

	32nd Annual Group Meeting All India Coordinated Research Project on Rapeseed-Mustard ICAR-Indian Institute of Rapeseed-Mustard Research, Bharatpur	
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(AUGUST 06-08, 2025)

Venue: Rajmata Vijayaraje Scindia Krishi Vishwa Vidhyalaya, Gwalior (M.P.)

AGENDA

06 AUGUST 2025 (WEDNESDAY)		
08.00-09.30 hrs.	REGISTRATION	
09.30-10.45 hrs.	INAUGURAL SESSION	
	Chairman	Prof. A.K. Shukla, Vice-Chancellor, RVSKVV, Gwalior (M.P.)
	Chief Guest	Dr. D.K. Yadava, DDG (CS), ICAR, New Delhi
	Guest of honor	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Rapporteurs	Dr. Ram Avtar, Sr. Breeder, CCSHAU, Hisar Dr. Hariom Kumar Sharma, Senior Scientist, ICAR-IIRMR, Bharatpur
09.30-09.35 hrs.	Lightning of lamp	
09.35-09.40 hrs.	Welcome address	Dr. S. K. Sharma, Director of Research, RVSKVV, Gwalior
09.40-09.50 hrs.	Presentation of Research highlights and Action Taken Report	Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur
09.50-09.55 hrs.	Release of publications	Guests on the dias
09.55-10.05 hrs.	Remarks by Guest of honor	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
10.05-10.15 hrs.	Remarks by Chairman	Prof. A.K. Shukla, Vice-Chancellor, , RVSKVV, Gwalior (M.P.)
10.15- 10.20 hrs.	Remarks by Chief Guest	Dr. D.K. Yadava, DDG (CS), ICAR, New Delhi
10.20-10.40 hrs.	Vote of thanks	Dr. Sandeep Singh Tomar, ADR, ZARS, Morena, , RVSKVV,
10.45-11.00 hrs.	HIGH TEA	
11.00-13.10 hrs.	PRESENTATION OF REPORTS (2024-25)	
	Chairman	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Co-Chairman	Prof. S.S. Banga, Ex- National Professor (ICAR), Ludhiana Dr. S.R. Bhatt, Ex-Principal Scientist, ICAR-NIPB, New Delhi
	Rapporteurs	Drs. Bhagirath Ram, Principal Scientist, ICAR-IIRMR, Bharatpur Dr. Chhaya Atri, P.S. PAU, Ludhiana
	Plant Breeding Agronomy Plant Physiology Plant Pathology Entomology Biochemistry	Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur Dr. R.S. Jat, PI Agronomy, AICRP-RM Dr. Lalit Krishna Meena, PI Plant Physiology, AICRP-RM Dr. P.D. Meena, PI Plant Pathology, AICRP-RM Dr. Sarwan Kumar, PI Entomology, AICRP-RM Dr. Anubhuti Sharma, PI Biochemistry, AICRP-RM
13.10-14.00 hrs.	LUNCH BREAK	
14.00-17.30 hrs.	Centers Presentation (10 minutes each)	
	PAU, Ludhiana	PIs of respective centers
	CCSHAU, Hisar	
	GBPUA&T, Pantnagar	
	BHU, Varanasi	
	RLBCAU, Jhansi	
	SDAU, SK Nagar	
	RARS, Shillongani	
	RPCAU, Dholi	
	SKUAS&T, Jammu	
	ARS, Sriganaganagar	
	SKNAU, Jobner	
	ZARS, Morena	

17.30-18.30 hrs.	Varietal Identification Committee Meeting	
	Chairman	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Members	Nominated by DDG (CS)
07 AUGUST, 2025 (THURSDAY)		
9.30-13.00 hrs.	CONCURRENT SESSIONS	
PLANT BREEDING	Chairman	Prof. S.S. Banga, Ex- National Professor (ICAR), Ludhiana
	Co-Chairman	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Subject Expert	Dr. S.R. Bhatt, Ex-Principal Scientist, ICAR-NIPB, New Delhi
	Rapporteurs	Dr. Bhagirath Ram, Principal Scientist, ICAR-IIRMR, Bharatpur Dr. H.S. Meena, Principal Scientist, ICAR-IIRMR, Bharatpur
AGRONOMY	Chairman	Dr. R.S. Chundawat, Head RVSKVV, Gwalior
	Co-Chairman	Dr. N.K. Jain, Pr. Scientist, HRD, ICAR, New Delhi
	Subject Expert	Dr. N. Ravishanker, Incharge IFS, ICAR-IIFSR, Meerut
	Rapporteurs	Dr. M.S. Negi, Pof., Agronomy, GBPUA&T, Pantnagar Dr. R.L. Choudhary, Scientist, ICAR-IIRMR, Bharatpur
PLANT PATHOLOGY	Chairman & Subject Expert	Dr. R.P. Awasthi, Ex-Prof. Plant Pathology, GBPUA&T, Pantnagar
	Co-Chairman	Dr. Pankaj Sharma, Joint Director (School of Crop Health Biology Research), ICAR-NIBSM
	Rapporteurs	Prof. A.K. Tiwari, Plant Pathology, GBPUA&T, Pantnagar Dr. N.R. Bhardwaj, Scientist, ICAR-IIRMR, Bharatpur
11.00-11.15 hrs.	Tea Break	
ENTOMOLOGY	Chairman and Subject Expert	Dr. Subhash Chander, Ex. Director, ICAR-NRIIPM, New Delhi
	Co-Chairman	Dr. Mukesh Kumar Dhillon, Head Entomology, IARI, New Delhi
	Rapporteurs	Dr. Sarwan Kumar, Senior Entomologist, PAU, Ludhiana
		Dr. Rudra N. Borkakti, Junior Entomologist, AAU, ZRS, Shillongani
BIOCHEMISTRY & PLANT PHISIOLOGY	Chairman and Subject Expert	Dr. Anil Kumar, Director Education, RLBCAU, Jhansi
	Co-Chairman	Dr. Maharaj Singh, Pr. Sci. Plant-Physiology, ICAR-CAZRI, Jodhpur
	Rapporteurs	Dr. Anubhuti Sharma, Pr. Scientist, Biochemistry, ICAR-IIRMR, Bharatpur
		Dr. Pushp Sharma, Prof. Plant Physiology, PAU, Ludhiana
13.00-14.00 hrs.	LUNCH	
14.00-15.00 hrs.	PLANNING AND TECHNICAL PROGRAMME FORMULATION (JOINT SESSION)	
	Chairman	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Co-Chairman	Prof. S.S. Banga, Ex- National Professor (ICAR), Ludhiana
	Rapporteurs	Dr. Kartikeya Srivastava, Prof., IASC, BHU, Varanasi
		Dr. H.S. Meena, Principal Scientist, ICAR-IIRMR, Bharatpur
15.00-16.30 hrs.	BREEDER SEED PRODUCTION/ DUS Testing/ Germplasm registration	
	Chairman & Subject Expert	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Co-Chairman	Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur
	Rapporteurs	Dr. Arun Kumar, Principal Scientist, ICAR-IIRMR, Bharatpur
		Dr. H.S. Meena, Pr. Scientist, ICAR-IIRMR, Bharatpur
	Breeder Seed production	Dr. B.L. Meena, Sr. Scientist, ICAR-IIRMR, Bharatpur
	Management & Utilization of Rapeseed-Mustard Germplasm	Dr. Rashmi Yadav, Pr. Scientist, ICAR-NBPGR, New Delhi
	PPV&FRA act in India	Sh. D.S. Pilania, Technical Officer, PPV&FRA, New Delhi
16.30-16.45 hrs.	Tea Break	
16.45-17.45 hrs.	TECHNOLOGY DISSEMINATION, MANAGEMENT	
	Chairman & Subject Expert	Dr. S.R.K Singh, Director of ICAR-ATARI, Zone IX, Jabalpur

	Co-Chairman	Dr. S.K. Jha, PS (O&P), ICAR, New Delhi
	Rapporteurs	Dr. S.K. Sharma, Head, KVK, ICAR-IIRMR, Bharatpur Dr. R.K. Yogi, Sr. Scientist, ICAR-IIRMR, Bharatpur
	Front Line Demonstration	Dr. A.K. Sharma, Pr. Scientist, ICAR-IIRMR, Bharatpur
	Promotion of Rapeseed-Mustard in NEH Region	
	Accelerating Technology dissemination through effective linkage with KVKs	Dr. S.R.K Singh, Director of ICAR-ATARI, Zone IX, Jabalpur
08 AUGUST, 2025 (FRIDAY)		
9.30-11.30 hrs.	BRAIN STORMING SESSION	Management of <i>Orobanche</i> in Rapeseed-Mustard: Issues and Opportunities
	Chairman	Dr. Dhiraj Singh, Ex- Director, ICAR-IIRMR, Bharatpur
	Co-Chairman	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Presentation	Dr. R.S. Jat, Pr. Scientist, ICAR-IIRMR, Bharatpur
	Panelist	Prof. S.S. Banga, Ex- National Professor (ICAR), Ludhiana Dr. S.R. Bhatt, Ex- Pr. Scientist, ICAR-NIPB Dr. Jitendra Kumar, ADG (NASF), ICAR, New Delhi Dr. S. K. Sharma, Director of Research, RVSKVV, Gwalior Dr. V.K Chaudhary, PS, ICAR-DWR, Jabalpur
	Rapporteurs	Dr. Aashish Gupta, Pr, scientist, ICAR-NIPB, New Delhi Dr. R.L. Choudhary, Sr. Scientist, ICAR-IIRMR, Bharatpur
11.30-13.00 hrs.	PLENARY SESSION	
	Chairman	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Rapporteurs	Dr. R.S. Jat, Principal Scientist, ICAR-IIRMR, Bharatpur Dr. M.K. Tripathi, I/C AICRP-RM, Morena
	Presentation of Recommendations	
	Plant Breeding	Dr. Bhagirath Ram, Pr. Scientist, ICAR-IIRMR, Bharatpur
	Agronomy	Dr. R.S. Jat, Principal Scientist, ICAR-IIRMR, Bharatpur
	Plant Physiology	Dr. Lalit Krishna Meena, Scientist, ICAR-IIRMR, Bharatpur
	Biochemistry	Dr. Anubhuti Sharma, Pr. Scientist, ICAR-IIRMR, Bharatpur
	Entomology	Dr. Sarwan Kumar, Professor, PAU, Ludhiana
	Plant Pathology	Dr. P.D. Meena, Pr. Scientist, ICAR-IIRMR, Bharatpur
	Breeder Seed	Dr. B.L. Meena, Sr. Scientist, ICAR-IIRMR, Bharatpur
	FLD's	Dr. A.K. Sharma, Pr. Scientist, ICAR-IIRMR, Bharatpur
	Recommendations of Varietal Identification Committee	Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur
	Concluding remarks	Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
	Vote of thanks	Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur
13.00-14.00 hrs.	LUNCH	

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Session: Inaugural

Chairman	: Prof. A.K. Shukla, Vice-Chancellor, RVSKVV, Gwalior
Chief Guest	: Dr. D.K. Yadava, Deputy Director General, (Crop Science), ICAR, New Delhi
Guest of Honor	: Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
Convener	: Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur
Rapporteurs	: Prof. Ram Avtar, Sr. Breeder, CCSHAU, Hisar : Dr. Hariom Kumar Sharma, Senior Scientist, ICAR-IIRMR, Bharatpur

The session started with welcome address by Dr. S.K. Sharma, Director Research, RVSKVV, Gwalior briefed about the history and activities of RVSKVV, Gwalior and contribution of Madhya Pradesh in rapeseed-mustard production and achievements of ZARS Morena in terms of development of high yielding varieties and technologies of rapeseed-mustard. Dr. Vijay Veer Singh, Director, ICAR-IIRMR, Bharatpur presented the highlights of AICRP-RM for year 2024-25. He briefed about research highlights including production trend of rapeseed-mustard in world and India, experiments and trials conducted in different disciplines and major outcomes. He also presented the Action taken report of last 31st Annual Group Meet. On this occasion six publications including AICRP-RM annual report were released. Further, Best main-centre award was given to CCSHAU, Hisar and best sub-centre award was given to College of Agriculture, Nagpur (PDKV, Akola).

Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi and Guest of Honour, apprised the house that rapeseed-mustard occupy the second position after soybean in oilseed production. Significant progress has been made by rapeseed-mustard in production and productivity in last decade. He told that 85% of total rapeseed-mustard production comes from Rajasthan, Haryana, Uttar Pradesh and Madhya Pradesh. New states including West Bengal, Bihar, Assam and Jharkhand should be tapped for area expansion since there is significant scope for this. He advocated conducting adaptive trials for Indian mustard, toria and yellow sarson in these states. In this direction IIRMR, Bharatpur is making the efforts. In Gujarat state rapeseed-mustard area is declining, so efforts should to address the declining area under mustard cultivation in Gujarat. Mustard suitability mapping should be done in Maharashtra and Karnataka states. For this work take help from NBSSLUP, Nagpur and IARI, New Delhi. He told that green revolution states are facing sustainability issue. Hence, efforts should be made for diversifying the cropping system in these states including rapeseed-mustard in their cropping system. However, Maize-Mustard-Mung cropping system and Potato-Mustard intercropping, Mustard-Sugarcane inter cropping should be tested and promoted in Uttar Pradesh. Govt. of India is targeting rapeseed-mustard yield >2 tones. There is demand for early duration (<90 days) toria and yellow sarson. We should promote taramira in more than three states. Sclerotinia stem rot has become major disease of rapeseed-mustard so, there is a need for urgent and time bound management of this disease. Orobanch is another big problem in rapeseed-mustard production, which can survive in the soil for more than 10 years. Therefore, we need to explore different options for management of Orobanch. He further, emphasized to conduct brainstorming sessions for management of Stem rot and Orobanch.

He further urged to identify hotspot for key diseases and pests (white rust, alternaria blight, powdery mildew, stem rot, Aphids, Orobanch) of rapeseed-mustard. He stressed that only key centres/main centre should make the crosses and share the segregating materials to other centres. He congratulated and thanked rapeseed-mustard fraternity for cooperation and support.

Prof. A.K. Shukla, Vice-Chancellor, RVSKVV, Gwalior and Chairman of the session, praised the achievements of AICRP-RM. He told that there is further scope for area expansion in our country especially eastern and NE states. He stressed that all recommendations of rapeseed-mustard should reach to the farmers. Marginal soils are deficient in nutrients so farmers should apply proper recommended dose of fertilizers for rapeseed-mustard production. We need to develop climate resilient varieties of rapeseed-mustard. We need to study the effect of different methods of oil extraction on chemical composition of oil. Every centre should follow the research

programme of AICRP-RM seriously to avoid failing of trials. We need to convince the farmers to grow the rapeseed-mustard hence, it is necessary to make mustard a remunerative crop. He anticipated that deliberations of AICRP-RM shall be fruitful to enhance the oilseed production of the country.

Dr. D.K. Yadava, DDG (Crop Science), ICAR, New Delhi and Chief Guest of the session, in his address told that mustard is most potential crop among all oilseed crops. In last 44 years a very significant work has been done in terms of varietal development for enhancement of seed yield and oil quality in rapeseed-mustard. In last one decade about 68 varieties of rapeseed-mustard has been released. We have witnessed a four times enhancement in productivity of rapeseed-mustard since 1950. Last year good hybrids having yield of 28-29 q/ha have been released last year. Both public and private hybrids are coming with high yield potential. We need to develop varieties/hybrids with >3.5t/ha and oil content with >42%. Good numbers of experimental hybrids are being developed under CRPHT projects which need to be distributed to different centers. He suggested to conduct a meeting regarding pre-breeding work including NBPGR, New Delhi and different AICRP-RM centres. We need to focus on development of doubled haploids in to get success in pre-breeding. Molecular tools like genomic selection, genome editing should be followed for further improvement in the crop. We should also give due importance to toria and yellow sarson as well. There is a need to work on precision agriculture technologies, diagnostic tools for various disease detection, forewarning system for pest and diseases, smart extension system. Further, area expansion in Bihar, West Bengal, Odisha, and NE states is required for horizontal expansion of the rapeseed-mustard. We need to modify the quality parameters for consumers of south India. He suggested commercializing our varieties for wider acceptability. He also told that every released variety of rapeseed-mustard should be registered with PPVFRA, New Delhi. We need to device a mechanism to have DUS testing of AVT-I stage varieties to avoid delay in getting DUS registration. Further, we should focus on enhancing the genetic gain, development of climate resilient varieties, strengthening of resistance breeding programme for major diseases (white rust, stem rot) and Orobanch. We need to breed varieties for alkalinity and accelerated breeding cycles. We should fix the benchmark of disease screening in hotspots. We need to focus on enhancing the precision of conducting the trials to reduce the failure of trials. Trial data should be reported with great precision. Skewed data in different trials should be removed from analysis. He requested to fill the different vacant posts at different AICRP-RM centre. At the end he congratulated rapeseed-mustard fraternity for their contribution in oilseed crop economy of India and expected to come up with quality recommendations from this AGM. The session ended with vote of thanks by Dr. S.S. Tomar, ADR, ZARS, Morena.

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Presentation of Reports (2024-25)

Chairman	: Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
Co- Chairman	: Prof. S. S. Banga, Ex-National Professor (ICAR), Ludhiana : Dr. S. R. Bhatt, Ex- Principal Scientist, ICAR-NIPB, New Delhi
Rapporteurs	: Dr. Bhagirath Ram, Principal Scientist, ICAR-IIRMR, Bharatpur : Dr. Chhaya Atri, Sr. Oilseed Breeder, PAU, Ludhiana

Session started with the opening remarks of the Chairman Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi. Dr. H. S. Meena, Pr. Scientist, ICAR-IIRMR, Bharatpur made a presentation on crop improvement programme. He informed the house that a total of 7520 accessions comprising toria (1010), Indian mustard (5047), yellow sarson (442), gobhi sarson (619), brown sarson (64), karan rai (268), taramira (*Eruca sativa*) (04) and other wild species (66) were maintained by adopting appropriate mating design at Bhubaneshwar, Dholi, Hisar, Pantnagar, Ludhiana, Kanpur, Hisar, IARI, New Delhi, Jhansi, Kangra, Chatha-Jammu, Nagpur and SK Nagar.

In addition, 340 new accessions comprising toria (72), Indian mustard (203), yellow Sarson (55), gobhi sarson (05), and karan rai (05) were collected. He further informed the house that accessions consisting of 2059 Indian mustard, 89 toria, 61 yellow sarson, 7 karan rai, 37 gobhi sarson, and 18 brown sarson, were evaluated. He mentioned that 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/pests and quality traits in toria at Bhubaneshwar, Dholi, Chatha-Jammu, Pantnagar, Imphal, New Delhi, Ludhiana, SK Nagar, Varanasi and Kanpur. Subsequently, he informed the house that advanced breeding lines were evaluated under different station/state /preliminary yield trials at various centres. 112 strains of toria were tested at Kanpur, Bhubaneshwar, Chatha-Jammu, Dholi, and Pantnagar. The yield superiority in toria station trial was up to 22.07 over the check (Tapeshwari) at Pantnagar. In yellow sarson, 90 strains were tested at Kanpur, Pantnagar and Bhubaneshwar. The yield superiority in station trial I up to 23.16 % over the check Pitambari was recorded at Pantnagar. In Indian mustard, 611 strains were evaluated at 09 centres; Chatha, Imphal, Hisar, Kanpur, Ludhiana, Pantnagar, Dholi, Bhubaneshwar and SK Nagar in 43 trials. Seed yield superiority up to 25.78 % over the check PAB-9511 (1890) was recorded at Pantnagar. Ten strains at Hisar, 66 strains at Ludhiana and 18 strains at Chatha of gobhi sarson were evaluated for seed yield and its component characters. Seed yield superiority up to 16.60 % over the check GSC 7 was recorded at Ludhiana. He raised the certain issues while discussion in the house such as rejection of trials due to several reasons.

Thereafter, Dr R. S Jat , PI (Agronomy) made a presentation on zone-wise agronomic trials and informed the house about details of experiments and findings on long-term fertility experiment on cropping systems involving rapeseed-mustard, Evaluation of herbicides for weed management in rapeseed-mustard, Agronomic evaluation of promising rapeseed-mustard entries, Response of macro and micro nutrient bio-fertilizers in enhancing rapeseed-mustard productivity and soil health, Optimization of mineral nutrient management for higher productivity, Technological advancement for mustard production in rice-fallow areas, Effect of nano-fertilizers on yield and quality of rapeseed-

mustard, Scaling of natural farming practices in rapeseed-mustard, and management of *Orobanche* through novel herbicide formulations.

Subsequently, Dr. P. D. Meena, PI (Plant Pathology) made a presentation on plant pathology programme mentioning that moderate to severe occurrence of *Alternaria* blight and white rust diseases was recorded at different locations. Low to moderate incidence of downy mildew was observed at the cotyledonary stage at MOR, JAG and PNT. Powdery mildew severity was high at SKN and JAG. Moderate to severe incidence of *Sclerotinia* rot was observed at HSR, MOR and BPR. Different trials were sown on dates as per technical program at different locations.

Dr. Sarwan Kumar, PI (Entomology) presented that the crop season 2024-25 witnessed moderate to high population development of mustard aphid on different *Brassica* species. Out of 153 IVT entries, 29 entries were found to be moderately resistant to mustard aphid since these recorded Aphid Infestation Index (AII) < 2.0. These included RH 1999-18, JD 6, KMR (E) 24-2, PM 25, NPJ 274, NJI24-401, NPJ 278, RL-19-237, RL-19-162, RCC-4 (ZC), KMR-24-4, SKM-2209, RAURD-14-18, NPJ-280, RH-2265, RKM-588, RH 2299-64, RH 1424, NPJ 281, RAURD-14-18, DRMRIJ-22-2, RH 2370, NPJ-280, RGN-592, NPJ 276, ORM-2019-30, 4205D300-01, KBH-5256 (NC) and PM 30 (NC). Similarly, in AVT-I and AVT-II entries out of 46 entries screened, none was found to be resistant while eight entries viz. Basanti (WRR Check), CS-60 (LR), DRMRHT-18-65, Kranti (NC), NPJ-268, Varuna, RH-2299-63 and NPJ-271 recorded AII < 2.0. Among the 10 AVT-II entries screened under artificial conditions, all were found susceptible.

Dr. L. K. Meena, PI (Plant Physiology) presented evaluation of mustard genotypes for abiotic stresses under different agro-climatic zones. At the same time, he also appraised the house about assessment of the effectiveness of biostimulants in mitigating drought stress, while another focused on testing microbial formulations to alleviate heat stress at the terminal stage in Indian mustard. He further explained about the evaluation of the efficacy of biostimulants through foliar spray (two applications), drought-tolerant varieties were tested at five locations (Bharatpur, Dholi, Hisar, Mandore, and Ludhiana). Results revealed that biostimulants effectively enhanced seed yield and biological yield by positively influencing various traits, including relative water content, membrane stability, photosynthetic pigment levels, siliques on the main shoot, total siliques per plant, number of seeds per silique, and 1000-seed weight.

Dr. Anubhuti Sharma, PI (Plant Biochemistry) presented on IVT/AVT quality trials evaluation at Bharatpur, Pantnagar, Hisar, Ludhiana and Varanasi. She informed the house that oil content ranged from 35.75 (DRMR CI (Q) 181) ($CV \leq 0.02$) to 41.08 (LES 68) ($CV \leq 0.01$). Oil stability index ratio of MUFA: PUFA ranged from 0.70 (RGN73) ($CV \leq 0.07$) to 1.71 (PMAS 1604) ($CV \leq 0.11$). All entries were also analyzed for fatty acid profile and it has palmitic acid ranged from 2.29% (RH 749 (ZC)) ($CV \leq 0.19$) to 4.61% (PDZ 11) ($CV \leq 0.20$). Stearic acid: 0.82% (RH 749 (ZC)) ($CV \leq 0.36$) to 2.36 (PM 30 (NC)) ($CV \leq 0.16$). Oleic acid ranged 13.63% (RH 749 (ZC)) ($CV \leq 0.32$) to 49.71% (PMAS 1604) ($CV \leq 0.01$). Linoleic acid: 15.86% ((RH 749 (ZC)) ($CV \leq 0.05$) to 40.31% (PDZ 11 (DLC)) ($CV \leq 0.06$). Linolenic acid: 9.83 (DRMRCI (Q) 179) ($CV \leq 0.11$) to 20.73 (RH (OE) 1704). ($CV \leq 0.09$).

Centre wise presentations were made by respective PIs of PAU, Ludhiana, CCSHAU, Hisar, GBPUA&T, Pantnagar, BHU, Varanasi, RLBCAU, Jhansi, SDAU, SK Nagar, RARS, Shillongani, RPCAU, Dholi, SKUAS&T, Jammu, ARS, Sriganaganagar, SKNAU, Jobner and ZARS, Morena. The Chairman stressed on sharing of segregating breeding material between AICRP centres, attempting crosses as per mandate of the centre, growing F2 populations in more number of rows to ensure optimum population size, conduction of adaptive trials for toria and yellow sarson in Zone V-VII and population improvement programme in toria at different AICRP-RM centres.

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Session I: Planning and Technical Programme Formulation: Genetics & Plant Breeding

Chairman	: Prof. S. S. Banga, Ex-National Professor (ICAR), Ludhiana
Co-chairman	: Dr. Sanjeev Gupta, ADG (OP), ICAR, New Delhi
Subject Expert	: Dr. S. R. Bhatt, Former Professor, ICAR-NRCPB, New Delhi
Rapporteurs	: Dr. Bhagirath Ram, Principal Scientist, ICAR-IIRMR, Bharatpur : Dr. H. S. Meena, Sr. Scientist, ICAR-IIRMR, Bharatpur

Session started with the opening remarks of Prof. S. S. Banga, Ex-National Professor (ICAR), Ludhiana, Chairman of the session. He stressed upon strengthening of trait specific pre-breeding programme and re-visiting of QRT recommendations. Co-chairman of the session, Dr. Sanjeev Gupta, ADG (OP), ICAR, New Delhi welcomed the participants and raised his concern about rejection of trials. Dr. S. R. Bhat, Subject expert of the session emphasized on precision of trials. Following recommendations were made:

- AVT-I trials shall be repeated only once in all the zones.
- Inventory of introgression lines, diversity set, and trait specific lines should be prepared by collecting data from centres.
- Fertility of hybrids should be confirmed by both methods using selfing and molecular markers.
- All WRR lines should be validated through WR specific markers.
- National Crossing Programme should be finalized as per discussion and crosses should be attempted by respective centers.
- Instead of bi-parental mating, population improvement programme may be followed on toria at different AICRP-RM centres.
- House decided that filler should be removed from AVT I/AVT II trials conducted in Zone VI.
- Proper record should be maintained for sharing of breeding material.
- Breeding material shared by BARC Mumbai should be intimated to IIRMR, Bharatpur
- A separate zone for south India may be decided after the discussion with the Director Research of Universities.
- Adaptive trials of yellow sarson, toria and Indian mustard for Bihar, Jharkhand, Chhattisgarh and West Bengal should be conducted.
- It was decided that Medziphema, Barapani, Tikamgarh and Bajaura be excluded from all trials. Faizabad and Berhampore may be included as voluntary centres.
- Genome edited lines ((GED 1 and GED 2) shall be repeated in AVT-I
- NPJ 271 shall be repeated in AVT-I of respective Zone
- LES 70 derived through MAS shall be promoted to AVT-I and recurrent parent of MAS derived entries shall be included as a check in quality trial. Decision on promotion of entries shall be subject to genome recovery data.

Later on, after in-depth deliberations, different crop wise trials were constituted and presented by Dr. H.S. Meena, Principal Scientist, Plant Breeding.

1. AVT-I Yellow Sarson (repeat)

Zone-V

Entries: PYS 2018-1, YSH-401 (NC), Benoy, (ZC), Pitambari (LR), Filler

Locations: Shillongani, Imphal, Kanke, Kalyani, Bhubaneswar

2. Mustard

2.1. IVT Early Mustard

SN	Entry	Pedigree	Method of breeding	Centre
1	KMR (E) 25-1	Pusa Bold X Sej-2	Pedigree selection	CSAUA&T, Kanpur
2	KMR (E) 25-2	Seeta X Aravali	Pedigree selection	CSAUA&T, Kanpur
3	RH 2469	RH 1599-41 X PM 25	Pedigree selection	CCS HAU, Hisar
4	RH 2393	RH 1599-44 X NPJ 198	Pedigree selection	CCS HAU, Hisar
5	PRE-2022-5	PRE-2011-15 X RRN-778	Bulk selection	GBPUA&T, Pantnagar
6	PRE-2023-3	Albeli X NPJ-112	Bulk selection	GBPUA&T, Pantnagar
7	DRMRHT-18-83	DRMRIJ-31 X BPR 549-9	Pedigree selection	ICAR-IIRMR, Bharatpur
8	DRMRHT-13-5-4	GM-2 X BPR 549-9	Pedigree selection	ICAR-IIRMR, Bharatpur
9	NPJ 282	RH-1573/PM 28	Pedigree selection	IARI, New Delhi
10	NPJ 283	PM 30/ Donskaja// PM 30* ³	MABC	IARI, New Delhi
11	DRMR 2019-55	NRJ 112 X RRN 727	Pedigree selection	ICAR-IIRMR, Bharatpur
12	HUJM(E)-24-15	Ashirwad X RH-8812	Pedigree selection	BHU, Varanasi
13	SKM 2306	SYJ 64 X GM 1	Pedigree selection	SDAU, SK Nagar
14	RAUTM 18-313-1	PM 25 X Local Rai Ageti	Pedigree selection	RAU, Dholi
15	RAUTM 18-310-2	PM 25 X Local Rai	Pedigree selection	RAU, Dholi
16	Mali Mustard 71	MMJA-08A X MMFR-X2	Hybrid	Mali Agri Tech Pvt. Ltd
17	BAUM-17-3	0.6%EMS treatment of Pusa Bold	Mutation Breeding	BAU, Kanke, Ranchi
18	TM317-2	TJD-1 X RH 749	Pedigree selection	BARC, Mumbai
19	PM 25 (NC)			
20	JD 6 (ZC)			
21	LR			
22	Pro 5111 (Hy. check)			

Zonal check/Latest Release: Zone IV : GDM 4 Zone V: NRCHB 101
Zone VI: NRCHB 101 Zone VII: NRCHB 101

Locations:

Zone IV : S. K. Nagar, Nagpur, Mandore, Junagarh

Zone V : Kanke, Shillongani, Kalyani, Dholi, Varanashi, Berhampore

Zone VI : Imphal, Pasighat, Tripura (COA), Bermiok (Sikkim)

Zone VII : Jagdalpur, Bhubaneswar(Ranital), Kanker, Ambikapur

Southern zone: Dharwad, Raichur, Jagtial, Coimbatore, ARS Ragolu

2.2. AVT I Early Indian mustard

Zone IV

Entries : KMR(E) 24-1, KMR(E) 24-2, RH 2399-2, RH 1999-18, DRMRHT 13-2, DRMRCI-206, PM 25 (NC), GDM 4 (LR), JD 6 (ZC), Filler

Locations: S. K. Nagar, Nagpur, Mandore, Junagarh

2.3. AVT I Early Indian mustard

Zone V

Entries : Kesari 5113, PRE 2022-12, 4205B296-01@, KMR(E) 23-1@, KMR(E) 22-2@, PM 25 (NC), NRCHB 101 (LR), JD 6 (ZC), Pro 5111 (Hybrid Check), Filler

Locations: Kanke, Shillongani, Kalyani, Dholi, Varanasi

@ Repeat entry

2.4. AVT I Early Indian mustard (repeat)

Zone VI

Entries : DRMRHT 18-65, 4205B296-01, PM 25 (NC), NRCHB 101 (LR), JD 6 (ZC), Pro 5111 (Hybrid Check),

Locations: Imphal, Pasighat, Tripura (COA), Bermiok (Sikkim)

2.5. AVT I Early Indian mustard

Zone VII

Entries : KMR(E) 24-1, KMR(E) 24-2, DRMRHT 22-125, KMR(E) 23-1@, PM 25 (NC), NRCHB 101 (LR), JD 6 (ZC), Filler

Locations: Jagdalpur, Bhubaneswar(Ranital), Kanker, Bilaspur, Ambikapur

@ Repeat entry

2.6. IVT Timely Sown, Irrigated

SN	Entry	Pedigree	Method of breeding	Centre
1	DRMRCI 214	DRMRIJ-31 X RB-50	Pedigree selection	ICAR-IIRMR, Bharatpur
2	DRMR 2023-5	NPJ 112 X Pusa Bold	Pedigree selection	ICAR-IIRMR, Bharatpur
3	DRMRDR 2372	NRCHB 101 X DRMR 2019	Pedigree selection	ICAR-IIRMR, Bharatpur
4	SKM 2308	GM 2 X PM 28	Pedigree selection	SDAU, SK Nagar
5	SKM 2324	SKJM 5 X SKM 219	Pedigree selection	SDAU, SK Nagar
6	RH 2404	RH 555 X RH 1656	Pedigree selection	CCS HAU, Hisar
7	RH 2343	RH 9608 X RH 8812	Pedigree selection	CCS HAU, Hisar
8	KMR 25-3	Kranti X Pusa Bold	Pedigree selection	CSAUA&T, Kanpur
9	KMR 25-4	Maya X NDR 8501	Pedigree selection	CSAUA&T, Kanpur
10	NPJ 286	PM 25/ (NPJ 124/ BM 97)	Pedigree selection	IARI, New Delhi
11	NPJ 287	RH 1556/ NPJ 211	Pedigree selection	IARI, New Delhi
12	PR-2022-5	PR-2009-6 X RGN-73	Bulk pedigree	GBPUA&T, Pantnagar
13	PYR-2020-11	PYR-2009-3 X Navgold	Bulk pedigree	GBPUA&T, Pantnagar
14	HUJM-17-15	DRMR 904 X HUJM-99-03-2	Pedigree selection	BHU, Varanasi
15	AKMS-25-215	RGN 238 X 44S01	Bulk selection	SAREC, Kangra
16	RMM 19-10	JM-4 X MRNJ-101	Pedigree selection	ZARS, Morena
17	ACN 271	JD-6 X Bio 902	Pedigree selection	CoA, Nagpur
18	RGN 601	RGN 439 X Raj Vijay	Pedigree selection	SKRAU, Sriganganagar
19	RL-19-30	PBR 357 X Giriraj	Pedigree selection	PAU, Ludhiana
20	RL-19-85	Giriraj X PBR 357	Pedigree selection	PAU Ludhiana
21	RKM 647	NPJ-124 X Bio-902	Pedigree selection	ARS, Kota
22	Kranti (NC)			
23	Zonal Check			
24	Latest Release			

Zonal Checks: Zone I: RCC 4 Zone- II- RH 749 Zone- III – Maya Zone- IV – Bio 902

Latest Release: Zone I- RH 1975, Zone- II- PM-37 Zone- III: PM-37 Zone- IV-GDM-4

Locations :

Zone I: Kangra, Chatha, Pantnagar, Dhaulakuan, Una

Zone II: Abohar, Bawal, Ludhiana, Hisar, New Delhi, Navgaon, Modipuram

Zone III: Kanpur, Morena, Kota, Jhansi, Banda, Faizabad

Zone IV: S.K. Nagar, Nagpur, Jalgaon, Mandore, Sumerpur (Pali), Jobner

2.7. AVT-I+II Mustard, Timely Sown (Irrigated)

Zone I

Entries: RB-118, AKMS 1003-50, CS 2009-219, RL 19-237, SKM 2209, RH 2299-63#, SKM 2104#, RH 1975 (LR), Giriraj (LR), RCC 4 (ZC), Kranti (NC), Filler

Locations : Kangra, Chatha, Pantnagar, Dhaulakuan, Una

#AVT II strain

2.8. AVT-I (Timely Sown Irrigated/Quality)

Zone II

Entries: NPJ 271***@, GED-1@, GED-2@, RH (OE) 1710@, RH (OE) 1702, LES-70, RH 749 (ZC), PM 30 (NC), PM 32 (Quality LR), PM 34 (Quality LR), PDZ 11 (DLC), Giriraj (LR), Kranti (NC), Varuna, Filler
Locations: Abohar, Bawal, Ludhiana, Hisar, New Delhi, Modipuram, Navgaon
 @ repeat strain, *** WRR strain

2.9. AVT-I (Timely Sown Irrigated/Quality) repeat

Zone III

Entries: GED-1@, GED-2@, PM 30 (NQC), PM 30 (quality LR), PDZ 11 (DLC), RGN 73 (ZC), Varuna, Filler

Locations: Pantnagar, Kanpur, Morena, Bharatpur, Varanasi, Dholi, Jhansi, Kota
 @ repeat strain

2.10. AVT-I (Timely Sown Irrigated)

Zone IV

Entries: PYR 2018-1, Kranti (NC), Bio 902 (ZC), GDM 4 (LR), Filler

Locations: SK Nagar, Nagpur, Jalgaon, Mandore, Sumerpur (Pali)

2.11. IVT Mustard, Timely sown (Rainfed)

SN	Entry	Pedigree	Method of breeding	Centre
1	DRMRHT-2063	Urvashi x DRMR 2205	Pedigree selection	ICAR-IIRMR, Bharatpur
2	DRMRCI 213	RH 119 X Laxmi	Pedigree selection	ICAR-IIRMR, Bharatpur
3	DRMR 2019-7	RH 749 X NRCHB 101	Pedigree selection	ICAR-IIRMR, Bharatpur
4	DRMRHJ 3820	MJA 38 X MJR 20	Hybrid Breeding	ICAR-IIRMR, Bharatpur
5	NPJ 287	RH 1556/ NPJ 211	Pedigree selection	IARI, New Delhi
6	NPJ 288	PM 25//DRMRIJ 31/BCI-12	Pedigree selection	IARI, New Delhi
7	RH 2424	RH 1590 X RH 1656	Pedigree selection	CCS HAU, Hisar
8	RH 2452	RH 0119 X IC-491013	Pedigree selection	CCS HAU, Hisar
9	RGN 611	RGN 447 X RH 761	Pedigree selection	SKRAU, Sriganganagar
10	RKM 598	PM 27 X (PM 28 X RB 50)	Pedigree selection	ARS, Kota
11	RMM 25-01	MRNJ-87 X JM-3	Pedigree selection	ZARS, Morena
12	HUJM-24-09	RGN-73 x HUJM-9901	Pedigree selection	BHU, Varanasi
13	BAUM-16-4	TM-179 X RGN-73	Pedigree selection	BAU, Kanke, Ranchi
14	Kranti (NC)			
15	Zonal Check			
16	Latest Release			

Zonal Check - Zone II : RH 725 Zone V: NRCHB 101

Latest Release – Zone II : RH 1424 Zone V : DRMR 150-35

Locations:

Zone II : Sriganganagar, Hisar, Bawal, Ludhiana, Abohar

Zone V : Kanke, Shillongini, Dholi, Varanasi, Berhampore

2.12. IVT- Mustard Late sown

SN	Entry	Pedigree	Method of breeding	Centre
1	DRMRIJ 21-12	MJA 11 X SSR 1-9	Pedigree selection	ICAR-IIRMR, Bharatpur
2	DRMRDR 2363	NRCDR-2 X DRMR 2019	Pedigree selection	ICAR-IIRMR, Bharatpur
3	DRMR 2022-1	NRCHB 101 X DRMRIJ-31	Pedigree selection	ICAR-IIRMR, Bharatpur
4	RH 2480	RH 555 X JD-6	Pedigree selection	CCS HAU, Hisar
5	RH 2396	RH 725 X NPJ 224	Pedigree selection	CCS HAU, Hisar
6	KMR (L) 25-5	Ashirwad X Kanti	Pedigree selection	CSAUA&T, Kanpur
7	KMR (L) 25-6	Jawahar-I X Ashirwad	Pedigree selection	CSAUA&T, Kanpur
8	NPJ 284	NPJ 209 / Pro 5111	Pedigree selection	IARI, New Delhi
9	NPJ 285	Pusa Vijay / Pusa Agrani	Pedigree selection	IARI, New Delhi
10	Pusa MH 191	MJA 38 / NPJ 93R	Hybrid Breeding	IARI, New Delhi
11	PRL-2020-2	NPJ-170 X RGN-73	Bulk Pedigree	GBPUA&T, Pantnagar

12	PRL-2020-19	PRL-2012-13 × NRCHB 101	Bulk Pedigree	GBPUA&T, Pantnagar
13	HUJM-24-01	NDRE-4 X Pusa Bold	Pedigree selection	BHU, Varanasi
14	RGN 609	RGN 446 X RGN 400	Pedigree selection	SKRAU, Sriganganagar
15	RKM 593	NPJ 124 28 X Laxmi	Pedigree selection	ARS, Kota
16	RMM 19-05	RMM-09-3 X MRNJ-137	Pedigree selection	ZARS, Morena
17	ACN 308	Pusa Bold X Kranti	Pedigree selection	CoA, Nagpur
18	BAUM-16-5	TM-179 X PM-25	Pedigree selection	BAU, Kanke, Ranchi
19	TM 142	TM102 x Sunbean	Pedigree selection	BARC, Mumbai
20	BRBJ-1	Pusa Bold x Kranti	Pedigree selection	BAU, Sabour
21	Kranti (NC)			
22	Zonal Check			
23	Latest Release			
24	Filler			

Zonal check: Zone-II - Pusa Mustard 26 (NPJ 113) Zone-III- NRCHB-101 Zone-V- NRCHB-101

Latest Release : Zone-II – Radhika (DRMR 2017-15) Zone-III- BPM- 11 Zone-V- CS 56

Locations :

Zone II : Sriganganagar, Hisar, New Delhi, Ludhiana, Abohar

Zone III : Kanpur, Morena, Kota, Jhansi, Banda,

Zone V : Kanke, Shillongini, Dholi, Varanasi, Sabour

2.13. AVT-I+II Mustard, Late Sown (Irrigated)

Zone – II

Entries: SVJH 78, DRMRDR 2141***, NPJ 267#, Kranti (NC), Radhika (LR), PM 26 (ZC), Filler

Locations: Sriganganagar, Hisar, New Delhi, Ludhiana, Abohar

*** White rust resistant strain, # AVT-II Strain

2.14. AVT-I+II Mustard, Late Sown (Irrigated)

Zone – III

Entries: RMWR 19-01, DRMR 2018-1#, Kranti (NC), CS 56 (LR), BPM 11 (LR) NRCHB 101 (ZC), Filler

Locations: Kanpur, Morena, Kota, Bharatpur, Banda

AVT-II Strain

2.15. AVT-I Mustard, Late Sown (Irrigated)

Zone – V

Entries: RMWR 19-01***, DRMRDR 2141*** Kranti (NC), CS 56 (LR), NRCHB 101 (ZC), Filler

Locations: Kanke, Shillongini, Dholi, Varanasi, Sabour

*** White rust resistant strain

2.16. IHT, Hybrid Mustard (To be conducted in Lattice Design, layout is given in last section of plant breeding technical programme)

SN	Entry	Pedigree	CMS system used	Centre
1	RHH 2501	RH 630-OA X Ogura 08-DHR	Ogura CMS	CCS HAU, Hisar
2	RHH 2502	RH 427-OA X Ogura 08-DHR	Ogura CMS	CCS HAU, Hisar
3	RHH 2503	RH 630-OA X Ogura 146-3	Ogura CMS	CCS HAU, Hisar
4	PHR 2402	Ogu-CMSM-5401 X FRM-2	Ogura CMS	PAU Ludhiana
5	PHR 2403	Ogu-CMSM 170 x FRM-2	Ogura CMS	PAU Ludhiana
6	DRMRHJ 3818	MJA 38 X MJR 18	mori CMS	ICAR-IIRMR, Bharatpur
7	DRMRHJ 2520	MJA 25 X MJR 20	mori CMS	ICAR-IIRMR, Bharatpur
8	DRMRHJ 320	MJA 03 X MJR 20	mori CMS	ICAR-IIRMR, Bharatpur
9	Pusa MH 231	MJA 9/ EC 62-67-1R	mori CMS	IARI, New Delhi
10	Pusa MH 232	MJA 11/ EC 62-67-1R	mori CMS	IARI, New Delhi
11	64M25-01	SVJ64A/SVJ73R	Ogura CMS	Shakti Vardhak Hybrid Seeds Pvt. Ltd.
12	NMH90M01	GRU283A/GRU284B X	Ogura CMS	Nuziveedu Seeds Ltd.

		GRU509/GRU476		
13	PMH90V02	GRU269A/GRU270B X GRU509/GRU483	Ogura CMS	Prabhat Agri Biotech Ltd.
14	KBH 5255	KB22SA015 X KB22SR017	Ogura CMS	Kaveri Seed Company Ltd
15	US 8757	SWJ06A X SWJ52R	Ogura CMS	Seed Works International Pvt. Ltd.
16	NIMOH-8	NMOA-12 X NMOR-87	Ogura CMS	Nirmal Seeds Pvt. Ltd. Jalgaon (M.S.)
17	AMH-399	AMA04A X AMR01	Ogura CMS	Ajeet Seeds Pvt. Ltd.
18	NATJH-401	NATJA-01 X NATJR-05	Ogura CMS	Nath Bio-Genes (I) Ltd.
19	PA 5232	Bj6-0208 x Bj9-0668	Ogura CMS	Crystal Crop Protection Ltd.
20	VNR 5020	VNRF 05 X VNRR 406	Ogura CMS	VNR Seeds Pvt. Ltd, Raipur
21	ADV 424	AFG0797/RFN9001	Ogura CMS	Advanta Seeds Pvt. Ltd.
22	DHM 231	D030 X OR	Ogura CMS	Dayal Seeds Pvt. Ltd.
23	4205F337-01	783F X 4PBRA34R	Ogura CMS	Corteva Agriscience
24	Kranti (NC)			
25	Zonal Check			
26	DMH-1 (Hybrid Check)			
27	SVJH-71 (Hybrid Check)			

Observations on number of sterile/fertile plants are to be recorded on 30 plants in separate trial by covering main raceme at bud stage and recording observation on seed set at maturity in hybrid trial only at selected centres.

Zonal check: Zone-II : RH 749 Zone-III : RGN 73 Zone IV : GDM 4

Locations:

Zone II : Hisar, Ludhiana, New Delhi, Navgaon, Bawal,

Zone III : Kanpur, Morena, Kota, Jhansi, Bharatpur

Zone IV: SK Nagar, Mandore, Pali (Sumerpur) , Jalgaon, Nagpur

2.17. AHT-I+II Hybrid Mustard

Zone – II

Entries: RHH 2402, HRH191290#, Kranti(NC), DMH-1(Hybrid Check), NRCHB 506 (Hybrid Check), RH 0749 (ZC), Filler

Locations: Ludhiana, Hisar, New Delhi, Navgaon, Bawal

#AHT-II strain

2.18. AHT-I Hybrid Mustard

Zone – IV

Entries : 4205D300-01, US 8787, Kranti (NC), DMH-1(Hybrid Check), NRCHB 506 (Hybrid Check), GDM-4 (ZC), Filler

Locations: SK Nagar, Mandore, Pali, Jalgaon, Nagpur

2.19. IVT, Quality Mustard

SN	Entry	Pedigree	Method of breeding	Centre
1	LES-72	PM 30/ RLC 3	Pedigree selection	IARI, New Delhi
2	LES-73	PM 30/ RLC 3	Pedigree selection	IARI, New Delhi
3	PDZ-24#	(PM 30/ RLC 3) / PM 30	Pedigree selection	IARI, New Delhi
4	PDZ-25#	RLC 3 / (PM 21 / Heera// LES 52)	Pedigree selection	IARI, New Delhi
5	PMAS 1603	PBR 357/ RLC 3//PBR 357	MABC	PAU Ludhiana
6	PMAS 1612	PBR 91/ RLC 3//PBR 357	MABC	PAU Ludhiana
7	RH(OE) 1802	EC 597328 X RH(HO) 0502	Back Cross	CCS, HAU, Hisar
8	RH(OE) 1807	EC 597328 X RH(HO) 0502	Back Cross	CCS, HAU, Hisar
9	DRMRCI (Q) 215	DRMR 150-35 X RLC 3	MABC	IIRMR, Bharatpur

10	DRMRCI (Q) 216	NRCHB 101 X RLC 3	MABC	IIRMR, Bharatpur
11	LR			
12	Zonal Check			
13	PM 30 (NC quality)			
14	PDZ 11 (double low check)			
15	PBR 357 (RP)			
16	PBR 91 (RP)			
17	DRMR 150-35 (RP)			
18	NRCHB 101 (RP)			

- double low strains, RP- recurrent parent

Zonal check :- Zone II –RH 749; **Zone III** – RGN 73

Latest Release (Quality Check): Zone II- Pusa Mustard 34 (LES 60); Zone III- Pusa Mustard 30

Locations:

Zone II: Bawal, New Delhi, Hisar, Ludhiana, Sriganaganagar

Zone III: Kanpur, Morena, Kota, Jhansi

3. IVT Gobhi Sarson

SN	Entry	Pedigree	Method of breeding	Centre
1	JGS-19-5	DGS-1 X GSL-1	Pedigree selection	SKUAST, Chatha
2	AKGS 25-101	AKGS 1242 X GSH 2196	Bulk pedigree	SAREC, Kangra
3	AKGS 25-1003-55	AKGS 1242 X PHR-2	Bulk pedigree	SAREC, Kangra
4	PGSH 2638	Ogu-CMS-DTN-127 X FR-ZYM 0050-2	Hybrid Breeding	PAU Ludhiana
5	PGSH 2654	Ogu-CMS-DTN 59 X FR-ZY002	Hybrid Breeding	PAU Ludhiana
6	BPGS 2401	NRCGS-1 X GSC-6	Pedigree selection	IIRMR, Bharatpur
7	BPGS 2402	NRCGS-1 X GSC-6	Pedigree selection	IIRMR, Bharatpur
8	GSL-1 (NC)			
9	GSC 6 (QC)			
10	AKMS 8141 (LR)			

Locations: Kangra, Dhaulakuan, Pantnagar, Chatha, Ludhiana, Abohar, Khudwani

4. IVT Taramira

SN	Entry	Pedigree	Method of breeding	Centre
1	RTCN-06	RTM X T-27	Hybridization followed by recurrent selection	ARS, Navgaon
2	RTCN-10	RTM-1624 X RTM -1351	Hybridization followed by recurrent selection	ARS, Fatehpur - Shekhawati
3	RTM-2219	RTM-1624 X RTM -314	Hybridization followed by recurrent selection	SKNCOA, Jobner
4	RTM-2011	RTM-1351 X RTM -1624	Hybridization followed by recurrent selection	SKNCOA, Jobner
5	T-27 (NC)			
6	RTM-314 (ZC)			
7	RTM 1624 (LR)			

Locations: Jobner, Morena, Bawal, Navgoan, Abohar

National Crossing Programme

Indian Mustard			Yellow Sarson		
SN	Donors	Traits	SN	Donors	Traits
1	PM 37	Bold seeded	1	Pitambari	High yielding & bold seeds
2	NPJ 262	High siliqua density	2	Pant Sweta	Basal branching, high siliqua density and test weight
3	NPJ 268	Short duration & WRR	3	PPS-2	Basal branching, high siliqua density and test weight
4	RH 2399-2	Early maturing, bold seeds	4	NRCYS 05-02	High seed & oil yield, bold seeds
5	RH 1999-18	Early maturing, bold seeds	5	Benoy	Early, bi-locular, dwarf
6	BPM 1825	High seed & oil yield, WRR	6	YSH 401	Bold seeds & high yielding,
7	PAB 9511	Alternaria blight tolerance	7	PYS 2022-3	Bold seeds
8	PR-20	High temperature tolerance at terminal stage, bold seeds	8	PYS 2018-1	Basal branching
9	MJB 38	Bold seeds & WRR	9	DRMR 2508	Basal branching, long main raceme
10	MJB 24	Dwarf & early maturing	10	DRMR 2386	Basal branching

Crosses shall be attempted in diallel fashion at AICRP centres

Toria	
Donors	Traits
Bhawani, RAUTS-17, RAUDT14-9, TS 38, PT-141, PHT-1, DRMR 2392, DRMR 2501, TL-17 and TK-06-1	Early maturing, high siliqua density, basal branching, dwarf plant height, high seed weight, suitable for hilly areas and high seed & oil yield

Population improvement shall be followed for toria at different AICRP centres

LAYOUT OF EXPERIMENTS

Trial	IVT	AVT
Design	RBD/Alpha Lattice	RBD
Replication	Three (two blocks in each replication)	Four
Plot size Varieties- Zone II	Gross: 2.7 X 5 m; Net: 1.8 X 4.5 m	Gross: 4.5 X 5 m; Net: 3.6 X 4.5 m
Plot size Varieties-Zone I, III, IV & V	Gross: 1.8 X 5 m; Net: 1.2 X 4.5 m	Gross: 3.0 X 5 m; Net: 2.4 X 4.5 m
Plot size Hybrids	Gross All Zones: 2.7 X 5 m Net All Zones : 1.80 X 4.5 m	Gross All Zones: 4.5 X 5 m Net All Zones : 3.6 X 4.5 m
No. of Rows Zone I, II, III, IV & V	Six, Data to be recorded from four rows	Ten, Data to be recorded from eight rows
No. of Rows NEH region	Six of 4 m length	Ten of 4 m length
Spacing varietal trials	45 X 15 cm Zone II (Except early & LS) 30 X 10 cm Zone I, III, IV and V	45 X 15 cm Zone II (Except early & LS) 30 X 10 cm Zone I, III, IV and V
Spacing hybrid trials	45 X 15 cm	45 X 15 cm

Note : In case of combined IVT + AVT 1 Trial, layout of AVT I Trial shall be followed

Fertilizer doses :

Toria	:	50 : 25 : 25 , N: P ₂ O ₅ : K ₂ O kg/ha
Yellow sarson	:	50 : 30: 30, N : P ₂ O ₅ : K ₂ O g/ha
Mustard, Karan	:	Irrigated-80 : 40 : 40, N : P ₂ O ₅ :K ₂ O kg/ha
Rai,Gobhi Sarson	:	Rainfed- 40 : 20 : 20, N : P ₂ O ₅ :K ₂ O kg/ha
Taramira	:	30 N kg/ha
Hybrids	:	125 % of RDF for the respective states

Seed Supply:

- Seed material of Toria, Yellow sarson and Mustard (Early sown) trials should be sent latest by 25th August.
- Seed material of rest of the trials should be sent latest by 31st August.
- In case of late receipt of seed material, it will not be included in the trials.
- 50 g seed for IVT and 100 g seed for AVT for each location should be sent.
- 200 g seed of IVT, AVT 1 and AVT 2 entries should be added for Entomological and Pathological experiments.
- 250 g seed / location of AVT-2 entries should be added for Agronomical experiments.
- 300 g seed of each quality strain should be added for biochemical analysis
- **Entire quantity of seed of each entry is to be sent in one lot in proper packing to avoid mixing of seed with other entry seed. Do not make separate packets and seed should be without any treatment or any other identification mark.**

Data reporting: -

- Data should be sent to Director, IIRMR (director.drmr@gmail.com) on the prescribed data sheets latest by May 15, otherwise it will not be possible to include in the report
- Weather data with brief weather report should be supplied along with trial data.
- Yield data (kg/ha) should be sent after analysis. Unanalyzed data will not be included in Annual Report.
- Entries along with pedigree and method of breeding should be sent in the prescribed proforma available at IIRMR website latest by 10th July for inclusion in concerned IVT trial. In case of hybrid entry, mention the name of CMS system used for hybrid development.

Note:

- In each case, preceding crop may be reported.
- Soil test for NPK may be got done and reported along with the results.
- No irrigation is to be given for rainfed experiments and 5m buffer spacing in all sides should be kept.
- If there is no rain before the sowing, pre-sowing irrigation is to be given.
- The centres, which have accepted the trials, must report data, otherwise their test entries will not be included in trials if the data are not supplied without any valid reason.

Cut off sowing dates for different trials

S.N.	Trial	Zone					
		I & II	III	IV	V	VI	VII
1	Toria	10 th October	10 th October	10 th October	31 st October	15 th November	31 st October
2	Yellow sarson	10 th October	10 th October		31 st October	15 th November	31 st October
3	Early mustard	30 th September	10 th October	10 th October	15 th November	30 th November	15 th November
4	Indian mustard, TS Irrigated/ Rainfed, (Hybrid, Quality, Salinity)	31 st October	31 st October	31 st October	30 th November	30 th November	30 th November
5	Indian mustard Late Sown	November 15-30	November 15-30	November 15-30	30 th November		

Criteria for promoting the strains

- The strain (variety/hybrid) out yielding the best check by margin of at least 10 percent either for seed yield or for oil yield shall be promoted for advanced stage of testing, however an exemption upto 10 kg for seed yield may be considered.
- The qualifying strains for possessing any specific trait like quality, drought, and disease and pest resistance will be promoted even if its yield is numerically at par with the best check.
- In single zero lines, promotion shall be on the basis of 10 % superiority for seed/oil yield over quality check as well as seed/oil yield at par/ better than the best non quality check
- In double zero lines, promotion shall be on the basis of 10% superiority for seed/oil yield over quality check as well as seed/oil yield at par/ better than the best non quality check
- The qualifying trials for computing the mean seed yield should have CV less than 15% for trials conducted under irrigated and less than 20% for trials conducted under rainfed and alkaline and saline conditions.
- If the differences in seed yield of same genotype being used as filler/check are equal or greater than CD value, the data of the centre shall not be considered.
- If the variation for seed yield among the strains of a trial is more than four times at one centre and not supported by similar trend at other centres of the zone, such data of that centre shall not be considered.
- Seed yield data of developing centres will be discarded if found two times higher than any entry of particular trial.
- The plant population should be at least 80% of the expected plant population.

Plant Population -Minimum Criteria

IVT	110
AVT	260

- The experimental mean seed yield should be equal to or greater than the state mean for the seed yield.
- 75% of state average yield during last 3 years shall be the criteria for inclusion of data on the basis of General Mean for late sown, Rainfed, Salinity. In taramira 50% of state average yield shall be the criteria for inclusion of data on the basis of grand mean of trial
- In Salinity trials EC levels should be 10 or >10 dS/m and pH >8.5 for inclusion of the data.
- In toria/early mustard trial, promotion shall be based upon superiority over the earliest maturing check. A margin of 5 days over the best check's maturity duration shall be given in early maturity toria/mustard trial.
- Non-significant data shall not be considered for computation of mean.
- Expts with <5% C.V. shall not be considered for computation of mean
- Entries developed through pure line selection from germplasm/variety shall not be evaluated.

Criteria for Promotion of Indian Mustard hybrids to higher order of testing and identification

- 10% and 5% higher seed yield over the best performing variety check and hybrid check, respectively and numerically at par oil yield or 10% and 5% higher oil yield over the best performing variety check and hybrid check, respectively and numerically at par seed yield.
- Numerically at par with best performing check variety/ hybrid for seed or oil yield for specialty types like low erucic acid (< 2%); glucosinolates (< 30 umole/g defatted seed meal) or any other character of Zonal/national importance.
- Moderately resistant or resistant reaction to major key diseases/ pest of the crop at several locations while comparing with check variety/ hybrid
- Stable performance in terms of consistency in yield and oil content across locations within a zone.
- Thermo stability if indicated in physiological trials

Criteria for Promotion of Near Isogenic Lines (NILs) in AICRP- Rapeseed & Mustard

- Promotion of NILs shall be based on the consistency in the performance of target trait in the target environment and yield equivalence with recurrent parent.

Randomized Layout

Field Plan for **Initial Hybrid Trial (IHT, Hybrid Mustard)** Expt. under Alpha Lattice Design, are given below: $v = 27$, $b = 9$, $r = 3$, $k = 9$, $AE = 0.9626$, $DE = 0.9832$ $\alpha (0, 1, 2, 3)$

Randomized Layout

REPLICATION 1									
Block 1	19	9	4	15	2	27	10	22	18
Block 2	23	20	7	16	25	3	5	13	11
Block 3	14	21	1	12	26	17	24	8	6

REPLICATION 2									
Block 1	20	17	8	10	4	14	3	22	27
Block 2	16	19	24	7	26	6	12	13	2
Block 3	23	11	25	18	5	9	1	21	15

REPLICATION 3									
Block 1	9	6	21	15	3	27	18	24	12
Block 2	14	17	20	23	26	5	11	8	2
Block 3	1	7	19	25	10	4	13	22	16

Datasheet for recording the observations IHT, Hybrid Mustard

rep	block	treatment	Seed yield	rep	block	treatment	Seed yield	rep	block	treatment	Seed yield
1	1	19		2	1	20		3	1	9	
1	1	9		2	1	17		3	1	6	
1	1	4		2	1	8		3	1	21	
1	1	15		2	1	10		3	1	15	
1	1	2		2	1	4		3	1	3	
1	1	27		2	1	14		3	1	27	
1	1	10		2	1	3		3	1	18	
1	1	22		2	1	22		3	1	24	
1	1	18		2	1	27		3	1	12	
1	2	23		2	2	16		3	2	14	
1	2	20		2	2	19		3	2	17	
1	2	7		2	2	24		3	2	20	
1	2	16		2	2	7		3	2	23	
1	2	25		2	2	26		3	2	26	
1	2	3		2	2	6		3	2	5	
1	2	5		2	2	12		3	2	11	
1	2	13		2	2	13		3	2	8	
1	2	11		2	2	2		3	2	2	
1	3	14		2	3	23		3	3	1	
1	3	21		2	3	11		3	3	7	
1	3	1		2	3	25		3	3	19	
1	3	12		2	3	18		3	3	25	
1	3	26		2	3	5		3	3	10	
1	3	17		2	3	9		3	3	4	
1	3	24		2	3	1		3	3	13	
1	3	8		2	3	21		3	3	22	
1	3	6		2	3	15		3	3	16	

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Session II: Planning and Technical Programme Formulation 2025-26: Agronomy

Chairman	: Dr. R.S. Chundawat, Head, Agronomy, RVSKVV, Gwalior
Co-Chairman	: Dr. N.K. Jain, Pr. Scientist, HRD, ICAR, New Delhi
Subject Expert	: Dr. N. Ravishanker, Incharge IFS, ICAR-IIFSR, Meerut
Rapporteurs	: Dr. M.S. Negi, Prof., Agronomy, GBPUA&T, Pantnagar
	: Dr. R.L. Choudhary, Sr. Scientist-Agronomy, ICAR-IIRMR, Bharatpur

The session was started with the opening remarks of the Chairman, Dr. R.S. Chundawat, Head, Agronomy, RVSKVV, Gwalior on various aspects of the agronomic research and emphasized on sowing of crop at optimal ambient temperature and weed related issues including the PPI application of herbicides in rapeseed-mustard. He also highlighted the importance of soil, water and nutrient management aspects including the moisture conservation practices in rainfed areas. Dr. N.K. Jain, Pr. Scientist, HRM, ICAR, New Delhi emphasized to include location specific K application due to emerging K deficiency in soil, and formulation of an experiment on ICM involving the improved varieties and latest crop production and protection technologies. He also emphasized to determine the S application periodicity for its efficient use and cost reduction. The subject expert, Dr. N. Ravishanker, Incharge, IFS, ICAR-IIFSR, Meerut stressed on improving the technical program of LTFE and natural farming experiments for the better research outcomes. He further highlighted that the higher doses of fertilizers are having many negative consequences, therefore there is need to supplement the additional nutrient requirements through organic sources. He also suggested to increase the mustard productivity through adjusting sowing time of rice in rice-fallow areas of north-east. He also made a point to quantify the effects of different nutrient management practices on oil cake quality parameters. Dr. N. Ravishanker also suggested to have some common centers of IIFSR, Meerut and IIRMR, Bharatpur for mutual benefits.

Dr. R.S. Jat, PI and Principal Scientist-Agronomy, ICAR-IIRMR, Bharatpur presented the proposed technical program to be conducted during the ensuing 2025-26 *Rabi* season at various centre's on soil, tillage, nutrient and weed, and related aspects of the agronomic research. After a thorough discussion, the technical program was finalized and a new experiment on LCC-based precision N management was framed during the meeting. It was decided to conclude the experiment on "*Response of macro and micro nutrient bio-fertilizers in enhancing rapeseed-mustard productivity and soil health*". In a strong address to the coordinating centers, the PI underscored the critical importance of data precision and timely submission of report. He requested scientists to adhere strictly to the outlined technical program ensuring that all the experiments should be conducted with utmost care, and data should be reported accurately and promptly to the Institute before the last deadline.

The technical program formulated in the concurrent session, were presented in the joint session of planning and technical program formulation chaired by Dr. Sanjeev Gupta, ADG (OP & Seeds). Dr. Sanjeev Gupta flagged emerging deficiencies in B and Zn, urging that these micronutrients be included in experiments to ensure long-term soil and crop health.

The session ended with the vote of thanks to the Chairman. The following points were recommended for the implementation:

1. Experiment on "Biopolymeric seed dressing for stress tolerance in rapeseed-mustard" should be formulated and conducted initially at Bharatpur.
2. Experiment on "Precision N management using LCC-based in rapeseed-mustard" should be formulated and conducted at different locations.

3. The treatments in LTFE experiment should be revised appropriately with the inclusion of organic sources to reduce the over reliance on chemical fertilizers.
4. Include the rice sowing window treatments in “Technological advancement for mustard production in rice fallow areas”, and blanket application of 20 kg S/ in rabi to increase rapeseed-mustard productivity. Remove the Imphal centre and add the Kalyani as one of the centre where ICAR-IIFSR, Meerut is also having its centre.
5. Include the nano-zinc in nano-fertilizers experiment to address the issues of Zn deficiency.
6. Jhansi should be included as one of the centers for undertaking the Natural farming experiment. Whereas, Bansur, Morena and Shillongani should be included a new center for undertaking experiment on “Management of Orobanche through novel herbicide formulations”.

Recommendation:

1. To enhance the productivity, profitability and soil health in rapeseed-mustard, the use of recommended levels of nutrients (100% RDF) along with the seed inoculation with liquid biofertilizers involving NPK consortia + ZSB for Bawal, Bharatpur, Chatha, Dholi, Kota, Ludhiana, Morena, Pantnagar, Shillongani, Sriganganagar and Varanasi, while, use of Azotobacter at Kangra and Kanke, and ZSB at SK Nagar are recommended. At Imphal use of KMB or PSMO with 75% RDF is recommended.

Technical programme for 2025-26

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

Treatment	Season	
	Rabi (Rapeseed-mustard)	Kharif
T1	Control	Control
T2	100% PK	100% PK
T3	100% NPK	100% NPK
T4	125% NPK + 5 t FYM/ha	100% NPK
T5	100% NPK + S (recommended as per zone)	100% NPK
T6	100% NPK + Zn @ 5 kg/ha	100% NPK
T7	100% NPK + B @ 1 kg B/ha	100% NPK
T8	100% NPK + FYM @ 5t/ha	100% NPK
T9	100% NP	100% NP
T10	100% NK	100% NK

Replication: 3

Design: RBD

Locations: Bharatpur (Pearl millet-Mustard), Hisar (Pearl millet-Mustard), Kangra (Maize-Mustard), Ludhiana (Maize-Mustard), Kota (Urdbean-Mustard) and Pantnagar (Maize-Mustard).

Observations to be recorded in all crops every year

1. Growth, yield attributes, yield, system productivity, oil content and economics.
2. Disease and pest incidence, if any, is to be reported by the pathologist.
3. Soil samples every year from 0-15 cm and 15-30 cm depth to be taken after mustard harvest to assess build up/ depletion of soil fertility (Organic carbon, pH, N, P, K, S, Zn, B).
4. The experiment should be conducted on fixed plots.
5. Potassium is to be applied @ 20 kg K₂O/ha in case of no recommendation for potassium application.
6. Observations on weed infestation needs to be recorded treatment wise.

3.2 Evaluation of herbicides for weed management in rapeseed - mustard.

Treatment

1. Pendimethalin 1.0 kg ai/ha(PE)
2. Pendimethalin 0.75 kg ai/ha(PE)
3. Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)
4. Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)
5. Pendimethalin 0.75 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)
6. Pendimethalin 1.0 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)
7. Pendimethalin 0.75 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)
8. Pendimethalin 1.0 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)
9. Weedy check
10. Weed free

Design: RBD

Replication: 3

Locations: Ludhiana, Hisar, Pantnagar, SK Nagar, Ranital, Imphal

Observations:

1. Data on growth, yield attributes, yield, oil content and economics.
2. Species-wise weed dynamics, weed control efficiency should be reported at 45 DAS and weed index at harvest.
3. Information on plant and soil residue analysis should be reported or send the samples at ICAR-IIRMR, Bharatpur.
4. Phytotoxicity effects on mustard as well as on crops in the cropping system should be reported with photographs.
5. Relative density and relative frequency of weeds should be taken.

3.3 Agronomic evaluation of promising rapeseed-mustard entries

Objectives:

1. Identified advanced strains promoted to AVT-II of rapeseed-mustard will be taken along with check varieties of national/zonal importance.
2. The zone wise entries seeds should be supplied to the Director, IIRMR, Bharatpur latest by **10th August 2025** by the concerned breeder.
3. The recommended fertility level should be mentioned.
4. Economics should be worked out giving cost of cultivation and net returns.

Zone-I Mustard timely sown (Irrigated)

Entries: RH 2299-63, SKM 2104, Giriraj (LR), RCC 4 (ZC), Kranti (NC)

Locations : Kangra, Chatha, Pantnagar, Bajaura, Dhaulakuan

Zone-II Mustard late sown (Irrigated)

Entries: NPJ 267, Kranti (NC), Radhika (LR), PM 26 (ZC)

Locations: Sriganganagar, Hisar, New Delhi, Ludhiana, Abohar

Zone-III Mustard late sown (Irrigated)

Entries: DRMR 2018-1, Kranti (NC), CS 56 (LR) NRCHB 101 (ZC)

Locations: Kanpur, Morena, Kota, Jhansi, Banda

Zone-II Hybrid Mustard

Entries: HRH191290, Kranti (NC), DMH-1(Hybrid Check), RH 0749 (ZC)

Locations: Ludhiana, Hisar, New Delhi, Navgaon, Bawal

Fertility levels (for all the locations)

1. Recommended fertility level
2. 125% of the recommended fertility level
3. 150% of the recommended fertility level

Design: Split-plot (Entries in main plots and fertility levels in sub-plots)

Replications: 3

Observations:

1. Yield and yield attributes (branches/plant, siliquae/plant, seeds/silique, 1000 seed weight and seed weight/plant and seed yield).
2. Oil content.
3. Initial fertility status of soil.
4. Uptake of nitrogen, phosphorus and potassium at pre-flowering and harvest stage.
5. Calculate N, P & K economy and use efficiency at different fertility levels.
6. Always report the data in two-way table with entries and fertility levels as given in the report.
7. Identify advanced strains promoted to AVT-II of rapeseed-mustard will be taken along with check varieties of national/ zonal importance.

3.4 Optimization of mineral nutrient management for higher productivity

Treatment details:

Main plot treatments: Major nutrients (NPK)

1. Control
2. 100% NPK
3. 125% NPK
4. 150% NPK

Sub plot: Secondary & micro nutrients

1. 20 kg S + 2.5 kg Zn + 0.5 kg B/ha
2. 40 kg S + 5 kg Zn + 1 kg B/ha
3. 20 kg S + 2.5 kg Zn + 0.5 kg B/ha enriched with 500 kg FYM/ha
4. 40 kg S + 5 kg Zn + 1 kg B/ha enriched with 500 kg FYM/ha

Replication: 3

Design: Split Plot Design

Locations: Chatha, Dholi, Hisar, Imphal, Jhansi, Jobner, Kangra, Kanke, Kanpur, Khudwani, Kota, Ludhiana, Morena, Nagpur, Pantnagar, Ranital, SK Nagar, Shillongani

Observations:

1. Growth and yield attributes, yield, oil content is to be reported every year.
2. System productivity, profitability and sustainability to be reported every year.
3. Initially measure soil physical and chemical properties from 0-15 cm and 15-30 cm depth.
4. Soil analysis (Organic carbon, pH, N, P, K, S, Zn, B) before and at harvest. Accordingly prepare balance sheet of all the nutrients in soil.
5. Always report the data in two-way table with CV (%), LSD values ($p = 0.05$) of main-plot, sub-plot and interactions as given in the report.
6. Conduct the experiment in system mode.

Note: all the centers should analyse oil content, economics and nutrient uptake.

3.5 Technological advancement for mustard production in rice fallow areas

Main plot treatments- Rice planting

1. Mid of June
2. Last week of June
3. Mid of July

Sub plot: Tillage

1. CT
2. ZT + 30% kharif rice residue + Pusa decomposer (500 ml/ha)

Sub-sub plot: Nutrient management

1. N+P+K (100 % basal)
2. N+P+K+Zn (100 % basal)
3. N+P+K+Zn (50 % N basal & 50 % N top dressing)

*20 kg S/ha should be applied at each centre if it is not recommended in RDF

Replication: 3

Design: Split-split Plot Design

Locations: Dholi, Shillongani and Kalyani

Plot size: the sub plot should be minimum of 25 m²

Rice: Sowing method- DSR and medium duration variety uniformly to all the centres

Mustard: Short duration variety (DRMR 150-35)

RDF: as per location including seed treatment with microbes, biofertilizers and Trichoderma

Weed management: as per recommended herbicides in rice and mustard

Crop residue: the height of rice stubbles should be same in both CT and ZT

Observations:

1. Growth attributes: plant height, dry matter, chlorophyll content.
2. Yield attributes: number of primary & secondary branches/ plant, siliquae/plant, main shoot length & test weight.
3. System productivity, economics and sustainable yield index.
4. Soil analysis (Organic carbon, pH, N, P, K, S, Zn, B) before and at harvest. Accordingly prepare balance sheet of all the nutrients in soil.
5. Always report the data in two-way table with CV (%), LSD values (p = 0.05) of main-plot, sub-plot and interactions as given in the report.

3.6. Effect of nano-fertilizers on yield and quality of rapeseed-mustard

Treatments:

Factor A: RD-NP levels

1. 100% RD-NP
2. 75% RD-NP
3. 50% RD-NP

Factor B: Nano-fertilizers

1. 2 sprays of nano-urea
2. 2 sprays of nano-DAP
3. 2 sprays of each nano-urea & nano-DAP
4. 2 sprays of each nano-urea & nano-DAP + nano zinc

*Absolute control (water spray)

Design: FRBD

Replication: 3

Plot size: min. 25 m²

Dose: Nano-fertilizers @ 4 ml/litre, water quantity- 300 litre/ha; RDF as per location

Stage of spray: At 25-30 & 45-50 DAS

Locations: Bawal, Chatha, Dholi, Hisar, Imphal, Jhansi, Jobner, Kangra, Kanke, Kanpur, Khudwani, Kota, Ludhiana, Mandore, Morena, Nagpur, Pantnagar, Ranital, SK Nagar, Shillongani

Note: Replace Nano-urea with Nano-urea Plus at the same rate of application.

Observations:

1. Growth attributes: plant height, dry matter, chlorophyll content and leaf area index.
2. Yield attributes: number of primary & secondary branches/ plant, siliquae/plant, seeds/silique, main shoot length & test weight.
3. Seed yield, harvest index, oil content & economics.
4. Soil analysis (Organic carbon, N, P, K) before and at harvest.
5. Plant analysis: N, P & K content and uptake.

3.7 Scaling of natural farming practices in rapeseed-mustard

Treatments:

1. Natural farming
2. Organic farming
3. Integrated nutrient management
4. Farmers practice

Design: RBD

Replication: 5

Plot size: min. 10 x 10 m

Locations: Bawal, Kota, Pantnagar, Jhansi

Observations:

1. Initial and final soil health parameters (physical, chemical and biological properties)
2. Seed yield, oil content & oil yield.
3. System productivity, profitability and sustainability.
4. Quality parameters of the produce (protein content, fatty acid profile)

Note: conduct the experiment in cropping system mode as per ICAR guidelines.

3.8 Management of *Orobanche* through novel herbicide formulations**Treatments:**

Main plot: Time of application

1. 1 DAS
2. 2 DAS
3. 3 DAS

Sub plot: Dose of herbicides ((NHF)

1. 3 ml a.i./ha
2. 4 ml a.i./ha
3. 5 ml a.i./ha
4. Weedy check
5. Weed free

Replication: 3

Design: Split Plot Design

Plot size: 5 x 3 m

Locations: Bawal, Bansur, Dausa, Morena, Shillongani

Observations:

1. Weed count (*Orobanche* and other weeds)
2. Seed yield of mustard
3. Weed control efficiency
4. Weed index
5. Phytotoxicity effects on mustard as well as on crops in the cropping system should be reported with photographs.
6. Information on plant and soil residue analysis should be reported or send the samples at ICAR-IIRMR, Bharatpur.

Note: Herbicide formulation will be supplied by ICAR-IIRMR, Bharatpur.

3.9 Precision N management using LCC-based in rapeseed-mustard**Objectives**

- ❖ To study the effect of LCC based N management on plant growth, yield attributes and yield of mustard.
- ❖ To find out best N management source and N-levels for higher uptake and NUE.
- ❖ To evaluate profitability of the different N management options in mustard.

Treatment details

1. RDF
2. RDN- 50% N basal + LCC_N -NCU
3. RDN- 50% N basal + LCC_N -SCU
4. RDN- 25% N basal + LCC_N -NCU
5. RDN- 25% N basal + LCC_N -SCU

Design: RBD

Replications: 4

Plot size: 5m x 5 m

Locations: Abohar, Bawal, Chatha, Dholi, Hisar, Imphal, Jhansi, Jobner, Kangra, Kanke, Kota, Ludhiana, Morena, Nagpur, Pantnagar, Ranital, SK Nagar, Shillongani

Observations:

1. Growth attributes: plant height, dry matter, chlorophyll content and leaf area index.

2. Yield attributes: number of primary & secondary branches/ plant, siliquae/plant, seeds/silique, main shoot length & test weight.
3. Seed yield, harvest index, oil content & economics.
4. Soil analysis (Organic carbon, N, P, K) before and at harvest.
5. Plant analysis: N, P & K content and uptake.

Suggestions for proper conduct of agronomical trials

1. The treatments of any experiment should not be modified by the centres at their end.
2. The results should be presented in the report as per format given in the technical program including two-way tables with interaction table in split plot and factorial experiments.
3. Report all the important observations as per experimental requirement.
4. The trials should be laid out on time so that treatment effects could be identified properly and yield levels are optimized.
5. The reports should be submitted latest by 31st May, 2026. No report will be accepted after the due date.
6. The centres should send the information pertaining to field trials along with date of sowing to Director, IIRMR latest by 25th November 2025.
7. The centres accepting the trial (whose names are given in the technical programme) must positively report the data. In case of any difficulty individual centre should write immediately to PI/Director, IIRMR.
8. The fertility/ tillage experiments should be conducted in fixed plots of the field at the same location over the years.
9. The economics of each treatment should be calculated on the basis of MSP and state recommended cost of cultivation for respective crops. The ICBR should be reported instead of B:C ratio.
10. Data without statistical analysis will not be considered.
11. All the ancillary data of component crops should be recorded and reported.
12. The initial and final soil analysis data of all the experiments should be done and reported every year.
13. If the yield level of recommended fertiliser dose is less than the state average, the trial will be rejected.
14. If any centre needs oil and nutrient analysis, depute concerned scientist along with samples to IIRMR, Bharatpur latest by 30th April, 2026 for analysis.
15. The plot size should not be less than 21.6 m² and width of buffer channel should not be less than 1.0 m.
16. The field layout of all the agronomy trials should be provided to the Plant Pathologist/Entomologist of the AICRP-RM centres for recording of insect and disease infestation if any, and due credit will be shared with the agronomist.

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Session III: Planning and Technical Programme Formulation: Plant Pathology

Chairman & Subject Expert	: Dr. R.P. Awasthi, Ex-Prof. Plant Pathology, GBPUA&T, Pantnagar
Co-Chairman	: Dr. Pankaj Sharma, Joint Director (School of Crop Health Biol Res), ICAR-NIBSM, Raipur
Rapporteurs	: Prof. A.K. Tiwari, Plant Pathology, GBPUA&T, Pantnagar : Dr. N.R. Bhardwaj, Scientist, ICAR-IIRMR, Bharatpur

The presentation of results, planning and technical programme formulation session of Plant Pathology started with introductory remark by the Chairman and subject expert Prof. R. P. Awasthi, Ex-Professor, Dept. of Plant Pathology, GBPUAT, Pantnagar. Significant achievements of Plant Pathological trials conducted during the year 2024-25 at different locations were presented by Dr. P.D. Meena, PI, Plant Pathology. The results were reviewed critically and the technical programme for the year 2025-26 was finalized after through discussion among the Plant Pathologists. Chairman suggested that pedigree of all entries contributed in NDN/UDN trials should be provided by respective breeders. Dr. Pankaj Sharma, suggested to follow the technical programme for use of infector rows between test entries particularly for AVT-I & II entries under artificial inoculated conditions for creating maximum disease pressure. Considering the non-availability of novel bio-formulations from NBAIM, the management trial was reconstituted by including promising bio-formulations from different centres. As suggested by house, a brainstorming session on Sclerotinia rot in rapeseed-mustard needs to be organized at ICAR-IIRMR, Bharatpur.

The group discussion concluded the following recommendations:

1. After consistent testing under artificial/ natural field conditions at different geographical locations DRMRCI-139 and DRMRM 163 genotypes are recommended as white rust resistant sources for use in the breeding program.

Technical Programme

All centres should report observations on percent disease severity (AB, WR, PM) following 0-9 rating scale. Date of sowing and date of observation(s) should be indicated in data sheet itself. Data for disease severity/ incidence to be reported replication-wise as also after proper statistical analysis (angular transformation) in the same format as in the AICRP-RM Annual Progress Report 2025 with CD ($P < 0.05$) and CV (%) values for comparison of treatments. Transformed value should be indicated in parenthesis. Soft copy of data should be prepared only in **MS Excel sheets. Text of report should be in MS Word. Only soft (by email file attachment only)** copy of data should reach the PI (Plant Pathology), ICAR-IIRMR, Bharatpur latest by **30th April, 2026**. Unanalysed data will not be accepted. Data after due date will not be considered. If the disease severity/incidence on susceptible check(s) is less than resistant/ tolerant checks, and/or the disease severity in susceptible check is less than 20%, the data will not be considered for publication in the report.

Attention: (i) Seeds from different trials labelled suitably and in separate packets should reach the PI, Plant Pathology, ICAR-IIRMR, Bharatpur **latest by 10 September 2025**. (ii) Pathologist from respective centre should take action for supply of seed well in time. The national disease nursery (NDN) for different diseases should be conducted with artificial inoculation. Data for all other major diseases occurring on the test entries needs to be recorded and reported. Respective centres should take up detail work on sources of resistance, epidemiology, losses and control of diseases of local importance.

4.1 Screening of Brassica germplasm and breeding material against major diseases

Objective: Disease response of elite accessions under different geographical conditions

4.1.1 Screening of *Brassica* AVT-I & II strains against major diseases under natural condition

Layout:

- Single row: two replications of 3 m row length
- Susceptible checks will be used after every two test rows

Hybrid mustard	RHH 2402, HRH191290#, 4205D300-01, US 8787
TSI mustard	RB-118, AKMS 1003-50, CS 2009-219, RL 19-237, SKM 2209, RH 2299-63#, SKM 2104#, PYR 2018-1
LSI mustard	SVJH 78, DRMRDR 2141***, NPJ 267#, RMWR 19-01, DRMR 2018-1#, RMWR 19-01***
Early mustard	KMR(E) 24-1, KMR(E) 24-2, RH 2399-2, RH 1999-18, DRMRHT 13-2, DRMRCI-206, Kesari 5113, PRE 2022-12, 4205B296-01@, KMR(E) 23-1@, KMR(E) 22-2@, DRMRHT 18-65, DRMRHT 22-125,
Quality mustard	NPJ 271***@, GED-1@, GED-2@, RH (OE) 1710@, RH (OE) 1702, LES-70
Yellow Sarson	PYS 2018-1
Checks	<i>B. juncea</i> : Rohini, NRCHB 101 (SC) & Local Check, BIOYSR, DRMRMJA-35, DRMR-2035 (RC-WR), PHR 2 (TC-AB), DMH 1, PDZ 1; <i>B. napus</i> : GSL 1; <i>B. carinata</i> : DLSC 1, <i>B. rapa</i> ssp Yellow Sarson: NRCYS-5-2; <i>B. rapa</i> var Toria: PT 303; RTM 314
Location	Pantnagar, Hisar, Morena, Ludhiana, S.K. Nagar, Dholi, Shillongani, Jhansi
#AVT II strain, @ repeat strain, **quality strain, *** white rust resistant strain	

4.1.2 Screening of *Brassica* AVT-I and AVT-II strains against major diseases using artificially inoculated under field condition

Disease	Location
Alternaria blight:	Dholi, Pantnagar, Shillongani
White rust/ DM:	Pantnagar, Morena, Hisar, NIPB (New Delhi)
Sclerotinia rot:	Ludhiana, Hisar, Bharatpur, Jhansi
Powdery mildew:	S K Nagar, Nagpur

Methodology:

- Add oosporic material of local isolate only after grinding hypertrophied plant material collected from the previous year crop along with seed for white rust and downy mildew.
- For secondary spread of the disease make repeated inoculations after collecting inoculum from the naturally infected plants for major diseases (AB, WR, DM, PM, SR).
- Give frequent irrigation and higher doses of nitrogenous fertilizer to create epiphytotic.
- The source of inoculum for creating epiphytotic conditions for PM screening needs to be implemented by collecting infected plant stubbles from previous crop season.

Observations to be recorded

- Date of first appearance of each disease including bacterial rot
- Data as percent disease severity / percent disease incidence for WR (75 DAS/ at maximum disease pressure), AB / PM/ BR (90 DAS/ at maximum disease pressure) on leaves and pods and number of staghead (15 days before harvest) should be recorded on 10 randomly selected plants from each plot using 0-9 scale. Date of observation and date of sowing should be indicated in data sheet.
- Cotyledonary infection due to downy mildew and pod infection due to Alternaria blight should be recorded separately.

Staghead formation should be recorded as percent incidence and percent twigs infected.

Staghead (% twigs affected) = (number of twigs infected/ total number of twigs) x 100.

- iv. Data for all major diseases may be recorded as percent disease severity (AB, WR and PM) on leaves/ pods or as percent disease incidence (SR, DM, CR, BR).
- v. Date of each observation should be provided in the data sheet.
- vi. Data should be statistically analysed as per the design using ANOVA after arc sin transformation. Actual and transformed (in parenthesis) values along with mean, CD ($P < 0.05$) and CV (%) are to be submitted for report preparation.

Scale (0-9) for rating of entries for reaction to Alternaria blight, white rust and powdery mildew should be used

0 (Immune for WR)	=	No lesion
1 (HR)	=	Non-sporulating pinpoint size or small brown necrotic spots, less than 5% leaf area covered by lesion
3 (R)	=	Small roundish slightly sporulating larger brown necrotic spots, about 1-2 mm in diameter with a distinct margin or yellow halo, 5-10% leaf area covered by lesions
5 (MR)	=	Moderately sporulating, non-coalescing larger brown spots, about 2-4 mm in diam with a distinct margin or yellow halo, 11-25% leaf area covered by the spots
7 (S)	=	Moderately sporulating, coalescing larger brown spots about 4-5 mm in diam, 26-50% leaf area covered by the lesions
9 (HS)	=	Profusely sporulating, rapidly coalescing brown to black spots measuring more than 6mm diam without margins covering more than 50% leaf area

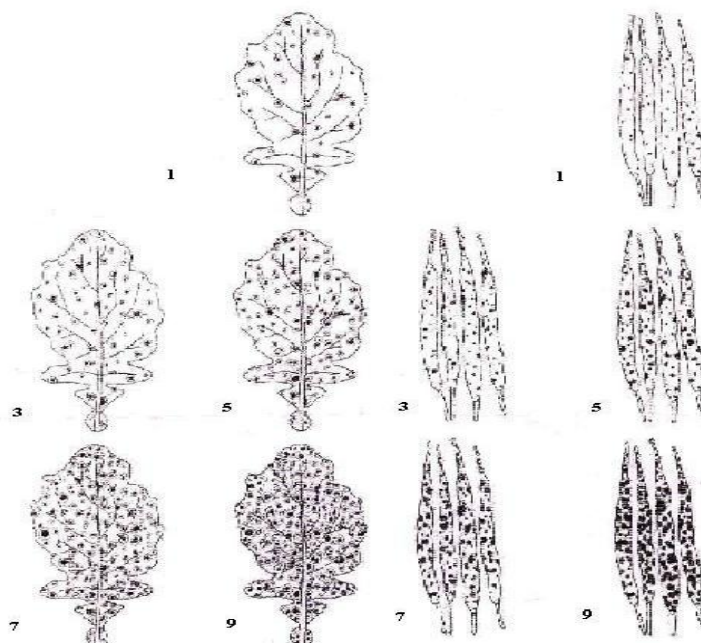
$$\text{Average severity score} = \frac{(N-1 \times 0) + (N-2 \times 1) + (N-3 \times 3) + ((N-4 \times 5) + (N-5 \times 7) + (N-6 \times 9))}{\text{Number of leaf samples}}$$

$$\text{Per cent Disease Intensity (PDI)} = \frac{(N-1 \times 0) + (N-2 \times 1) + (N-3 \times 3) + ((N-4 \times 5) + (N-5 \times 7) + (N-6 \times 9))}{\text{No. of leaf samples} \times 9} \times 100$$

Where N-1 to N-6 represents frequency of leaves in the respective score

Note:

- (1) The word spots can be read as pustules if the same scale is used for white rust rating
- (2) In case of white rust, brown spot can be read as creamy white pustule
- (3) This scale can also be used in management trials
- (4) For PM, the same rating scale will be followed ignoring the lesion/ pustule characteristics



Diseased leaf and pod area assesment key for for Alternaria blight of rapeseed-mustard (Conn et al. 1990) modified and adopted by AICRP-RM Plant Pathologist during 17th AICRP-RM Group meeting -2010 at Gwalior

Scale (0-4) for rating of entries for reaction to Sclerotinia rot

Reaction	Rating	Lesion (cm)
Resistant	0	< 3
Moderately resistant	1	3-5
Moderately susceptible	2	5-10
Susceptible	3	10-15
Highly susceptible	4	>15

*Stem diameter and % incidence must also be recorded

Method of artificial inoculation for white rust:

Test plants (including checks) should be inoculated twice i.e. at initiation of flowering and pod formation stage. Inoculum may be prepared by collecting fresh zoosporangia from naturally infected leaves with *Albugo candida*. Petri plates containing zoosporangia suspended in distilled water be kept at 4°C for 2 h to facilitate germination of zoosporangia. To assure germination of the sporangia, the plates may be examined under the low power microscope. Germinating zoosporangia would be emptied and zoospores will be visible in the suspension. Suspension containing zoospores be filtered through double layered muslin cloth and further diluted with distilled water for spraying on leaves of test plants. This may be done with the help of atomizer / small sprayer in the afternoon (after 1500 hrs). Data for disease severity may be recorded 75 DAS/ at maximum disease pressure on leaves and 15 days before harvest for staghead.

Method of artificial inoculation for Alternaria blight

Test plants (including checks) should be inoculated twice i.e. at initiation of flowering and pod formation in the afternoon (after 1500 hrs) with conidial suspension (10^5 cfu / ml) of pure culture of *Alternaria brassicae*/ *A. brassicicola* using distilled water. Disease severity should be recorded 90 DAS/ at maximum disease pressure on leaves and 15 days before harvest on pods.

Method of artificial inoculation for Sclerotinia rot

Cut 5 mm discs of fungal mycelium along with medium from 7-days old pure culture *Sclerotinia sclerotiorum* grown on thick layer of PDA at 20°C. Place one disc on third internode of plant at flowering stage. Wrap the stem along with the fungal agar disc with a swab of cotton dipped in sterile distilled water. Record observation 3-weeks after inoculation for lesion size and per cent disease incidence.

Method of artificial inoculation for downy mildew

Freshly harvested conidia in distilled water from naturally/ artificially infected cotyledonary leaves of susceptible variety should be used for preparation of conidial suspension. Inoculum concentration should be adjusted to 10^4 conidia/ ml using distilled water. Prepared conidial suspension of *Hyaloperonospora parasitica* should be inoculated directly to test plants at 2/3 leaf stage in the afternoon (after 1500 hrs). Observations should be recorded after 7-10 days of inoculation.

4.2 Uniform disease nursery (UDN) trial for major diseases of rapeseed-mustard

Objective: Disease reaction of accessions under different geographical conditions (under natural conditions) for identification of lines for respective national disease nursery trials

Materials: Concerned breeders/ scientists will supply the seed material to Director, IIRMR indicating 'for Pathology 4.2 UDN trial'. PI, Plant Pathology, IIRMR will in turn send the material to different centres. Pathologist of each centre, with the help of plant breeder, should be responsible for sending the seed of each entry (minimum 100 g) under proper cover labelling species and accession details. Entries must be arranged species-wise.

Observations: Should be recorded and reported as percent disease severity (AB, WR, PM) or percent disease incidence (Sclerotinia rot, Club root as per trial 4.1.

Centre	Entries to be sent
Bharatpur	Bj: DRMRDR 2133, DRMRDR 2140, DRMRDR 2201, DRMRDR 2203, DRMRDR 2206, DRMRDR 2227, DRMRDR 2241, DRMRCI 170, DRMRCI 179, DRMRCI 180, DRMRCI 181, DRMRCI 201, DRMRCI 202, DRMRCI 203, DRMRCI 204, DRMRCI 205, DRMRSJ 12, DRMR 2019-20, DRMR 2019-16, DRMRIJWR 20-30, DRMRDR 2301, DRMR 2020-14, DRMR 2023-11, DRMR 2023-13, IC399680, EC766431, EC766551, EC766170, EC766270, EC766029, IC570324, EC414314, IC399839, EC720977
Pantnagar	Bj: PRD-2014-23, PAB-14-5, PAB-14-10, PAB-17-8, PAB-17-9, PAB-17-23, PAB-24-2, PRD-24-3, PAB-24-4 Not available: PAB-17-10, PAB-17-11, PAB-2017-24, PRD-2014-8, PRD-2014-23, PRD-2014-27, PAB-14-1, PAB-2017-20, PRD-2014-6, PRD-2014-7, PRD-2014-15, PRD-2014-21, PRD-2019-4, PRD-2019-20
Check:	<i>Brassica juncea</i> : Rohini, NRCHB 101 (SC) & Local Check, BIOYSR, DRMRMJA 35 (RC-WR), PHR 2 (TC-AB), RH 1222-28 (TC-SR); <i>B. napus</i> : GSL 1; <i>B. carinata</i> : DLSC 1, <i>B. rapa</i> ssp Yellow Sarson: NRCYS-5-2; <i>B. rapa</i> var <i>Toria</i> : PT 303
Locations:	Dholi, Pantnagar, Morena, Hisar, S.K. Nagar, Ludhiana, Shillongani, New Delhi, Varanasi, Jhansi, Jagdalpur, Nagpur, Jaipur

NOTE: All concerned scientists should mention the name of the species of the entry while sending seeds.

4.3 National disease nursery (NDN) for Alternaria blight

Objective:	To identify potential donors against Alternaria blight after screening under different geographical locations
Centre	Entries to be sent
Bharatpur	Bj: DRMRSJ-349, DRMR-PMJ-17, DRMRSJ 22, DRMRIJWR 20-11, DRMRIJWR 20-15, DRMRIJWR 20-16, DRMRIJWR 20-19, DRMRHJ 3130
Pantnagar	Bj: PAB 14-1, PAB 17-20, PRD-2014-23, PAB 2017-10, PAB 2017-11, PRD 2014-6 Not available: PAB-2014-4, PAB- 2014-7, PAB- 2014-8, PAB- 2014-18, PAB-2017-15, PAB-2017-18, PAB-2017-22, PAB-2017-4, PAB-2017-25, PAB-2017-1, PRD-2014-26, PAB 2014-23
Hisar	RH-1700-3
Check:	<i>B. juncea</i> : Rohini, NRCHB 101 (SC) & Local Check, BIOYSR, DRMRMJA 35 (RC-WR), PHR 2 (TC-AB); <i>B. napus</i> : GSL 1; <i>B. carinata</i> : DLSC 1; <i>B. rapa</i> ssp Yellow Sarson: NRCYS-5-2; <i>B. rapa</i> var <i>Toria</i> : PT 303
Locations:	Pantnagar, Dholi, Hisar, Ludhiana, Shillongani, Jagdalpur

Layout: Repl: 02: Each entry should be sown in paired row of 3m length between susceptible local check with 30x10 cm spacing.

Method of inoculation: Test plants (including checks) should be inoculated at initiation of flowering and initiation of pod formation during afternoon (after 1500 hrs) with pure culture of *Alternaria brassicae*/ *A. brassicicola* using 10^5 conidial suspensions/ ml in distilled water. Data for disease severity may be recorded at 90 DAS/ at maximum disease pressure on leaves and 15 days before harvest on pods. **Screening is to be done strictly under artificial inoculation condition.** Data should be reported as percent disease severity as per 4.1.

Observations: Date of sowing, date of first appearance of Alternaria blight, its intensity on leaf and pod in each entry should be reported as per trial 4.1. In addition, seed infection should also be detected following standard procedure.

Note: Concerned breeder/ scientist will supply the seed material of each entry (minimum 50 g) to

Director, IIRMR indicating ‘for Pathology 4.3 NDN / AB trial’. Director, ICAR-IIRMR will in turn send the material to different centres. Pathologist of each centre should be responsible for sending the seed of his centre with help of concern breeder. No responsibility shall be taken in the absence of seed not reaching to the Incharge, Plant Pathology, ICAR-IIRMR, Bharatpur.

4.4 National disease nursery (NDN) for white rust under artificial conditions

Objective: To identify potential donors against white rust under different geographical locations

Centre	Entries to be sent
Bharatpur	<i>Bj</i> : DRMR 2018-1, DRMRIJWR-20-11, DRMRIJWR-20-13, DRMRIJWR-20-14, DRMRIJWR-20-15, DRMRIJWR-20-17, DRMRIJWR-20-19, DRMRIJWR-20-20, DRMRIJWR-20-21, DRMRIJWR-20-23, DRMRIJWR-20-24, DRMRIJWR-20-26, DRMRIJ-12-44, DRMRIJ 12-37, DRMR 2018-26, DRMR 2019-15, DRMRSJ-271, DRMRSJ-206, DRMRDR 2135, DRMRDR 2141, DRMRDR 2143, DRMRDR 2151, DRMRDR 2152, DRMRDR 2155, DRMRSJ 9, DRMRDR 2304, DRMRIJWR 20-30, DRMRIJWR 20-12, DRMRIJWR 20-29, DRMRSJ 14, DRMRDR 2319, DRMR 2019-16, DRMRSJ 349, DRMRIJWR 20-18, DRMR 2020-15, DRMR 2020-14 Not available: DRMRCI (Q) 57, DRMRCI 153, DRMRCI 168, DRMRCI 169, DRMRCI 171, DRMRCI 182, DRMRCI 190, DRMRCI 191, DRMRCI 192, DRMRCI-139, DRMRM-163
New Delhi	<i>Bj</i> : PMW 18, PDZ 16, PDZ 17, NPJ 250
Hisar	<i>Bj</i> : RH-1900, RH-1900-1, RH 1900-3, RH 1900-4, RH-1900-5, RH 1900-6, RH 1900-7, RH 1800-1, RH 1800 Not available: RH- 1700, RH- 1700-1, RH- 1700-3
Pantnagar	<i>Bj</i> : PRD 2019-4, PRD 2019-20, PRD 2014-21, PRD 2014-15, PRD 2014-7
Ludhiana	<i>Bj</i> : JC 36, PMAS A 2010, PBR-813-2
Resistant / Susceptible check	<i>B. juncea</i> : Rohini, NRCHB 101 (SC) & Local Check, BIOYSR, DRMRMJA 35, DRMR-2035 (RC-WR), PHR 2 (TC-AB); <i>B. napus</i> : GSL 1; <i>B. carinata</i> : DLSC 1, <i>B. rapa</i> ssp Yellow Sarson: NRCYS-5-2; <i>B. rapa</i> var <i>Toria</i> : PT 303
Locations:	Pantnagar, Morena, Hisar, Bharatpur

Note: Concerned breeders/ scientists will supply the seed material of each entry (minimum 100 g) to PI, Plant Pathology, IIRMR indicating ‘for Pathology 4.4 NDN / WR trial’. PI, Plant Pathology, ICAR-IIRMR will in turn send the material to different centres. Pathologist of each centre should be responsible for sending the seed of his centre with the help of breeder.

Observations: Date of sowing, date of first appearance of white rust on each entry, its intensity should be reported as per trial 4.1. Screening is to be done under artificial inoculation condition.

Layout: Replications: 02; each entry should be sown in paired row of 3 m length between susceptible check of *B. juncea* (local check).

Method of artificial inoculation against white rust: Test plants (including checks) should be inoculated at initiation of flowering and initiation of pod formation. Inoculum may be prepared and inoculated as per method described in 4.1. Data for WR disease severity may be recorded at 75 DAS at maximum disease pressure on leaves and 15-days before harvest for stagheads.

4.5 National disease nursery (NDN) for Sclerotinia rot

Objective: To identify potential donors against Sclerotinia rot after screening under different geographical locations

Layout: Repln: 2; each entry should be sown in paired row of 3 m length between susceptible checks of *B. rapa* ssp. Yellow Sarson.

Centre	Entries to be sent
Materials:	Bj:, DRMRSJ-25, DRMRSJ 361, DRMRIS 20-1, DRMRIS 20-4, DRMRIS 20-5, DRMRIS 20-7, DRMRDR 2119, DRMRDR 2156, DRMRDR 2220, DRMRDR 2237, DRMRDR 2238, DRMRDR 2239, DRMRDR 2315, DRMRDR 2317, DRMRDR 2320, DRMRDR 2322, DRMRDR 2335, DRMRDR 2342, DRMRDR 2343, DRMRDR 2349, DRMRDR 2351, DRMRDR 2352, Not available: DRMRCI 171, PRD 2014-21, PAB 2017-25
NIPB (New Delhi)	SsBjN 1, SsBjN 2 , SsBjN 3, SsBjN 4, SsBjN 5, SsBjC 1, SsBjC 2
Susceptible check:	<i>Bj</i> : Rohini, NRCHB 101, BIOYSR, DRMRMJA 35, <i>Br</i> : NRCYS-5-2
Tolerant check:	<i>Bj</i> : RH 1222-28; <i>Bc</i> : NPC 16, DRMR-2035 (RC-WR)
Locations:	Dholi, Pantnagar, Hisar, Ludhiana, Bharatpur, Jhansi

Method of artificial inoculation for Sclerotinia rot: As described 4.1.

Observations: Date of sowing, date of first appearance of disease on each entry, percent disease incidence/ intensity of different diseases should be reported at 20 days before harvest as per trial 4.1. In addition, data on lesion length stem diameter and 1000-seed weight should also be recorded. **Screening is to be done strictly under artificial inoculation condition.**

Note: Concerned breeders/ scientists will supply the seed material of each entry (minimum 100 g) to Director, IIRMR indicating ‘for Pathology 4.5 NDN / SR trial’. Director, IIRMR will in turn send the material to different centres. Pathologist of each centre should be responsible for sending the seed of his centre with help of concern breeder(s). All centres must sow zonal check. Artificial inoculation should be done by stem inoculation. Monitoring team must visit the trial to observe uniform disease appearance, if it is not so than trial may be rejected on spot to avoid inconsistent data.

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

Objective:	Disease response of accessions promoted to IVT under different geographical conditions in natural conditions
Location:	Dholi, Jhansi, Morena, New Delhi, Pantnagar, Hisar, Ludhiana, SK Nagar, Shillongani, Nagpur

- Layout:**
- Single row: two replications of 3 m row length
 - Susceptible checks will be used after every two test rows

Observations: Should be recorded and reported as percent disease severity (AB, WR, PM) or percent disease incidence (SR, DM, CR) as per trial 4.1.

Early mustard	KMR (E) 25-1, KMR (E) 25-2, RH 2469, RH 2393, PRE-2022-5, PRE-2023-3, DRMRHT-18-83, DRMRHT-13-5-4, NPJ 282, NPJ 283, DRMR 2019-55, HUJM(E)-24-15, SKM 2306, RAUTM 18-313-1, RAUTM 18-310-2, Mali Mustard 71, BAUM-17-3, TM317-2
Timely sown irrigated mustard	DRMRCI 214, DRMR 2023-5, DRMRDR 2372, SKM 2308, SKM 2324, RH 2404, RH 2443, KMR 25-3, KMR 25-4, NPJ 286, NPJ 287, PR-2022-5, PYR-2020-11, HUJM-17-15, AKMS-25-215, RMM 19-10, ACN 271, RGN 601, RL-19-30, RL-19-85, RKM 647
Timely sown rainfed mustard	DRMRHT-2063, DRMRCI 213, DRMR 2019-7, DRMRHJ3820, NPJ 287, NPJ 288, RH 2424, RH 2452, RGN 611, RKM 598, RMM 25-01, HUJM-24-09, BAUM-16-4
Late sown mustard	DRMRIJ 21-12, DRMRDR 2363, DRMR 2022-1, RH 2480, RH 2396, KMR (L) 25-5, KMR (L) 25-6, NPJ 284, NPJ 285, Pusa MH 191, PRL-2020-2, PRL-2020-19, HUJM-24-01, RGN 609, RKM 593, RMM 19-05, ACN 308, BAUM-16-5, TM 142, BRBJ-1

Hybrid mustard	RHH 2501, RHH 2502, RHH 2503, PHR 2402, PHR 2403, DRMRHJ 3818, DRMRHJ 2520, DRMRHJ 320, Pusa MH 231, Pusa MH 232, 64M25-01, NMH90M01, PMH90V02, KBH 5255, US 8757, NIMOH-8, AMH-399, NATJH-401, PA 5232, VNR 5020, ADV 424, DHM 231, 4205F337-01
Quality mustard	LES-72, LES-73, PDZ-24#, PDZ-25#, PMAS 1603, PMAS 1612, RH(OE) 1802, RH(OE) 1807, DRMRCI(Q) 215, DRMRCI(Q) 216
Gobhi Sarson	JGS-19-5, AKGS 25-101, AKGS 25-1003-55, PGSH 2638, PGSH 2654, BPGS 2401, BPGS 2402
Taramira	RTCN-06, RTCN-10, RTM-2219, RTM-2011
Check	<i>B. juncea</i> : DMH-1, Rohini, NRCHB 101 (SC), BIOYSR, DRMRMJA 35 (RC-WR), PHR 2 (TC-AB); PDZ 1 (Q), <i>B. rapa</i> var. <i>Toria</i> : PT 303; <i>B. napus</i> : GSL 1; <i>B. carinata</i> : DLSC 1; <i>Eruca sativa</i> : RTM 314; <i>B. rapa</i> var. <i>YS</i> : NRCYS-05-02

4.7 Management of rapeseed-mustard diseases

Objective:	To assess the effect of some novel bio-formulation on major diseases of rapeseed-mustard at different locations
Locations:	PNT, HSR, LDH, JHS, SHL, SKN
Treatments:	<p>T1: ST with Th3 (<i>T. harzianum</i>) @ 10ml/Kg +Soil incorporation by incubated FYM before sowing @ 100ml/10Kg + FS with Th3 @ 10 ml/lit</p> <p>T2: ST @ 50ml/kg seed + foliar spray @2 ml/ liter water with a bioactive compound of <i>Trichoderma asperellum</i></p> <p>T3: ST with PBSR-1 (<i>Clonostachys rosea</i>) @ 10gm/Kg +Soil incorporation by incubated FYM before sowing @ 100gm/10Kg + FS with PBSR-1 @ 10 gm/lit</p> <p>T4: ST with PBTMSR-4 (<i>T. afroharzianum</i>) @ 10gm/Kg +Soil incorporation by incubated FYM before sowing @ 100gm/10Kg + FS with PBTMSR-4 @ 10 gm/lit</p> <p>T5: ST with PBTMSR-17 (<i>T. atrobrunnum</i>) @ 10gm/Kg +Soil incorporation by incubated FYM before sowing @ 100gm/10Kg + FS with PBTMSR-17 @ 10 gm/lit</p> <p>T6: ST with PBTRMR-5 (<i>T. aureoviride</i>) @ 10gm/Kg +Soil incorporation by incubated FYM before sowing @ 100gm/10Kg + FS with PBTRMR-5 @ 10 gm/lit</p> <p>T7: ST with RLBT4 (<i>T. harzianum</i>) @ 10gm/Kg +Soil incorporation by incubated FYM before sowing @ 100gm/10Kg + FS with RLBT4 @ 10 gm/lit</p> <p>T8: ST with Ridomil gold @ 4 g/kg seed + FS with tebuconazole + trifloxostrobin @ 1g/l</p> <p>T9: Water spray</p> <p>T10: Control</p> <p>*ST: Seed treatment; FS: Foliar spray Foliar spray at 50 DAS.</p>
Observations:	Disease occurrence, severity/ incidence for major diseases including Alternaria blight and AB on pods, white rust, % stag head, powdery mildew—following new rating scale adopted by the group (2010), Sclerotinia rot incidence should be recorded as per trial 4.5. Data may be recorded from 10-tagged plants randomly in experimental plot. Seed yield per plot be recorded and provided in kg/ ha. Data should be reported after statistical analysis along with IBCR
Layout:	Repln: 3; Plot size: 3x5m, Spacing: 30x10cm; D/S: 20-25 Oct; Var: Radhika
Note:	<ul style="list-style-type: none"> ➤ Treatment T1, T2 will be provided by IARI, New Delhi; Treatments T3, T4, T5, T6 will be provided by GBPUA&T, Pantnagar and Treatment T7 will be provided by RLBCAU, Jhansi to different centers. ➤ All scientists who are providing different formulations should ensure that the formulation should reach to respective centres by 10 October.

4.8 Epidemiology of major rapeseed-mustard diseases

Objective: To develop models for forecasting of the major diseases at different locations

Locations: Pantnagar, Hisar, Shillongani, SK Nagar, Dholi, Jhansi, Morena, Jagdalpur

Layout: The experiment shall be laid out in split-plot design with one replication with varieties Varuna & Local (important variety of the locality) as main-plot treatments and dates of sowing (08) at weekly

interval (01, 08, 15, 22, 29 Oct, 05, 12 and 19 Nov) as sub-plot treatments. Each plot shall be of 1.5 m x 5 m size with a spacing of 30 cm x 10 cm (the plot may have 5 rows at 30 cm spacing). Recommended doses of N and P fertilizers shall be applied with no application of K fertilizer; insect-pest protection practices to be undertaken (apply seed treatment with appropriate insecticide and spray 1 ml/l at 15-day interval). No protection to be taken against any disease.

Observations: Data for initial date of appearance of disease in each plot shall be recorded on copies of data sheet with data for percent disease severity (PDS) in each treatment/ plot twice-a-week (on Tuesday morning and Friday evening) till harvest on leaf for Alternaria blight (powdery mildew in SK Nagar) and white rust and Alternaria blight PDS on pods – all following new rating scale adopted by the group (2010). Plot-wise observation for staghead percent and percent incidence of Sclerotinia rot shall also be recorded. Data may be recorded from 10-tagged plants randomly in experimental plot (tagged by sticking with stick). Seed yield per plot be recorded and provided in kg/ ha. Maximum possible details of daily weather data for crop period (September to day of harvest of the last plot) for different parameters [Min & max. temp. (°C), rainfall (mm), max and min RH (%), solar intensity/ sunshine hours] may also be recorded and submitted to PI, Plant pathology, ICAR- IIRMR, Bharatpur at end of every month. Wherever possible, data for leaf wetness and wind velocity (km/ h) may also be recorded and submitted. Data should be reported after correlation regression analysis along with disease severity of different diseases during the year accompanied by weather data for its finalization. Data for disease severity/ incidence may be recorded in excel of prescribed data sheets and they may be sent along with daily weather data at the end of every month for necessary analysis.

4.9 National Genetic Stock Nursery

Objective: To maintain resistant/ tolerant sources

Location: ICAR-IIRMR, Bharatpur

Layout: Five lines of each entry to be sown 3m length row. All checks from different trials to be taken for sowing. Maintain purity of different species according to breeding methods i.e. selfing/ isolation etc.

Entries:

NRCHB 101& Rohini (SC), Varuna, DRMRIJ 31 (Mgt trials), DRMRMJA 35, DRMR 2035, BIOYSR (RC-WR), PHR 2 (TC-AB), RH 1222-28 (TC-SR), DMH 1 (HBC), PDZ 1 (QC), NRCYS-05-2 (YSC), NPC 16, DLSC 1 (Bc C), GSL 1 (Bn C), PT 303 (Br C), RTM 314 (Es C)

4.10 Farmers' field for disease outbreak

Objective: Survey of farmers' fields for occurrence of major/minor diseases

Location: All centres

Observations: Take disease severity/incidence from 10 locations/ farmer's field surrounding the center. Data must be recorded either as presence or absence of disease. If it is absent mark it as '0' and if it is present, then note the percent severity/incidence along with name of crop, disease, date of observation, name of location along with its latitude/longitude. Emerging diseases must be reported from all centers.

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Session IV Planning & Technical Programme Formulation: Entomology

Chairman : Dr Subhash Chander, Ex-Director, NCIPM, New Delhi

Co-chairman : Dr MK Dhillon, Head, Division of Entomology, ICAR-IARI, New Delhi

Rapporteurs : Dr Sarwan Kumar, PAU, Ludhiana

: Dr Rudra Narayan Borkakti, AAU- ZRS, Shillongani

The planning and technical programme formulation session of Entomology began with welcome address by Dr. Swati Singh Tomar, ZRS, Morena. She extended a warm welcome to the Chairman, co-chairman and the fellow entomologists. As per the suggestion of the house, Dr Sarwan Kumar proposed to formulate a new trial on the management of painted bug. Dr MK Dhillon proposed that the trial 5.1 A-C be separated to 5.1, 5.2 and 5.3. Based on the discussion of entomologists, the chairman suggested that one entomologist should be included as a member of every monitoring team. He further suggested that all entomologists should report all the insect-pests and natural enemies in survey and surveillance trial.

Dr. Sarwan Kumar, PI of AICRP-RM, emphasized that experiments must be conducted according to the technical programme with proper statistical analysis, and that report should be submitted by May 15th each year. A uniform data recording format will be distributed to all centres, and data must be submitted in this format as provided by the PI. All entomologists should follow technical programme strictly. After three years of experimentation, a trial on the 'Effect of aphid herbivory on changes in biochemical parameters of Brassica plants' concluded with the following conclusion:

Aphid herbivory resulted in upregulation of defense enzymes viz. peroxidase, myrosinase and defense compounds total phenols, ortho-dihydroxy phenols, flavonols while there was downregulation of total glucosinolates in both *Brassica juncea* and *B. napus*.

Technical Programme (2025-26)

Project 5.1: Screening of IVT entries for their reaction to mustard aphid infestation

Locations: Bharatpur, Ludhiana, Hisar, New Delhi, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi, Shillongani

Methodology: Grow entries in 3 m long paired rows in 3 replications. Delay the sowing by 20 to 25 days than the normal to ensure heavy aphid pressure under natural conditions.

Observations: Record observations on number of aphids per plant (10 cm top twig), per cent plants with aphids on 10 randomly selected plants per entry, and derive aphid population index (API), aphid damage index (ADI), and aphid resistance index (ARI) as described in the below given table.

Time of observation: 1. At full flowering stage 2. At full siliqua formation stage.

Note: The material will be supplied by the PI, Entomology.

Record data separately for different *Brassica* spp.

Material for screening will be provided by the respective breeders.

Maximum grading either at full flowering stage or at pod formation stage should be considered to classify the genotypes.

Self at least two plants per entry for genetically pure seed.

Aphid infestation index can be calculated as per the following table:

Table 1: Aphid population, damage and resistance indices to categorize rapeseed-mustard for resistance to *Lipaphis erysimi*

S.N	Aphid population index (API)	Aphid damage index (ADI)	Aphid resistance index (ARI)	Resistance category
1	1 = No or less than 20 aphids on the inflorescences of test Plants	1 = Normal plant growth, no symptoms of injury, no curling or yellowing of leaves	0.1-1.0 (API+ADI/2)	0.0-1.0 = Resistant
2	2 = upto 25% inflorescences have 21-100 aphids on the test plants	2 = Average plant growth, curling and yellowing of few leaves, flowering and fruiting	1.1-2.0 (API+ADI/2)	1.1-2.0 = Moderately resistant
3	3 = upto 50% of inflorescences have 101-250 aphids across test plants	3 = Poor plant growth, curling and yellowing of leaves on some branches, drying of few flowers and poor pod setting	2.1-3.0 (API+ADI/2)	2.1-2.5 = Tolerant
4	4 = upto 75% inflorescences have 251-500 aphids across test plants	4 = Stunted plant growth, heavy curling and yellowing of leaves all through the plant, drying and curling of almost half the inflorescence with poor flowering and rare pod setting	3.1-4.0 (API+ADI/2)	2.6-3.5 = Susceptible
5	5 = 100% of inflorescences have more than 500 aphids across test plants	5 = Severe stunting and ragged plant appearance, yellowing and curling of almost all the leaves, complete drying of inflorescence without any flower and immature drying of pods if any	4.1-5.0 (API+ADI/2)	3.6-5.0 = Highly susceptible

(Ref. Dhillon, 2018)

5.1: Screening of germplasm and advanced genotypes for their reaction to mustard aphid infestation

	IVT Early Mustard
1	KMR (E) 25-1
2	KMR (E) 25-2
3	RH 2469
4	RH 2393
5	PRE-2022-5
6	PRE-2023-3
7	DRMRHT-18-83
8	DRMRHT-13-5-4
9	NPJ 282
10	NPJ 283
11	DRMR 2019-55
12	HUJM(E)-24-15
13	SKM 2306
14	RAUTM 18-313-1

15	RAUTM 18-310-2
16	Mali Mustard 71
17	BAUM-17-3
18	TM317-2
19	PM 25 (NC)
20	JD 6 (ZC)
21	Pro 5111 (Hy. check)
	IVT Timely Sown Irrigated
1	DRMRCI 214
2	DRMR 2023-5
3	DRMRDR 2372
4	SKM 2308
5	SKM 2324
6	RH 2404
7	RH 2443

8	KMR 25-3
9	KMR 25-4
10	NPJ 286
11	NPJ 287
12	PR-2022-5
13	PYR-2020-11
14	HUJM-17-15
15	AKMS-25-215
16	RMM 19-10
17	ACN 271
18	RGN 601
19	RL-19-30
20	RL-19-85
21	RKM 647
22	Kranti (NC)
	IVT Mustard, Timely Sown (Rainfed)
1	DRMRHT-2063
2	DRMRCI 213
3	DRMR 2019-7
4	DRMRHJ 3820
5	NPJ 287
6	NPJ 288
7	RH 2424
8	RH 2452
9	RGN 611
10	RKM 598
11	RMM 25-01
12	HUJM-24-09
13	BAUM-16-4
14	Kranti (NC)
	IVT Mustard, Late Sown
1	DRMRIJ 21-12
2	DRMRDR 2363
3	DRMR 2022-1
4	RH 2480
5	RH 2396
6	KMR (L) 25-5
7	KMR (L) 25-6
8	NPJ 284
9	NPJ 285
10	Pusa MH 191
11	PRL-2020-2
12	PRL-2020-19
13	HUJM-24-01
14	RGN 609
15	RKM 593
16	RMM 19-05
17	ACN 308
18	BAUM-16-5
19	TM 142
20	BRBJ-1
21	Kranti (NC)
	IHT Hybrid Mustard
1	RHH 2501
2	RHH 2502
3	RHH 2503
4	PHR 2402
5	PHR 2403
6	DRMRHJ 3818

7	DRMRHJ 2520
8	DRMRHJ 320
9	Pusa MH 231
10	Pusa MH 232
11	64M25-01
12	NMH90M01
13	PMH90V02
14	KBH 5255
15	US 8757
16	NIMOH-8
17	AMH-399
18	NATJH-401
19	PA 5232
20	VNR 5020
21	ADV 424
22	DHM 231
23	4205F337-01
24	DMH-1 (Hybrid check)
25	SVJH-71 (Hybrid check)
	IVT Quality Mustard
1	LES-72
2	LES-73
3	PDZ-24#
4	PDZ-25#
5	PMAS 1603
6	PMAS 1612
7	RH(OE) 1802
8	RH(OE) 1807
9	DRMRCI (Q) 215
10	DRMRCI (Q) 216
11	PM 30 (NC Quality)
12	PDZ 11 (double low check)
13	PBR 357 (RP)
14	PBR 91 (RP)
15	DRMR 150-35 (RP)
16	NRCHB 101 (RP)
	IVT Gobhi Sarson
1	JGS-19-5
2	AKGS 25-101
3	AKGS 25-1003-55
4	PGSH 2638
5	PGSH 2654
6	BPGS 2401
7	BPGS 2402
8	GSL-1 (NC)
9	GSC 6 (QC)
10	AKMS 8141 (LR)
	IVT Taramira
1	RTCN-06
2	RTCN-10
3	RTM-2219
4	RTM-2011
5	T-27 (NC)
6	RTM-314 (ZC)
7	RTM 1624 (LR)

Checks: RH-749 (Conventional check), BSH-1 (Susceptible check), 45-S-46 (Hybrid check), PM 34 (Quality check), Kranti (NC) and BPM 11 (LR) and *Brassica fruticulosa* introgressed *Brassica juncea* line (resistant check) will be the check entries for all screening programme.

5.2: Screening of AVT I and II entries of *Brassica* for their reaction to mustard aphid infestation

Following are the AVT-I+II entries of *Brassica* to be screened for their reaction to mustard aphid

SN	Entry
1	AVT-I Yellow Sarson (Repeat) Entries: PYS 2018-1, YSH-401(NC), Benoy (ZC), Piambari (LR)
2	AVT- I Early Indian Mustard Entries: KMR(E) 24-1, KMR(E) 24-2, RH 2399-2, RH 1999-18, DRMRHT 13-2, DRMRCI-206, Kesari 5113, PRE 2022-12, 4205B296-01@, KMR(E) 23-1@, KMR(E) 22-2@, DRMRHT 18-65, DRMRHT 22-125, PM 25 (NC), GDM 4 (LR), JD 6 (ZC), NRCHB 101 (LR), Pro 5111 (Hybrid Check)
3	AVT-I+II: (Timely Sown, Irrigated/Quality/WRR) Entries: RB-118, AKMS 1003-50, CS 2009-219, RL 19-237, SKM 2209, RH 2299-63#, SKM 2104#, PBR 813-2, DRMRCI(Q) 179, DRMRCI(Q) 181, RH (OE) 1710, LES 68, NPJ 271***@, GED-1@, GED-2@, RH (OE) 1710@, RH (OE) 1702, LES-70, PYR 2018-1, RH 1975 (LR), RCC 4 (ZC), Giriraj (LR), RH 749 (ZC), Kranti (NC), PM 30 (NC), PM 32 (Quality LR), RGN 73 (ZC), PDZ 11 (DLC), Varuna, PM 34 (QLR), Bio 902 (ZC), GDM 4 (LR)
4	AVT –I+II Mustard, Late Sown (Irrigated) SVJH 78, DRMRDR 2141***, NPJ 267#, RMWR 19-01, DRMR 2018-1#, Kranti (NC), Radhika (LR), PM 26 (ZC), CS 56 (LR), BPM 11 (LR) NRCHB 101
5	AHT I+II Hybrid Mustard RHH 2402, HRH191290#, 4205D300-01, US 8787, Kranti(NC), DMH-1(Hybrid Check), NRCHB 506 (Hybrid Check), RH 0749 (ZC), GDM-4 (ZC)

Checks: RH-749 (Conventional check), BSH-1 (Susceptible check), 45-S-46 (Hybrid check), PM 34 (Quality check), Kranti (NC) and BPM 11 (LR) and *Brassica fruticulosa* introgressed *Brassica juncea* line (resistant check) will be the check entries for all screening programme.

5.3: Screening of AVT II entries under artificial infestation conditions

Locations: Bharatpur, Ludhiana, Hisar, New Delhi, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi, Shillongani

Following are the AVT-II entries of *Brassica* to be screened for their reaction to mustard aphid

SN	Entry
1	AVT-II: (Timely Sown, Irrigated/Quality/WRR) Entries: RH 2299-63#, SKM 2104#, RH 1975 (LR), Giriraj (LR), RCC 4 (ZC), Kranti (NC)
2	AVT-II: (Late Sown, Irrigated) Entries: NPJ 267#, DRMR 2018-1#, Kranti (NC), Radhika (LR), PM 26 (ZC), CS 56 (LR), BPM 11 (LR) NRCHB 101 (ZC)
3	AVT–II Hybrid Mustard Entries: HRH191290#, Kranti(NC), DMH-1(Hybrid Check), NRCHB 506 (Hybrid Check), RH 0749 (ZC)

Checks: RH-749 (Conventional check), BSH-1 (Susceptible check), 45-S-46 (Hybrid check), PM 34 (Quality check), Kranti (NC) and BPM 11 (LR) and *Brassica fruticulosa* introgressed *Brassica juncea* line (resistant check) will be the check entries for all screening programme.

Methodology: Grow entries in 3 m long paired rows in 3 replications as detailed in project 5.1. At flowering artificially infested 5 plants in each entry @ 20 aphids/ plant and cover them with muslin cage. For artificial infestation, collect the aphid population from the naturally infested plot in the field. For the release of aphids, pin the twig infested with aphids on the side shoot of the test entry. After 15 days, when the aphid population has multiplied, remove the muslin cage and record the data as in project 5.1.

Observations: Record aphid infestations index (AII) on 0-5 scale, average aphid population per plant (10 cm top twig) and per cent plant infestation on the basis of 10 randomly selected plants per entry [Calculated as per the given methods in table:1, (Ref. Dhillon, 2018)]

Time of observation:

1. At full flowering stage
2. At full siliqua formation stage.

Note:

1. The material will be supplied by the PI, Entomology.
2. Record data separately for different *Brassica* sp.
3. Material for screening will be provided by the respective breeders.
4. **Maximum grading either at full flowering stage or at pod formation stage should be considered to classify the genotypes.**
5. Self at least two plants per entry for genetically pure seed.

5.4: Assessment of yield losses due to insect-pests in *Brassica* crops

Objective: To find out yield losses caused by various insect-pests

Locations: Bharatpur, Ludhiana, Hisar, New Delhi, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and Shillongani

Treatments (2) (i) Protected (ii) Unprotected

The protected set to be sprayed with locally recommended insecticide against insect-pests. Spray should be done when the pest population reaches economic threshold level or pest appearance where ETL is not available.

Entries: The recent released/identified varieties for *Brassica juncea* were taken for yield losses trial: BPM 11 and RH 1975 and locally high performing variety

Design - RBD, Plot size: 4.2 m x 3m, **Replications** 4

Sowing time: Second fortnight of November

Observations: 1. Observations of different insect pests to be recorded on randomly selected 10 plants per plot as per standard methodology given in 5.3. However, before every spray data on insect-pests population will be recorded and per cent reduction in pest population will be worked out.

2. Percent reduction in insect pest population in protected set over unprotected one of the same variety.

3. Yield data at harvest.

4. Yield loss to be worked out.

Format for data recording of project 5.2

Project 5.2: Assessment of yield losses due to insect pests in <i>Brassica</i> crops								
Date of Sowing: ----- Date of Harvesting: -----								
Entries	Aphid population before treatment		Aphid population after treatment		% reduction in aphid population in protected set over unprotected	Yield kg/ha		Avoidable yield loss (%)
	Protected	Unprotected	Protected	Unprotected		Protected	Unprotected	
BPM 11								
RH 1975								
Local high yielding Variety								

5.5(A): Agro-ecological analysis of various insect-pests on *Brassica* crops

Locations: Bharatpur, Ludhiana, Hisar, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and Shillongani

Crops/Entries (i) *Brassica juncea* (DRMRIJ 31) (ii) *Eruca sativa* (T 27) (iii) *B. napus* (GSC 7) (iv) *B. rapa* (BSH 1)

Plot size: 4.2 m x 3 m

Replications: 3

Crop sowing (i) Timely sown (ii) Late sown

Observations: (Recorded at weekly intervals)

(a) Insect-pests

1. Mustard aphid, cabbage aphid and green peach aphid: Number of aphids/10 cm twig on 10 plants per genotype (See Project No. 5.1)
2. Mustard sawfly : Number of larvae/10 plants (sawfly larval population to be recorded at 3 days interval)
3. Painted bug : Number of bugs (adult + nymph)/10 plants
4. Flea beetle : Number of beetles/10 plants
5. Cabbage caterpillar : Number of larvae/10 plants
6. Thrips : Number of thrips/ 10 flower/plant from 10 randomly selected plants
7. Others : a) Number of insects/10 plants

b) Pollinator diversity should be recorded (Species diversity can be recorded through taxonomic identification as well as image verification from the experts)

c) Natural enemies (i.e. parasitoids, predators and entomogenous pathogens diversity etc) diversity should be recorded (Species diversity can be recorded through taxonomic identification as well as image verification from the experts).

Format for data recording for Project 5.3(A): Agro-ecological analysis of various insect-pests

Date of Harvesting : Date of sowing :											
SM W	Weather Parameters							Aphids /10cm top twig			
	Temperature (°C)		R.H. (%)		Sunshine (hrs)	Wind speed Kmph	Rainfall (mm)	<i>B. juncea</i>	<i>Eruca sativa</i>	<i>B. napus</i>	<i>B. rapa</i>
	Max	Min.	Max	Min.							

Note- The same format can be used for other pests as well.

5.5 (B): Monitoring of alate aphids on yellow sticky traps

Objective: All the centres will install yellow (chrome) painted smeared with transparent greasy material on 1 kg oil tin box (round) at 5 locations in the experimental farm at 1.5 m above ground from first week of October onwards. The height of trap should be adjusted so that it remains 1 foot above the crop canopy. The data on the winged trapped mustard aphid is to be recorded daily by taking care of cardinal directions throughout the year

Locations: Bharatpur, Ludhiana, Hisar, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and Shillongani

Observations i) Temperature (maximum and minimum), RH (morning and evening), sunshine hours, rainfall and rainy days

Analysis: Data on the insect-pests infestation from different centres will be analyzed with respect to meteorological parameter

5.6 Management of mustard aphid with exogenous application of salicylic acid

Locations: Bharatpur, Ludhiana, Hisar, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and Shillongani

Plot size: 4.2 m x 3 m

Replications: 3

Mustard variety: *Brassica juncea*: Giriraj

Sowing time second/third week of November

Treatments: T₁: Salicylic acid 0.5 mM (69 ppm)
T₂: Salicylic acid 1.0 mM (138 ppm)
T₃: Salicylic acid 1.5 mM (207 ppm)
T₄: Thiamethoxam 25 @ 0.1 g/l
T₅: Control

Treatments to be applied at the initiation of aphid population.

Observations: 1. Data on the population of mustard aphid will be recorded before, 1, 3, 7, 10 and 14 days after treatment from 10 plants selected at random in each replication.

2. Also record data for the other pests prevalent in the centre.
3. Yield data at harvest
4. Economics

5.7 Management of painted bug in rapeseed-mustard

Locations: Morena, Hisar, Pantnagar, Shillongani, New Delhi

Plot size: 4.2 x 3 m

Replications: 5

Mustard variety: Recommended variety of the region.

Sowing time: Last week of September to first week of October

Treatments: T₁: Seed treatment with imadacloprid 70 WG @ 7 g/kg seed
T₂: Dusting of Fenvalerate dust 0.4 DP @ 4 kg/acre
T₃: Dusting of dung/wood ash @ 8 kg/acre
T₄: Control

Observations: 1. Weekly data on painted bug incidence (No. of bugs (nymphs+adults)/ mrl) and per cent seedling mortality.

2. Also record data for the other pests prevalent in the centre.

3. Yield data at harvest

4. Economics

Seedling mortality by painted bug can be differentiated from that by high temperature by the nature of symptoms. Painted bug damaged seedlings have small pale white patches on the leaves (even if the insects are not present) while no such patches appear in seedlings wilted due to high temperature.

5.8 Survey and surveillance of insect pests and their natural enemies in Rapeseed-Mustard:

Locations : Ludhiana, Hisar, Bharatpur, Kanpur, Pantnagar, S.K. Nagar, Dholi, Morena, New Delhi and Shillongani

Observations:

- i) Insect-pests population / infestation will be recorded from sowing to harvesting at fortnightly intervals at 10 locations in the zone.
- ii) Natural enemies of insect-pests will also be recorded.
- iii) Four places will be selected in a field and observations will be recorded from 5 plants from each place per location.

Data reporting:

- Data should be sent to Director, DRMR (director.drmr@gmail.com) on the prescribed data sheets latest by May 15, otherwise it will not be possible to include in the report
- Weather data with brief weather report should be supplied along with trial data.
- Yield data (kg/ha) should be sent after analysis. Unanalyzed data will not be included in the report

Note:

- 1 Report should be submitted on time
- 2 As suggested by DG, ICAR, Pictures of different stages of the crop, trial conducted, insect damage and operation performed to be submitted from all the centers.

Problem faced by center PI with respect to conducting the AICRP-RM trials can be communicated to DRMR through official mail as and when they come across so needful can be done.

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Session V

Planning and Technical Programme: Plant Physiology & Biochemistry

Chairman: Dr. Anil Kumar, Director Education, RLBCAU, Jhansi
Co-Chairman: Dr. Maharaj Singh, Principal Scientist, ICAR-CAZRI, Jodhpur
Rapporteurs: Dr. Anubhuti Sharma, Principal Scientist, ICAR-DRMR, Bharatpur
Dr. Pushp Sharma, Prof. Plant Physiology, PAU, Ludhiana

The technical session on Plant Physiology and Biochemistry was chaired by Dr. Anil Kumar, Director Education, RLBCAU, Jhansi and Dr. Maharaj Singh, Principal Scientist, ICAR-CAZRI, Jodhpur was the co-chairman. Dr. LK Meena, PI (Plant Physiology) and Dr. Anubhuti Sharma, PI (Biochemistry) from ICAR-IIRMR, Bharatpur presented the on-going technical programme and salient findings of experiments conducted by different centers during *rabi* 2024-25 of their respective disciplines. The highlights of the programme of Plant Physiology in 2024-25 were

1. 35 Indian mustard entries were screened for high temperature tolerance at seedling stage for the trait's seedling mortality $\leq 20\%$ and 10 seedlings dry weight ≥ 40 mg under controlled lab condition and seedling mortality $\leq 20\%$ with dry matter ≥ 6 g per ten seedlings under field condition. None of the genotypes met the selection criteria at the seedling stage under laboratory conditions. While under field condition with standard seedling mortality and dry matter criteria along with tolerance indices (STI > 0.85 SSTI > 0.65) entries DRMRSJ 272, HUIJM(E) 23-7, DRMRCI 188, DRMRCI 187, PRE 2022-6, DRMRHT 22125, DRMRCI 125, NJI 24-401, RH 1999-18, DRMR 19-36, DRMRCI 165, Pro 5111, GDM-4, JD-6 shows high temperature tolerance. Conclusively, three genotypes DRMRCI 187, PRE 2022-6 and DRMR 19-36 considered as promising under both controlled and field conditions.
2. In the second experiment, 31 germplasm were tested for drought tolerance and as per criteria ($\leq 20\%$ seed yield reduction, ≤ 0.5 DSI and YSI ≥ 0.9) genotypes DRMR 2020-3, DRMRCI 148, DRMRCI 161, RH 2265, DRMR 21-17, RGN 229, DRMR 2019-7 found tolerance at > 1 locations. These entries maintained higher chlorophyll content, RWC, SPAD values and lesser decline in siliquae on main shoot, seeds per siliqua, seed weight and higher yield stability index under drought condition.
3. Out of 31 entries RKM 599, NPJ 267, PRL 2022-5, DRMRDR 2195, ORM 2019-30, NPJ 276 at Bharatpur and DRMR 2018-1 at Hisar were identified as high temperature tolerant for terminal stage with $\leq 20\%$ seed yield reduction, ≤ 0.5 heat susceptibility index and ≥ 0.9 YSI.
4. Biostimulants sodium thiosulphate (5 mM) at Bharatpur and Dholi locations; and orthosilicic acid (5ml) at Hisar and Mandore centers improves seed yield and other attributes to mitigate drought stress.
5. Microbial treatment enhanced biological yield and seed yield across varieties under late sown condition at both the centers i.e. Hisar and Ludhiana.

After the presentation, the chairman and co-chairman suggested to some improvement in ongoing programmes, report and data presentation. Recommendations are as followed:

1. In the trial 6.3 on terminal heat stress, periodic and stage specific data of CT, CTD and ambient temperature should be included in the report.
2. A new experiment on multiple abiotic stress has been formulated which will be standardized at ICAR-IIRMR, Bharatpur.
3. Presentation enriched with climatic recorded data along with graphs.

Technical Programme 2025-26
Plant Physiology

6.1 Screening of genotypes from different agro climatic zones for high temperature tolerance at seedling stage.

Entries of AVT/IVT (early/germplasm) along with promising strains of 2024-25: DRMRCI 187, PRE 2022-6, DRMR 19-36, KMR (E) 25-1, KMR (E) 25-2, RH 2469, RH 2393, PRE-2022-5, PRE-2023-3, DRMRHT-18-83, DRMRHT-13-5-4, NPJ 282, NPJ 283, DRMR 2019-55, HUJM(E)-24-15, SKM 2306, RAUTM 18-313-1, RAUTM 18-310-2, Mali Mustard 71, BAUM-17-3, TM317-2, KMR(E) 24-1, KMR(E) 24-2, RH 2399-2, RH 1999-18, DRMRHT 13-2, DRMRCI-206, Kesari 5113, PRE 2022-12, 4205B296-01 @, KMR(E) 23-1 @, KMR(E) 22-2 @, DRMRHT 18-65, DRMRHT 22-125, GDM 4, DRMRCI 220, DRMR 24-1, DRMRDR 2135, DRMR 2019-7, DRMRHT 20-82, DRMRCI 188 Checks: PM 25 (NC), JD 6 (ZC), NRCHB 101, PRO 5111 (Hy. check)

Methodology:

Controlled condition (Laboratory)

1. Take 5 kg soil in plastic trays and add water to bring it to field capacity.
2. Sow the seeds in rows and place the tray in seed germinator at $25 \pm 1^\circ\text{C}$ for germination.
3. After 4-5 days (when the seedlings have about 2.5 cm height), the seedling should be exposed to high temperature ($45 \pm 1^\circ\text{C}$) with 30-40% relative humidity for 4 hours daily for 4 days.

Observations: Seedling mortality, dry weight (10 seedlings) and TTC test

Field condition

1. Sowing should be done around 20-25 September.
2. Plot will be irrigated prior to the sowing (Only pre-sowing irrigation).
3. 100 count seeds will be sown in 2 m row length.
4. Experiment will be continued for 30 days.

Observations: Soil moisture at depth of 0-15cm (at the time of seeding, 10, 20 and 30 DAS), ambient temperature, daily soil temperature, seedling mortality, dry weight (10seedlings), canopy temperature, membrane stability, seedling thermo tolerance index (STI) and seed to seedling thermotolerance index (SSTI).

Design: CRD (Lab.)/ RCBD (Field), **Replication:** 3

Centers: Dholi, Bharatpur, Hisar and Ludhiana.

6.2 Screening of genotypes for drought tolerance

Entries of AVT/IVT (*rainfed*/germplasm) along with promising strains identified during 2024-25: DRMR 2020-3, DRMRCI 161, DRMR 21-17, DRMRHT-2063, DRMRCI 213, DRMR 2019-7, DRMRHJ 3820, NPJ 287, NPJ 288, RH 2424, RH 2452, RGN 611, RKM 598, RMM 25-01, HUJM-24-09, BAUM-16-4, DRMRCI 218, DRMR 2019-19, DRMR 21-16, DRMRDR 2141, DRMRHT 20-53 Checks: Kranti (NC), RH 725, RGN-229, RH 1424

Methodology:

1. Sowing will be done in 5 rows each of 2.5 m row length.
2. Surface irrigation (5-6 cm) will be done prior to the sowing.
3. In irrigated condition, two irrigations will be given, first at 35 and second at 65 DAS while *rainfed* set be grown without irrigation.

Design: RBD, **Replication:** 3

Observations: Soil moisture (0-30, 30-60 cm) at the time of seeding, before 2nd irrigation and maturity, field capacity, rainfall, SPAD value, chlorophyll content, RWC, CT, seed weight, siliquae on main shoot (SMS), seeds/silique, biological yield (kg/ha), seed yield (kg/ha), harvest index, yield stability index (YSI), drought susceptibility index (DSI) and oil content.

Centers: Dholi, Bharatpur, Hisar and Ludhiana.

6.3 Screening of genotypes for high temperature tolerance at terminal stage

Entries of AVT/IVT (late sown/ germplasm) along with promising strains from 2024-25: PRL 2022-5, DRMRDR 2195, DRMRIJ 21-12, DRMRDR 2363, DRMR 2022-1, RH 2480, RH 2396, KMR (L) 25-5, KMR (L) 25-6, NPJ 284, NPJ 285, Pusa MH 191, PRL-2020-2, PRL-2020-19, HUJM-24-01, RGN 609, RKM 593, RMM 19-05, ACN 308, BAUM-16-5, TM 142, BRBJ-1, SVJH 78, DRMRDR 2141, NPJ 267, RMWR 19-01, DRMR 2018-1, DRMRCI 222, DRMR 2017-27, DRMRDR 2372, DRMR 21-23, DRMRHT 20-53 Checks: Kranti (NC), PM-26, Radhika, BPM 11, CS 56

Procedure: Two rows of each genotype will be sown at optimum date of sowing and one month thereafter as late sown.

Plot Size: 5.0 x 0.6m, Spacing: 30 x 10 cm

Design: RBD **Replication:** 3.

Observations: Ambient temperature (from flowering to maturity), canopy temperature, canopy temperature depression (CTD), membrane stability index, number of seeds/silique, 1000 seed weight, seed yield (kg/ha) and heat stability index (HSI) and yield stability index (YSI).

Centers: Dholi, Bharatpur, Hisar and Ludhiana

6.4 Effect of biostimulants to mitigate drought stress

Methodology:

1. Latest released local variety for rain fed condition
2. Rainfed variety will be sown in 5 rows each of 5 m row length.
3. Treatments:
 - Sodium thiosulphate - 3 and 5 mM,
 - Seaweed at 3 and 5ml
 - Orthosilicic acid at 3 and 5ml concentrations
 - Water spray
 - Control (No spray)
4. Foliar sprays at Initiation of flowering and 50% flowering stage with the spray volume of 350 lit/ha.

Design: RBD, **Replication:** 3

Observations: Photosynthetic pigments in 3rd or 4th leaf on main shoot (chl a, chl b, total chl and carotenoids), CSI, RWC, LWR, siliquae on main shoot (SMS), total siliquae/plant, number of seeds/silique, seed weight, biomass (kg/ha), seed yield (kg/ha) and B:C ratio.

Centers: Dholi, Bharatpur, Hisar and Ludhiana

6.5 Microbes for mitigating temperature stress in mustard

Methodology:

1. Sowing will be done in 5 rows each of 3m row length at optimum date of sowing and one month thereafter as late sown.
2. Microbial culture will be applied as seed dressing before sowing
3. Treatments: Without culture,
Microbial consortium –I (ICAR-NBAIM, Mau)
Microbial consortium –II (CSIR-NBRI, Lucknow).

Varieties: RH 1975, BPM 1825 and PBR 357

Design: SPD **Replication:** 3

Observations: Soil microbial counts before and after sowing, ambient temperature (from flowering to maturity), photosynthetic pigments (chl a, chl b, total chl and carotenoids), canopy temperature, canopy temperature depression, membrane stability, RWC, total siliquae/plant, 1000 seed weight, biomass (kg/ha) seed yield (kg/ha) and oil content (%).

Centres: Dholi, Bharatpur, Hisar and Ludhiana

Seed Supply:

- Seed material of rest of the trials should be sent latest by 30th August. In case of late receipt of seed material, it will be not included in trials.
- For trial 6.1 (150g), 6.2 and 6.3 (250g) seed should be sent.

Data reporting:

- Data should be sent to Director, ICAR-IIRMR (director.drmmr@gmail.com) on the prescribed data sheets latest by May 15, otherwise it will not be possible to include in the report.
- Data should be sent after analysis for annual report.

Technical Programme (Biochemistry)

7.1 Evaluation of important breeding materials for Nutritional Quality Index (NQI) of oil.

Parameters:

- Oil content,
- Fatty acid profiling (palmitic, stearic, oleic, linoleic, linolenic, eicosanoic and erucic acid),
- $\omega 6/ \omega 3$ ratio,
- Oil stability index,
- SFA: MUFA: PUFA,
- Saturated and unsaturated fatty acid ratio

Centres: Bharatpur, Ludhiana, Hisar, Pantnagar
PM 30 and PDZ 1 (quality checks)

7.2 Screening of seed meal in promising breeding materials for fish/poultry meal and human utilization.

Parameters:

- β -carotene content
- Total antioxidant content
- DPPH radical scavenging activity
- Total sinapine content

Centres: Bharatpur, Ludhiana, Hisar, Pantnagar

7.3 Screening of anti-nutritional factors in quality breeding material

Parameters:

- Total glucosinolates,
- Total phytic acid

Centres: Bharatpur, Ludhiana, Hisar, Pantnagar

PM 30 and PDZ 1 (quality checks)

7.4 Evaluation of enzymatic/thermal treatments to reduce anti-nutritional factors in promising genotypes.

Centres: Bharatpur, Ludhiana

Parameters:

- Glucosinolate content
- Phytic acid
- Sinapine content

Recommendations

- ❖ Maximum entries to be tested should not be more than 30 with 50g of seed amount.
- ❖ All the centers should follow the same protocols for all the experiments.
- ❖ Each center should send statistically (CV/SD/SE) analyzed report and the data in triplicate.
- ❖ CV should not be more than five, otherwise data may not be considered.
- ❖ Seeds sent for analysis should be free from sediments, particles and dust.
- ❖ Promising entries should be repeated for three consecutive years.
- ❖ Due credit should be given to biochemist in varietal development program at respective centers.
- ❖ Experiment outcome should be extended in terms of publications, patents and products.
- ❖ Promising genotypes should be highlighted and presented graphically to represent outcome oriented results.
- ❖ Checks having extreme value of nutritional and anti-nutritional traits should be added along with quality check, national check.

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Session VI : **Breeder Seed Production/ DUS Testing/ Germplasm registration**

Chairman & Subject Expert : Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi

Co-Chairman : Dr V. V. Singh, Director ICAR-IIRMR, Bharatpur

Rapporteur : Dr. Arun Kumar, PS, ICAR-IIRMR, Bharatpur

: Dr. H. S. Meena, PS, ICAR-IIRMR, Bharatpur

The session was started with the introductory remarks by the Chairman followed by presentation of the detailed report on breeder seed production for the year 2024-25 by Dr. B. L. Meena, Sr. Scientist, ICAR-IIRMR. He informed that an indent of 95.30 quintals of breeder seed of 86 rapeseed-mustard varieties was received from Department of Agriculture and Cooperation (DAC), Ministry of Agriculture and Farmers Welfare, Govt of India for production during the year 2024-25. Against the indent, 95.30, 252.40 quintals breeder seed was produced, indicating a surplus of 157.10 quintals. Breeder seed of 02 varieties Vasundhara and Urvashi of Indian mustard one variety Subinoy of yellow sarson, 1 variety RVT-2 of toria was not produced. Further, he informed the shortage in breeder seed production of PDZM-35 and PDZM 36 of Indian mustard, T-9 variety of toria. In addition, 39.45 q breeder seed of 9 varieties of Indian mustard was also reported from seven centres. He presented an account of the percent contribution of recently notified (2015-2024) varieties in breeder seed production chain as well as crop wise contribution of Breeder seed indent received during 2024-25. Dr. Sanjeev Gupta, ADG (OP), expressed deep concern on deficit breeder seed production of certain varieties and suggested the concern breeder/centre to take strict measures in future. Concern breeder/centre should purify the varieties PDZM 35 and PDZM 36. Further, chairman and co-chairman suggested that the focus should be on increase in breeder seed indent of recently released varieties. Chairman and co-chairman also suggested to all the seed hubs to produce quality seed as per the target. Further, a lecture on 'Management & Utilization of Rapeseed-Mustard Germplasm' by Dr. Rashmi Yadav, Principal Scientist, ICAR-NBPGR, New Delhi were delivered. Dr. Rashmi Yadav presented a detailed report on availability of Rapeseed-Mustard Germplasm, trait specific germplasms of different species, procedures for import- export of germplasm and registration with NBPGR. Dr. D. S. Pania, Technical Officer, PPVFRA, New Delhi presented the details of PPV&FR Act in India. The Chairman, in his concluding remarks, appreciated the status of breeder seed production in the country. The session was ended with the vote of thanks to the Chair.

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Session VII : Technology Dissemination Management

Chairman : Dr. Shyam Ranjan Kumar Singh, Director, ICAR-ATARI, Zone-IX, Jabalpur
Co-Chairman : Dr. S.K. Jha, Pr. Scientist, ICAR, New Delhi
Rapporteurs : Dr. Sushil Kumar Sharma, Pr. Scientist-cum-Head, KVK, Bansur, Alwar
: Dr. Raj Kumar Yogi, Sr. Scientist, ICAR-IIRMR, Bharatpur

After brief introductory remarks from chairman and co-chairman about the importance of frontline demonstrations for scientists in technology dissemination, its impact on popularization of new varieties and technologies, Dr. Ashok Kumar Sharma, Pr. Scientist, (Ag Extension), ICAR-IIRMR, Bharatpur presented the annual report of frontline demonstrations (FLDs) on rapeseed-mustard conducted during 2024-25. He informed the house that 10571 frontline demonstrations (FLDs) were conducted in 168 districts across 20 states during 2024-25 through 56 cooperating centres of AICRPRM/ ICAR institutes/ Ag. Universities under the scheme “Frontline demonstrations and other related activities of Oilseeds” funded under the NFSM-Oilseed by DAC&FW, Ministry of Agriculture and Farmers’ Welfare, Government of India. The maximum FLDs were conducted in Uttar Pradesh (2110) followed by Rajasthan (2013), Assam (1691), Madhya Pradesh (1441) and Jammu & Kashmir (545).

The maximum average yield of 2,418 kg/ha from the IP under irrigated condition was in Punjab followed by 2,338 kg/ha in Madhya Pradesh; 2,121 kg/ha in Rajasthan; 2,097 kg/ha in West Bengal; 1,916 kg/ha in Uttar Pradesh; 1,732 kg/ha in Uttarakhand; 1,646 kg/ha in Bihar; 1,587 kg/ha in J&K; 1,552 kg/ha in Himachal Pradesh; 1,314 kg/ha in Chhattisgarh; 1,210 kg/ha in Assam; 1,046 kg/ha in Maharashtra; 857 kg/ha in Odisha. The maximum yield gap of 79.00% was recorded in Maharashtra followed by 60.46 % in Jammu & Kashmir; 56.38% in Odisha; 51.25% in Assam; 42.82% in Chhattisgarh; 39.56% in Himachal Pradesh; 28.33% in Uttar Pradesh; 23.18% in Madhya Pradesh; 21.21% in West Bengal; 19.36 % in Bihar; 12.57% in Rajasthan; 8.72% in Punjab. The maximum ANMR/ha were Rs 29,353; Rs 27,520; Rs. 22,667; Rs. 22,430; Rs. 21,943; Rs. 21,827; Rs. 20,436; Rs. 19,597; Rs. 13,134; Rs. 13,093; Rs. 12,375; Rs. 11,775; Rs. 11,416; in Jammu & Kashmir, Madhya Pradesh, Uttar Pradesh, Maharashtra, Chhattisgarh, Himachal Pradesh, West Bengal, Assam, Uttarakhand, Bihar, Odisha, Rajasthan, Punjab, respectively. The cost of cultivation ranged from Rs. 11,411/ha in Chhattisgarh to Rs. 40,754 /ha in Bihar in IP under irrigated Whole package demonstrations.

The maximum average yield of 1,459 kg/ha from the IP of WP demonstrations under rainfed conditions was in Rajasthan followed by 1,347 kg/ha in Bihar; 1,330 kg/ha in Jharkhand; 1,279 kg/ha in Himachal Pradesh; 1,221 kg/ha in Jammu & Kashmir; 1,118 kg/ha in Uttarakhand; 996 in Manipur; 974 kg/ha in Assam; 961 kg/ha in Meghalaya; 914 kg/ha in Tripura; 803 kg/ha in Andhra Pradesh; 755 kg/ha in Odisha. The maximum yield gap of 72.00% was recorded in Arunachal Pradesh followed by 58.13% in Tripura; 50.09% in Odisha; 47.61% in Jharkhand; 40.66% in Jammu & Kashmir; 33.24% in Assam; 28.8% in Uttarakhand; 27.9% in Himachal Pradesh; 27.42% in Rajasthan; 26.44% in Meghalaya; 21.76% in Manipur; 4.58 % in Bihar. The maximum ANMR/ha were Rs 22,286; Rs 20,079; Rs 17,698; Rs 16,579; Rs 13,638; Rs 13,490; Rs 12,212; Rs 10,999; Rs 10,614; Rs 9,760; Rs 8,643; Rs 2,319 in Jharkhand, Rajasthan, Andhra Pradesh, Jammu & Kashmir, Uttarakhand, Himachal Pradesh, Tripura, Odisha, Manipur, Assam, Meghalaya, Bihar, respectively. The cost of cultivation ranged from 14,502 Rs/ha in Rajasthan to Rs. 36,302/ha in Tripura in IP under rainfed Whole package demonstrations.

A total of 420 FLDs with 06 component technologies for Indian Mustard were carried out by different centres. Among the components, Seed Treatment with carbendazim @2 g/kg seed and two foliar sprays of 0.1 % carbendazim at 45 and 60 DAS by Hisar centre had maximum average yield of 2,650 kg/ha with variety RH 1706 and RH 725, respectively.

A total of 19 improved varieties of Indian mustard, 4 each of Gobhi sarson and Toria and 3 of Yellow sarson were used in WP covering 13 states under irrigated condition. Under irrigated condition, improved variety PBR 357 demonstrated in 100 FLDs in Punjab, recorded highest average yield of 2,775 kg/ha with a yield improvement of 12% over local (FP) practice followed by RH-749 (30 FLDs) in Uttar Pradesh with average seed yield of 2,576 kg/ha with yield improvement 48.55%.

During the session, Dr. Shyam Ranjan Kumar Singh, Director, ICAR-ATARI, Zone-IX, Jabalpur delivered a talk on “Accelerating Technology dissemination through effective linkages with KVKs” The house appreciated the talk and emphasized for effective linkages.

The chairman and delegates appreciated the work done and presentation of results. **After in depth discussion the following suggestions emerged.**

1. All centers should ensure to follow the guidelines for conducting FLDs. However, practical constraints/bottlenecks including unavailability of certified seed of new varieties, problem of getting Soil Health Card and Geo tagging of each beneficiary farmers, uploading on Krishi Mapper, *etc.* for conducting a large number of FLDs needs to be submitted by all the centers to Director, IIRMR Bharatpur. The Director, IIRMR shall submit request to DA&FW/ICAR for some relaxation in the guidelines or reducing the number of FLDs to be conducted by different canter.
2. All centres/seed hubs shall submit the details of quantity of certified/ TFL seed of latest varieties which can be used in FLDs.
3. All centres should submit the periodical report along with statement of Expenditure timely so that budget can be released.
4. A request letter should be sent to the DA&FW/ICAR by Director, IIRMR for using TFL in FLDs this year.

The session ended with vote of thanks to chair.

Frontline Demonstrations on Rapeseed-Mustard 2025-26

Guidelines for conducting frontline demonstrations

1. Each implementing centre will conduct the FLDs as per the allotment list given along with the technical programme.
2. Ensure implementation of various activities as per the approved norms/guidelines of NMEO-OS.
3. The farmer field may be selected in coordination with District Agriculture Officer. This would ensure maximization of exposure for the demonstration, Soil Health Card and its related advisory & if within Natural Farming cluster, support through the same.
4. Soil Testing is mandatory for all demonstration plots. Details of Soil Health Card (SHC) must be updated on the Soil Health portal before the start of demonstration. Fertilizer inputs will be provided to farmers under FLDs on the basis of Soil health card. The chemical fertilizers/ pesticides under FLDs should only be given by identifying the gaps in adoption. Growth promoters, Micro nutrients, etc can also be given.
5. Digital Crop Surveys is also mandatory for all demonstration. All FLDs should be mapped through Krishi Mapper and upload & photographs of different phases of growth of the crops and record Geo-reference / Geo tagging invariable. Digital Crop Cutting Experiment report should be uploaded. The services of Krishi Sakhi can be hired for this activity as per the guidelines in vogue.
6. All Demonstrations shall preferably use digital crop estimation surveys using the DGCES (Digital General Crop Estimation Survey) mobile application under GCES wherever feasible replacing traditional manual processes.
7. Ensure involvement of representative of State Department of Agriculture/CDDs in implementation and monitoring of the FLD programme.
8. Institute shall submit crop-wise and institute-wise details of beneficiary farmers covered, technologies to be demonstrated under FLDs, periodic reports, and yield gap analysis after crop harvesting as per the prescribed format.
9. Only Certified Seed of less than 5 years old varieties must be used under FLDs. Centers shall give preference to Seed Hubs, established for various oilseed crops, for purchasing seeds. In case seeds are unavailable at the seed hub, institutes/centers may obtain a certificate from the Seed Hub and procure seeds from outside sources. Institutes shall restrict to only public sector varieties for conducting FLDs.
10. Centers/ Institutes shall preferably use digital crop estimation surveys using the DGCES mobile application under GCES wherever feasible replacing traditional manual processes.
11. Emphasis should be given to component technology demonstrations including INP and IPM. For organizing FLDs, adopt adjoining villages of a panchayat (Cluster approach) preferably 2-3 village in one district only to show the impact and carry out PRA for identifying the critical factor for low productivity. A group of multidisciplinary scientists, instead of one scientist should be involved in FLDs programme.
12. One FLD is for one acre plot only. Funds for conducting FLDs will be Rs. 3600.0 for an area of one acre (one FLD). No farmer should be allotted more than one FLD.
13. The binding of one-acre area for one demonstration may not be observed, where holdings areas are too small. In these areas, one FLD (one-acre area) can be divided in 2-3 farmers as per land holdings available.

14. Unspent balance of previous years may be utilized but subject to revalidation by ICAR-IIRMR.
15. In the report, specifically mention the rainfed and irrigated situation and also the normal and late sown conditions under which FLDs are actually conducted.
16. The improved varieties recommended for a particular zone should also be tested against the local variety. At least 50 per cent of recently released varieties of the zone must be included in FLDs by each centre other than its own centers.
17. The in-charge of the implementing centre should indent the requisite quantity of the varieties to the concerned centres/ breeders well before the start of the season.
18. The total cost of cultivation for improved plot (IP) and farmers' plot (FP) per ha should be reported including all input, labour and miscellaneous cost separately and ensure that they vary from each other only on the technology being tested (whole package, component, cropping system as the case may be).
19. The package of practices should be improved / recommended for the concerned zone. Technology used in FLDs should be clear and thoroughly described along with complete package in the report
20. Each centre must work out the economics of the FLDs and report the B:C ratio for the improved plot (IP) and farmer's plot (FP) for each demonstration instead of IBCR value.
21. Document farmers' practices and the prevailing ITK during PRA and send the same along with the preliminary report to the Director, DRMR within one month after the sowing.
22. Ensure maximum farmer participation in the field day program aimed at promoting improved crop varieties and disseminating modern agricultural technologies.
23. The impact of new technology should be discussed during scientist-farmer interaction, training and field visit / kisan diwas / kisan mela, etc in the village. Photography and videography of the FLD activities must be done and send good photographs to IIRMR, Bharatpur for record.
24. The centres should send the preliminary report pertaining to the name of farmer, location along with date of sowing and technology demonstrated to the Director, ICAR-IIRMR, Director Agriculture of the respective state/ICAR institutes/DAC&FW/ the district level extension agency and NGOs, for proper monitoring, strengthening the linkages and also extending learning experiences to relatively large population of farmers.
25. Ensure to forward crop-wise and institute-wise details of beneficiary farmers covered (Name & address) during release of 2nd installment for Kharif and during the 3rd installment for Rabi and Summer, technologies to be demonstrated under FLDs, periodical report and yield gap analysis over check after harvesting of crops.
26. The final data book for individual farmer, as supplied by the ICAR-IIRMR, must be sent to ICAR-IIRMR, Bharatpur along with the summary sheet of results latest by April 30, 2026.
27. Every center should send the list of selected farmers for the FLDs for the release of 25% budget as an advance. After receiving the audit utilization certificate of the previous season, the budget would be released.
28. Reservation for SC and ST community must be followed in selecting beneficiary farmers for conducting FLDs as per norms.
29. Submission of consolidated quarterly/season-wise physical and financial progress and annual progress reports at the end of financial year along with statement of expenditure of current year and audited utilization certificate in GFR-12-A.
30. Submission of States/District wise yield performance of FLDs of each crop season-wise along with recommendations for replication of results.
31. All VCPs supported by district OS mission must participate in the Field Day program.
32. It may be ensured that variety wise performance and yield should be tracked & maintained, so that best performing varieties are given priority for subsequent seasons.

1. Zone wise improved varieties recommended for FLDs on rapeseed-mustard (2025-26)

Zone-I: Kangra, Chatha, Pantnagar, Bajaura, Dhaulakuan, Una, Khudwani

Indian mustard: DRMR 1165-40, Radhika, RH 1424, RCH-1, RH 1975, Brijraj, JM 135, PM 33, PM 34, CS 64, THPM-1, RH (OE) 1706

Brown sarson: Shalimar Sarson-2, Shalimar Sarson-3

Gobhi Sarson: AKMS 8141, GSH 1699 (hybrid), Him Palam Gobhi Sarson 2, JGS 123, KGS-32

Yellow Sarson: Pant Pilli Sarson 2, Pant Girja

Zone -II: Abohar, Bawal, Ludhiana, Hisar, Sriganganagar, New Delhi, Modipuram, Navgaon

Indian Mustard:

Irrigated Timely Sown: RH 1975, PHR 126, PM 37, BPM 1825, TM 108-1, TM 267-3

Rainfed: RH 1424, PBR 378, DRMR 1165-40

Late Sown irrigated: Radhika, Brijraj

Quality: BPMQ-47, RH (OE) 1706, PM 32, PM 34, PM 33 (Double Zero), PM 35 (Double Zero), PM 36 (Double Zero), RCH 1 (hybrid),

Salinity/Alkalinity: CS 61, CS 62, CS 64

Gobhi Sarson: AKMS 8141, GSH 1699, Him Palam Gobhi Sarson 2

Zone-III: Kanpur, Morena, Kota, Jhansi, Banda, Bharatpur, Jaipur (RARI), Tikamgarh, Pantnagar and Dholi,

Indian Mustard:

Irrigated Timely Sown: PM 37, BPM 1825, RH 1975, Surekha, Azad Mahak

Rainfed: DRMR 1165-40, RH 1424

Quality: PDZM 35, PDZM 36, RH (OE) 1706

Late sown: BPM 11, Radhika, Brijraj, RVM-2

Yellow Sarson: Pant Pilli Sarson 2, Pant Girja, Jodhpur Yellow Sarson-1, Jodhpur Yellow Sarson-2

Toria: Azad Chetna, RVT-2, RVT-3

Taramira: RTM 1624

Salinity: CS 61, CS 62

Zone-IV: S.K. Nagar, Nagpur, Jalgaon, Mandore, ARS Washim (COA, Nagpur), Pali, Jobner

Indian Mustard: GM 6, BPM-11, GM 7, GM 8

Taramira: RTM 1624

Zone-V: Kanke, Shillongani, Kalyani, Dholi, Varanasi

Indian Mustard: DRMR 150-35, BPM 11, BPM 1825, BBM-1, TBM 204

Yellow Sarson: Sanchita, Anushka

Toria: TS 38, Jeuti

Zone-V: Imphal, Pasighat, Tripura (COA), Medziphema (Nagaland), Bermiok (Sikkim)

Indian Mustard: DRMR 150-35, BPM 11

Yellow Sarson: Anushka, Sanchita

Toria: TS 38, Jeuti

Zone-V: Jagdalpur, Bhubaneshwar (Ranital), Kanker, Bilaspur, Ambikapur

Indian Mustard: DRMR 150-35

Yellow Sarson: Anushka, Sanchita

Toria: TS 38, Jeuti

Taramira: RTM 1624

Centre wise allotment of FLDs on rapeseed-mustard for 2025-26

S.No	Zone/Centre	Allotment
1.	Kangra	100
2.	Jammu	200
3.	Hisar	100
4.	Bawal	100
5.	Sriganganagar	100
6.	Ludhiana	100
7.	Abhor	100
8.	RVSKVV, Morena	400
9.	RLBCAU, Jhansi	300
10.	BUAT, Banda (Uttar Pradesh)	100
11.	Kota	200
12.	Pantnagar	100
13.	Kanpur	200
14.	Varanasi	200
15.	Dholi	300
16.	Jobner	50
17.	Jodhpur	200
18.	Nagpur	200
19.	S.K. Nagar	100
20.	Bhubaneshwar	250
21.	Shillongani	300
22.	Kalyani/ Berhampore	500
23.	Kanke	200
24.	Jagdalpur, Chhattisgarh	100
25.	CAU, Imphal	200
26.	ICAR-IIRMR	300
	Grand total	5000

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

**Session VII :Management of Orobanche in Rapeseed-Mustard:
Issues and Opportunities
Brainstorming Session**

Chairman	: Dr. Dhiraj Singh, Ex- Director, ICAR-IIRMR, Bharatpur
Co-Chairman	: Dr. Sanjeev Gupta, ADG (OP), ICAR, New Delhi
Presentation	: Dr. R.S. Jat, Pr. Scientist-Agronomy, ICAR-IIRMR, Bharatpur
Panellist	: Prof. S.S. Banga, Ex- National Professor (ICAR), Ludhiana : Dr. S.R. Bhatt, Ex- Pr. Scientist, ICAR-NIPB, New Delhi : Dr. Jitendra Kumar, ADG (NASF), ICAR, New Delhi : Dr. S.K. Sharma, Director Research, RVSKVV, Gwalior : Dr. V.K. Choudhary, Pr. Scientist- Agronomy, ICAR-DWR, Jabalpur
Rapporteurs	: Dr. Aashish Gupta, Pr. Scientist, ICAR-NIPB, New Delhi : Dr. R.L. Choudhary, Sr. Scientist, ICAR-IIRMR, Bharatpur

The session was started with the welcome of the Chair and Co-chair and the panellists, and opening remarks by Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur. He highlighted that Orobanche is a real and emerging threat to rapeseed-mustard cultivation in India and need urgent and actionable solution on priority. He cited that under severe Orobanche infestation in Indian mustard, the farmers in Bharatpur region have to uproot and throw the crop.

Co-Chairman of the session, Dr. Sanjeev Gupta, ADG (OP), ICAR, New Delhi with pressing concerns over the threat being emerged due the large-scale infestation of Orobanche in rapeseed-mustard in particular and other field crops in general. He stressed that there should be serious and sincere efforts to control this chlorophyll less notorious weed and develop a '*National Strategy for Sustainable Management of Orobanche in field crops*' at priority basis.

Dr. R.S. Jat, Principal Scientist-Agronomy, ICAR-IIRMR, Bharatpur given a comprehensive presentation on Orobanche covering its taxonomy, biology & pathogenic characteristics, threats in new areas, surveyed and mapped infested district-wise area, yield losses assessment in economically important crops, growth cycle and its synchrony with host, parasitic weed management approaches, and chronological results of the field studies carried out with novel herbicide formulations. He reported 2.5-3.0 mha rapeseed-mustard area infested with Orobanche in Rajasthan, Haryana, Madhya Pradesh, Gujarat, Uttar Pradesh, West Bengal, Assam, Punjab causing yield toll 75-80%. Other crops like sunflower, safflower, cotton, tomato, potato, chilli, brinjal, tobacco, fababean, lentil, cumin, fennel, coriander, fenugreek and ashwagandha are also affected with Orobanche in India with yield losses about 50-80%. Its infestation is evolutionary referring to its adaptability and evolving nature that can potentially spread to new plant species, posing ongoing challenges to agriculture. He opinioned that management strategies should be aligned to control Orobanche at germination or before attachment stage to avoid the early infection and yield loss. Since, the subterranean tuber development is the most critical stage causing significant yield loss in rapeseed-mustard. Any management after emergence of Orobanche will be a futile exercise since damage has already been caused by tuber development stage. Dr. Jat highlighted the research advancements made so far for the Orobanche control through herbicidal control (botanical & chemical), exploration of natural source, exploration of mutagenesis for Orobanche tolerance, HT gene identification and editing and transgenics for target-site herbicide resistance by different research institutes. He elaborately discussed the Orobanche control using novel herbicide formulations (botanical & chemical) developed in collaboration with IPFT, Gurugram and discussed the findings. The results of multiple field trials summarized that metsulfuron methyl 5% SC @ 3-4 g a.i./ha decreased the yield losses and Orobanche infestation up to 90% (weed control efficiency) in Indian mustard under hot-spot conditions. He also stressed that an effective Orobanche control strategy require a multi-pronged approach, focusing on preventing seed dispersal, reducing the seed bank, and inhibiting parasite development at early stage.

Prof. S.S. Banga, Ex- National Professor (ICAR), Ludhiana has showed concerns over the effectiveness of sulfonylurea herbicides against the Orobanche and metribuzin resistance in weeds. He also suggested to have some alternative herbicides too, same herbicide should not be applied every year. Development of herbicide resistant cultivars are the better options, he added. He suggested that;

- Imazethapyr and metribuzin should also be explored for Orobanche control
- Screening of wild germplasms for Orobanche tolerance
- Develop a joint project involving all the centres having resistant/tolerant lines
- Use of *Fusarium solani* as-bioagent for Orobanche management.

Dr. S.R. Bhatt, Ex- Pr. Scientist, ICAR-NIPB, New Delhi suggested to have the experiences from the other crops infested by Orobanche and how it is being controlled there. He suggested to identify different Orobanche species and their diversity in consultation with Taxonomists. He explained that herbicides might be indirectly working in controlling the Orobanche weeds because of holo-parasitic nature of Orobanche herbicide may not work on it. He also pointed out the challenges in *in-vitro* germination of Orobanche, and suggested to use Arabidopsis to standardize the germination protocol. He mentioned the;

- Use of wild germplasms, genomics-based approaches and study on strigolactone to develop resistance.
- Creation of synthetic *B. napus* or *B. juncea* resistant lines, breeding programs, and standardize screening techniques.
- Study on receptor-inducer recognition and herbicide tolerant lines to build up a program in 1-2 years.

Dr. Jitendra Kumar (Ex-ADG, NASF) while, citing the example of IPFT residue studies, cautioned that metribuzin poses groundwater contamination risks and requires precise delivery systems. He informed the house that metsulfuron methyl do not have any residual effect and it is a safe herbicide. He also suggested that;

- Selection of most effective herbicides by reviewing literature should be first step for effective Orobanche control strategy
- Dose of herbicides can be reduced in the mutant lines
- EOI for metsulfuron-methyl formulations should be invited by the private companies for its commercialization
- Apply genome editing (base substitution) to target the ALS gene, alongside EMS and gamma mutagenesis.
- Suggested to have a comparative study of Corteva herbicide and newly developed formulation of metsulfuron methyl against the Orobanche in hot spot areas.

Dr. S.K. Sharma, Director Research, RVSKVV, Gwalior expressed his concern that Orobanche is causing huge yield losses to farmers, and they are looking for its effective management. He advocated for early-stage control of Orobanche to avoid the yield losses. He pointed out that;

- Neem oil achieved 80% control and should be studied for its mode of action, along with safe herbicide use.
- Mentioned Corteva's herbicide and imazethapyr and imidazoline combinations for integration.

Dr. V.K. Choudhary, Pr. Scientist- Agronomy, ICAR-DWR, Jabalpur revealed yield losses ranging from 40–50% with no known host resistance and suggested some technologies to control Orobanche like;

- Cultural measures such as summer deep plowing, soil solarization, and crop rotation with legumes (chickpea, cowpea, cluster bean) or cereals (wheat, barley) to reduce infestation intensity.
- Use of neem cake at 200 kg/ha (effective after three years), custard apple cake, and glyphosate application in non-cropped areas, along with trap crops like sunflower and fenugreek.
- Application of chlorsulfuron and triasulfuron against the Orobanche besides metsulfuron-methyl but, stressed the need for ALS-tolerant lines in mustard.

Dr. Naveen Singh, Pr. Scientist informed the house about the development of imazethapyr tolerant lines of Indian mustard by ICAR-IARI, New Delhi.

Dr. Naveen Chandra Bisht, Scientist VI, University of Delhi South Campus, New Delhi, suggested for targeting the both ESPS and ALS inhibitor herbicides in the development of herbicide tolerant lines of rapeseed-mustard.

Dr. Sanjeev Gupta, ADG (O&P) noted that Orobanche, a chlorophyll-deficient parasitic plant, produces up to 5 lakh seeds and causes severe yield losses. He highlighted the need of induced mutagenesis which could be applied to develop ALS-resistant lines, suggesting an integrative national-level strategy for Orobanche control and emphasizing the need for bio-herbicide-based crop protection systems.

- Induced mutagenesis should be used to create ALS resistant lines
- Develop integrative Orobanche management strategy at National level
- Development of a system of crop protection using bio-herbicide

Chairman of the session, Dr. Dhiraj Singh, Ex- Director, ICAR-IIRMR, Bharatpur put concerns over the acceptance of herbicide resistance mustard by the farmers in general and natural and organic farming grower in particular. He emphasized to develop a precise screening protocol for Orobanche tolerant lines. He also expressed satisfaction over the Orobanche management through the novel herbicides formulations, a most practical method to control such a perilous weed. He suggested the following points;

- Standardize a robust screening protocol using soil from infested areas
- Strictly monitor the herbicide toxicity in plant and soil prior to making any recommendation for herbicide to control Orobanche
- The allelopathic effects of crops like sunflower could be explored in Orobanche sick/susceptible areas.
- Formulating a chemical action plan with appropriate method of application.

After thorough discussion, the session concluded with a way-forward in developing a multi-pronged and sustainable approach to manage the devastating impact of Orobanche in Indian mustard. The session ended with the vote of thanks to the Chairman.

Action points:

1. **Tolerant/resistant sources re-evaluation:** the resistance lines available with ICAR-IIRMR, Bharatpur, ICAR-IARI, New Delhi, PAU, Punjab, ICAR-NBPGR and Corteva should be pooled and re-evaluated in hot spot areas.
2. **Novel herbicide formulations:** the experiment on exploration of novel herbicides formulations should be continued and identified formulations should be commercialized for Orobanche control.
3. **Project formulation:** formulate a multi-location project involving all cultural, biological, chemical and genetic options focusing on preventing seed dispersal, reducing the seed bank, and inhibiting parasite development at early stage in Indian mustard.

**XXXII Annual Group Meeting of AICRP Rapeseed-Mustard
August 6-8, 2025 at RVSKVV, Gwalior**

Session IX : Plenary Session

Chairman	: Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi
Co-Chairman	: Prof. S.S. Banga, Ex-National Professor (ICAR), Ludhiana
Convener	: Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur
Rapporteurs	: Dr. Hariom Kumar Sharma, Sr. Scientist, ICAR-IIRMR, Bharatpur
	: Dr. M.K. Tripathi, I/C, AICRP-RM, Morena

The session started with welcome and remark by Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur. The recommendations of each technical session were presented by respective Principal Investigators. Dr. Bhagirath Ram, Pr. Scientist, presented recommendations of Plant Breeding session. Dr. R.L Choudhary, Sr. Scientist presented recommendations of Agronomy session. He was advised to include recommendations of micro-nutrients with every recommendation. Dr. P.D. Meena, Pr. Scientist presented recommendations of Plant Pathology session. Dr. Anubhuti Sharma, Pr. Scientist presented recommendations of Biochemistry session. She was advised to make some modifications in recommendations. Dr. R.K. Yogi, Sr. Scientist presented recommendations of Front Line Demonstration session. Chairman of session told that breeder seed should not be used for conducting FLDs. Recommendations of plant Physiology session was presented by Dr. L.K. Meena.

Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur presented the proceedings of varietal identification committee meeting. He apprised the house that one hybrid and four varieties of Indian mustard has been identified by VIC. Dr. Singh, congratulated and appreciated the efforts of the centres, and scientists whose varieties were identified.

Dr. Sanjeev Gupta, ADG (OP & Seeds), ICAR, New Delhi advised that breeders should ensure the availability of breeder seed of newly identified varieties and hybrids of India mustard. He admired the efforts of scientists and other staffs for development of varieties and successful completion of 32nd AGM.

Before the session, Dr. P.D. Meena, Pr. Scientist, ICAR-IIRMR, Bharatpur and Dr. Pushp Sharma, Principal Physiologist cum HOD Botany, PAU, Ludhiana were felicitated on the occasion of their superannuation.

The session ended with the vote of thanks by Dr. V.V. Singh, Director, ICAR-IIRMR, Bharatpur. He conveyed his regards to Dr. A.K. Shukla, Vice-Chancellor, RVSKVV, Gwalior; Dr. S.K. Sharma, Director Research, RVSKVV, Gwalior and In-charge and team of ZARS, Morena for nicely organising the 32nd AGM at RVSKVV, Gwalior. He expressed his sincere gratitude to Secretary, DARE, GoI & DG, ICAR, New Delhi, DDG (CS), ICAR, New Delhi, ADG (OP & Seeds), ICAR, New Delhi, for their constant encouragement, guidance and support to improve rapeseed-mustard research and development programme. He also thanked all the PIs, rapporteurs, chairman, co-chairman, subject experts and all the delegates, press and electronic media and sponsoring agencies.