **0.83** |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 1.12 | 1.07 | 1.03 | 1.07 | 1.07 | **1.07** |
| 16. | BIOCHEM-18-16 | PDZ-12 | 0.96 | 0.89 | 0.92 | 0.89 | 0.89 | **0.91** |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 1.05 | 1.17 | 1.18 | 1.16 | 1.17 | **1.15** |
| 18. | BIOCHEM-18-18 | RLC-9 | 1.02 | 1.15 | 1.13 | 1.15 | 1.15 | **1.12** |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 0.85 | 0.73 | 0.67 | 0.73 | 0.73 | **0.74** |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 1.10 | 1.3 | 1.25 | 1.3 | 1.3 | **1.25** |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 1.05 | 1.17 | 1.07 | 1.21 | 1.17 | **1.13** |
| 22. | BIOCHEM-18-22 | RLC-3 | 1.05 | 1.18 | 1.2 | 1.18 | 1.18 | **1.16** |

(* Mean is excluding Ludhianacentre)

**Table 3: Palmitic acid (%)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 3.92 | 4.88 | 2.67 | 3.79 | 4.4 | 4.88 | **4.09** |
| 2. | BIOCHEM-18-2 | RCH-3 | 3.51 | 3.9 | 2.43 | 3.55 | 3.9 | 3.9 | **3.53** |
| 3. | BIOCHEM-18-3 | RLC-10 | 3.68 | 4.06 | 2.47 | 3.74 | 4.06 | 4.06 | **3.68** |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 3.75 | 3.49 | 2.9 | 3.52 | 3.49 | 3.49 | **3.44** |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 4.06 | 4.73 | 2.77 | 4.81 | 4.73 | 4.73 | **4.31** |
| 6. | BIOCHEM-18-6 | LES-59 | 4.03 | 4.07 | 3.47 | 4.22 | 4.07 | 4.07 | **3.99** |
| 7. | BIOCHEM-18-7 | LES-58 | 3.80 | 4.48 | 2.85 | 4.27 | 4.48 | 4.48 | **4.06** |
| 8. | BIOCHEM-18-8 | RLC-7 | 3.49 | 3.89 | 2.83 | 3.63 | 3.89 | 3.89 | **3.60** |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 3.51 | 2.95 | 3.07 | 1.90 | 2.95 | 2.95 | **2.89** |
| 10. | BIOCHEM-18-10 | RCH-1 | 3.11 | 3.18 | 2.17 | 3.53 | 3.12 | 3.18 | **3.05** |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 3.97 | 4.61 | 3.35 | 3.64 | 4.61 | 4.61 | **4.13** |
| 12. | BIOCHEM-18-12 | LES-57 | 3.65 | 3.87 | 3.4 | 3.77 | 3.2 | 3.87 | **3.63** |
| 13. | BIOCHEM-18-13 | LES-54 | 3.58 | 3.92 | 3.03 | 3.92 | 3.92 | 3.92 | **3.72** |
| 14. | BIOCHEM-18-14 | PDZ-11 | 4.51 | 4.72 | 4.13 | 4.84 | 4.72 | 4.72 | **4.61** |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 3.50 | 3.51 | 3.23 | 3.43 | 3.51 | 3.51 | **3.45** |
| 16. | BIOCHEM-18-16 | PDZ-12 | 3.58 | 4.01 | 4.16 | 4.58 | 4.01 | 4.01 | **4.06** |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 4.22 | 4.34 | 4.27 | 4.23 | 4.34 | 4.34 | **4.29** |
| 18. | BIOCHEM-18-18 | RLC-9 | 3.67 | 4.15 | 2.37 | 4.07 | 4.15 | 4.15 | **3.76** |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 3.28 | 3.55 | 2.67 | 2.47 | 3.55 | 3.55 | **3.18** |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 3.44 | 3.54 | 4.03 | 3.83 | 3.54 | 3.54 | **3.65** |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 3.84 | 4.58 | 3.29 | 4.64 | 4.58 | 4.58 | **4.25** |
| 22. | BIOCHEM-18-22 | RLC-3 | 3.46 | 3.4 | 4.07 | 3.71 | 3.4 | 3.4 | **3.57** |

**Table 4: Stearic acid (%)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 0.57 | 0.47 | 2.9 | 1.91 | 0.47 | 0.47 | **1.13** |
| 2. | BIOCHEM-18-2 | RCH-3 | 0.80 | 1.11 | 2.83 | 2.07 | 1.11 | 1.11 | **1.50** |
| 3. | BIOCHEM-18-3 | RLC-10 | 0.73 | 0.88 | 2.6 | 1.57 | 0.88 | 0.88 | **1.26** |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 1.09 | 1.1 | 2.7 | 1.84 | 1.1 | 1.1 | **1.49** |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 0.77 | 0.65 | 2.93 | 1.92 | 0.65 | 0.65 | **1.26** |
| 6. | BIOCHEM-18-6 | LES-59 | 1.10 | 1.12 | 2.53 | 2.13 | 1.12 | 1.12 | **1.52** |
| 7. | BIOCHEM-18-7 | LES-58 | 0.75 | 0.77 | 2.92 | 2.31 | 0.77 | 0.77 | **1.38** |
| 8. | BIOCHEM-18-8 | RLC-7 | 0.96 | 1.07 | 2.57 | 1.91 | 1.07 | 1.07 | **1.44** |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 0.57 | 0.66 | 1.8 | 0.80 | 0.66 | 0.66 | **0.86** |
| 10. | BIOCHEM-18-10 | RCH-1 | 0.87 | 0.98 | 3.1 | 1.75 | 0.98 | 0.98 | **1.44** |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 0.92 | 0.76 | 2.5 | 1.43 | 0.76 | 0.76 | **1.19** |
| 12. | BIOCHEM-18-12 | LES-57 | 0.93 | 1.1 | 2.43 | 2.40 | 1.1 | 1.1 | **1.51** |
| 13. | BIOCHEM-18-13 | LES-54 | 0.88 | 0.81 | 2.83 | 2.12 | 0.81 | 0.81 | **1.38** |
| 14. | BIOCHEM-18-14 | PDZ-11 | 0.70 | 1.01 | 2.1 | 1.62 | 1.01 | 1.01 | **1.24** |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 0.71 | 0.86 | 2.63 | 1.78 | 0.86 | 0.86 | **1.28** |
| 16. | BIOCHEM-18-16 | PDZ-12 | 0.87 | 0.91 | 2.29 | 1.49 | 0.91 | 0.91 | **1.23** |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 0.89 | 0.76 | 2.71 | 1.35 | 0.76 | 0.76 | **1.20** |
| 18. | BIOCHEM-18-18 | RLC-9 | 0.74 | 0.91 | 2.8 | 1.73 | 0.91 | 0.91 | **1.33** |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 0.57 | 0.64 | 1.6 | 0.92 | 0.64 | 0.64 | **0.83** |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 0.81 | 0.81 | 2.19 | 2.37 | 0.81 | 0.81 | **1.30** |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 0.85 | 0.79 | 2.47 | 1.64 | 0.79 | 0.79 | **1.22** |
| 22. | BIOCHEM-18-22 | RLC-3 | 0.50 | 0.65 | 2.61 | 2.04 | 0.65 | 0.65 | **1.18** |

**Table 5:Oleic acid (%)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean* |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 38.77 | 40.76 | 40.92 | 46.38 | 39.42 | 40.76 | 41.17 |
| 2. | BIOCHEM-18-2 | RCH-3 | 39.56 | 40.15 | 40.23 | 48.41 | 40.15 | 40.15 | 41.44 |
| 3. | BIOCHEM-18-3 | RLC-10 | 34.64 | 32.64 | 34.05 | 40.18 | 32.64 | 32.64 | 34.47 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 34.72 | 35.82 | 36.14 | 44.07 | 36.93 | 35.82 | 37.25 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 35.28 | 34.13 | 36.57 | 46.43 | 35.24 | 34.13 | 36.96 |
| 6. | BIOCHEM-18-6 | LES-59 | 37.93 | 38.5 | 37.9 | 41.24 | 38.15 | 38.5 | 38.70 |
| 7. | BIOCHEM-18-7 | LES-58 | 35.91 | 38.67 | 37.84 | 42.69 | 38.67 | 38.67 | 38.74 |
| 8. | BIOCHEM-18-8 | RLC-7 | 40.30 | 41.09 | 41 | 46.57 | 41.09 | 41.09 | 41.86 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 10.18 | 9.75 | 10.16 | 9.71 | 9.75 | 9.75 | 9.88 |
| 10. | BIOCHEM-18-10 | RCH-1 | 35.69 | 36.1 | 38.16 | 50.22 | 36.1 | 36.1 | 38.73 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 37.43 | 39.54 | 40.78 | 49.31 | 39.54 | 39.54 | 41.02 |
| 12. | BIOCHEM-18-12 | LES-57 | 38.77 | 39.67 | 39.03 | 46.69 | 39.41 | 39.67 | 40.54 |
| 13. | BIOCHEM-18-13 | LES-54 | 33.18 | 33.91 | 35.79 | 43.61 | 33.71 | 33.91 | 35.68 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 31.95 | 33.79 | 34.67 | 38.91 | 33.79 | 33.79 | 34.48 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 32.71 | 30.01 | 31.59 | 37.70 | 30.01 | 30.01 | 32.01 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 34.00 | 34.61 | 35.28 | 40.38 | 34.61 | 34.61 | 35.58 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 37.26 | 38.66 | 40.31 | 48.65 | 38.16 | 38.66 | 40.28 |
| 18. | BIOCHEM-18-18 | RLC-9 | 37.24 | 40.48 | 40.25 | 45.19 | 39.35 | 40.48 | 40.50 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 23.10 | 13.82 | 11.41 | 11.60 | 13.82 | 13.82 | 14.59 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 39.46 | 41.48 | 41.22 | 48.40 | 41.48 | 41.48 | 42.25 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 36.24 | 34.58 | 35.13 | 41.42 | 34.32 | 34.58 | 36.04 |
| 22. | BIOCHEM-18-22 | RLC-3 | 37.04 | 38.37 | 39.77 | 42.58 | 38.37 | 38.37 | 39.08 |

**(* mean is excluding Ludhiana centre)**

**Table 6: Linoleic acid (%)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 36.28 | 36.55 | 35.74 | 34.73 | 35.67 | 36.55 | 35.92 |
| 2. | BIOCHEM-18-2 | RCH-3 | 35.17 | 33.59 | 33.85 | 32.94 | 33.59 | 33.59 | 33.79 |
| 3. | BIOCHEM-18-3 | RLC-10 | 36.49 | 34.72 | 34.55 | 33.28 | 34.42 | 34.72 | 34.70 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 31.96 | 30.32 | 32.53 | 32.41 | 31.67 | 30.32 | 31.53 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 38.34 | 36.17 | 36.71 | 36.02 | 37.24 | 36.17 | 36.78 |
| 6. | BIOCHEM-18-6 | LES-59 | 38.40 | 36.67 | 35.81 | 41.37 | 36.11 | 36.67 | 37.51 |
| 7. | BIOCHEM-18-7 | LES-58 | 39.31 | 38.01 | 36.51 | 41.04 | 38.01 | 38.01 | 38.48 |
| 8. | BIOCHEM-18-8 | RLC-7 | 33.00 | 30.72 | 31.17 | 31.05 | 30.5 | 30.72 | 31.19 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 17.97 | 14.65 | 14.63 | 15.40 | 14.65 | 14.65 | 15.33 |
| 10. | BIOCHEM-18-10 | RCH-1 | 34.43 | 29.04 | 32.19 | 32.01 | 29.04 | 29.04 | 30.96 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 36.31 | 34.86 | 35.5 | 34.28 | 33.77 | 34.86 | 34.93 |
| 12. | BIOCHEM-18-12 | LES-57 | 37.71 | 35.09 | 34.51 | 36.46 | 35.09 | 35.09 | 35.66 |
| 13. | BIOCHEM-18-13 | LES-54 | 37.61 | 36.3 | 37.1 | 36.37 | 36.3 | 36.3 | 36.66 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 44.90 | 40.16 | 38.21 | 42.55 | 39.16 | 40.16 | 40.86 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 29.14 | 28.16 | 30.56 | 27.46 | 28.16 | 28.16 | 28.61 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 35.56 | 39.1 | 38.17 | 43.57 | 39.1 | 39.1 | 39.10 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 35.57 | 33 | 34.06 | 33.21 | 33 | 33 | 33.64 |
| 18. | BIOCHEM-18-18 | RLC-9 | 36.56 | 35.22 | 35.76 | 34.59 | 34.22 | 35.22 | 35.26 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 27.24 | 18.87 | 17.09 | 16.10 | 18.87 | 18.87 | 19.51 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 35.94 | 31.87 | 32.94 | 37.14 | 31.87 | 31.87 | 33.60 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 34.41 | 29.47 | 32.75 | 29.87 | 28.47 | 29.47 | 30.74 |
| 22. | BIOCHEM-18-22 | RLC-3 | 35.36 | 32.53 | 33.24 | 31.70 | 32.53 | 32.53 | 32.98 |

**Table 7:Linolenic acid (%)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 10.37 | 10.14 | 11.84 | 12.15 | 10.37 | 10.14 | 10.84 |
| 2. | BIOCHEM-18-2 | RCH-3 | 14.45 | 14.1 | 14.87 | 12.01 | 14.45 | 14.1 | 14.00 |
| 3. | BIOCHEM-18-3 | RLC-10 | 15.45 | 15.45 | 15.51 | 14.165 | 15.45 | 15.45 | 15.25 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 18.26 | 18.26 | 15.26 | 17.095 | 18.26 | 18.26 | 17.57 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 10.37 | 10.36 | 11.79 | 10.445 | 10.37 | 10.36 | 10.62 |
| 6. | BIOCHEM-18-6 | LES-59 | 11.17 | 11.17 | 11.02 | 11.215 | 11.17 | 11.17 | 11.15 |
| 7. | BIOCHEM-18-7 | LES-58 | 10.41 | 10.06 | 11.28 | 9.25 | 10.41 | 10.06 | 10.25 |
| 8. | BIOCHEM-18-8 | RLC-7 | 15.24 | 14.16 | 14.76 | 14.21 | 15.24 | 14.16 | 14.63 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 15.53 | 15.53 | 13.78 | 18.515 | 15.53 | 15.53 | 15.74 |
| 10. | BIOCHEM-18-10 | RCH-1 | 14.57 | 13.73 | 15.39 | 12.46 | 14.57 | 13.73 | 14.08 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 10.24 | 10.24 | 11.66 | 10.805 | 10.24 | 10.24 | 10.57 |
| 12. | BIOCHEM-18-12 | LES-57 | 12.99 | 12.18 | 12.14 | 10.65 | 12.99 | 12.18 | 12.19 |
| 13. | BIOCHEM-18-13 | LES-54 | 13.11 | 12.34 | 12.28 | 13.645 | 13.11 | 12.34 | 12.80 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 14.48 | 14.48 | 13.73 | 12.045 | 14.48 | 14.48 | 13.95 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 23.2 | 23.75 | 17.98 | 23.135 | 23.2 | 23.75 | 22.50 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 13.34 | 12.04 | 11.51 | 10.01 | 13.34 | 12.04 | 12.05 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 12.48 | 12.48 | 12.56 | 12.57 | 12.48 | 12.48 | 12.51 |
| 18. | BIOCHEM-18-18 | RLC-9 | 13.86 | 14.28 | 15.5 | 12.63 | 13.86 | 14.28 | 14.07 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 15.1 | 15.48 | 15.45 | 18.52 | 15.1 | 15.48 | 15.86 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 11.67 | 10.53 | 10.62 | 7.515 | 11.67 | 10.53 | 10.42 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 12.16 | 12.16 | 13.36 | 14.375 | 12.16 | 12.16 | 12.73 |
| 22. | BIOCHEM-18-22 | RLC-3 | 17.39 | 17.59 | 13.95 | 16.98 | 17.39 | 17.59 | 16.82 |

**Table 8:Eicosanoic acid (%)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean* |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 8.92 | 8.35 | 4.54 | 0 | 8.35 | 8.35 | 6.42 |
| 2. | BIOCHEM-18-2 | RCH-3 | 7.96 | 5.11 | 2.93 | 0 | 5.11 | 5.11 | 4.37 |
| 3. | BIOCHEM-18-3 | RLC-10 | 9.07 | 7.61 | 4.26 | 0 | 7.42 | 7.61 | 5.99 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 9.16 | 6.14 | 3.54 | 0 | 6.14 | 6.14 | 6.22 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 9.86 | 9.12 | 5.1 | 0 | 9.12 | 9.12 | 7.05 |
| 6. | BIOCHEM-18-6 | LES-59 | 9.68 | 8.27 | 4.91 | 0 | 8.27 | 8.27 | 6.57 |
| 7. | BIOCHEM-18-7 | LES-58 | 7.63 | 6.19 | 3.65 | 0 | 6.19 | 6.19 | 4.98 |
| 8. | BIOCHEM-18-8 | RLC-7 | 8.63 | 6.37 | 3.87 | 0 | 6.37 | 6.37 | 5.27 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 11.10 | 10.47 | 7.11 | 0.68 | 10.25 | 10.47 | 8.35 |
| 10. | BIOCHEM-18-10 | RCH-1 | 8.10 | 5.95 | 2.98 | 0 | 6.13 | 5.95 | 4.85 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 10.43 | 9.81 | 4.61 | 0 | 9.81 | 9.81 | 7.41 |
| 12. | BIOCHEM-18-12 | LES-57 | 7.96 | 5.51 | 3.66 | 0 | 6.21 | 5.51 | 4.81 |
| 13. | BIOCHEM-18-13 | LES-54 | 10.76 | 10.21 | 5.61 | 0 | 10.21 | 10.21 | 7.83 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 6.56 | 5.89 | 3.8 | 0 | 5.74 | 5.89 | 4.65 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 9.17 | 9.19 | 5.19 | 0.37 | 9.19 | 9.19 | 7.05 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 7.55 | 6.59 | 4.44 | 0 | 6.13 | 6.59 | 5.22 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 9.74 | 9.24 | 3.61 | 0 | 9.26 | 9.24 | 6.85 |
| 18. | BIOCHEM-18-18 | RLC-9 | 8.64 | 6.2 | 2.46 | 0 | 6.2 | 6.2 | 4.95 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 10.28 | 10.21 | 7.01 | 0.62 | 10.21 | 10.21 | 8.09 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 8.14 | 5.95 | 5.25 | 0 | 6.94 | 5.95 | 5.37 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 9.70 | 9.55 | 5.73 | 0 | 9.55 | 9.55 | 7.35 |
| 22. | BIOCHEM-18-22 | RLC-3 | 8.41 | 5.16 | 3.78 | 0 | 5.16 | 5.16 | 4.61 |

**(*Mean is excluding Ludhiana centre)**

**Table 9:Erucic acid (%)**

| Sl. No | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean* |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 1.83 | 1.32 | 0.83 | 1.03 | 1.32 | 1.32 | 1.32 |
| 2. | BIOCHEM-18-2 | RCH-3 | 1.45 | 1.69 | 0.97 | 0.90 | 1.69 | 1.69 | 1.50 |
| 3. | BIOCHEM-18-3 | RLC-10 | 4.05 | 5.13 | 2.73 | 6.33 | 5.13 | 5.13 | 4.43 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 3.28 | 2.41 | 2.33 | 1.02 | 2.41 | 2.41 | 2.57 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 2.45 | 2.65 | 3.7 | 0.00 | 2.65 | 2.65 | 2.82 |
| 6. | BIOCHEM-18-6 | LES-59 | 1.51 | 1.11 | 1.97 | 0.00 | 1.11 | 1.11 | 1.36 |
| 7. | BIOCHEM-18-7 | LES-58 | 1.38 | 1.47 | 1.59 | 0.00 | 1.47 | 1.47 | 1.48 |
| 8. | BIOCHEM-18-8 | RLC-7 | 1.78 | 1.84 | 1.21 | 1.98 | 1.84 | 1.84 | 1.70 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 37.20 | 48.55 | 45.88 | 53.21 | 46.21 | 48.55 | 45.28 |
| 10. | BIOCHEM-18-10 | RCH-1 | 6.08 | 10.06 | 5.1 | 0.00 | 10.06 | 10.06 | 8.27 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 1.12 | 1.27 | 0.78 | 0.00 | 1.27 | 1.27 | 1.14 |
| 12. | BIOCHEM-18-12 | LES-57 | 1.64 | 2.23 | 2.67 | 0.00 | 2 | 2.23 | 2.15 |
| 13. | BIOCHEM-18-13 | LES-54 | 1.77 | 1.94 | 2 | 0.00 | 1.94 | 1.94 | 1.92 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 1.60 | 1.1 | 0.73 | 0.00 | 1.1 | 1.1 | 1.13 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 3.16 | 5.07 | 3.59 | 5.99 | 5.07 | 5.07 | 4.39 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 2.11 | 1.9 | 1.31 | 0.00 | 1.9 | 1.9 | 1.82 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 5.56 | 2.02 | 2.09 | 0.00 | 2 | 2.02 | 2.74 |
| 18. | BIOCHEM-18-18 | RLC-9 | 3.20 | 1.31 | 0.79 | 1.84 | 1.31 | 1.31 | 1.58 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 23.44 | 37.81 | 40.41 | 49.10 | 37.81 | 37.81 | 35.46 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 7.02 | 3.29 | 2.98 | 0.00 | 3.69 | 3.29 | 4.05 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 8.55 | 10.13 | 6.29 | 7.90 | 10.13 | 10.13 | 9.05 |
| 22. | BIOCHEM-18-22 | RLC-3 | 5.86 | 2.5 | 2.29 | 3.54 | 2.5 | 2.5 | 3.13 |

**(*Mean is excluding Ludhiana data)**

**Table 10: ω6 and ω3 ratio**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 3.50 | 3.6 | 3.02 | 2.86 | 3.44 | 3.6 | **3.34** |
| 2. | BIOCHEM-18-2 | RCH-3 | 2.43 | 2.38 | 2.28 | 2.74 | 2.32 | 2.38 | **2.42** |
| 3. | BIOCHEM-18-3 | RLC-10 | 2.36 | 2.25 | 2.23 | 2.35 | 2.23 | 2.25 | **2.28** |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 1.75 | 1.66 | 2.13 | 1.90 | 1.73 | 1.66 | **1.80** |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 3.70 | 3.49 | 3.11 | 3.45 | 3.59 | 3.49 | **3.47** |
| 6. | BIOCHEM-18-6 | LES-59 | 3.44 | 3.28 | 3.25 | 3.69 | 3.23 | 3.28 | **3.36** |
| 7. | BIOCHEM-18-7 | LES-58 | 3.78 | 3.78 | 3.24 | 4.44 | 3.65 | 3.78 | **3.78** |
| 8. | BIOCHEM-18-8 | RLC-7 | 2.17 | 2.17 | 2.11 | 2.18 | 2 | 2.17 | **2.13** |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 1.16 | 0.94 | 1.06 | 0.83 | 0.94 | 0.94 | **0.98** |
| 10. | BIOCHEM-18-10 | RCH-1 | 2.36 | 2.12 | 2.09 | 2.57 | 1.99 | 2.12 | **2.21** |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 3.55 | 3.4 | 3.04 | 3.17 | 3.3 | 3.4 | **3.31** |
| 12. | BIOCHEM-18-12 | LES-57 | 2.90 | 2.88 | 2.84 | 3.42 | 2.7 | 2.88 | **2.94** |
| 13. | BIOCHEM-18-13 | LES-54 | 2.87 | 2.94 | 3.02 | 2.67 | 2.77 | 2.94 | **2.87** |
| 14. | BIOCHEM-18-14 | PDZ-11 | 3.10 | 2.77 | 2.78 | 3.53 | 2.7 | 2.77 | **2.94** |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 1.26 | 1.19 | 1.7 | 1.19 | 1.21 | 1.19 | **1.29** |
| 16. | BIOCHEM-18-16 | PDZ-12 | 2.67 | 3.25 | 3.32 | 4.35 | 2.93 | 3.25 | **3.29** |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 2.85 | 2.64 | 2.71 | 2.64 | 2.64 | 2.64 | **2.69** |
| 18. | BIOCHEM-18-18 | RLC-9 | 2.64 | 2.47 | 2.31 | 2.74 | 2.47 | 2.47 | **2.52** |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 1.80 | 1.22 | 1.11 | 0.87 | 1.25 | 1.22 | **1.25** |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 3.08 | 3.03 | 3.1 | 4.95 | 2.73 | 3.03 | **3.32** |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 2.83 | 2.42 | 2.45 | 2.08 | 2.34 | 2.42 | **2.42** |
| 22. | BIOCHEM-18-22 | RLC-3 | 2.03 | 1.85 | 2.38 | 1.87 | 1.87 | 1.85 | **1.98** |

**Table 11: SFA: MUFA: PUFA ratio**

| Sl. No | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR |
|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 01:11:10 | 01:09:09 | 01:08:09 | 01:08:08 | 01:10:10 | 09:08.7 |
| 2. | BIOCHEM-18-2 | RCH-3 | 01:11:12 | 01:09:10 | 01:08:09 | 01:09:08 | 01:09:10 | 09:09.5 |
| 3. | BIOCHEM-18-3 | RLC-10 | 01:11:12 | 01:09:10 | 01:08:10 | 01:09:09 | 01:09:10 | 01:09:10 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 01:10:10 | 01:10:11 | 01:08:09 | 01:08:09 | 01:10:11 | 01:10:11 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 01:10:10 | 01:09:09 | 01:08:09 | 01:07:07 | 01:09:09 | 01:09:09 |
| 6. | BIOCHEM-18-6 | LES-59 | 01:10:10 | 01:09:09 | 01:08:08 | 01:07:08 | 01:09:09 | 01:09:09 |
| 7. | BIOCHEM-18-7 | LES-58 | 01:10:11 | 01:09:09 | 01:08:08 | 01:07:08 | 01:08:09 | 1:9..:9 |
| 8. | BIOCHEM-18-8 | RLC-7 | 01:11:11 | 01:10:09 | 01:09:09 | 01:09:08 | 01:10:09 | 01:10:09 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 01:14:08 | 01:19:08 | 01:13:06 | 01:24:13 | 01:18:09 | 01:19:08 |
| 10. | BIOCHEM-18-10 | RCH-1 | 01:13:12 | 01:13:10 | 01:09:09 | 01:10:09 | 01:13:11 | 01:13:10 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 01:10:10 | 01:09:08 | 01:08:08 | 01:10:09 | 01:09:08 | 01:09:08 |
| 12. | BIOCHEM-18-12 | LES-57 | 01:11:11 | 01:10:10 | 01:08:08 | 01:08:08 | 01:11:11 | 01:10:10 |
| 13. | BIOCHEM-18-13 | LES-54 | 01:10:11 | 01:10:10 | 01:07:08 | 01:07:08 | 01:10:10 | 01:10:10 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 01:08:11 | 01:07:10 | 01:07:08 | 01:06:08 | 01:07:09 | 01:07:10 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 01:11:12 | 01:10:12 | 01:07:08 | 01:08:10 | 01:10:12 | 01:10:12 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 01:10:11 | 01:09:10 | 01:06:08 | 01:07:09 | 01:09:11 | 01:09:10 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 01:10:09 | 01:10:09 | 01:07:07 | 01:09:08 | 01:10:09 | 01:10:09 |
| 18. | BIOCHEM-18-18 | RLC-9 | 01:11:11 | 01:09:10 | 01:08:10 | 01:08:08 | 01:09:10 | 01:09:10 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 01:15:11 | 01:15:08 | 01:14:08 | 01:18:10 | 01:15:08 | 01:15:08 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 01:13:11 | 01:12:10 | 01:08:07 | 01:08:07 | 01:12:10 | 01:12:10 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 01:12:10 | 01:10:08 | 01:08:08 | 01:08:07 | 01:10:08 | 01:10:08 |
| 22. | BIOCHEM-18-22 | RLC-3 | 01:13:13 | 01:11:12 | 01:07:07 | 01:08:08 | 01:11:12 | 01:11:12 |

**Table 12: Protein content (%)**

| SlNo | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 36.46 | 32.1 | 32.75 | 33.83 | 36.46 | 37.12 | 34.79 |
| 2. | BIOCHEM-18-2 | RCH-3 | 37.28 | 33.19 | 32.93 | 34.42 | 37.28 | 37.25 | 35.39 |
| 3. | BIOCHEM-18-3 | RLC-10 | 36.05 | 31.67 | 33.29 | 36.75 | 36.05 | 35.47 | 34.88 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 33.6 | 33.2 | 34.35 | 35.00 | 33.6 | 38.1 | 34.64 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 34.11 | 34.31 | 33.46 | 36.75 | 34.11 | 36.1 | 34.81 |
| 6. | BIOCHEM-18-6 | LES-59 | 35.64 | 32.66 | 36.39 | 37.33 | 35.64 | 35.15 | 35.47 |
| 7. | BIOCHEM-18-7 | LES-58 | 36.05 | 34.43 | 35.38 | 36.17 | 36.05 | 37.43 | 35.92 |
| 8. | BIOCHEM-18-8 | RLC-7 | 35.23 | 32.93 | 33.46 | 35.58 | 35.23 | 38.42 | 35.14 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 34.83 | 34.84 | 34.71 | 33.25 | 34.83 | 38.26 | 35.12 |
| 10. | BIOCHEM-18-10 | RCH-1 | 35.21 | 31.03 | 31.86 | 39.67 | 35.21 | 36.26 | 34.87 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 33.01 | 28.81 | 28.12 | 35.00 | 33.01 | 38 | 32.66 |
| 12. | BIOCHEM-18-12 | LES-57 | 36.64 | 35.66 | 35.96 | 36.75 | 36.64 | 36.51 | 36.36 |
| 13. | BIOCHEM-18-13 | LES-54 | 34.22 | 34.2 | 34.35 | 35.58 | 34.22 | 35.34 | 34.65 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 35.23 | 30.76 | 29.55 | 36.75 | 35.23 | 37.77 | 34.22 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 36.08 | 34.02 | 34.89 | 35.58 | 36.08 | 36.33 | 35.50 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 35.46 | 28.07 | 29.73 | 34.42 | 35.46 | 38.82 | 33.66 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 36.66 | 30.1 | 29.19 | 35.00 | 36.66 | 36.32 | 33.99 |
| 18. | BIOCHEM-18-18 | RLC-9 | 34.01 | 34.17 | 33.29 | 32.67 | 34.01 | 38.43 | 34.43 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 34.83 | 32.67 | 32.93 | 33.83 | 34.83 | 37.84 | 34.49 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 34.28 | 28.57 | 29.55 | 39.08 | 34.28 | 35.85 | 33.60 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 35.23 | 29.04 | 28.18 | 32.08 | 35.23 | 35.77 | 32.59 |
| 22. | BIOCHEM-18-22 | RLC-3 | 34.42 | 29.72 | 31.03 | 35.58 | 34.42 | 36.81 | 33.66 |

**Table 13: Methionine content (g/100g protein)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 1.67 | 1.69 | 1.89 | 1.23 | 1.44 | 1.461 | 1.56 |
| 2. | BIOCHEM-18-2 | RCH-3 | 1.75 | 1.44 | 1.9 | 0.81 | 1.64 | 1.765 | 1.55 |
| 3. | BIOCHEM-18-3 | RLC-10 | 1.69 | 1.88 | 1.92 | 0.99 | 1.35 | 1.304 | 1.52 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 1.87 | 2.07 | 1.98 | 0.87 | 1.41 | 1.745 | 1.66 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 1.59 | 1.39 | 1.94 | 0.76 | 1.03 | 1.766 | 1.41 |
| 6. | BIOCHEM-18-6 | LES-59 | 1.93 | 1.64 | 2.11 | 1.20 | 1.52 | 1.688 | 1.68 |
| 7. | BIOCHEM-18-7 | LES-58 | 1.78 | 1.59 | 2.07 | 0.83 | 1.52 | 1.663 | 1.58 |
| 8. | BIOCHEM-18-8 | RLC-7 | 1.92 | 1.50 | 1.94 | 0.75 | 1.77 | 1.162 | 1.51 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 1.86 | 1.76 | 2.01 | 0.65 | 2 | 0.958 | 1.54 |
| 10. | BIOCHEM-18-10 | RCH-1 | 1.72 | 1.72 | 1.84 | 0.83 | 1.92 | 0.794 | 1.47 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 1.79 | 2.11 | 1.61 | 0.76 | 1.51 | 0.634 | 1.40 |
| 12. | BIOCHEM-18-12 | LES-57 | 1.99 | 1.54 | 2.07 | 0.63 | 1.05 | 0.785 | 1.34 |
| 13. | BIOCHEM-18-13 | LES-54 | 1.59 | 1.64 | 1.98 | 0.71 | 1.29 | 1.647 | 1.48 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 1.78 | 1.85 | 1.71 | 0.80 | 1.43 | 0.974 | 1.42 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 1.84 | 1.76 | 2.02 | 0.84 | 1.55 | 1.553 | 1.59 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 1.99 | 2.03 | 1.72 | 0.56 | 1.67 | 0.999 | 1.49 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 2.01 | 2.39 | 1.68 | 0.84 | 1.68 | 0.683 | 1.55 |
| 18. | BIOCHEM-18-18 | RLC-9 | 1.86 | 1.69 | 1.92 | 0.89 | 1.74 | 1.668 | 1.63 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 1.79 | 1.73 | 2.01 | 0.84 | 1.63 | 1.587 | 1.60 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 1.95 | 2.07 | 1.7 | 0.68 | 1.49 | 0.892 | 1.46 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 1.79 | 1.93 | 1.66 | 1.34 | 1.63 | 0.854 | 1.53 |
| 22. | BIOCHEM-18-22 | RLC-3 | 1.97 | 1.84 | 1.74 | 0.63 | 1.19 | 1.478 | 1.48 |

**Table 14: Tryptophan content (g/100g protein)**

| Sl. No | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 0.98 | 1 | 1.07 | 1.93 | 1.06 | 0.984 | 1.17 |
| 2. | BIOCHEM-18-2 | RCH-3 | 1.01 | 0.964 | 1.07 | 2.57 | 1.1 | 1.143 | 1.31 |
| 3. | BIOCHEM-18-3 | RLC-10 | 1.07 | 1.043 | 1.09 | 1.85 | 1.22 | 0.928 | 1.20 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 0.99 | 1.169 | 1.12 | 2.44 | 1.15 | 1.133 | 1.33 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 1.11 | 1.047 | 1.08 | 2.06 | 1.14 | 1.034 | 1.25 |
| 6. | BIOCHEM-18-6 | LES-59 | 1.18 | 1.164 | 1.18 | 2.06 | 0.97 | 1.036 | 1.26 |
| 7. | BIOCHEM-18-7 | LES-58 | 1.07 | 1.052 | 1.15 | 2.33 | 0.93 | 0.788 | 1.22 |
| 8. | BIOCHEM-18-8 | RLC-7 | 1.14 | 0.974 | 1.08 | 2.62 | 0.97 | 0.867 | 1.27 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 1.08 | 1.144 | 1.12 | 3.00 | 0.95 | 1.112 | 1.40 |
| 10. | BIOCHEM-18-10 | RCH-1 | 1.06 | 1.011 | 1.02 | 2.49 | 1.25 | 0.955 | 1.30 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 0.92 | 0.974 | 0.92 | 2.24 | 1.28 | 0.682 | 1.17 |
| 12. | BIOCHEM-18-12 | LES-57 | 0.95 | 1.144 | 1.18 | 1.64 | 1.08 | 1.156 | 1.19 |
| 13. | BIOCHEM-18-13 | LES-54 | 1.02 | 1.052 | 1.11 | 2.05 | 1.13 | 1.023 | 1.23 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 1.17 | 1.113 | 0.96 | 2.23 | 1.03 | 1.165 | 1.28 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 1.21 | 1.11 | 1.14 | 2.34 | 1.13 | 0.887 | 1.30 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 0.89 | 1.059 | 0.97 | 2.53 | 0.87 | 0.857 | 1.20 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 0.91 | 0.948 | 0.95 | 2.68 | 0.94 | 0.738 | 1.19 |
| 18. | BIOCHEM-18-18 | RLC-9 | 1.1 | 1.044 | 1.07 | 2.60 | 1.09 | 0.839 | 1.29 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 1.21 | 0.97 | 1.07 | 2.53 | 1.17 | 1.125 | 1.35 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 1.13 | 0.98 | 0.97 | 2.02 | 1.28 | 0.951 | 1.22 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 0.95 | 0.938 | 0.92 | 2.38 | 1.13 | 0.844 | 1.19 |
| 22. | BIOCHEM-18-22 | RLC-3 | 1.06 | 1.041 | 1 | 1.56 | 1.1 | 1.113 | 1.15 |

**Table 15: Total antioxidant capacity (mg/g AAE)**

| Sl. No | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 19.66 | 21.06 | 20.07 | 17.86 | 16.97 | 20.24 | 19.31 |
| 2. | BIOCHEM-18-2 | RCH-3 | 20.32 | 18.79 | 21.32 | 20.84 | 21.91 | 25.12 | 21.38 |
| 3. | BIOCHEM-18-3 | RLC-10 | 20.92 | 20.78 | 19.55 | 22.44 | 27.51 | 22.85 | 22.34 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 17.12 | 16.52 | 18.72 | 16.13 | 15.81 | 27.83 | 18.69 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 17.03 | 18.31 | 15.39 | 17.39 | 17.2 | 25.55 | 18.48 |
| 6. | BIOCHEM-18-6 | LES-59 | 16.67 | 20.88 | 13.99 | 15.13 | 10.63 | 19.53 | 16.14 |
| 7. | BIOCHEM-18-7 | LES-58 | 16.34 | 13.66 | 13.42 | 21.94 | 11.55 | 28.68 | 17.60 |
| 8. | BIOCHEM-18-8 | RLC-7 | 19.81 | 22.14 | 18.82 | 18.46 | 11.53 | 28.46 | 19.87 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 22.61 | 23.27 | 19.29 | 25.28 | 21.98 | 25.66 | 23.02 |
| 10. | BIOCHEM-18-10 | RCH-1 | 20.79 | 21.80 | 20.7 | 19.87 | 21.14 | 22.33 | 21.10 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 19.76 | 19.10 | 22.8 | 17.37 | 19.58 | 22.56 | 20.20 |
| 12. | BIOCHEM-18-12 | LES-57 | 18.73 | 16.41 | 15.9 | 23.88 | 17.03 | 23.31 | 19.21 |
| 13. | BIOCHEM-18-13 | LES-54 | 22.42 | 24.47 | 16.02 | 26.78 | 23.29 | 20.42 | 22.23 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 18.74 | 19.08 | 15.39 | 21.75 | 23.65 | 24.42 | 20.50 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 23.76 | 27.23 | 19.76 | 24.28 | 30.26 | 23.55 | 24.81 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 23.24 | 31.20 | 15.71 | 22.81 | 19.5 | 18.86 | 21.89 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 21.46 | 21.05 | 23.56 | 19.76 | 18.42 | 25.26 | 21.59 |
| 18. | BIOCHEM-18-18 | RLC-9 | 20.43 | 23.95 | 20.38 | 16.95 | 23.47 | 15.77 | 20.16 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 24.78 | 30.51 | 19.72 | 24.10 | 30.03 | 17.88 | 24.50 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 18.29 | 16.18 | 20.3 | 18.39 | 27.37 | 17.55 | 19.68 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 18.61 | 20.09 | 15.91 | 19.83 | 12.37 | 19.45 | 17.71 |
| 22. | BIOCHEM-18-22 | RLC-3 | 22.21 | 30.08 | 18.77 | 17.78 | 28.6 | 17.15 | 22.43 |

**Table 16: Total Phenol content (%)**

| Sl. No. | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 4.35 | 3.77 | 4.4 | 6.54 | 4.88 | 2.66 | 4.43 |
| 2. | BIOCHEM-18-2 | RCH-3 | 4.02 | 3.22 | 4.67 | 7.21 | 4.16 | 2.54 | 4.30 |
| 3. | BIOCHEM-18-3 | RLC-10 | 3.92 | 3.85 | 4.29 | 7.40 | 3.61 | 2.67 | 4.29 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 3.75 | 3.28 | 4.1 | 7.51 | 3.86 | 2.35 | 4.14 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 2.75 | 2.67 | 3.37 | 7.32 | 2.22 | 2.46 | 3.47 |
| 6. | BIOCHEM-18-6 | LES-59 | 2.85 | 2.41 | 3.01 | 6.56 | 3.14 | 2.18 | 3.36 |
| 7. | BIOCHEM-18-7 | LES-58 | 3.48 | 3.39 | 2.94 | 6.04 | 4.1 | 2.81 | 3.79 |
| 8. | BIOCHEM-18-8 | RLC-7 | 4.34 | 4.38 | 4.13 | 7.26 | 4.52 | 1.84 | 4.41 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 4.18 | 4.52 | 4.15 | 7.23 | 3.86 | 1.78 | 4.29 |
| 10. | BIOCHEM-18-10 | RCH-1 | 4.43 | 4.18 | 4.54 | 7.13 | 4.57 | 1.92 | 4.46 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 5.08 | 4.45 | 5.47 | 7.05 | 5.31 | 0.89 | 4.71 |
| 12. | BIOCHEM-18-12 | LES-57 | 3.82 | 3.80 | 3.42 | 6.72 | 4.24 | 2.14 | 4.02 |
| 13. | BIOCHEM-18-13 | LES-54 | 3.76 | 4.45 | 3.51 | 6.87 | 3.32 | 2.94 | 4.14 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 3.83 | 4.43 | 3.69 | 6.83 | 3.38 | 2.22 | 4.06 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 4.89 | 4.64 | 4.33 | 7.20 | 5.69 | 2.65 | 4.90 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 3.95 | 4.27 | 3.51 | 6.04 | 4.06 | 2.88 | 4.12 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 5.16 | 4.41 | 5.65 | 7.39 | 5.41 | 2.94 | 5.16 |
| 18. | BIOCHEM-18-18 | RLC-9 | 4.88 | 4.65 | 4.47 | 6.99 | 5.52 | 2.58 | 4.85 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 4.52 | 4.48 | 4.24 | 6.48 | 4.84 | 2.91 | 4.58 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 4.15 | 4.00 | 4.54 | 6.57 | 3.9 | 2.39 | 4.26 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 4.07 | 3.74 | 3.74 | 6.75 | 4.74 | 2.81 | 4.31 |
| 22. | BIOCHEM-18-22 | RLC-3 | 4.21 | 4.10 | 4.2 | 5.95 | 4.33 | 2.32 | 4.19 |

**Table 17: Total glucosinolate (µmole/g )**

| Sl. No | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean* |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 12.22 | 12.22 | 24.74 | 16.62 | 11.62 | 29.56 | 15.48 |
| 2. | BIOCHEM-18-2 | RCH-3 | 14.51 | 13.78 | 26.24 | 17.86 | 12.42 | 32.69 | 16.96 |
| 3. | BIOCHEM-18-3 | RLC-10 | 12.71 | 15.31 | 16.13 | 17.49 | 10.11 | 76.36 | 14.35 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 59.29 | 83.91 | 81.51 | 71.12 | 60.07 | 76.29 | 71.18 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 53.87 | 70.56 | 76.53 | 81.17 | 56.04 | 73.2 | 67.63 |
| 6. | BIOCHEM-18-6 | LES-59 | 63.39 | 74.63 | 76.42 | 77.89 | 61.64 | 94 | 70.79 |
| 7. | BIOCHEM-18-7 | LES-58 | 57.65 | 73.25 | 63.63 | 76.19 | 53.15 | 74 | 64.77 |
| 8. | BIOCHEM-18-8 | RLC-7 | 15.25 | 14.32 | 13.99 | 17.39 | 15.25 | 74.58 | 15.24 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 69.70 | 79.50 | 77.73 | 94.52 | 69.78 | 74.8 | 78.25 |
| 10. | BIOCHEM-18-10 | RCH-1 | 13.53 | 28.03 | 26.89 | 15.64 | 13.45 | 36.28 | 19.51 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 15.33 | 11.44 | 10.93 | 15.90 | 15.40 | 33.12 | 13.80 |
| 12. | BIOCHEM-18-12 | LES-57 | 54.12 | 57.37 | 75.61 | 70.10 | 56.11 | 128.57 | 62.66 |
| 13. | BIOCHEM-18-13 | LES-54 | 70.27 | 45.18 | 44.50 | 59.34 | 73.29 | 81.08 | 58.52 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 18.12 | 17.33 | 5.25 | 10.60 | 16.18 | 35.33 | 13.50 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 51.17 | 97.38 | 92.00 | 73.52 | 55.41 | 46.58 | 73.90 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 29.52 | 14.66 | 19.02 | 28.21 | 24.20 | 44 | 23.12 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 16.48 | 11.81 | 12.46 | 14.76 | 13.19 | 44.58 | 13.74 |
| 18. | BIOCHEM-18-18 | RLC-9 | 14.02 | 13.83 | 13.53 | 12.31 | 14.65 | 44.8 | 13.67 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 53.96 | 65.16 | 78.92 | 73.29 | 62.11 | 73.28 | 66.69 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 23.45 | 15.75 | 15.52 | 25.68 | 25.14 | 33.12 | 21.11 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 29.68 | 18.64 | 5.90 | 20.88 | 26.91 | 38.57 | 20.40 |
| 22. | BIOCHEM-18-22 | RLC-3 | 19.68 | 14.25 | 10.72 | 26.85 | 27.11 | 38.08 | 19.72 |

**(*Mean is excluding Kanpur data)**

**Table 18:Phytic acid (%)**

| Sl. No | Code | Genotype | BPR | PNT | KNG | LDH | HSR | KPR | Mean |
|---|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 2.02 | 2.20 | 2.18 | 2.15 | 1.93 | 2.94 | 2.24 |
| 2. | BIOCHEM-18-2 | RCH-3 | 1.82 | 1.89 | 2.03 | 1.86 | 1.09 | 3.28 | 1.99 |
| 3. | BIOCHEM-18-3 | RLC-10 | 2.15 | 2.04 | 2.05 | 1.97 | 2.29 | 2.54 | 2.17 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 2.30 | 1.88 | 2.23 | 2.69 | 2.4 | 1.87 | 2.23 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 2.00 | 1.80 | 1.93 | 2.21 | 1.35 | 1.99 | 1.88 |
| 6. | BIOCHEM-18-6 | LES-59 | 2.14 | 1.97 | 2 | 2.62 | 2.62 | 2.45 | 2.30 |
| 7. | BIOCHEM-18-7 | LES-58 | 2.29 | 1.98 | 2.15 | 2.97 | 2.32 | 2.76 | 2.41 |
| 8. | BIOCHEM-18-8 | RLC-7 | 2.17 | 1.64 | 2.06 | 2.97 | 2.1 | 2.88 | 2.30 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 2.43 | 1.72 | 2.32 | 2.45 | 1.64 | 1.96 | 2.09 |
| 10. | BIOCHEM-18-10 | RCH-1 | 1.75 | 1.72 | 2.15 | 2.19 | 1.45 | 2.65 | 1.98 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 3.00 | 1.80 | 2.18 | 3.27 | 1.17 | 3.11 | 2.42 |
| 12. | BIOCHEM-18-12 | LES-57 | 2.14 | 2.08 | 2.13 | 3.09 | 2.14 | 2.55 | 2.36 |
| 13. | BIOCHEM-18-13 | LES-54 | 2.46 | 2.00 | 2.04 | 2.84 | 2.24 | 2.86 | 2.41 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 2.77 | 1.92 | 2 | 3.42 | 2.8 | 3.73 | 2.77 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 2.56 | 1.97 | 2.26 | 3.43 | 2.95 | 2.88 | 2.67 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 2.28 | 1.91 | 1.82 | 2.96 | 2.25 | 2.13 | 2.22 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 1.79 | 1.20 | 1.67 | 2.15 | 1.65 | 2.21 | 1.78 |
| 18. | BIOCHEM-18-18 | RLC-9 | 2.41 | 1.77 | 2.26 | 2.59 | 2.37 | 2.66 | 2.34 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 2.85 | 2.23 | 2.54 | 3.13 | 2.46 | 1.69 | 2.48 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 2.92 | 2.17 | 2.1 | 3.09 | 3.05 | 2.34 | 2.61 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 2.51 | 2.21 | 2.05 | 2.64 | 1.87 | 2.55 | 2.30 |
| 22. | BIOCHEM-18-22 | RLC-3 | 2.46 | 2.41 | 2.23 | 2.30 | 1.47 | 2.1 | **2.16** |

**Table 19: β-carotene (ppm)**

| Sl. No | Code | Genotype | BPR | PNT | KNG | LDH | HSR | Mean |
|---|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 3.71 | 3.42 | 3.01 | 4.84 | 4.49 | 3.89 |
| 2. | BIOCHEM-18-2 | RCH-3 | 5.70 | 5.54 | 3.1 | 3.23 | 4.13 | 4.34 |
| 3. | BIOCHEM-18-3 | RLC-10 | 4.73 | 5.02 | 3.25 | 7.90 | 6.36 | 5.45 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 3.56 | 4.93 | 4.22 | 7.35 | 6.09 | 5.23 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 7.70 | 5.26 | 3.52 | 5.00 | 4.28 | 5.15 |
| 6. | BIOCHEM-18-6 | LES-59 | 5.85 | 5.44 | 4.02 | 4.60 | 3.79 | 4.74 |
| 7. | BIOCHEM-18-7 | LES-58 | 5.42 | 5.37 | 3.99 | 3.89 | 2.83 | 4.30 |
| 8. | BIOCHEM-18-8 | RLC-7 | 4.42 | 4.12 | 3.47 | 5.23 | 5.83 | 4.61 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 4.70 | 4.98 | 2.9 | 4.43 | 3.93 | 4.19 |
| 10. | BIOCHEM-18-10 | RCH-1 | 4.56 | 4.42 | 4.08 | 5.68 | 4.99 | 4.74 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 2.99 | 2.09 | 4.5 | 3.15 | 2.89 | 3.12 |
| 12. | BIOCHEM-18-12 | LES-57 | 4.28 | 4.48 | 3.78 | 3.81 | 4.03 | 4.08 |
| 13. | BIOCHEM-18-13 | LES-54 | 4.13 | 4.35 | 4.21 | 5.85 | 5.6 | 4.83 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 3.99 | 4.50 | 3.52 | 2.80 | 2.43 | 3.45 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 3.14 | 2.79 | 4.26 | 5.62 | 5.99 | 4.36 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 5.85 | 5.83 | 3.51 | 4.26 | 4.33 | 4.76 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 2.71 | 2.56 | 4.49 | 4.02 | 3.66 | 3.49 |
| 18. | BIOCHEM-18-18 | RLC-9 | 2.57 | 2.77 | 2.91 | 4.02 | 4.39 | 3.33 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 5.56 | 6.55 | 4.19 | 5.17 | 5.39 | 5.37 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 3.56 | 3.16 | 4.02 | 3.07 | 2.63 | 3.29 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 5.70 | 5.67 | 4.29 | 3.56 | 5.86 | 5.02 |
| 22. | BIOCHEM-18-22 | RLC-3 | 3.99 | 3.85 | 4.33 | 5.34 | 2.24 | 3.95 |

(* Mean is excluding Kanpur centre)

**Table 20: Tocopherol (mg/100gm)**

| **SlNo** | **Code** | **Genotype** | **BPR** | **PNT** | **KNG** | **HSR** | **Mean*** |
|---|---|---|---|---|---|---|---|
| 1. | BIOCHEM-18-1 | RLC- 8 | 134.42 | 131.51 | 134.52 | 132.45 | 133.23 |
| 2. | BIOCHEM-18-2 | RCH-3 | 142.94 | 139.88 | 145.65 | 142.11 | 142.64 |
| 3. | BIOCHEM-18-3 | RLC-10 | 138.255 | 138.60 | 140.33 | 138 | 138.80 |
| 4. | BIOCHEM-18-4 | RH (OE) 1705 | 96.27 | 90.90 | 93.1 | 95.25 | 93.88 |
| 5. | BIOCHEM-18-5 | LR (PM-29) | 48.61 | 41.62 | 43.43 | 40.13 | 43.45 |
| 6. | BIOCHEM-18-6 | LES-59 | 55.525 | 56.91 | 54.07 | 56.18 | 55.67 |
| 7. | BIOCHEM-18-7 | LES-58 | 65.205 | 68.34 | 64.87 | 62.1 | 65.13 |
| 8. | BIOCHEM-18-8 | RLC-7 | 139.225 | 138.84 | 136.53 | 133.7 | 137.07 |
| 9. | BIOCHEM-18-9 | RH-749(ZC) | 148.53 | 150.09 | 147.71 | 144.19 | 147.63 |
| 10. | BIOCHEM-18-10 | RCH-1 | 149.84 | 143.91 | 154.01 | 153.94 | 150.42 |
| 11. | BIOCHEM-18-11 | DRMRQ4-7-23 | 179.595 | 171.89 | 189.24 | 191.58 | 183.08 |
| 12. | BIOCHEM-18-12 | LES-57 | 78.455 | 80.08 | 76.65 | 79.74 | 78.73 |
| 13. | BIOCHEM-18-13 | LES-54 | 53.705 | 58.52 | 52.71 | 55.04 | 54.99 |
| 14. | BIOCHEM-18-14 | PDZ-11 | 110.97 | 113.20 | 115.41 | 113.07 | 113.16 |
| 15. | BIOCHEM-18-15 | RH (OE) 1706 | 128.145 | 129.62 | 126.05 | 128.17 | 128.00 |
| 16. | BIOCHEM-18-16 | PDZ-12 | 109.78 | 110.67 | 104.99 | 106.93 | 108.09 |
| 17. | BIOCHEM-18-17 | DRMRQ1-16-27 | 196.91 | 195.04 | 199.23 | 196.54 | 196.93 |
| 18. | BIOCHEM-18-18 | RLC-9 | 142.56 | 140.12 | 142.99 | 145.05 | 142.68 |
| 19. | BIOCHEM-18-19 | KRANTI (NC) | 167.925 | 164.03 | 170.13 | 172.14 | 168.56 |
| 20. | BIOCHEM-18-20 | PDZ-1(QC) | 164.395 | 159.33 | 163.67 | 162.17 | 162.39 |
| 21. | BIOCHEM-18-21 | 7IJ0002 | 172.98 | 170.63 | 174.31 | 173.45 | 172.84 |
| 22. | BIOCHEM-18-22 | RLC-3 | 146.44 | 142.49 | 148.69 | 149.77 | 146.85 |

(*Mean is excluding Kanpur & Ludhianacentres)

# Front Line Demonstrations

# 8. Frontline Demonstrations

### 8.1 Distribution of frontline demonstrations

Under the scheme "Frontline demonstrations and other related activities of Oilseeds" funded under the NMOOP by DAC&FW, Ministry of Agriculture and Farmers' Welfare, Govt. of India, 27 cooperating centres of AICRPRM/ ICAR institutes/ Ag. Universities conducted 2080 frontline demonstrations (FLDs) under irrigated as well as rainfed conditions on rapeseed (toria, yellow sarson, taramira, brown sarson and gobhi sarson) and mustard (Indian mustard) in 67 districts across 14 states during 2018-19. Rajasthan had maximum FLDs (533) followed by Manipur (450), Assam (320) Uttar Pradesh (236) and Madhya Pradesh (129). Out of 28 FLDs conducting centres, 6 were in Rajasthan, 5 in Uttar Pradesh, 2 each in Assam, Haryana, Himachal Pradesh, and Jammu & Kashmir and one each in rest of the 8 states. Maximum districts (12) were covered in Uttar Pradesh followed by 10 in Rajasthan, 8 in Madhya Pradesh, 5 each in Haryana, Jammu & Kashmir and Uttarakhand, 4 each in Assam, Maharashtra and Manipur, 3 in Himachal Pradesh, 2 in in Gujarat and one each in Punjab, Jharkhand and Odisha (Table 8.1). The sowing time spread from Sept. 28, 2018 (Uttar Pradesh) to Dec 18, 2018 (Odisha) for Indian mustard.

### 8.2 Types of demonstrations

Four hundred nine FLDs were conducted on rapeseed and 1671 on mustard. Maximum 1671 FLDs were conducted on Indian mustard followed by toria (239), yellow sarson (61), gobhi sarson (59) brown sarson (30), and taramira (20). All the demonstrations were conducted under whole package demonstrations in two different situations viz., irrigated (1129) and rainfed (951). Variety wise analysis was also done to see the performance of demonstrated improved varieties. There were 20 varieties of Indian mustard followed by 3 of yellow sarson, 2 of toria and one of gobhi sarson under irrigated condition. The 5 varieties of Indian mustard, 5 of toria, 3 of brown sarson, 2 each of yellow sarson and taramira and one of gobhi sarson were demonstrated under rainfed condition (Table 8.2). The results included the mean seed yield (kg/ha) for both the improved plot (IP) with improved technology and the farmers' plot (FP) with farmers' practice, besides yield superiority of improved technology (%), cost of cultivation (CoC), gross monetary return (GMR) and additional net monetary return (ANMR) in Rs/ha from the IP and benefit: cost (B:C) ratio for both the IP and FP.

### 8.3 Whole package FLDs of rapeseed-mustard under rainfed condition

Sriganganagar and Jobner centres (Rajasthan); Khudwani (J&K); Kangra & CPU, Hamirpur (Himachal Pradesh); CAU, Imphal (Manipur); AAU, Jorhat & Shillongani (Assam); BAU (Jharkhand) and Pantnagar (Uttarakhand) conducted 951 FLDs on WP of rapeseed-mustard under rainfed condition (Table 8.3). The maximum demonstrations (450) were conducted on Indian mustard, yellow sarson and toria in Manipur under rainfed condition with mean seed yield of 1007 kg/ha in IP and 786 kg/ha in FP. IP had a yield advantage of 28.1% and ANMR of Rs 7,998/ha under rainfed condition in Manipur. The 26 demonstrations were conducted on Indian mustard by BAU, Ranchi centre in Jharkhand which recorded maximum yield advantage of 47.7% and ANMR of Rs. 9,687/ha, followed by Assam that recorded 46.2 % yield improvement in 320 FLDs with 1,167 kg/ha average seed yield in IP and maximum ANMR of Rs. 11,803 under rainfed condition**.** Rajasthan with 40 FLDs observed lowest yield advantage of 16.3% from IP under rainfed condition with mean seed yield of 1,590 kg/ha in IP and 1,367 kg/ha in FP. Jammu and Kashmir with average mean seed yield of 1,128 kg/ha in 30 FLDs observed yield advantage of 18.2% from IP. Himachal Pradesh with average mean seed yield of 1,037 kg/ha in 48 FLDs observed yield advantage of 39.2% from IP

The maximum (1,590 kg/ha) and minimum (1,007kg/ha) mean seed yield were observed in Rajasthan and Manipur, respectively. The cost of cultivation of IP ranged from Rs. 11,702 /ha in Rajasthan to Rs 26,152 /ha in Jammu & Kashmir under rainfed condition. The IP also had higher B:C ratio in all the states than that of FP in rainfed condition.

### 8.4 Whole package FLDs of rapeseed-mustard under irrigated condition

The whole package technology demonstration included use of improved variety, balanced use of fertilizers and micronutrients and need based plant protection and cultural practices in comparison to farmers' practices of crop cultivation. Bharatpur, KVK (Bansur), Jodhpur and Kota centres in Rajasthan; Ag. University (Banda), RLBCAU (Jhansi), Kanpur, Amity University (Noida) and Varanasi in Uttar Pradesh; Hisar and Bawal in Haryana; Morena and RLBCAU (Jhansi) in Madhya Pradesh; S K Nagar in Gujarat; Ludhiana in Punjab; Kangra in Himachal Pradesh; Chatha in J&K; Pantnagar in Uttarakhand; Nagpur in Maharashtra and Bhubaneswar in Odisha conducted 1129 FLDs on whole package of rapeseed-mustard under irrigated condition (Table 8.4).

The maximum FLDs (493) were conducted in Rajasthan where improved plot recorded average yield of 2,443 kg/ha with yield superiority of 11.8% and ANMR of Rs 12,457/ha.

Under irrigated condition, mean seed yield from IP ranged from 933 in Odisha to 2,754 kg/ha in Haryana, whereas from FP ranged from 582 in Odisha to 2,352 kg/ha in Haryana. The yield increase due to IP ranged from 5.7% in Punjab to 62.7% in Jammu and Kashmir.

For IP, Haryana had the highest cost of cultivation (Rs 34,462/ha), while Maharashtra had the lowest cost of cultivation (Rs 13,273/ha).

The maximum ANMR (Rs 22,544 /ha) was reported due to the improved WP of Indian mustard in Jammu and Kashmir, while minimum was in Punjab (Rs 4,520 /ha). All IP had positive ANMR. The higher B:C ratio for the improved WP under irrigated condition in all the states was realized. The highest B:C ratio of IP (3.91) was realized in Jammu and Kashmir. (Table 8.4).

### 8.5 Varietal performance in Whole package FLDs of rapeseed-mustard under irrigated condition

An effort was also made to see the performance of demonstrated varieties in whole package demonstrations in different states under irrigated and rainfed condition.

#### 8.5.1 Indian mustard

A total of 20 improved varieties of Indian mustard namely Giriraj, NRCHB101, RH 725, RH 406, RH 749, PM 30, DRMR 1165-40, RB 50, RGN 73, PM 28, CS 58, Maya, Urvashi, GDM 4, GM 3, RVM 2, JM 3, RSPN 25, PBR 357 and PR 20 were used in WP covering 10 states under irrigated condition (Table 8.5). Improved variety RH 725 demonstrated in 30 FLDs in Haryana recorded highest average yield of 2,790 kg/ha with a yield improvement of 16.3% over local (FP) practice and ANMR of Rs 13,559 /ha followed by DRMR 1165-40 demonstrated in 10 FLDs in Rajasthan with average seed yield of 2,650 kg/ha. The maximum yield improvement 66.1% was recorded in Jammu & Kashmir with NRCHB 101 variety. The minimum yield improvement of 4.4% was reported from RH 406 variety in Rajasthan, while minimum average seed yield of 933 kg/ha was reported from NRCHB 101 variety in Odisha

The Giriraj variety was demonstrated in 4 states which recorded highest yield improvement of 61.4% with mean seed yield of 1,642 kg/ha in Jammu and Kashmir (19 FLDs) followed by 29.8% with mean seed yield of 1,547 kg/ha in Madhya Pradesh (9 FLDs), 28.5% with mean seed yield of 1,669 kg/ha in Uttar Pradesh (55 FLDs) and 11.4% with mean seed yield of 2,507 kg/ha in Rajasthan (321 FLDs) over FP.

The improved variety RH 749 was demonstrated in 3 states which recorded highest yield improvement of 27.6% with mean seed yield of 1,800 kg/ha in Uttar Pradesh (65 FLDs) followed by 17.8% with mean seed yield of 1,875 kg/ha in Madhya Pradesh (43 FLDs) and 17.3% with mean seed yield of 2,276 kg/ha in Rajasthan (16 FLDs) over FP.

The improved variety NRCHB 101 was demonstrated in 5 states which recorded highest mean seed yield of 2,385 kg/ha with yield improvement of 12.76% in Rajasthan (89 FLDs), followed by 1,709 kg/ha mean seed yield with 66.08% yield improvement in Jammu & Kashmir (9 FLDs), 1,407 kg/ha mean seed yield with 50.8% yield improvement in Uttar Pradesh (26 FLDs), 1,070 kg/ha mean seed yield with 17.8% yield improvement in Maharashtra (30 FLDs) and 933 kg/ha mean seed yield with 60.3% yield improvement in Odisha (15 FLDs) over FP

In Uttar Pradesh, nine improved varieties viz. RH 406, RH 749, Giriraj, NRCHB 101, RGN 73, PM 28, CS 58, Maya and Urvashi were demonstrated in 231 FLDs by 5 centres under irrigated condition. Out of which, improved variety Maya demonstrated in 12 FLDs in Uttar Pradesh recorded highest yield of 2,445 kg/ha with yield improvement of 45.6% over FP. The lowest yield improvement of 19.2% with an average seed yield of 2,125 kg/ha was recorded with improved variety PM 28 used in 10 demonstrations conducted in Uttar Pradesh. In Uttar Pradesh, the improved variety RH 749 was used in maximum demonstrations (65 FLDs), which recorded average seed yield of 1,800 kg/ha with yield improvement of 27.6%. The improved variety RH 406 was demonstrated in 30 FLDs, which recorded average seed yield of 1,515 kg/ha with yield improvement of 39.0%. The improved varieties NRCHB 101 (26 FLDs), RGN (20 FLDs) CS 58 (10 FLDs) and Urvashi (3 FLDs) recorded a yield improvement of 50.8, 21.7, 31.0 and 41.0%, respectively in Uttar Pradesh.

The seven improved varieties viz. Giriraj, NRCHB 101, RH 725, RH 406, RH 749, PM 30 and DRMR 1165-40 were demonstrated in 493 FLDs by four centres in Rajasthan under irrigated condition. Out of which, improved variety Giriraj was demonstrated in maximum demonstrations (321 FLDs) conducted by Bharatpur, KVK (Bansur) and Kota centres in Rajasthan recorded average yield of 2,507 kg/ha with yield improvement of 11.4% followed by NRCHB 101 (89 FLDs), which recorded average seed yield of 2,385 kg/ha with yield improvement of 12.8% over FP. The other important variety DRMR 1165-40 demonstrated in 10 FLDs by Bharatpur centre in Rajasthan, recorded highest average seed yield of 2,650 kg/ha under IP with yield improvement of 13.7%. The improved variety RH 725 demonstrated in 22 FLDs, recorded 2,531 kg/ha average seed yield under IP with yield improvement of 10.1%. The other improved varieties RH 406 (19 FLDs) and PM 30 (16 FLDs) recorded 2,098 and 2,302 kg/ha average seed yield under IP with yield improvement of 4.4 and 7.6%, respectively.

In Haryana, the improved variety RH 725 demonstrated in 30 FLDs by two centres recorded highest mean seed yield of 2,790 kg/ha with yield improvement of 16.3%, while RB 50 demonstrated in 10 FLDs by one centre recorded mean seed yield of 2,645 kg/ha with yield improvement of 19.4%

The yield improvement of 18.5% from GDM 4 and 7.5% from GM 3 was recorded in Gujarat. In Madhya Pradesh, the improved varieties RVM 2 (34 FLDs), JM 3 (33 FLDs), RH 749 (43 FLDs), RH 406 (10 FLDs) and Giriraj (9 FLDs) recorded 1,986; 1,876; 1,875; 1,573 and 1,547 kg/ha average seed yield with 16.8, 17.1, 17.8, 32.0, 29.8% yield improvement, respectively over FP. The RSPN 25 gave 62.4% yield improvement with 1,825 kg/ha mean seed yield in Jammu & Kashmir. Punjab recorded 5.7% yield improvement with 2,093 kg/ha mean seed yield from PBR 357 variety, whereas Uttarakhand recorded 14.7% yield improvement with 1,750 kg/ha mean seed yield from PR 20 variety in IP over FP.

### 8.5.2 Yellow sarson

Pantnagar conducted 11 FLDs with PPS 1 and 3 FLDs with Pant sweta varieties of yellow sarson. The IP with Pant sweta and PPS 1 had the average yield of 1,692 kg/ha and 1,425 kg/ha, respectively with yield improvement of 15.2% and 11.1% respectively. Kanpur conducted 5 FLDs on yellow sarson in WP demonstrations with Pitambari variety in Uttar Pradesh under irrigated condition. The IP demonstrations with Pitambari had the average yield of 1,790 kg/ha against 1,240 kg/ha in FP, resulted into 44.3% higher yield and ANMR of Rs 18,077/ ha (Table 8.5).

### 8.5.3 Gobhi sarson

Kangra centre conducted 11 FLDs using GSC 7 variety of gobhi sarson (Table 8.5). The IP recorded an average yield of 1,357 kg/ha with a yield improvement of 60.0% and an ANMR of Rs 16,503 /ha in Himachal Pradesh.

### 8.5.4 Toria

Pantnagar conducted 5 FLDs with Uttara and 4 FLDs with PT 508 varieties of toria. The IP with Uttara and PT 508 had the average yield of 1,280 kg/ha and 1,356 kg/ha, respectively with yield improvement of 9.68% and 12.43%, respectively. All demonstrated varieties had higher B:C ratio than that of FP. (Table 8.5).

### 8.6 Varietal performance in Whole package FLDs of rapeseed-mustard under rainfed condition

#### 8.6.1 Indian mustard

Sriganganagar in Rajasthan conducted 10 FLDs each with RGN 229 and RGN 298 varieties of Indian mustard under rainfed condition which showed average seed yield of 2,080 and 1,955 kg/ha with yield improvement of 12.4% and 13.7%, respectively in Rajasthan (Table 8.6)

The improved variety NRCHB 101 was demonstrated in 3 states under rainfed situations, which recorded highest mean seed yield of 1,171 kg/ha with highest yield improvement of 46.4% in Assam (320 FLDs), followed by 1,057 kg/ha mean seed yield with 42.3% yield improvement in Jharkhand (15 FLDs) and 1,012 kg/ha mean seed yield with 29.2% yield improvement in Manipur (104 FLDs) over FP. The DRMR 150-35 variety demonstrated in 123 FLDs in Manipur recorded lowest average seed yield of 994 kg/ha with 27.3% yield improvement. In Jharkhand, 11 demonstrations with variety Shivani recorded average seed yield of 1,034 kg/ha with yield improvement of 55.95% over FP under rainfed situation.

#### 8.6.2 Yellow sarson

Pantnagar and CAU (Imphal) centres conducted 21 FLDs each using PPS 1 and YSH 401 varieties of yellow sarson in Uttarakhand and Manipur, respectively (Table 8.6). The IP demonstrations with PPS 1 recorded highest average yield of 1,065 kg/ha with yield improvement of 20.61% in Uttarakhand, while demonstrations with YSH 401 recorded an average yield of 980 kg/ha with a yield improvement of 25.0% in Manipur (Table 8.6).

#### 8.6.3 Gobhi sarson

Kangra and CPU, Hamirpur centres used GSC 7 variety of gobhi sarson in 48 demonstrations conducted in Himachal Pradesh under rainfed condition (Table 8.6). The IP demonstrations with GSC 7 had the average yield of 1,037 kg/ha against 745 kg/ha in FP with a yield improvement of 39.2%.

#### 8.6.3 Brown sarson

Khudwani centre conducted 30 FLDs using Shalimar sarson-1,2,3 varieties of brown sarson in Jammu & Kashmir (Table 8.6). The IP demonstrations recorded yield improvement of 18.2% with an average yield of 1,128 kg/ha in Jammu & Kashmir.

#### 8.6.4 Toria

Pantnagar conducted 6 FLDs with PHT 1, 3 FLDs with Uttara and 7 FLDs with PT 508 varieties of toria in rainfed situation of Uttarakhand which recorded an average yield of 1,042; 992 and 860 kg/ha with 25.4, 21.4 and 23.9% yield improvement in IP, respectively. CAU (Imphal) conducted 202 FLDs with TS 38 variety in of toria in rainfed situation of Manipur which recorded 27.9% yield improvement and an average yield of 1,004 kg/ha in IP. Shillongani centre conducted 7 and 5 FLDs with TS 38 and TS 36 varieties, respectively in Assam. The TS 36 and TS 38 varieties recorded an average yield of 1,068 and 1,040 kg/ha from IP in Assam with a yield improvement of 52.1% and 32.8%, respectively. All demonstrated varieties had higher B:C ratio than that of FP. (Table 8.6).

#### 8.6.5 Taramira

Jobner centre conducted 20 FLDs using RTM 1351 and RTM 1355 varieties of taramira under rainfed situation of Rajasthan (Table 8.6). The demonstrations with RTM 1351 (11 FLDs) recorded an average yield of 1,171 kg/ha with a yield improvement of 22.7% and an ANMR of Rs 7,395 /ha, while demonstrations with RTM 1355 (9 FLDs) recorded an average yield of 1,155 kg/ha with a yield improvement of 22.5%.

### 8.7 Exploitable yield reservoir in rapeseed-mustard

It is evident from the productivity potentials and profitability of improved rapeseed-mustard production technologies that there exists vast potential to improve the rapeseed-mustard productivity under real farm situations. An attempt was made to estimate the extent of such yield reservoir available for exploitation (Table 8.7). Yield gap-I as a result of demonstration of improved technology over farmers practices was ranging from 5.7% in Punjab to 60.3% in Odisha, whereas, the yield gap-II (between IP and three year from 2015-16 to 2017-18 state average productivity) was ranging from 16.5% in Gujarat to as high as 238.6% in Maharashtra.

Exploitable production-1 (EP-I is the sum of 3 year State average production and production increased over State average production by bridging yield gap-I) and exploitable production-II (EP-II is the sum of 3 year State average production and production increased over State average production by bridging gap-II) were also worked out as indicated in Table 8.7.

It can be understood from the Table 8.7 that rapeseed-mustard productivity at national level could be improved by 18.7 and 57.23% by bridging the yield gaps-I and II, respectively. Similarly, the national rapeseed-mustard production could be increased from 6.93 to 8.23 and 10.91 mt by bridging yield gaps I and II, respectively. This indicates the presence of significant yield reservoir which can be exploited through spread of appropriate technology among the farmers. Therefore, there is an urgent need for effective transfer of improved rapeseed-mustard production technologies to the rapeseed-mustard growers in order to convince them to adopt such technologies so that yield gaps can be bridged and rapeseed-mustard production in the country can be stepped up.

### 8.8 Training of field level extension workers under the programme of FLDs and other related activities

For upgrading the knowledge and skills of grass root extension workers of States Department of Agriculture about research developments in the field of rapeseed-mustard, 10 training programmes for extension workers of two days each were organized by ICAR-DRMR and AICRPRM centres during 2018-19 under this scheme.

In these training programmes, a total of 198 extension workers from State Department of Agriculture of Rajasthan, Punjab, Jammu & Kashmir, Haryana, Uttar Pradesh, Madhya Pradesh and Gujarat participated and they were made aware of the new technologies advances in rapeseed-mustard cultivation so that they communicate the same to the farmers in the field.

| State of participants | Place of training (AICRPRM Centres) | Dates | No. of participants |
|---|---|---|---|
| Punjab | Ludhiana | 11-12 March 2019 | 20 |
| Haryana | Hisar | 30-31 Jan 2019 | 20 |
| Jammu & Kashmir | Chhata | 27-28 Feb. 2019 | 18 |
| Uttar Pradesh | Kanpur | 1-2 Feb. 2019 | 20 |
| Madhya Pradesh | Morena | 21-22 Feb. 2019 | 25 |
| Gujarat | SK Nagar | 17-18 Jan 2019 | 20 |
| Rajasthan | Sriganganagar | 27-28 Feb. 2019 | 20 |
| Rajasthan | Kota | 12-13 Feb. 2019 | 20 |
| Rajasthan (2 programme simultaneously) | KVK (ICAR-DRMR), Bansur, Alwar | 24-25 Feb 2019 | 35 |

**Table 8.1 State wise FLDs on rapeseed-mustard conducted during 2018-19**

| State | Centre(s) | Total FLDs | Districts covered | Crops | Period of Sowing 2018 |
|---|---|---|---|---|---|
| Assam (ASM) | DoR, (AAU) | 300 | Dhemaji, Karbi Anglong, | Indian mustard Toria | Oct 30- Nov 20 |
| | Shillongani (SHL) | 20 | Morigaon, Nagaon | Indian mustard Toria | Oct 30- Nov 14 |
| Odisha | Bhubaneswar (BHU) | 15 | Bhadrak | Indian mustard | Dec 15-18 |
| Gujarat (GUJ) | S K Nagar (SKN) | 52 | Banaskantha, Kachchh | Indian mustard | Oct 16-Nov 5 |
| Haryana (HAR) | Hisar (HSR) | 20 | Jind, Bhiwani, Fatehabad, Hisar | Indian mustard | Oct 04-29 |
| | Bawal (BAW) | 20 | Rewari | Indian mustard | Oct 22-27 |
| Himachal Pradesh (HP) | Kangra (KNG) | 40 | Kangra | Gobhi sarson | Oct 9-Nov 4 |
| | Hamirpur (CPU) | 19 | Hamirpur, Mandi | Gobhi sarson | Nov 2-15 |
| Jammu & Kashmir (J&K) | Chatha (CHT) | 42 | Jammu | Indian Mustard | Oct 10-30 |
| | Khudwani (KHD) | 30 | Kulgam, Pulwama, Anantnag, Budgam, | Brown sarson | Oct 10-25 |
| Jharkhand (JHD) | BAU, Ranchi | 26 | Ranchi | Indian Mustard | Oct 16-19 |
| Madhya Pradesh (MP) | Morena (MOR) | 100 | Morena, Datia, , Shivpuri, Ashok Nagar , Neemuch , Ujjain and Jhabua | Indian mustard | Oct 13-Nov 05 |
| | Jhansi (JHI) | 29 | Datia, Shivpuri & Niwari | Indian mustard | Oct 25-30 |
| Maharashtra (MH) | Nagpur (NGP) | 30 | Amravati, Nagpur, Chandrapur, Gadchiroli | Indian mustard | Nov 02-08 |
| Manipur (MAN) | CAU (IMP) | 450 | Imphal West, Thoubal, Kangpokpi, Bishnupur | Indian mustard YS, Toria | Nov 15-Dec 10 |
| Punjab (PUN) | Ludhiana (LDH) | 50 | Bathinda | Indian mustard | Oct 17-Nov 13 |
| Rajasthan (RAJ) | Bharatpur (BPR) | 353 | Bharatpur | Indian mustard | Oct 8-26 |
| | Bansur (BAN) | 50 | Alwar | Indian mustard | Oct 30-Nov 8 |
| | Jodhpur (JDH) | 50 | Nagaur and Jodhpur | Indian mustard | Oct 25-Nov 6 |
| | Kota (KOT) | 40 | Kota, Baran | Indian mustard | Oct 20-28 |
| | Jobner (JOB) | 20 | Jaipur, Sikar and Dausa | Taramira | Oct 20-30 |
| | Sriganganagar (SGN) | 20 | Sriganganagar | Indian mustard | Oct 12-29 |
| Uttar Pradesh (UP) | Banda (BND) | 50 | Banda | Indian mustard | Oct 26-Nov 16 |
| | Jhansi (JHI) | 46 | Jhansi | Indian mustard | Oct 25-30 |
| | Kanpur (KPR) | 20 | Auriya, Kanpur Nagar, Kanpur Dehat, Unnao, Lucknow, Kannauj | Indian mustard, | Sept 28-Oct 31 |
| | Varanasi (VAR) | 100 | Mirzapur, Varanasi, Chanduali | Indian mustard | Oct 15-Nov 0 |
| | Amity University (AMT) | 20 | Gautam Budh Nagar | Indian mustard | Oct 8-12 |
| Uttarakhand (UK) | Pantnagar (PNT) | 68 | U.S. Nagar, Nainital, Pauri Gharwal, Haridwar, Almora | Indian mustard Toria, Yellow sarson | Sept 15-Nov 12 |
| **14** | **27** | **2080** | **67** | **6** | **Sept 28-Dec 18** |

**Table 8.2 Frontline demonstrations conducted on rapeseed-mustard**

| Crop | FLDs (No) | Distribution of FLDs | | | |
|---|---|---|---|---|---|
| | | Whole package | | Varietal distribution (total No. of Varieties) | |
| | | Irrigated | Rainfed | Irrigated | Rainfed |
| Toria | 239 | 9 | 230 | 2 | 5 |
| Yellow sarson | 61 | 19 | 42 | 3 | 2 |
| Gobhi sarson | 59 | 11 | 48 | 1 | 1 |
| Brown sarson | 30 | 00 | 30 | 00 | 3 |
| Taramira | 20 | 00 | 20 | 00 | 2 |
| Indian mustard | 1671 | 1090 | 581 | 20 | 5 |
| **Total** | **2080** | **1129** | **951** | **26** | **18** |

*Abbreviations used in the text and table: WP: whole package; IR: Irrigated; RF: Rainfed; YIOFP: Yield increase over farmer's practice; CoC: Cost of cultivation; GMR: Gross monetary return; ANMR: Additional Net Monetary Return; IP: Improved practices; FP: Farmers' Practices; B:C : Benefit : Cost;*

**Table 8.3 Performance of whole package FLDs on rapeseed-mustard under rainfed condition during 2018-19**

| State | Centre | Crops | FLDs | Mean yield (kg /ha) | | YIOFP (%) | COC (Rs/ha) | | GMR (Rs/ha) | | ANMR (Rs/ha) | B: C Ratio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IP | FP | | IP | FP | IP | FP | | IP | FP |
| RAJ | SGN (20)<br>JOB (20) | Indian mustard (20)<br>Taramira (20) | 40 | 1590<br>(1085-2800) | 1367<br>(875-2450) | 16.3 | 11702 | 10735 | 65643 | 56469 | 8207 | 5.60 | 5.26 |
| J&K | KHD (30) | Brown sarson (30) | 30 | 1128<br>(928-1245) | 954<br>(796-1048) | 18.2 | 26152 | 23997 | 54144 | 45792 | 6197 | 2.07 | 1.90 |
| HP | KNG (28)<br>CPU (19) | Gobhi sarson (29) | 48 | 1037<br>(650-1310) | 745<br>(525-885) | 39.2 | 13204 | 12040 | 36295 | 26075 | 9056 | 2.74 | 2.16 |
| MAN | CAU (450) | Indian mustard (227)<br>Yellow sarson (21)<br>Toria (202) | 450 | 1007<br>(760-1760) | 786<br>(667-950) | 28.1 | 13066 | 11119 | 45315 | 35370 | 7998 | 3.46 | 3.18 |
| ASM | DoR, AAU (300)<br>SHL (20) | Indian mustard (300)<br>Toria (20) | 320 | 1167<br>(890-1520) | 798<br>(650-1065) | 46.2 | 24822 | 21865 | 46680 | 31920 | 11803 | 1.88 | 1.45 |
| JHD | BAU (26) | Indian mustard (26) | 26 | 1047<br>(924-1146) | 709<br>(521-812) | 47.7 | 19478 | 17335 | 36645 | 24815 | 9687 | 1.88 | 1.43 |
| UK | PNT (37) | Yellow sarson (21)<br>Toria (16) | 37 | 1016<br>(810-1175) | 834<br>(660-980) | 21.8 | 17507 | 15387 | 42672 | 35028 | 5524 | 2.43 | 2.27 |

*Figure in parenthesis is the number of FLDs conducted by the centre*

**Table 8.4 Performance of whole package FLDs on rapeseed-mustard under irrigated condition during 2018-19**

| State | Centre | Crops | FLDs | Mean yield (kg /ha) | | YIOFP (%) | COC (Rs/ha) | | GMR (Rs/ha) | | ANMR (Rs/ha) | B: C Ratio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IP | FP | | IP | FP | IP | FP | | IP | FP |
| RAJ | BPR (353)<br>BAN (50)<br>JDH (50)<br>KOT (40) | Indian mustard (493) | 493 | 2443<br>(1500-3250) | 2185<br>(1475-3200) | 11.8 | 30798 | 32419 | 102606 | 91770 | 12457 | 3.33 | 2.83 |
| UP | VAR (100)<br>BND (50)<br>JHI (46)<br>KPR (20)<br>AMT (20) | Indian mustard (236) | 236 | 1793<br>(1310-3040) | 1301<br>(750-2698) | 37.8 | 28581 | 23260 | 75306 | 54642 | 15343 | 2.63 | 2.34 |
| HAR | Hisar (20)<br>Bawal (20) | Indian mustard (40) | 40 | 2754<br>(1800-3800) | 2352<br>(1600-3400) | 17.1 | 34462 | 31110 | 115668 | 98784 | 13532 | 3.35 | 3.17 |
| MP | MOR (100)<br>JHI (29) | Indian mustard (129) | 129 | 1858<br>(1260-2620) | 1564<br>(1010-2280) | 18.8 | 25195 | 23355 | 78036 | 65688 | 10508 | 3.09 | 2.81 |
| GUJ | SKN (52) | Indian mustard (52) | 52 | 1999<br>(1453-3049) | 1769<br>(1418-2086) | 13.0 | 23336 | 23762 | 83958 | 74298 | 10086 | 3.59 | 3.12 |
| PUN | LDH (50) | Indian mustard (50) | 50 | 2093<br>(1960-2250) | 1980<br>(1800-2150) | 5.7 | 33500 | 33500 | 83720 | 79200 | 4520 | 2.49 | 2.36 |
| HP | KNG (11) | Gobhi sarson (11) | 11 | 1357<br>(1240-1600) | 848<br>(750-925) | 60.0 | 13772 | 12460 | 47495 | 29680 | 16503 | 3.44 | 2.38 |
| J&K | CHT (42) | Indian mustard (42) | 42 | 1717<br>(1460-2320) | 1055<br>(860-1440) | 62.7 | 18400 | 13140 | 72114 | 44310 | 22544 | 3.91 | 3.37 |
| UK | PNT (31) | Indian Mustard (8)<br>Yellow Sarson (14)<br>Toria (9) | 31 | 1502<br>(1100-2100) | 1335<br>(1050-1650) | 12.5 | 26932 | 25961 | 63084 | 56070 | 6043 | 2.34 | 2.15 |
| MH | NGP (30) | Indian mustard (30) | 30 | 1070<br>(1000-1150) | 908<br>(810-980) | 17.8 | 13273 | 12397 | 44940 | 38136 | 5928 | 3.38 | 3.07 |
| ODH | BHU (15) | Indian mustard (15) | 15 | 933<br>(798-1075) | 582<br>(485-645) | 60.3 | 28215 | 22225 | 39186 | 24444 | 8752 | 1.38 | 1.09 |

*Figure in parenthesis is the number of FLDs conducted by the centre*

**Table 8.5 Variety-wise performance in whole package FLDs on rapeseed-mustard under Irrigated conditions during 2018-19**

| State | Centre | Varieties | FLDs | Mean yield (kg /ha) | | YIOF P (%) | COC (Rs/ha) | | GMR (Rs/ha) | | ANMR (Rs/ha) | B: C Ratio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IP | FP | | IP | FP | IP | FP | | IP | FP |
| **Indian mustard** | | | | | | | | | | | | | |
| RAJ | BPR (266)<br>KOT (40)<br>BAN (15) | Giriraj | 321 | 2507<br>(1500-3125) | 2251<br>(1500-3200) | 11.4 | 31340 | 33124 | 105294 | 94542 | 12536 | 3.35 | 2.85 |
| RAJ | BPR (39)<br>JDH (50) | NRCHB 101 | 89 | 2385<br>(1870-3250) | 2115<br>(1475-2750) | 12.8 | 28773 | 28783 | 100170 | 88830 | 11350 | 3.48 | 3.08 |
| RAJ | BPR (22) | RH 725 | 22 | 2531<br>(1875-3000) | 2298<br>(1625-2750) | 10.1 | 30577 | 32151 | 106302 | 96516 | 11360 | 3.47 | 3.00 |
| RAJ | BAN (19) | RH 406 | 19 | 2098<br>(1625-2580) | 2010<br>(1700-2460) | 4.4 | 30860 | 34295 | 88116 | 84420 | 7131 | 2.85 | 2.46 |
| RAJ | BAN (16) | RH 749 | 16 | 2276<br>(1790-2860) | 1940<br>(1735-2680) | 17.3 | 30860 | 34295 | 95592 | 81480 | 17547 | 3.09 | 2.37 |
| RAJ | BPR (16) | PM 30 | 16 | 2302<br>(2000-2750) | 2139<br>(1750-2700) | 7.6 | 31825 | 34695 | 96684 | 89838 | 9716 | 3.03 | 2.58 |
| RAJ | BPR (10) | DRMR 1165-40 | 10 | 2650<br>(2000-3250) | 2330<br>(1825-2750) | 13.7 | 30000 | 32500 | 111300 | 97860 | 15940 | 3.71 | 3.01 |
| HAR | HSR (20)<br>BAW (10) | RH 725 | 30 | 2790<br>(1800-3800) | 2398<br>(1600-3400) | 16.3 | 32887 | 29982 | 117180 | 100716 | 13559 | 3.56 | 3.35 |
| HAR | BAW (10) | RB 50 | 10 | 2645<br>(2400-2850) | 2215<br>(1850-2600) | 19.4 | 39185 | 34495 | 111090 | 93030 | 13370 | 2.83 | 2.69 |
| UP | VAR (40)<br>JHI (16)<br>BND (9) | RH 749 | 65 | 1800<br>(1250-3040) | 1411<br>(890-2698) | 27.6 | 29263 | 22117 | 75600 | 59262 | 9192 | 2.58 | 2.67 |
| UP | JHI (15)<br>BND (15) | RH 406 | 30 | 1515<br>(1250-1750) | 1090<br>(850-1340) | 39.0 | 24826 | 20027 | 63630 | 45780 | 13051 | 2.56 | 2.28 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UP | VAR (40)<br>JHI (15) | Giriraj | 55 | 1669<br>(1310-2999) | 1299<br>(785-2634) | 28.5 | 30299 | 25711 | 70098 | 54558 | 10952 | 2.31 | 2.12 |
| UP | BND (26) | NRCHB 101 | 26 | 1407<br>(1225-1600) | 933<br>(750-1200) | 50.8 | 23500 | 17000 | 59094 | 39186 | 13408 | 2.51 | 2.30 |
| UP | VAR (20) | RGN 73 | 20 | 2291<br>(1580-2390) | 1882<br>(1268-1973) | 21.7 | 30903 | 28075 | 96222 | 79044 | 14350 | 3.11 | 2.81 |
| UP | AMT (10) | PM 28 | 10 | 2125<br>(2000-2300) | 1782<br>(1700-1850) | 19.2 | 18500 | 17200 | 89250 | 74844 | 13106 | 4.82 | 4.35 |
| UP | AMT (10) | CS 58 | 10 | 2342<br>(2150-2600) | 1788<br>(1740-1830) | 31.0 | 18500 | 17200 | 98364 | 75096 | 21968 | 5.31 | 4.36 |
| UP | KPR (12) | Maya | 12 | 2445<br>(2300-2550) | 1679<br>(1550-1800) | 45.6 | 42382 | 34500 | 102690 | 70518 | 24290 | 2.42 | 2.04 |
| UP | KPR (3) | Urvashi | 3 | 2350<br>(2300-2450) | 1666<br>(1600-1700) | 41.0 | 42382 | 34500 | 98700 | 69972 | 20846 | 2.32 | 2.02 |
| GUJ | SKN (26) | GDM 4 | 26 | 2097<br>(1527-3049) | 1769<br>(1418-2086) | 18.5 | 23336 | 23762 | 88074 | 74298 | 14202 | 3.77 | 3.12 |
| GUJ | SKN (26) | GM 3 | 26 | 1901<br>(1453-2777) | 1769<br>(1418-2086) | 7.5 | 23336 | 23762 | 79842 | 74298 | 5970 | 3.42 | 3.12 |
| MP | MOR (33)<br>JHI (10) | RH 749 | 43 | 1875<br>(1260-2620) | 1592<br>(1020-2280) | 17.8 | 25271 | 23531 | 78750 | 66864 | 10146 | 3.11 | 2.84 |
| MP | MOR (34) | RVM 2 | 34 | 1986<br>(1480-2600) | 1700<br>(1260-2240) | 16.8 | 24884 | 23513 | 83412 | 71400 | 10641 | 3.35 | 3.03 |
| MP | MOR (33) | JM 3 | 33 | 1876<br>(1420-2300) | 1602<br>(1280-2030) | 17.1 | 24321 | 22926 | 78792 | 67284 | 10113 | 3.23 | 2.93 |
| MP | JHI (10) | RH 406 | 10 | 1573<br>(1276-1870) | 1192<br>(1010-1350) | 32.00 | 26693 | 22870 | 66066 | 50064 | 12179 | 2.47 | 2.18 |
| MP | JHI (9) | Giriraj | 9 | 1547<br>(1260-1690) | 1192<br>(1010-1286) | 29.8 | 27550 | 24035 | 64974 | 50064 | 11395 | 2.35 | 2.08 |
| J&K | CHT (19) | Giriraj | 19 | 1642<br>(1480-1840) | 1017<br>(860-1140) | 61.4 | 18400 | 13140 | 68964 | 42714 | 20990 | 3.74 | 3.25 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J&K | CHT (14) | RSPN 25 | 14 | 1825 (1460-2320) | 1124 (860-1440) | 62.4 | 18400 | 13140 | 76650 | 47208 | 24182 | 4.16 | 3.59 |
| J&K | CHT (9) | NRCHB 101 | 9 | 1709 (1460-2000) | 1029 (940-1180) | 66.1 | 18400 | 13140 | 71778 | 43218 | 23300 | 3.90 | 3.28 |
| PUN | LDH (50) | PBR 357 | 50 | 2093 (1960-2250) | 1980 (1800-2150) | 5.7 | 33500 | 33500 | 83720 | 79200 | 4520 | 2.49 | 2.36 |
| MS | NAG (30) | NRCHB 101 | 30 | 1070 (1000-1150) | 908 (810-980) | 17.8 | 13273 | 12397 | 44940 | 38136 | 5928 | 3.38 | 3.07 |
| ODH | BHU (15) | NRCHB 101 | 15 | 933 (798-1075) | 582 (485-645) | 60.3 | 28215 | 22225 | 39186 | 24444 | 8752 | 1.38 | 1.09 |
| UK | PNT (8) | PR 20 | 8 | 1750 (1400-2000) | 1525 (1320-1650) | 14.7 | 26004 | 25175 | 73500 | 64050 | 8621 | 2.82 | 2.54 |
| **Yellow sarson** | | | | | | | | | | | | | |
| UK | PNT (11) | PPS 1 | 11 | 1425 (1100-1550) | 1283 (1050-1375) | 11.1 | 27152 | 26043 | 59850 | 53886 | 4855 | 2.20 | 2.06 |
| UK | PNT (3) | Pant sweta | 3 | 1692 (1625-1800) | 1468 (1430-1550) | 15.2 | 25037 | 24392 | 71064 | 61656 | 8763 | 2.83 | 2.52 |
| UP | KPR (5) | Pitambari | 5 | 1790 (1700-1850) | 1240 (1200-1300) | 44.3 | 39395 | 34372 | 75180 | 52080 | 18077 | 1.90 | 1.51 |
| **Gobhi sarson** | | | | | | | | | | | | | |
| HP | KNG (11) | GSC 7 | 11 | 1357 (1240-1600) | 848 (750-925) | 60.1 | 13772 | 12460 | 47495 | 29680 | 16503 | 3.44 | 2.38 |
| **Toria** | | | | | | | | | | | | | |
| UK | PNT (5) | Uttara | 5 | 1280 (1200-1500) | 1167 (1100-1365) | 9.7 | 28356 | 27137 | 53760 | 49014 | 3527 | 1.89 | 1.80 |
| UK | PNT (4) | PT 508 | 4 | 1356 (1325-1400) | 1206 (1125-1300) | 12.4 | 27827 | 27017 | 56952 | 50652 | 5490 | 2.04 | 1.87 |

*Figure in parenthesis is the number of FLDs conducted by the centre*

## Table 8.6 Varietal performance in Whole package FLDs of rapeseed-mustard under rainfed condition during 2018-19

| State | Centre | Varieties | FLDs | Mean yield (kg /ha) | | YIOFP (%) | COC (Rs/ha) | | GMR (Rs/ha) | | ANMR (Rs/ha) | B: C Ratio | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IP | FP | | IP | FP | IP | FP | | IP | FP |
| **Indian mustard** | | | | | | | | | | | | | |
| RAJ | SGN (10) | RGN 229 | 10 | 2080 (2000-2400) | 1850 (1750-2200) | 12.4 | 14000 | 13370 | 87360 | 77700 | 9030 | 6.24 | 5.81 |
| RAJ | SGN (10) | RGN 298 | 10 | 1955 (1600-2800) | 1720 (1400-2450) | 13.7 | 14000 | 13315 | 82110 | 72240 | 9185 | 5.86 | 5.42 |
| ASM | DoR, AAU (300) SHL (20) | NRCHB 101 | 320 | 1171 (890-1520) | 800 (650-1065) | 46.4 | 24910 | 21838 | 46840 | 32000 | 11768 | 1.88 | 1.46 |
| MAN | CAU (123) | DRMR 150-35 | 123 | 994 (847-1118) | 781 (667-900) | 27.3 | 13053 | 11086 | 44730 | 35145 | 7618 | 3.42 | 3.17 |
| MAN | CAU (104) | NRCHB 101 | 104 | 1012 (890-1110) | 783 (675-900) | 29.2 | 13076 | 11087 | 45540 | 35235 | 8316 | 3.48 | 3.17 |
| JHD | BAU (15) | NRCHB 101 | 15 | 1057 (924-1146) | 743 (624-954) | 42.3 | 19478 | 17335 | 36995 | 26005 | 8847 | 1.89 | 1.50 |
| JHD | BAU (11) | Shivani | 11 | 1034 (942-1132) | 663 (521-812) | 55.9 | 19478 | 17335 | 36190 | 23205 | 10842 | 1.85 | 1.33 |
| **Yellow sarson** | | | | | | | | | | | | | |
| UK | PNT (21) | PPS 1 | 21 | 1065 (950-1175) | 883 (775-983) | 20.6 | 17478 | 15332 | 44730 | 37086 | 5498 | 2.55 | 2.41 |
| MAN | CAU (21) | YSH 401 | 21 | 980 (760-1110) | 784 (687-900) | 25.0 | 13122 | 11190 | 44100 | 35280 | 6888 | 3.36 | 3.15 |
| **Gobhi sarson** | | | | | | | | | | | | | |
| HP | KNG (29) CPU (19) | GSC 7 | 48 | 1037 (650-1310) | 745 (525-885) | 39.2 | 13204 | 12040 | 36295 | 26075 | 9056 | 2.74 | 2.16 |
| **Brown sarson** | | | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J&K | KHD (30) | Shalimar sarson-1, 2, 3 | 30 | 1128 (928-1245) | 954 (796-1048) | 18.2 | 26152 | 23997 | 54144 | 45792 | 6197 | 2.07 | 1.90 |
| **Toria** | | | | | | | | | | | | | |
| UK | PNT (7) | PT 508 | 7 | 860 (810-910) | 697 (660-740) | 23.38 | 17396 | 15265 | 36120 | 29274 | 4715 | 2.07 | 1.91 |
| UK | PNT (6) | PHT 1 | 6 | 1042 (920-1185) | 831 (695-925) | 25.39 | 17698 | 15718 | 43764 | 34902 | 6882 | 2.47 | 2.22 |
| UK | PNT (3) | Uttara | 3 | 992 (945-1050) | 817 (780-870) | 21.4 | 17587 | 15393 | 41664 | 34314 | 5156 | 2.36 | 2.22 |
| MAN | CAU (202) | TS 38 | 202 | 1004 (815-1760) | 785 (667-950) | 27.89 | 13073 | 11161 | 45180 | 35325 | 7943 | 3.45 | 3.16 |
| ASM | SHL (7) | TS 38 | 7 | 1040 (1030-1050 | 783 (740-850) | 32.82 | 22100 | 22100 | 43680 | 32886 | 10794 | 1.97 | 1.48 |
| ASM | SHL (5) | TS 36 | 5 | 1068 (1010-1140) | 702 (650-750) | 52.13 | 23200 | 23200 | 44856 | 29484 | 15372 | 1.93 | 1.27 |
| **Taramira** | | | | | | | | | | | | | |
| RAJ | JOB (11) | RTM 1351 | 11 | 1171 (1095-1230) | 954 (875-1024) | 22.7 | 9497 | 8212 | 46840 | 38160 | 7395 | 4.93 | 4.64 |
| RAJ | JOB (9) | RTM 1355 | 9 | 1155 (1085-1224) | 943 (875-1005) | 22.5 | 9291 | 8028 | 46200 | 37720 | 7217 | 4.97 | 4.69 |

**Table 8.7 Exploitable yield reservoir in rapeseed-mustard during 2018-19**

| State | No. of FLDs | FLDs Mean yield (kg /ha) | | Yield gap- I (%) | Three year State average yield (Kg/ha) ( 2015-16 to 2017-18) | Yield gap- II (%) | Three year State average production (000 tonnes) | Expected production (000 tonnes) | |
|---|---|---|---|---|---|---|---|---|---|
| | | IP | FP | | | | | EP-I | EP-II |
| RAJ | 533 | 2379 | 2123 | 12.1 | 1429.5 | 66.4 | 3481.6 | 3902.7 | 5793.4 |
| HAR | 40 | 2754 | 2352 | 17.1 | 1827 | 50.7 | 952.6 | 1115.5 | 1435.6 |
| MP | 129 | 1858 | 1564 | 18.8 | 1235.9 | 50.3 | 854 | 1014.5 | 1283.6 |
| UP | 236 | 1793 | 1301 | 37.8 | 1227 | 46.1 | 802 | 1105.1 | 1171.7 |
| ODH | 15 | 933 | 582 | 60.3 | 298.9 | 212.0 | 2.6 | 4.2 | 8.1 |
| GUJ | 52 | 1999 | 1769 | 13.0 | 1715 | 16.5 | 349 | 394.4 | 406.5 |
| ASM | 320 | 1167 | 798 | 46.2 | 660 | 76.8 | 191.4 | 279.8 | 338.4 |
| JHD | 26 | 1047 | 709 | 47.7 | 715 | 46.4 | 184.2 | 272.0 | 269.7 |
| PUN | 50 | 2093 | 1980 | 5.7 | 1419 | 47.5 | 44.1 | 46.6 | 65.0 |
| J&K | 72 | 1471 | 1013 | 45.2 | 642.8 | 128.8 | 31.2 | 45.3 | 71.4 |
| MAN | 450 | 1007 | 786 | 28.1 | 852.1 | 18.2 | 24.8 | 31.8 | 29.3 |
| UK | 68 | 1238 | 1062 | 16.6 | 874.4 | 41.6 | 13.1 | 15.27 | 18.5 |
| HP | 59 | 1108 | 768 | 44.3 | 522 | 112.3 | 4.5 | 6.5 | 9.5 |
| MS | 30 | 1070 | 908 | 17.8 | 316.2 | 238.6 | 2.9 | 3.4 | 9.8 |
| **All India** | **2080** | **1637** | **1336** | **18.7** | **1333** | **57.23** | **6938** | **8237.1** | **10910.5** |

# Appendix

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**Zone-wise research centres for multi-location testing**

| | | |
|---|---|---|
| **Zone I** | | |
| **Jammu & Kashmir** | **:** | **Khudwani, Srinagar*** |
| **Himachal Pradesh** | **:** | **Kangra, Dhaula Kuan*, Bajaura*, Una*** |
| **Zone II** | | |
| **Jammu & Kashmir** | **:** | **Chatha** |
| **Punjab** | **:** | **Ludhiana** |
| **Haryana** | **:** | **Hisar, Bawal, Karnal, Palwal (Sohna)*, Panipat*** |
| **Rajasthan** | **:** | **Navgaon, Sriganganagar** |
| **Delhi** | **:** | **IARI New Delhi** |
| **Zone III** | | |
| **Uttar Pradesh** | **:** | **Kanpur, Varanasi, Lucknow*, Agra*, Banda*, Jhanshi** |
| **Uttarakhand** | **:** | **Pantnagar** |
| **Madhya Pradesh** | **:** | **Morena** |
| **Rajasthan** | **:** | **Kota , Bharatpur** |
| **Bihar** | **:** | **Dholi (on the basis of proceeding 2016)** |
| **Zone IV** | | |
| **Rajasthan** | **:** | **Jobner, Bikaner*, Diggi*, Mandore*** |
| **Gujarat** | **:** | **S.K. Nagar, Deesa (Palanpur)** |
| **Maharashtra** | **:** | **Nagpur, Jalgaon*, Pachora** |
| **Zone V** | | |
| **Chhattisgarh** | **:** | **Jagdalpur** |
| **Jharkhand** | **:** | **Kanke** |
| **West Bengal** | **:** | **Kalyani** |
| **Odisha** | **:** | **Bhubaneswar** |
| **Asom** | **:** | **Shillongani** |
| **Manipur** | **:** | **Imphal** |
| **Zone VI** | | |
| **Karnataka** | **:** | **Raichur*, Dharwad*** |
| **Telangana** | **:** | **Hyderabad*** |

*** Voluntary Centre :**

## Abbreviations used in the report

| **Zone I** | | **Zone III** | | **Zone IV** | |
|---|---|---|---|---|---|
| **SRN** | **Srinagar** | **BPR** | **Bharatpur** | **JUG** | **Junagadh** |
| **KHD** | **Khudwani** | **KOT** | **Kota** | **SKN** | **S.K. Nagar** |
| **KNG** | **Kangra** | **DOL** | **Dholi** | **JAL** | **Jalgaon** |
| **DLK** | **Dhaula Kuan** | | | **NGP** | **Nagpur** |
| **UNA** | **Una** | **VAR** | **Varanasi** | **MDR** | **Mandore** |
| **BJR** | **Bajaura** | **LKW** | **Lucknow** | **BKR** | **Bikaner** |
| | | **BND** | **Banda** | **DIG** | **Diggi** |
| | | **PNT** | **Pantnagar** | **DSA** | **Deesa** |
| **Zone II** | | | | **PHR** | **Pachora** |
| **CHT** | **Chatha** | **MOR** | **Morena** | **Zone V** | |
| **MDG** | **Mahendragarh** | **TKM** | **Tikamgarh** | **BER** | **Berhampore** |
| **LDH** | **Ludhiana** | **AGR** | **Agra** | **KLN** | **Kalyani** |
| **ABR** | **Abohar** | **KPR** | **Kanpur** | **BHU** | **Bhubaneswar** |
| **HSR** | **Hisar** | **JHS** | **Jhanshi** | **JAG** | **Jagdalpur** |
| **BAW** | **Bawal** | | | **SHL** | **Shillongani** |
| **KAR** | **Karnal** | | | **SHG** | **Shillong** |
| **NAV** | **Navgaon** | | | **Zone VI** | |
| **NDH** | **New Delhi** | | | **RAIRaichur** | |
| **PAL** | **Palwal** | | | **DWD** | **Dharwad** |
| **SGN** | **Sriganganagar** | | | **HYD** | **Hyderabad** |

**Zone wise FLD's Centres**

| | | |
|---|---|---|
| 1.ICAR-RC for NEH | : | ICAR-Research Complex for NEH Region, Tripura |
| 2. SEE | : | Society of Extension Education, Agra |
| 3. IIAB | : | Indian Institute of Agricultural Biotechnology Ranchi, Jharkhand |
| 4. JHD | : | Jharkhand |
| 5. MGL | : | Meghalaya |
| 6. ACP | : | Arunachal Pradesh |
| 7. CAU | : | Central Agriculture University, Imphal |
| 8. RLBCAU | : | Rani Laxmi Bai Central Agriculture University, Jhanshi |
| 9. AMT | : | Amity University, Noida |