5. ENTOMOLOGY

The 2019-20 crop season witnessed low to moderate population development of mustard aphid on different Brassica species.

5.1 Screening of advanced breeding germplasm against mustard aphid

One hundred fifty six strains (IVT) including susceptible/tolerant checks were evaluated. Aphid pressure was low at HSR, KAN, LDH and PTN centres and moderate to severe at NDH, DHO SHIL, SKN and BPR centres. Fourty two entries were found promising (excluding check) having the AAII $\leq$ 1.5 (Table 5.1A). Among the fifty four AVT entries (AVT I and AVT II) screened against mustard aphid, fifteen entries (excluding check) were found promising since these recorded AAII $\leq$1.5 (Table 5.1B). Following entries were found promising *i.e* JT 13-8, Rasi 1605 (hybrid), BAUM 08-14, DRMRCI 116, RH 1999-18, TM-52, AKMS 19-2, RMM 12-2-18, PM-30, PRB 15-2, JM 14-2, HUJM 18-7, RMM 12-1-18, RH 1424, SKM 1621, NPJ 231, BAUM 08-18, DRMRCI 117, CAN 184/ACN 184, RGN 462, DRMRCI 118, NPJ 234, RH 1799-24, RH 1653, TM 263-3, NPJ 235, SVJH 85, RHH 1902, 7IJ0004, DRMRHJ 817, PHR 3828, RH (OE) 1710, LES 60, HNS 0901, GSH 1699, AKGC 19-14, HNS 0702, AKGS 19-8, RTM 1726, RMT 314, RMM 10-1-1, PBR 385, RH 1676, 7IJ0003 (Hybrid), DRMRIC 16-38, Raj Vijay Mustard 2, RH 1599-41, SVJH 108, NRCHB 506 (HC), PM 29 (LC), AKGS 8217, GSH 1707, AKGS 8146, GSH 1717, GSH 1699, GSH 6 (QC), Tapeswari (LC), BSH-1, Kranti (NC), RGN 73(LR), GSL 1 (ZC)

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

The highest yield loss was observed in PM 31 (60.22%) followed by RH725 (58.94%) and BSH-1 (55.44.2%) at **Kanpur,** 37.56 % in PM 31 at **S K Nagar,** 46 % in RH 725, 29.76% in NRCDR-2 and 32.68% in PM 31 at **Dholi**. In general, PM 31 suffered high yield loss at **Kanpur** (60.22%), **Dholi** (32.68%), **Hisar** (27.2%), **New Delhi** (21.6%), **Pantnagar** (20.25%) and 9.37% at **Bharatpur** 9.37 (Table 5.2).

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

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

At **Dholi,** high population of mustard aphid was recorded. It remained active from 6th-13th standard meteorological week (SMW) with peak activity during 6th-8th SMW (Table 5.3.1). At **Hisar,** low aphid population was observed from 1st-13th SMW with peak during 9th-12th SMW. The aphid population was observed till 13th std week after which it disappeared from the crop. Low population of painted bug (0.1-0.8 bugs/ mrl) was observed from 43rd-46th SMW on GSC-6, BSH-1, DRMR IJ-31 and T-27, while no population of cabbage caterpillar was observed. The activity of coccinellid predators was observed from 10th-13th SMW (Table 5.3.2 A&B). At **Kanpur**, aphid population generally remained active from 5th-11th SMW with peak activity during 7th-9th and 8th-9th SMW under timely and late sown conditions, respectively. Low to moderate population of painted bug was observed from 11th - 13th std week. The activity of coccinellid predators was moderate to high during 7th-11th SMW. However, low population of leaf miner was observed which remained active from 3rd-11th SMW. In addition to this, low to moderate population of sawfly was observed on early sown crop from 46th to 49th SMW (Table 5.3.3A, B, C). At **Ludhiana**, the population of mustard aphid remained low, both under timely and late sown conditions. Under timely sown conditions first appearance of mustard aphid was recorded during 6th SMW and remained active till 10th SMW, while under late sown conditions it remained active from 7th-11th SMW (Table 5.3.4). At **Morena**, mustard aphid remained active from 54th-13th SMW while the activity of painted bug was observed from 47th -50th SMW and coccinellid was recorded between 50th-3rd week (5.3.5 A&B). At **Pantnagar**, moderate to high population of mustard aphid was recorded on BSH 1, YST 151, Varuna, GSC 6, *B. nigra*, *B. alba* and IJ-31 during 3rd-8th SMW. Very low activity of cabbage caterpillar was recorded both under timely and late sown conditions. Cabbage caterpillar appeared as early as on 9th SMW under timely sown conditions and remained active till 12th SMW (Table 5.3.6). At **Shillongani,** peak population of mustard aphid was recorded during 4th to 10th SMW, sawfly during 51st-5th SMW, flea beetle from 49th to 4th SMW, coccinellid predators during 2nd to 9th SMW (Table 5.3.7A&B). At **SK**

Nagar, population of mustard aphid was recorded from 50th to 10th SMW in timely and late sown crop (Table 5.3.8). At **Bharatpur**, population of mustard aphid started appearing

51st SMW, peaked at 9th SMW and started disappearing at 14th SMW (Table 5.3.8).

5.3 (B) Monitoring of alate mustard aphids on yellow sticky traps

The alate aphid population was recorded by eight centres. At **Hisar**, the alate population appeared little late during 5th SMW, peaked (96.5 aphids/ trap) during 10th SMW and disappeared after 14th SMW. At **SK Nagar**, alate mustard aphid population appeared during 51th SMW, reached its peak (1523.6 aphids/ trap) during 7th SMW and disappeared after 12th SMW. At **Ludhiana**, alate aphid appeared as early as 43th SMW and remained active upto 14th SMW with peak (163 aphids/ trap) during 9th SMW. At **Pantnagar**, the alate aphid appeared in 3rd SMW and peaked (240.4 aphids/ trap) during 7th SMW, while it disappeared after 12th SMW. At **Kanpur**, it appeared during 5th SMW, peaked (38.1 aphids/ trap) during 9th SMW and disappeared after 11th SMW. At **Morena**, it appeared during 1st SMW, peaked (110 aphids/ trap) during 8th SMW and disappeared after 15th SMW. At **Bharatpur**, its first appearance was recorded during 1st SMW with peak activity (110 aphids/ trap) during 8th SMW and disappeared after 15th SMW (Table 5.3.10). At **Dholi**, it first appeared during 6th SMW, peaked during 10th SMW (121 aphids/ trap) and disappeared after 12th SMW.

5.4 Management of major insect-pests in Indian mustard

Efficacy of biointensive IPM module against mustard aphid

At **New Delhi,** treatment T_3 i.e. application of *Beauveria bassiana* @ 2 g/l was found to be the most effective and resulted in seed yield of 1918 kg h^{a-1} and 50.7 IBCR. (Table 5.4.1). At **Dholi, Hisar, Kanpur Ludhiana, Morena, Shillongini, SK Nagar and Bharatpur** treatment T_6 i.e. application of dimethoate 30 EC @ 1ml/l was found effective with respective seed yield of 880.0, 1687.4, 1904.0, 1788.0 kg, 2799.2 kg $ha^{-1,}$ 1005.0, 1268.0 and 2910.0 kg ha^{-1} and IBCR of 7.86, 12.80, 44.35, 40.87, 2.0, 3.00, 4.28 and 41.67, respectively **(**Table 5.4.2 to Table 5.4.10). At **Pantnagar**, treatment T_5 i.e. *Verticillium lecanii* @ 2g/l was found effective with seed yield of 1798.0 kg ha^{-1} and IBCR of 5.74 followed by treatment T_4 (azadirachtin 3000 ppm @ 5 ml/l followed by *Verticillium lecanii* @2 g/t) was found effective with seed yield of 1682 kg ha^{-1} and IBCR of 2.67.

5.5 Bio-efficacy of newer insecticides against mustard aphid

At **Delhi** center treatment T_2 (thiamethoxam 25 WG @ 0.2 g/l) was found to be effective with highest IBCR of 68.5 and significantly high seed yield (1930 kg/ha) than control (Table 5.5.1) . At **Dholi and Pantnagar** treatment T_5 (clothianidine 50 WDG @ 0.12 g/l) was found to be the most effective with 891.0 and 2434 kg ha^{-1} yield with 7.86, 3.2 IBCR respectively (Tabl 5.5.2 and 5.5.7). At **Morena** treatment T_4 (Dimethoate 30 EC @ 1 ml/L) was found to be the most effective with yield 2382 kg ha^{-1} and IBCR 3.3 (Table 5.5.6). At **Hisar**, treatment T_2 was found effective with 1827.6 kg ha^{-1} yield and 19.7 IBCR (Table 5.5.3). At **Kanpur** treatment T_1 (Imidacloprid 17.8 SL @ 0.25 ml/l) was found effective with 1772.0 kg ha^{-1} seed yield and 71.44 IBCR (Table 5.5.4). At **Ludhiana** treatment T_2 (thiamethoxam 25 WG @ 0.2 g/l) was found effective with seed yield of 1827.8 kg ha^{-1} and 49.60 IBCR followed by treatment T_5 (clothianidine 50 WDG @ 0.12 g/l) with 1791.7 kg ha^{-1} yield and 26.1 IBCR (Table 5.5.5). At **Shillongini, SK Nagar and Bharatpur** treatment T_1 (Imidacloprid 17.8 SL @ 0.25 ml/l) was found effective with yield 1024.23,1247 and 2209 kg ha^{-1} and IBCR of 3.15, 4.39 and 17.92, respectively (Tables 5.5.8 to 5.5.10).

5.6 Survey and surveillance of insect pests and their natural enemies

Survey and surveillance of insect pests was conducted at **SK Nagar, Pantnagar, Kanpur, Ludhiana and Shillongani** (Table 5.5.1 to 5.5.5). At **SK Nagar**, the mustard aphid was reported from first fortnight of January to second fortnight of March, while the coccinellids predators were reported from first fortnight of February to second fortnight of March. At **Hisar**, aphid activity was reported from February to March while painted bug remained active during October-November and coccinellid predators remained active from February to March. At **Kanpur,** aphid activity was recorded from second fortnight of January to first fortnight of March while painted bug remained active from second fortnight of October to First fortnight of November and again in the month of March. The leaf miner remained

active from first fortnight of January to first fortnight of March. Low activity of coccinellids was recorded from second fortnight of February to first fortnight of March. Some early activity of sawfly was also recorded from second fortnight of November to second fortnight of November. At **Ludhiana,** low aphid activity was recorded in second fortnight of February. However, the population of coccinellids remained low. At **Shillongani,** aphid activity was recorded from first fortnight of December to second fortnight of January, while coccinellid beetles' activity was recorded from second fortnight of November to second fortnight of January. Flea beetle remained active from November to January, sawfly from second fortnight of November to secondt fortnight of January. At **SK Nagar** aphid population was recorded on 1st fortnight of January till second fortnight of March.

Table 5.1 (A): Screening of IVT entries against mustard aphid during , 2019-20

Code	Entry	NDH	DHO	MOR	PTN	SHIL	SKN	BPR	Mean*
1. Toria									
SBG 19-01	BAUT 08-07	2.1	2.4	2.4	0.5	1.4	2.2	1.3	1.8
SBG 19-02	TL-19 (ST-3)	2.1	3.2	3.2	0.5	1.1	2.2	1.0	1.9
SBG 19-03	CAU Toria 2	1.7	2.4	3.6	0.5	1.1	2.1	1.3	1.8
SBG 19-04	PT 2015-7	1.8	3.0	3.1	0.4	1.3	2.2	1.3	1.9
SBG 19-05	**PT 303 (NC)**	1.8	2.6	3.6	0.6	1.4	2.1	1.0	1.9
SBG 19-06	RMT 04-18-18	1.6	3.2	2.6	0.6	1.5	2.1	1.0	1.8
SBG 19-07	TKM 19-2	1.9	2.9	3.1	0.5	1.3	2.2	1.3	1.9
SBG 19-08	CG toria 3	1.8	3.2	1.8	0.4	1.1	2.3	1.0	1.7
SBG 19-09	BAUT 08-06	1.6	2.6	2.2	0.5	1.1	2.2	1.0	1.6
SBG 19-10	**Panchali (ZC)**	1.5	2.5	3.2	0.4	1.3	2.2	1.0	1.7
SBG 19-11	TL 18 (ST-2)	1.9	2.2	3.6	0.3	2.1	2.2	1.0	1.9
SBG 19-12	CAU Toria 1-1	1.8	3.4	1.2	0.5	1.4	2.3	1.0	1.7
SBG 19-13	ORT 17-6-16	1.8	2.7	2.5	0.6	1.6	2.1	1.3	1.8
SBG 19-14	PT 20`5-6	2.1	2.7	3.2	0.5	1.7	2.1	1.0	1.9
SBG 19-15	**Bhawani (ZC)**	1.9	2.6	3.8	0.5	1.7	2.2	1.0	2.0
SBG 19-16	RMT 10-5-18	1.9	2.4	3.6	0.8	1.7	2.1	1.0	1.9
SBG 19-17	JT 13-8	1.7	2.9	0.0	0.7	1.5	2.1	1.0	1.4
SBG 19-18	CG toria 2	1.7	2.9	3.8	0.7	1.5	2.2	1.0	2.0
SBG 19-19	TKM 19-1	2.1	3.0	2.9	0.6	1.5	2.2	1.0	1.9
SBG 19-20	**Tapeswari (LC)**	1.7	2.6	1.6	0.7	1.7	NG	1.0	1.5
2. Mustard 2.1 Early Mustard									
SBG 19-21	Rasi 1605 (hybrid)	1.8	2.2	1.1	0.7	1.5	2.1	1.0	1.5
SBG 19-22	NPJ 230	1.7	2.6	2.1	0.6	1.3	1.9	1.3	1.7
SBG 19-23	BAUM 08-14	1.9	2.1	1.2	0.6	1.5	1.9	1.3	1.5
SBG 19-24	KMR (E) 19-2	1.5	2.1	3.4	0.5	1.3	2.0	1.7	1.8
SBG 19-25	PRE 17-5	1.5	3.0	2.1	0.5	1.3	1.9	1.0	1.6
SBG 19-26	PM-30	1.3	2.9	1.8	0.6	1.6	1.9	1.3	1.6
SBG 19-27	TM 53	1.9	2.2	1.2	0.6	1.7	1.9	1.3	1.6
SBG 19-28	RH 1999-42	1.5	2.6	1.4	0.7	1.6	1.9	1.3	1.6
SBG 19-29	DRMRCI116	1.7	3.0	0.0	0.6	1.6	2.0	1.0	1.4
SBG 19-30	ORM 41-3-5	1.8	2.4	3.6	0.8	1.4	1.8	2.0	2.0
SBG 19-31	NPJ 229	1.5	2.6	3.2	0.9	1.5	1.9	1.0	1.8
SBG 19-32	BSH-1	1.7	2.6	1.0	0.9	1.5	2.0	1.0	1.5
SBG 19-33	RH 1999-18	1.5	3.0	0.0	0.7	1.3	1.8	1.0	1.3
SBG 19-34	KMR(E) 19-1	1.5	3.0	3.8	0.7	1.5	1.8	1.0	1.9
SBG 19-35	PRE 17-2	1.5	2.2	2.8	0.7	2.2	1.8	1.0	1.7
SBG 19-36	RMM 12-3-18	2.3	2.4	2.4	1.0	1.2	1.8	1.0	1.7
SBG 19-37	DRMR 2017-21	2.1	2.2	2.4	1.1	1.3	1.9	1.0	1.7
SBG 19-38	BAUM 09-12-1	1.8	2.8	1.4	0.8	1.4	1.9	1.0	1.6
SBG 19-39	TM-52	1.5	2.2	0.0	1.0	1.6	2.1	1.0	1.3
SBG 19-40	**Kranti (NC)**	1.8	2.2	1.6	1.3	1.6	1.9	1.0	1.6
2.2 Timely sown, Irrigated									
SBG 19-41	AKMS 19-2	2.0	2.1	1.0	0.8	1.3	1.7	1.0	1.4
SBG 19-42	RMM 12-2-18	1.7	2.1	2.0	0.8	1.2	1.9	1.0	1.5
SBG 19-43	RH 1799-24	1.9	3.0	1.0	0.9	1.4	1.9	1.0	1.6
SBG 19-44	NPJ 232	1.7	2.9	1.4	0.9	1.4	2.0	1.0	1.6
SBG 19-45	PM-30	1.8	2.2	1.4	0.9	1.2	2.0	1.0	1.5
SBG 19-46	DRMR 2018-25	1.9	2.6	3.2	0.9	1.2	1.9	1.3	1.9
SBG 19-47	PRB 15-2	1.7	2.4	0.0	1.0	1.6	1.9	1.0	1.4
SBG 19-48	SKM 1712	1.5	2.4	3.6	0.9	1.7	1.8	1.3	1.9

SBG 19-49	KMR 19-4	2.0	2.2	3.6	0.8	1.6	1.9	1.0	1.9
SBG 19-50	BSH -1	1.5	2.2	1.6	1.0	1.5	1.8	1.0	1.5
SBG 19-51	JM 14-2	1.7	2.4	1.0	0.9	1.3	2.0	1.0	1.5
SBG 19-52	HUJM 18-7	2.0	2.5	0.0	1.0	1.4	1.8	1.0	1.4
SBG 19-53	RMM 12-1-18	1.8	2.2	1.0	1.0	1.5	1.9	1.0	1.5
SBG 19-54	RH 1424	1.7	2.2	1.8	0.8	1.5	1.8	1.0	1.5
SBG 19-55	PM 30	1.7	2.6	1.0	0.8	1.4	1.8	1.0	1.5
SBG 19-56	SKM 1621	1.7	2.8	0.8	0.9	1.5	1.8	1.0	1.5
SBG 19-57	NPJ 231	2.3	2.1	0.2	0.8	1.4	1.9	1.0	1.4
SBG 19-58	BAUM 08-18	1.9	2.1	0.6	1.0	1.2	1.8	1.0	1.4
SBG 19-59	DRMRCI 117	1.5	2.8	1.2	0.9	1.3	1.9	1.0	1.5
SBG 19-60	**Kranti (NC)**	1.8	3.0	0.0	0.9	1.5	2.0	1.3	1.5
SBG 19-61	KMR 19-3	2.3	2.4	1.2	1.6	1.6	1.8	1.0	1.7
SBG 19-62	TM 172-1	1.8	3.2	0.4	1.6	1.5	1.9	1.3	1.7
SBG 19-63	CAN 184/ACN 184	2.4	2.2	0.2	0.9	1.6	1.9	1.0	1.4
SBG 19-64	RGN 462	2.3	2.2	0.4	1.1	1.2	1.9	1.0	1.4
SBG 19-65	PR 17-7	1.7	3.2	2.4	0.9	1.1	2.0	1.0	1.8
SBG 19-66	BSH-1	1.9	3.0	2.4	0.8	1.2	1.7	1.7	1.8
2.3 IVT Mustard Rainfed									
SBG 19-67	DRMRSJ 47	1.7	3.0	1.9	0.7	1.6	1.9	1.7	1.8
SBG 19-68	RB 108	1.7	2.8	2.0	0.7	1.2	2.0	1.3	1.7
SBG 19-69	DRMRCI 118	1.7	2.4	1.2	0.8	1.3	1.9	1.3	1.5
SBG 19-70	NPJ 234	1.5	2.2	0.2	0.9	1.3	2.1	1.0	1.3
SBG 19-71	CAU -RM 5-1RGN 471	1.5	2.2	1.3	2.1	1.5	2.1	1.0	1.7
SBG 19-72	RGN471	1.8	3.7	0.4	1.0	1.5	1.9	1.7	1.7
SBG 19-73	PM-30	2.3	2.8	0.8	1.0	1.5	1.9	1.7	1.7
SBG 19-74	RH 1799-24	1.5	2.2	1.0	0.7	1.5	1.9	1.7	1.5
SBG 19-75	TM 258	2.0	3.4	3.9	1.2	1.4	1.9	1.3	2.2
SBG 19-76	DRMRHJ 503 (hybrid)	1.7	2.6	1.0	1.2	1.4	1.9	1.7	1.6
SBG 19-77	BAUM 08-18	2.3	2.4	1.0	1.5	1.1	1.9	2.3	1.8
SBG 19-78	CAU -RM 4-1	2.2	2.1	2.0	1.7	1.3	2.0	1.3	1.8
SBG 19-79	NPJ 233	1.8	2.8	2.2	1.4	1.5	2.0	1.7	1.9
SBG 19-80	**Kranti (NC)**	2.0	2.6	3.4	1.3	1.5	1.9	1.7	2.0
SBG 19-81	RGN 472	1.7	3.0	1.6	1.3	1.6	1.8	2.0	1.9
SBG 19-82	RB 106	1.7	2.4	0.8	1.7	1.4	1.8	1.3	1.6
SBG 19-83	DRMRHT 19-2815	1.7	3.0	1.2	1.3	1.4	1.8	1.7	1.7
SBG 19-84	PBR 385	1.7	2.8	1.0	1.6	1.4	1.7	1.0	1.6
SBG 19-85	RH1653	2.0	2.6	0.0	1.4	1.3	2.0	1.3	1.5
SBG 19-86	TM 263-3	1.7	2.1	0.6	1.5	1.2	2.0	1.3	1.5
SBG 19-87	BSH -1	1.7	2.7	2.5	1.2	1.3	1.9	2.3	2.0
2.4 IVT Mustard Late Sown									
SBG 19-88	KMR (L) 19-6	1.7	2.2	3.1	1.6	1.6	1.9	1.7	2.0
SBG 19-89	HUJM 18-9	1.7	3.1	2.0	1.3	1.6	1.8	1.0	1.8
SBG 19-90	NPJ236	1.7	3.2	2.1	1.5	1.4	2.2	2.0	2.0
SBG 19-91	DRMRHT 19-283	1.8	3.0	1.9	1.2	1.5	1.8	1.7	1.8
SBG 19-92	PRL 16-5	2.0	3.0	3.6	1.1	1.3	1.7	1.3	2.0
SBG 19-93	RGN 476	2.0	2.2	1.5	1.1	1.3	1.8	1.0	1.6
SBG 19-94	PM 30	1.5	3.2	2.5	0.9	1.2	2.1	1.3	1.8
SBG 19-95	MCB 1-2-3-2-4		3.5	0.4	1.0	1.3	1.9	2.3	1.7
SBG 19-96	TM-134	1.5	3.2	3.8	0.9	1.3	1.9	1.7	2.0
SBG 19-97	RH 1899-40	1.5	2.6	2.5	1.0	1.5	2.1	1.7	1.8
SBG 19-98	DRMR 2017-26	1.5	3.1	2.1	0.8	1.2	2.0	2.0	1.8
SBG 19-99	KMR(L) 19-5	1.5	2.2	1.4	1.3	1.5	1.9	1.3	1.6
SBG 19-100	PRL 17-5	1.7	2.6	1.8	0.7	1.6	1.8	1.3	1.6
SBG 19-101	**Kranti (NC)**	1.5	2.8	0.8	1.2	1.5	1.9	1.3	1.6
SBG 19-102	PBR 396	1.5	2.4	3.0	1.0	1.3	1.9	1.0	1.7
SBG 19-103	RGN 463	1.7	3.0	1.0	0.8	1.4	1.8	1.3	1.6
SBG 19-104	RH 1599-44	1.5	2.6	1.8	1.2	1.4	1.8	1.3	1.7
SBG 19-105	NPJ 235	1.3	2.8	1.0	1.0	1.4	1.8	1.3	1.5
SBG 19-106	DRMRCI115	1.5	3.0	1.0	1.1	1.6	1.9	1.3	1.6
SBG 19-107	BSH -1 (C)	1.7	2.4	0.9	1.3	1.5	1.8	1.3	1.5
2.5 Hybrid Mustard									
SBG 19-108	17J157C	1.5	2.4	2.4	1.1	1.4	2.0	1.0	1.7
SBG 19-109	DRMRHJ3103	1.7	2.6	2.1	0.9	1.2	1.8	1.7	1.7
SBG 19-110	SVJH85	1.7	3.0	0.6	0.9	0.6	1.9	1.0	1.4
SBG 19-111	RHH1902	1.8	2.6	1.0	0.8	1.2	2.0	1.3	1.5

SBG 19-112	RASI 1604	1.5	3.2	1.0	0.9	1.2	1.9	1.7	1.6
SBG 19-113	PHR 3278A	1.7	3.0	1.6	0.8	1.3	1.9	1.0	1.6
SBG 19-114	PM30	1.5	2.2	3.6	0.8	1.6	1.9	1.3	1.8
SBG 19-115	7IJ0004	1.5	2.2	1.4	1.1	1.4	1.9	1.3	1.5
SBG 19-116	DRMRHJ817	1.5	2.4	0.8	1.0	0.8	1.9	1.0	1.3
SBG 19-117	PHR3828	1.5	2.6	0.8	0.9	1.5	1.9	1.0	1.5
SBG 19-118	SVJH008	1.5	2.2	2.1	1.2	1.2	2.0	1.0	1.6
SBG 19-119	17J039C	1.5	2.8	1.0	1.1	1.5	2.1	1.0	1.6
SBG 19-120	RHH1901	1.5	2.7	2.2	0.6	1.6	1.9	1.0	1.6
SBG 19-121	DRMRHJ1518	1.4	3.0	3.1	0.8	1.3	1.9	1.0	1.8
SBG 19-122	**Kranti (NC)**	1.5	3.6	3.0	1.0	1.3	1.9	1.3	2.0
2.6 Quality Mustard : IVT									
SBG 19-123	RH(OE)1722	1.5	3.2	2.1	0.7	1.4	2.0	1.0	1.7
SBG 19-124	9IJ5001	2.3	2.8	1.0	0.8	1.4	2.0	1.0	1.6
SBG 19-125	LES61	2.2	3.0	3.6	1.4	1.6	1.8	1.0	2.1
SBG 19-126	BSH-1	2.0	2.2	1.6	0.8	1.3	1.7	1.0	1.5
SBG 19-127	DRMRQ 5-2	1.7	2.6	1.8	1.2	1.2	2.0	1.0	1.6
SBG 19-128	PDZ 13#	1.8	3.4	1.6	1.1	1.4	1.9	1.3	1.8
SBG 19-129	JC 33	1.8	2.8	1.4	1.1	1.3	2.0	1.0	1.6
SBG 19-130	PM 30	2.0	2.4	1.4	1.2	1.2	2.0	1.0	1.6
SBG 19-131	RH (OE) 1710	1.5	2.4	0.2	0.8	1.4	2.0	1.0	1.3
SBG 19-132	LES 60	1.8	3.2	1.0	0.7	1.2	1.8	1.0	1.5
SBG 19-133	JC 21	1.8	3.4	2.6	0.6	1.2	2.0	1.0	1.8
SBG 19-134	BSH-1	1.7	3.0	3.1	0.9	1.2	1.9	1.0	1.8
2.7 Mustard : Saline/Alkaline condition									
SBG 19-135	CS 2005-143	2.0	3.0	3.4	0.7	1.4	1.8	1.0	1.9
SBG 19-136	CS 2002-99	1.5	2.6	3.0	0.6	1.4	1.9	1.0	1.7
SBG 19-137	CS54	1.5	2.8	2.5	0.8	1.3	2.0	1.0	1.7
SBG 19-138	CS 2007-165	1.3	2.6	1.8	1.0	1.3	1.9	1.3	1.6
SBG 19-139	CS 2009-313	1.5	2.2	3.8	0.9	1.0	1.8	1.3	1.8
SBG 19-140	CS 60	1.8	2.4	3.6	0.7	1.3	1.7	1.0	1.8
3. *Gobhi Sarson*: IVT									
SBG 19-141	HNS 0901	1.5	2.4	0.8	0.7	1.5	1.9	1.0	1.4
SBG 19-142	GSH 1699	1.8	2.4	1.1	0.9	1.4	1.9	1.3	1.5
SBG 19-143	AKGC 19-14	2.0	2.2	0.8	0.8	1.3	1.8	1.0	1.4
SBG 19-144	HNS 0702	1.8	2.6	1.0	0.8	1.2	1.8	1.0	1.5
SBG 19-145	**GSL 1 (ZC)**	1.7	2.4	1.0	0.5	1.3	1.8	1.0	1.4
SBG 19-146	GSH 2180	2.2	2.8	2.1	0.7	1.6	1.9	1.0	1.8
SBG 19-147	JGS 13-6	1.8	3.2	1.6	0.9	1.4	1.9	1.0	1.7
SBG 19-148	AKGS 19-8	1.7	2.4	1.4	0.9	1.3	1.8	1.0	1.5
SBG 19-149	GSH 2196	1.8	2.0	2.5	1.1	1.4	1.8	1.0	1.7
SBG 19-150	**GSH 6 (QC)**	1.7	2.8	3.2	0.8	1.2	2.0	1.0	1.8
4. *Taramira*: IVT+AVT I (Repeat)									
SBG 19-151	RTM 1726	1.5	2.2	1.0	0.8	1.4	1.9	1.0	1.4
SBG 19-152	**T27 (NC)**	1.5	3.0	2.4	0.9	1.3	1.8	1.0	1.7
SBG 19-153	RTM 1624 (AVT I Entry)	1.5	3.5	1.6	0.8	1.4	1.8	1.3	1.7
SBG 19-154	RMT 314 (C)	1.5	2.1	0.6	1.0	1.3	1.8	1.0	1.3
SBG 19-155	RMT1679	1.5	3.4	2.8	0.8	1.3	1.8	1.0	1.8
SBG 19-156	BSH1	1.5	2.0	3.0	1.1	1.3	2.3	1.0	1.7

*** Data from centres HSR, LDH, KAN not included as the aphid pressure was very low**

Project 5.1 (B): Screening of AVT I and AVT II genotypes for resistance against mustard aphid

Code No.	Entries	NDH	DHO	LDH	MOR	PTN	SHIL	SKN	BRP	Mean
Toria										
SAG 19-1	**PT-303 (NC)**	1.5	2.6	2.5	1.6	1.3	1.5	2.3	1.0	1.8
SAG-19-2	TS 38	1.5	2.2	2.9	0.8	1.2	1.6	2.4	1.0	1.7
SAG-19-3	**Panchasli (ZC)**	1.5	2.6	2.7	1.0	1.0	1.5	2.4	1.0	1.7
AVT I Early Mustard										
SAG-19-4	DRMRCI 96	1.5	3.4	1.9	1.0	1.1	1.7	2.2	1.0	1.7
SAG-19-5	PM -29	2.1	2.8	2.6	0.6	1.3	0.5	2.1	1.0	1.6
SAG-19-6	RMM 10-1-1	1.5	2.4	1.3	1.0	1.2	1.2	2.0	1.0	1.4
SAG-19-7	PM-28	1.4	2.4	1.0	2.1	1.4	1.5	2.1	1.0	1.6
SAG-19-8	DRMRHJ2403 (Hybrid)	Missing								
SAG-19-9	**JD6 (ZC)**	1.4	2.4	0.8	2.1	1.2	1.6	1.9	1.0	1.6
Timely Sown Irrigated										
SAG-19-10	RGN 443	1.7	2.2	2.1	2.4	1.3	1.3	1.9	1.0	1.7
SAG-19-11	SKM 1626	1.3	2.6	1.1	1.8	1.4	1.2	2.0	1.0	1.6
SAG-19-12	**Kranti (NC)**	1.5	2.2	1.5	1.4	1.6	1.3	2.0	1.0	1.6
SAG-19-13	PBR 385	1.5	2.2	1.1	1.6	1.5	1.0	2.0	1.0	1.5
SAG-19-14	PR 2016 -4	1.5	2.4	1.5	2.1	1.1	1.1	2.0	1.0	1.6
SAG-19-15	**RH 749 (ZC)**	1.5	3.2	1.2	2.1	1.3	1.1	2.0	1.0	1.7
SAG-19-16	**PR 749 (ZC)**	1.6	2.6	0.9	2.0	1.3	2.6	2.1	1.0	1.8
SAG-19-17	PR 2016 -8	1.8	2.2	1.7	2.4	1.4	1.4	2.1	1.0	1.8
SAG-19-18	DRMR 2017 -16	2.0	2.8	2.2	1.8	1.4	1.6	2.1	1.0	1.9
SAG-19-19	**DMH 1 (HC)**	1.5	3.0	2.9	1.0	1.4	1.3	2.1	1.0	1.8
SAG-19-20	RH 1676	1.3	2.6	1.3	1.6	1.5	0.7	1.9	1.0	1.5
SAG-19-21	7IJ0003 (Hybrid)	1.4	3.4	1.6	0.0	1.6	1.3	NG	1.0	1.5
SAG-19-22	**MAYA (ZC)**	1.6	2.8	0.9	1.6	1.4	1.3	2.0	1.0	1.6
SAG-19-23	**RGN 73(LR)**	1.5	2.1	1.1	1.2	1.1	1.5	2.0	1.0	1.4
Mustard (Rainfed)										
SAG-19-24	RH1424	1.5	2.5	1.1	1.6	1.3	1.3	1.9	1.0	1.5
AVT I Late Sown (Irrigated)										
SAG-19-25	DRMR 2017 -15	1.8	3.0	0.9	1.2	1.3	1.6	2.1	1.0	1.6
SAG-19-26	**PM 26(ZC)**	1.5	2.6	2.7	1.4	1.3	1.5	2.0	1.0	1.7
SAG-19-27	DRMRIC 16-38	1.6	3.2	0.3	0.6	1.3	1.5	2.1	1.0	1.4
SAG-19-28	Raj Vijay Mustard 2	1.4	2.5	2.0	0.4	1.4	1.2	2.1	1.0	1.5
SAG-19-29	RH1599-41	1.5	2.9	1.3	0.0	1.7	1.2	2.1	1.0	1.5
SAG-19-30	**Kranti (NC)**	1.5	3.0	0.7	1.0	1.3	1.4	2.0	1.0	1.5
Hybrid Mustard										
SAG-19-31	8IJI004	1.5	2.2	1.0	2.4	1.2	1.3	2.0	1.0	1.6
SAG-19-32	**DMH1(HC)**	1.6	2.6	1.7	1.0	1.5	1.6	2.0	1.0	1.6
SAG-19-33	SVJH 108	1.7	2.6	0.7	1.2	1.5	1.6	1.9	1.0	1.5
SAG-19-34	**NRCHB506 (HC)**	1.6	2.7	2.3	0.0	1.1	1.2	2.1	1.0	1.5
AVT Quality Mustard										
SAG-19-35	RH (OH) 1706	1.7	2.7	1.3	0.4	2.6	1.3	2.1	1.0	1.6
SAG-19-36	PDZ 12#	1.8	2.6	1.0	2.8	1.5	1.4	2.1	1.0	1.8
SAG-19-37	**PM 29 (LC)**	1.6	2.4	1.4	0.8	1.6	1.2	2.0	1.0	1.5
SAG-19-38	RH (OH) 1706	1.5	2.9	1.2	1.4	1.5	1.2	2.0	1.0	1.6
SAG-19-39	LES54*	1.8	2.4	3.2	2.6	1.4	1.3	2.1	1.0	2.0
SAG-19-40	PDZ 1 (Double low check)	1.6	2.4	1.4	2.8	1.1	1.5	2.2	1.0	1.7
SAG-19-41	LES 59	1.6	2.2	0.7	2.6	1.2	1.4	2.0	1.0	1.6
SAG-19-42	PDZ 11	1.7	2.2	1.9	2.8	1.2	2.0	2.0	1.0	1.9
SAG-19-43	PM30	1.7	2.1	1.8	1.0	1.3	1.5	2.0	1.0	1.6
Gobhi Sarson										
SAG-19-44	AKMS 8141	2.1	2.5	1.1	2.4	1.1	1.2	2.1	1.0	1.7
SAG-19-45	AKGS 8217	1.8	2.4	1.3	0.4	1.0	1.1	1.8	1.0	1.4
SAG-19-46	**GSL 1 (ZC)**	1.9	2.2	0.8	0.0	1.2	1.2	1.8	1.0	1.3
SAG-19-47	GSH 1707	2.0	3.0	0.8	0.0	1.0	1.1	1.8	1.0	1.3
SAG-19-48	AKGS 8146	2.1	2.2	1.5	0.4	1.1	2.1	1.8	1.0	1.5
SAG-19-49	**Kranti (NC)**	1.7	2.6	1.8	1.0	1.3	1.3	2.1	1.0	1.6
SAG-19-50	GSH1717	2.0	2.6	0.8	0.0	1.1	1.2	1.8	1.0	1.3
SAG-19-51	GSH1699	2.0	2.2	1.3	0.0	1.1	1.3	1.8	1.0	1.3
SAG-19-52	GSH6 (QC)	1.8	3.6	0.8	0.0	1.1	1.2	2.1	1.0	1.5
SAG-19-53	HNS 1102	1.6	2.2	0.8	2.4	1.0	1.5	2.1	1.0	1.6
SAG-19-54	BSH 1	1.3	2.5	2.2	2.8	1.0	1.7	2.3	1.0	1.8

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

Centre	Mustard aphid population in unprotected plot	Yield (kg/ha)		Avoidable yield losses (%)
		Protected	Unprotected	
Hisar				
PM-31	101.2	1866.5	1357.1	27.2
RH 725	91.8	1968.2	1684.2	14.4
CD (p=0.05)	**NS**	**88.41**	**142.3**	-
Dholi				
Rajendra Suflam	13.6	1090	840	29.76
PM-31	17.8	1015	765	32.68
RH-725	22.4	940	710	32.39
CD (p=0.05)	-	**92.05**	**66.14**	-
S.K.Nagar				
PM-31	223.6	1226	765	37.56
RH-725	232.4	1222	659	46.07
GDM-4	231.5	1069	805	24.72
Morena				
PM-31	65.2	2744	2369	13.6
RH-725	54.2	2992	2665	10.9
CD (p=0.05)	**11.38**	-	-	-
Kanpur				
PM-31	25.17	1745	694	60.22
RH-725	27.70	1666	684	58.94
BSH-1	56.40	734	327	55.44
CD (p = 0.05)	**1.120**	**273.674**	**254.859**	-
New Delhi				
PM-31	42.31	2197.8	1807.3	21.6
RH-725	110.6	2093.7	1880.1	11.4
Pant Nagar				
PM-31	111.21	1531	1221	20.25
RH-725	132.8	1195	1101	7.87
Varuna	106.2	1275	1157	9.25
Bharatpur				
PM-31	101.3	1697	1538	9.37
RH-725	58.0	1920	1790	6.77

Table 5.3.1: Population dynamics of various insect-pests and predators on *Brassica* varieties at Dholi during 2019-20

SMW	Weather parameters				No. of rainy days	Aphid population/10 cm top twig				
	Temperature (°C)		RH (%)							
	Max.	Min.	07hrs	14hrs		DRMRIJ-31	BSH-1	GSC-6	T-27	RS
4th	19.9	6.7	100.00	91.2	-	2.8	3.5	3.6	4.2	1.6
5th	22.0	8.4	100.00	90.0	-	7.7	11.8	6.2	7.0	3.8
6th	23.0	6.3	100.00	86.0	-	19.6	22.2	18.5	21.6	15.0
7th	24.6	9.7	100.00	87.4	-	26.2	32.0	28.0	29.7	22.2
8th	26.2	13.2	100.00	92.2	-	32.9	40.5	37.2	41.5	33.7
9th	24.0	13.1	100.00	91.5	-	7.4	10.2	8.4	12.3	6.4
10th	26.9	15.0	100.00	87.7	2	0.4	1.6	1.2	1.9	1.5
11th	26.0	14.5	100.00	88.2	1	0.0	0.0	0.0	0.0	0.0
12th	29.4	15.4	100.00	88.5	1	0.0	0.0	0.0	0.0	0.0
Correlation coefficient DRMRIJ-31	0.21	0.14	0.04	(-0.44)	(-0.07)					
BSH-1	0.31	0.19	0.05	(-0.50)	(-0.13)					
GSC-6	0.28	0.26	0.10	(-0.52)	(-)0.18					
T-27	0.22	0.19	0.07	(-0.40)	(-)0.14					
RS	0.30	0.20	0.02	(-0.57)	(-)0.09					

Table 5.3.2 (A): Population dynamics of various insect-pests and predators on *Brassica* varieties at Hisar during 2019-20

*S M W	Temperature (°C)		R.H. (%)		Sun shine (hrs)	Wind speed (Kmph)	RF (mm)	DRMRIJ 31		GT 27		GSC 6		BSH 1	
	Max.	Min.	Max.	Min.				No of aphid /10 cm top twig		No of aphid /10 cm top twig		No of aphid /10 cm top twig		No of aphid /10 cm top twig	
								*T	*L	T	L	T	L	T	L
1	17.3	5.7	96	60	3.5	0.0	2.6	T	L	0	0	0	0.0	-	0.0
2	17.7	5.7	96	64	3.3	3.2	0.0	0	0.0	0	0	0	0.0	-	0.0
3	13.4	4.7	100	82	2.1	0.0	0.0	0	0.0	0	0	0	0.0	-	0.0
4	19.2	5.0	97	56	5.9	7.2	0.0	0	0.0	0	0	0	0.0	-	0.3
5	18.8	3.9	98	61	6.3	0.0	0.0	0	0.0	0	0	0	0.0	-	0.7
6	20.1	2.8	92	46	7.2	0.0	0.3	0	0.0	0	0	0	0.0	-	2.1
7	24.7	4.8	93	36	8.7	0.0	0.0	0	0.0	0	0.8	0	3.1	-	14.3
8	23.8	10.5	89	61	6.4	10.9	0.0	0	2.8	0	14.9	0	21.4	0	37.5
9	26.0	12.1	95	55	6.7	0.2	12.0	0	18.8	0	39.4	0	44.2	0	101
10	23.1	11.7	90	66	5.7	61.8	0.0	0	55.7	0	58.2	0	98.7	0	68.1
11	23.8	9.8	94	53	6.5	11.6	4.5	0	113.1	0	48.5	0	67.5	0	42.3
12	29.2	14.4	91	52	6.3	1.5	0.0	0	88.8	0	11.4	0	20.2	0	31.5
13	27.6	15.0	92	55	5.2	20.6	0.0	0	22.6	0	1.3	0	4.8	0	6.4

*SMW- Standard Meteorological week *Timely sown, L- Late sown

Table 5.3.2 (B): Population dynamics of various insect-pests and predators on *Brassica* varieties at Hisar during 2019-20

*S M W	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	Wind speed Kmph	RF (mm)	(RH 30)		GT 27		(HNS 0901)		BSH 1	
	Max.	Min.	Max.	Min.				Coccinellids (Grub+adults)/ plant		Coccinellids (Grub+adults)/ plant		Coccinellids (Grub+adults)/ plant		Coccinellids (Grub+adults)/ plant	
								T	L	T	L	T	L	T	L
1	17.3	5.7	96	60	3.5	0.0	2.6	0	0	0	0.0	0	0.0	0	0.0
2	17.7	5.7	96	64	3.3	3.2	0.0	0	0	0	0.0	0	0.0	0	0.0
3	13.4	4.7	100	82	2.1	0.0	0.0	0	0	0	0.0	0	0.0	0	0.0
4	19.2	5.0	97	56	5.9	7.2	0.0	0	0	0	0.0	0	0.0	0	0.0
5	18.8	3.9	98	61	6.3	0.0	0.0	0	0	0	0.0	0	0.0	0	0.0
6	20.1	2.8	92	46	7.2	0.0	0.3	0	0	0	0.0	0	0.0	0	0.0
7	24.7	4.8	93	36	8.7	0.0	0.0	0	0	0	0.0	0	0.0	0	0.0
8	23.8	10.5	89	61	6.4	10.9	0.0	0	0	0	0.0	0	0.0	0	0.0
9	26.0	12.1	95	55	6.7	0.2	12.0	0	0.3	0	0.6	0	0.0	0	0.8
10	23.1	11.7	90	66	5.7	61.8	0.0	0	0.9	0	1.1	0	0.5	0	2.2
11	23.8	9.8	94	53	6.5	11.6	4.5	0	1.6	0	1.9	0	1.3	0	2.5
12	29.2	14.4	91	52	6.3	1.5	0.0	0	2.8	0	2.7	0	2.1	0	2.9
13	27.6	15.0	92	55	5.2	20.6	0.0	0	1.5	0	2.9	0	2.5	0	2.3

*SMW- Standard Meteorological week, *Timely sown, L- Late sown

Table 5.3.2 (C): Population dynamics of painted bug on *Brassica* varieties at Hisar, 2019-20

Population dynamics of painted bug on *Brassica* varieties															
*SWM	Meteorological observations						No. of painted bug/ m row							
							Timely Sown				Late Sown			
	Temperature (^{o}C)		RH (%)		Sun shine (hours)	Rain fall (mm)	*B. juncea*	*Eruca sativa*	*B. napus*	*B. rapa*	*B. juncea*	*Eruca sativa*	*B. napus*	*B. rapa*
	Max.	Min.	Mor	Even			DRMRIJ 31	T 27	GSC 6	BSH 1	DRMRIJ 31	T 27	GSC 6	BSH 1
40	31.8	21.0	92	50	5.5	2.6	0.0	0.0	0.0	0.0	-	-	-	-
41	32.7	17.6	90	39	7.5	0.0	0.0	0.0	0.0	0.0	-	-	-	-
42	34.1	18.4	79	34	7.3	0.0	0.0	0.0	0.0	0.0	-	-	-	-
43	31.9	14.9	79	31	6.5	0.0	0.3	0.3	0.1	0.4	-	-	-	-
44	30.7	16.2	90	35	1.8	0.0	0.5	0.8	0.6	0.5	-	-	-	-
45	28.4	12.7	85	36	6.6	0.3	0.9	1.4	0.9	1.1	-	-	-	-
46	26.8	12.7	86	41	2.5	0.0	1.2	1.8	1.2	1.4	-	-	-	-
47	26.7	10.9	88	42	4.7	0.0	0.4	0.9	0.7	0.8	0.0	0.0	0.0	0.0
48	22.6	12.1	92	62	2.8	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	23.1	6.0	88	47	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	19.2	8.3	95	73	2.2	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	13.7	6.1	99	81	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	11.9	2.6	97	76	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Weather data provided by the Department of Agricultural Meteorology, CCS HAU, Hisar, *SMW- Standard Meteorological week

Table 5.3.3 :(A): Population dynamics of various insect-pests and predators on *Brassica* varieties at Kanpur, 2019-20

*SMW	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	Wind speed Km/h	RF (mm)	Urvashi				GSC-6				BSH-1				T-27				DRMRIJ-31			
	Max.	Min.	Max.	Min.				No of aphid /10 cm twig		*No of Painted bug / mrl		No of aphid /10 cm twig		*No of Painted bug / mrl		No of aphid /10 cm twig		*No of Painted bug / mrl		No of aphid /10 cm twig		*No of Painted bug / mrl		No of aphid /10 cm twig		*No of Painted bug / mrl	
								*T	*L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
43	30.5	16.7	88.0	46.0	9.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	30.9	18.4	89.4	45.1	9.2	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	29.8	16.3	85.1	40.3	6.5	2.8	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.6	0.0	0.0	0.0	1.5	0.0
46	29.0	14.6	86.7	37.7	8.1	2.5	0.0	0.0	0.0	1.9	0.0	0.0	0.0	2.3	0.0	0.0	0.0	2.9	0.0	0.0	0.0	2.3	0.0	0.0	0.0	2.3	0.0
47	27.6	13.3	87.1	41.7	8.7	2.7	0.0	0.0	0.0	3.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	4.6	0.0	0.0	0.0	2.3	0.0	0.0	0.0	3.2	0.0
48	25.8	14.3	90.0	58.0	5.3	2.5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	2.6	0.0
49	24.3	9.9	92.0	44.0	6.9	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	21.3	11.9	95.0	69.0	4.5	3.5	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	16.8	8.8	86.0	66.0	7.3	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	12.3	4.2	90.3	72.3	7.3	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	20.3	9.5	93.0	62.0	4.4	3.9	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	18.1	8.1	95.0	67.0	4.9	4.4	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	17.3	10.9	96.0	81.0	8.0	4.0	65.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
4	21.2	7.5	89.0	46.0	3.2	4.4	0.0	1.6	0.0	0.0	0.0	0.8	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0
5	21.1	8.3	91.0	46.0	8.5	5.1	0.0	6.0	0.0	0.0	0.0	8.5	0.0	0.0	0.0	12.1	8.0	0.0	0.0	1.0	0.0	0.0	0.0	6.9	0.0	0.0	0.0
6	21.9	6.7	92.0	46.0	5.1	2.4	0.0	7.0	4.2	0.0	0.0	8.0	5.4	0.0	0.0	14.6	9.7	0.0	0.0	2.9	2.1	0.0	0.0	11.0	14.8	0.0	0.0
7	24.7	11.0	77.0	42.0	5.4	6.6	0.0	12.5	18	0.0	0.0	13.3	12.2	0.0	0.0	19.3	25.4	0.0	0.0	5.7	4.2	0.0	0.0	18.9	22.1	0.0	0.0
8	25.3	13.7	86.0	55.0	5.5	5.7	1.8	15.5	19.6	0.0	0.0	17.9	28.0	0.0	0.0	32.3	31.5	0.0	0.0	7.6	7.3	0.0	0.0	19.9	29.2	0.0	0.0
9	27.0	15.0	87.0	53.0	4.5	3.5	2.6	10.2	31.3	0.0	0.0	16.5	42.4	0.0	0.0	14.8	63.0	0.0	0.0	6.0	12.3	0.0	0.0	7.9	37.1	0.0	0.0
10	24.6	13.9	84.0	58.0	9.6	5.8	24.2	3.0	26.0	0.0	0.0	5.3	22.2	0.0	0.0	0.0	50.6	0.0	0.0	3.3	11.7	0.0	0.0	5.6	32.9	0.0	0.0
11	26.6	14.3	86.0	55.0	9.0	4.2	3.4	0.0	14.2	3.7	1.2	0.0	18.3	3.3	1.2	0.0	3.0	6.7	1.8	0.0	5.2	2.7	1.0	0.0	16.3	4.6	2.5
12	32.2	15.8	63.0	39.0	10.2	6.4	0.0	0.0	5.0	5.4	3.2	0.0	6.2	3.7	3.9	0.0	0.0	6.9	5.2	0.0	3.2	2.9	2.2	0.0	4.4	5.4	3.9
13	31.6	18.0	72.0	38.0	10.1	6.9	6.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	3.4	0.0	0.0	0.0	5.2	0.0	0.0	0.0	1.7	0.0	0.0	0.0	3.8

*SMW- Standard Meteorological week, , *Timely sown, L- Late sown, No of Painted bug (Nymphs+Adults)/ m row length

Table 5.3.3. (B): Population dynamics of various pest and predator on *Brassica* varieties at Kanpur, 2019-20

SMW	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	RF (mm)	Urvashi				GSC-6				BSH-1				T-27				DRMRIJ-31			
	Max	Min.	Max.	Min.			Sawfly/plant		Leaf miner /plant		Sawfly/plant		Leaf miner /plant		Sawfly/plant		Leaf miner /plant		Sawfly/plant		Leaf miner /plant		Sawfly /plant		Leaf miner /plant	
							T*	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
43	30.5	16.7	88.0	46.0	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	30.9	18.4	89.4	45.1	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	29.8	16.3	85.1	40.3	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	29.0	14.6	86.7	37.7	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	27.6	13.3	87.1	41.7	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	25.8	14.3	90.0	58.0	5.3	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	24.3	9.9	92.0	44.0	6.9	0.0	1.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.6	0.0	0.0	0.0	3.1	0.0	0.0	0.0
50	21.3	11.9	95.0	69.0	4.5	10.0	1.3	0.0	0.0	0.0	3.1	0.0	0.0	0.0	3.7	0.0	0.0	0.0	1.2	0.0	0.0	0.0	3.5	0.0	0.0	0.0
51	16.8	8.8	86.0	66.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	12.3	4.2	90.3	72.3	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	20.3	9.5	93.0	62.0	4.4	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	18.1	8.1	95.0	67.0	4.9	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	17.3	10.9	96.0	81.0	8.0	65.6	0.0	0.0	3.6	3.4	0.0	0.0	1.2	2.1	0.0	0.0	2.1	4.2	0.0	0.0	0.0	0.0	0.0	0.0	2.4	2.9
4	21.2	7.5	89.0	46.0	3.2	0.0	0.0	0.0	5.2	5.3	0.0	0.0	2.6	2.3	0.0	0.0	2.3	4.2	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.9
5	21.1	8.3	91.0	46.0	8.5	0.0	0.0	0.0	5.5	9.0	0.0	0.0	2.8	4.2	0.0	0.0	4.4	5.6	0.0	0.0	1.2	0.6	0.0	0.0	3.3	4.1
6	21.9	6.7	92.0	46.0	5.1	0.0	0.0	0.0	7.0	9.3	0.0	0.0	4.1	5.1	0.0	0.0	5.0	8.3	0.0	0.0	2.3	1.0	0.0	0.0	4.9	4.3
7	24.7	11.0	77.0	42.0	5.4	0.0	0.0	0.0	8.3	11.7	0.0	0.0	4.3	5.8	0.0	0.0	5.4	8.7	0.0	0.0	2.3	2.6	0.0	0.0	9.4	4.6
8	25.3	13.7	86.0	55.0	5.5	1.8	0.0	0.0	8.0	11.8	0.0	0.0	4.6	6.4	0.0	0.0	6.7	10.8	0.0	0.0	2.3	2.6	0.0	0.0	9.8	11.6
9	27.0	15.0	87.0	53.0	4.5	2.6	0.0	0.0	10.4	14.0	0.0	0.0	5.1	6.4	0.0	0.0	6.8	10.8	0.0	0.0	3.1	3.0	0.0	0.0	11.3	12.3
10	24.6	13.9	84.0	58.0	9.6	24.2	0.0	0.0	13.8	14.9	0.0	0.0	7.6	7.6	0.0	0.0	12.3	13.5	0.0	0.0	3.7	3.8	0.0	0.0	11.8	12.6
11	26.6	14.3	86.0	55.0	9.0	3.4	0.0	0.0	15.2	18.7	0.0	0.0	7.7	13.1	0.0	0.0	0.0	18.6	0.0	0.0	4.3	4.0	0.0	0.0	13.0	16.3
12	32.2	15.8	63.0	39.0	10.2	0.0	0.0	0.0	0.0	22.6	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.0	0.0	16.6
13	31.6	18.0	72.0	38.0	10.1	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SMW- Standard Meteorological week, *Timely sown, L- Late sown

Table 5.3.3 (C): Population dynamics of various insect-pests and predators on *Brassica* varieties at Kanpur, 2019-20

SMW	Weather Parameters							*Coccinellids* (Grub+ Adult beetle)/ Plant									
								Timely Sown					Late Sown				
	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	Wind speed Kmph	Rain fall (mm)	Urvashi	GSC-6	BSH-1	T-27	DRMRIJ-31	Urvashi	GSC-6	BSH-1	T-27	DRMRIJ-31
	Max.	Min.	Max.	Min.													
43	30.5	16.7	88.0	46.0	9.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	30.9	18.4	89.4	45.1	9.2	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	29.8	16.3	85.1	40.3	6.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	29.0	14.6	86.7	37.7	8.1	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	27.6	13.3	87.1	41.7	8.7	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	25.8	14.3	90.0	58.0	5.3	2.5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	24.3	9.9	92.0	44.0	6.9	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	21.3	11.9	95.0	69.0	4.5	3.5	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	16.8	8.8	86.0	66.0	7.3	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	12.3	4.2	90.3	72.3	7.3	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	20.3	9.5	93.0	62.0	4.4	3.9	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	18.1	8.1	95.0	67.0	4.9	4.4	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	17.3	10.9	96.0	81.0	8.0	4.0	65.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	21.2	7.5	89.0	46.0	3.2	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	21.1	8.3	91.0	46.0	8.5	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	21.9	6.7	92.0	46.0	5.1	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0
7	24.7	11.0	77.0	42.0	5.4	6.6	0.0	1.4	1.1	4.0	1.5	1.5	2.6	1.3	2.3	0.0	2.8
8	25.3	13.7	86.0	55.0	5.5	5.7	1.8	3.1	3.9	5.2	1.9	3.5	2.7	1.9	3.7	2.9	3.2
9	27.0	15.0	87.0	53.0	4.5	3.5	2.6	3.2	4.2	5.4	2.6	4.3	2.7	2.5	3.8	2.6	3.6
10	24.6	13.9	84.0	58.0	9.6	5.8	24.2	2.6	2.2	0.0	2.3	1.0	2.0	2.9	4.1	3.7	3.8
11	26.6	14.3	86.0	55.0	9.0	4.2	3.4	0.0	0.0	0.0	0.0	0.0	1.8	3.0	4.6	0.0	3.8
12	32.2	15.8	63.0	39.0	10.2	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
13	31.6	18.0	72.0	38.0	10.1	6.9	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SMW- Standard Meteorological week																	

Table 5.3.4: Population dynamics of various insect-pests on *Brassica* varieties at Ludhiana, 2019-20

SMW	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	RF (mm)	BSH 1				DRMR IJ 31				GSC 6				T 27			
	Max.	Min.	Max.	Min.			No of aphid /10 cm twig		Number of cabbage caterpillars/ plant		No of aphid /10 cm twig		Number of cabbage caterpillars/ plant		No of aphid /10 cm twig		Number of cabbage caterpillars/ plant		No of aphid /10 cm twig		Number of cabbage caterpillars/ plant	
							*T	*L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
1	16.3	5.7	93	63	2.8	13.4	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	15.1	7.1	93	69	4.1	20.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	16.1	7.4	93	67	3.8	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	18.3	6.2	93	55	6.3	6.4	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	17.5	5.7	95	59	7.2	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	18.9	4.9	94	49	7.9	0.0	0	0.0	0.0	0.0	0.3	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	23.0	7.8	93	45	9.7	0.0	0	3.3	0.0	0.0	0.9	7.3	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	23.4	12.0	85	51	6.9	6.0	0	6.2	0.0	0.0	2.7	16.8	1.7	0.0	0.0	5.4	0.0	0.0	0.0	0.0	0.0	0.0
9	24.8	13.1	93	53	6.2	0.0	0	11.9	0.0	0.0	7.3	42.6	0.0	13.1	1.9	15.9	0.0	0.0	0.0	0.0	0.0	0.0
10	21.1	10.8	88	61	5.7	29.4	0	0.0	0.0	0.0	1.5	55.5	0.0	18.3	8.0	24.2	0.0	0.0	0.0	1.8	0.0	0.0
11	23.3	11.8	87	55	8.6	17.8	0	0.0	0.0	0.0	0.0	61.4	0.0	24.0	23.0	36.7	0.0	39.2	0.0	5.3	0.0	0.0
12	27.5	14.6	87	50	6.8	3.0	0	0.0	0.0	0.0	0.0	0.0	0.0	23.7	30.5	0.0	0.0	53.9	0.0	0.0	0.0	0.0
13	26.2	15.3	90	53	6.4	18.8	0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-

SMW- Standard Meteorological week, *Timely sown, L- Late sown

Table 5.3.5 (A): Population dynamics of various insect-pests on *Brassica* varieties at ZARS Morena, 2019-20

SMW	Temperature (^{0}C)		R.H. (%)		RF (mm)	IJ-31				T-27				GSC-7				BSH-1			
						B. juncea				*E. sativa*				*B. napus*				*B. rapa*			
	Max	Min.	Max.	Min.		No. of aphids /10 cm top twig		No of Painted bug (Nymphs+Adults) / mrl*		No. of aphids /10 cm top twig		No of Painted bug (Nymphs+Adults)/ mrl*		No. of aphids /10 cm top twig		No of Painted bug (Nymphs+Adults) / mrl*		No. of aphids /10 cm top twig		No of Painted bug (Nymphs+Adults) / mrl*	
						*T	*L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
45	29.4	18.2	64.5	37.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	29.4	15.5	52.5	39.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	28.0	13.0	64.2	42.1	0.0	0.0	0.0	0.2	1.0	0.0	0.0	0.2	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.8	0.8
48	26.9	12.8	61.0	52.3	0.0	0.0	0.0	0.2	0.8	0.0	0.0	0.4	0.0	0.0	0.0	1.0	0.8	0.0	0.0	1.0	0.0
49	24.4	9.7	67.7	54.3	0.0	0.0	0.0	0.6	0.0	1.2	0.0	1.0	0.0	1.0	0.0	0.2	0.0	0.0	0.0	0.8	0.0
50	22.8	10.9	71.2	56.0	22.0	1.0	2.8	0.2	0.0	1.0	3.0	0.2	0.0	0.8	3.1	0.0	0.0	3.0	3.4	0.0	0.0
51	17.8	7.7	76.5	64.0	0.0	1.4	1.6	0.0	0.0	0.8	1.0	0.0	0.0	0.4	1.6	0.0	0.0	2.4	2.8	0.0	0.0
52	16.8	5.7	78.2	62.3	0.0	1.2	1.0	0.0	0.0	1.0	1.8	0.0	0.0	1.4	2.9	0.0	0.0	1.0	0.7	0.0	0.0
1	19.1	8.0	67.6	54.4	0.0	2.6	1.8	0.0	0.0	2.1	1.4	0.0	0.0	1.9	2.6	0.0	0.0	2.4	2.4	0.0	0.0
2	21.0	9.0	74.4	53.3	3.9	1.0	2.6	0.0	0.0	2.9	2.8	0.0	0.0	2.6	2.7	0.0	0.0	2.4	2.4	0.0	0.0
3	17.8	10.4	85.9	64.6	30	1.4	1.4	0.0	0.0	2.6	2.8	0.0	0.0	2.4	3.1	0.0	0.0	2.8	3.4	0.0	0.0
4	22.1	9.0	73.6	51.3	0.0	1.1	1.6	0.0	0.0	1.6	1.6	0.0	0.0	1.4	14	0.0	0.0	2.4	2.9	0.0	0.0
5	22.5	8.1	61.7	44.3	0.0	2.4	1.7	0.0	0.0	2.4	1.9	0.0	0.0	0.6	1.2	0.0	0.0	0.4	1.2	0.0	0.0
6	22.9	8.4	68.0	39.0	0.0	2.4	2.9	0.0	0.0	1.9	2.9	0.0	0.0	2.8	3.2	0.0	0.0	2.4	3.1	0.0	0.0
7	28.1	11.0	66.9	36.7	0.0	2.6	2.0	0.0	0.0	2.0	2.5	0.0	0.0	2.6	2.6	0.0	0.0	2.6	3.2	0.0	0.0
8	29.1	12.6	68.6	35.9	0.0	2.9	2.0	0.0	0.0	2.9	1.6	0.0	0.0	3.1	2.8	0.0	0.0	1.4	3.6	0.0	0.0
9	27.7	15.9	70.6	46.9	7.5	1.0	2.4	0.0	0.0	2.6	2.1	0.0	0.0	3.0	2.0	0.0	0.0	2.4	2.0	0.0	0.0
10	26.2	16.6	64.1	50.0	24	0.8	2.2	0.0	0.0	2.8	3.1	0.0	0.0	2.8	2.6	0.0	0.0	2.4	1.4	0.0	0.0
11	28.8	16.5	59.4	37.1	0.0	0.0	1.0	0.0	0.0	0.8	2.0	0.0	0.0	1.0	1.4	0.0	0.0	2.1	2.1	0.0	0.0
12	31.7	16.1	41.7	24.6	7.0	0.0	0.8	0.0	0.0	0.2	0.2	0.0	0.0	1.0	1.4	0.0	0.0	0.8	1.6	0.0	0.0
13	30.7	19.2	42.8	26.9	0.0	0.0	0.8	0.0	0.0	0.2	0.0	0.0	0.0	0.2	1.2	0.0	0.0	0.4	1.2	0.0	0.0

Note: - Weather data provided by Gramin Mausam Krishi Sewa , ZARS , Morena M.P., SMW- Standard Meteorological week,*T-Timely sown, *L- Late sown

Table 5.3.5 (B): Population dynamics of predators and honey bees on *Brassica* varieties at ZARS Morena, 2019-20.

*SMW	Temperature (^{0}C)		R.H. (%)		RF (mm)	IJ-31				T-27				GSC-7				BSH-1			
						B. juncea				*E. sativa*				*B. napus*				*B. rapa*			
	Max.	Min.	Max.	Min.		Coccinellids (Grub+adults) / plant		Honey bees visits/ plant		Coccinellids (Grub+adults)/ plant		Honey bees visits/ plant		Coccinellids (Grub+adults)/ plant		Honey bees visits/ plant		Coccinellids (Grub+adults)/ plant		Honey bees visits/ plant	
						*T	*L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
45	29.4	18.2	64.5	37.4	0.0	0.0	0.0	0.2	1.4	0.0	0.0	0.4	0.5	0.0	0.0	0.8	0.6	0.0	0.0	1.4	0.6
46	29.4	15.5	52.5	39.6	0.0	0.0	0.0	0.8	0.5	0.0	0.0	0.4	0.8	0.0	0.0	0.5	0.8	0.0	0.0	0.6	0.8
47	28.0	13.0	64.2	42.1	0.0	0.0	0.0	1.4	0.8	0.0	0.0	0.8	0.8	0.0	0.0	0.8	1.1	0.0	0.0	0.6	1.2
48	26.9	12.8	61.0	52.3	0.0	0.0	0.0	0.8	0.6	0.0	0.0	0.8	1.0	0.0	0.0	0.5	0.8	0.0	0.0	1.0	1.0
49	24.4	9.7	67.7	54.3	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.4	0.6	0.0	0.0	0.9	0.8	0.0	0.0	0.5	0.8
50	22.8	10.9	71.2	56.0	22.0	0.1	0.1	1.0	1.1	0.1	0.8	0.4	1.2	0.4	1.4	0.6	0.4	0.2	1.2	0.9	1.1
51	17.8	7.7	76.5	64.0	0.0	0.6	0.7	1.2	1.2	0.4	1.2	0.4	1.2	1.2	0.6	0.3	0.9	1.4	2.4	0.3	1.2
52	16.8	5.7	78.2	62.3	0.0	0.4	0.2	0.5	0.6	0.4	0.6	0.0	0.8	0.8	0.6	0.3	0.9	0.4	1.4	0	0.5
1	19.1	8.0	67.6	54.4	0.0	1.2	1.8	2.1	0.6	0.2	0.8	0.8	0.8	0.3	2.4	2.8	0.6	2.4	2.8	1.6	0.4
2	21.0	9.0	74.4	53.3	3.9	0.0	0.2	0.4	0.4	1.8	0.1	0.2	0.4	0.4	0.1	2.5	0.6	0.2	0.1	1.2	0.6
3	17.8	10.4	85.9	64.6	30	0.0	0.2	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.8	1.2	0.0	0.0	0.7	1.4
4	22.1	9.0	73.6	51.3	0.0	0.0	0.0	1.2	1.0	0.0	0.0	0.4	0.4	0.0	0.0	1.0	0.4	0.0	0.0	0.4	0.4
5	22.5	8.1	61.7	44.3	0.0	0.0	0.0	2.0	0.8	0.0	0.0	0.0	1.0	0.0	0.0	2.7	2.4	0.0	0.0	1.0	1.6
6	22.9	8.4	68.0	39.0	0.0	0.0	0.0	2.4	0.8	0.0	0.0	0.0	1.0	0.0	0.4	2.4	2.1	0.0	0.0	1.2	2.4
7	28.1	11.0	66.9	36.7	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	2.1	0.0	0.2	1.4	2.1	0.0	0.8	0.0	2.1
8	29.1	12.6	68.6	35.9	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	1.0	0.4	0.0	1.4	1.4	0.0	0.8	1.2	0.0
9	27.7	15.9	70.6	46.9	7.5	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.8	1.2	0.4	0.0	0.4	1.6
10	26.2	16.6	64.1	50.0	24	0.0	0.6	0.4	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	1.0	0.4	0.0	0.4	1.0
11	28.8	16.5	59.4	37.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.0	0.0	0.2	0.0
12	31.7	16.1	41.7	24.6	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	30.7	19.2	42.8	26.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: - Weather data provided by Gramin Mausam Krishi Sewa , ZARS , Morena M.P., *SMW- Standard Meteorological week, *T-Timely sown, *L- Late sown

Table 5.3.6: Population dynamics of mustard aphid on *Brassica* varieties at Pantnagar, 2019-20

SMW	Meteorological observation						No. of aphids /10 cm top twig															
	Temp. (C)		RH (%)		Rain fall (mm)	Sun-Shine (Hrs)	Timely sown								Late sown							
	Max.	Min.	Max	Min			BSH1	YST-151	Varuna	*B. nigra*	PM-31	GSC-6	*B. Alba*	IJ-31	BSH1	YST-151	Varuna	*B. nigra*	PM-31	GSC-6	*B. Alba*	IJ-31
1	20.1	7.5	92	55	0.80	5.0	5.30	6.80	2.10	0.0	4.9	0.0	0.0	6.26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	14.5	8.3	95	83	2.82	1.2	10.86	12.2	5.33`	3.98	12.03	3.58	4.23	10.86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	18.1	9.9	94	76	1.84	3.3	17.03	17.96	9.9	10.93	17.8	9.93	11.7	15.90	8.56	12.43	7.9	0.0	1.70	0.0	0.0	21.73
4	17.8	6.8	93	73	7.00	4.2	27.55	29.84	15.01	17.83	26.30	15.20	15.13	26.18	25.2	22.4	19.76	7.8	4.88	14.6	38.33	34.50
5	18.0	6.0	95	64	8.92	5.3	31.60	58.23	20.15	22.83	31.10	20.20	35.93	38.31	41.34	36.25	38.80	18.76	7.06	23.9	53.40	49.17
6	20.9	4.0	97	45	0.0	8.6	35.55	62.47	15.87	21.23	50.27	35.53	73.90	45.88	66.53	62.34	46.25	59.25	13.50	43.56	152	75.47
7	20.1	7.5	94	62	0.0	6.9	24.80	44.35	9.55	17.33	25.13	24.52	128.83	33.85	79.15	93.10	63.20	99.24	43.10	78.25	121.8	86.42
8	22.9	8.4	93	57	2.32	6.0	16.56	32.57	6.27	10.55	12.25	16.85	119.23	15.25	70.34	91.04	60.35	102.6	8.22	107.47	110.4	93.43
9	24.6	11.6	92	61	0.0	6.1	5.10	12.90	2.43	4.94	1.48	10.60	94.27	10.80	46.50	72.97	43.37	92.74	5.32	82.48	118.9	71.22
10	24.2	11.3	91	58	5.92	6.7	0.0	0.0	0.0	0.0	0.61	2.95	63.47	7.25	28.15	55.25	30.56	69.54	2.65	61.24	87.63	53.63
11	25.7	13.7	84	49	6.51	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.25	15.32	33.24	17.53	52.00	0.52	39.20	65.41	35.13

SMW- Standard Meteorological week

Table 5.3.7: Population dynamics of mustard sawfly larvae on *Brassicas* at Shillongani, Nagaon, 2019-20

*SMW	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	RF (mm)	Benoy(Check)				DRMRIJ-31				T- 27				GSC-6				BSH-1			
	Max.	Min.	Max.	Min.			Sawfly larvae/ plant		Flea beetles/ plant		Sawfly larvae/ plant		Flea beetles/ plant		Sawfly larvae/ plant		Flea beetles/ plant		Sawfly larvae/ plant		Flea beetles/ plant		Sawfly larvae/ plant		Flea beetles/ plant	
							*T	*L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
47	28.0	14.7	92	82	47	0.0	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
48	27.7	14.4	91	82	48	0.0	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
49	25.9	9.9	91	77	49	0.0	0.0	-	1.0	-	0.4	-	0.0	-	0.0	-	0.6	-	0.8	-	0.6	-	0.1	-	0.0	-
50	25.1	9.8	92	72	50	0.0	0.0	-	1.3	-	1.5	-	1.3	-	0.0	-	1.3	-	0.9	-	0.7	-	0.3	-	0.9	-
51	21.9	10.5	93	77	51	1.0	1.3	0.0	0.3	0.0	2.0	0.0	0.8	0.7	0.7	0.1	1.4	0.0	1.3	0.0	1.4	0.0	2.3	0.0	1.2	0.0
52	22.4	7.5	93	77	52	0.0	1.5	0.2	0.0	0.9	2.1	0.0	1.7	0.6	1.4	1.2	2.1	0.0	2.1	0.9	1.5	0.0	2.4	1.2	1.4	0.0
1	21.1	9.7	89	80	1	7.8	2.3	0.8	0.0	0.4	3.2	0.1	2.1	1.2	1.3	1.4	0.7	0.0	1.0	1.2	2.1	0.0	1.6	1.9	0.9	1.2
2	23.1	8.2	85	78	2	0.0	2.1	2.1	0.0	1.0	1.0	1.5	0.9	2.3	0.9	0.9	0.0	0.2	0.2	1.5	3.1	1.2	0.9	2.5	0.3	1.4
3	25.0	9.6	92	72	3	3.0	0.5	3.0	0.9	1.7	1.3	2.3	0.0	0.9	0.0	2.3	0.0	0.1	0.0	0.9	1.0	0.9	0.0	1.0	1.7	2.1
4	21.6	7.7	89	81	4	0.0	0.2	0.8	0.0	2.3	0.1	1.7	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.7	2.1	1.7
5	22.3	8.4	90	82	5	7.2	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	0.0	1.0
6	23.8	8.9	92	73	6	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	1.2	0.0	0.0	1.0	0.0
7	25.4	9.7	88	68	7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
8	25.7	11.0	89	77	8	0.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
9	26.4	12.1	90	71	9	37.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	25.9	13.3	91	72	10	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	29.4	14.4	88	73	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	29.6	13.9	89	65	12	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
13	31.7	17.2	84	58	13	3.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0
14	33.0	15.4	83	58	14	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0

*SMW- Standard Meteorological week, *T: Timely sowing, L: Late sowing

Table 5.3.7 (B): Population dynamics of mustard aphid and coccinellids on *Brassicas* at Shillongani, Nagaon, 2019-20

SMW	Temperature (^{0}C)		R.H. (%)		RF (mm)	Benoy(Check)				DRMRIJ-31				T- 27				GSC-6				BSH-1			
	Max	Min	Max	Min.		No. of aphids /10 cm top twig		Coccinellids (Grub+adults)/ plant		No. of aphids /10 cm top twig		Coccinellids (Grub+adults)/ plant		No. of aphids /10 cm top twig		Coccinellids (Grub+adults)/ plant		No. of aphids /10 cm top twig		Coccinellids (Grub+adults)/ plant		No. of aphids /10 cm top twig		Coccinellids (Grub+adults)/ plant	
						*T	*L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
47	28.0	14.7	92	82	0.0	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
48	27.7	14.4	91	82	0.0	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
49	25.9	9.9	91	77	0.0	0.0	-	0.0	--	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
50	25.1	9.8	92	72	0.0	0.0	-	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-
51	21.9	10.5	93	77	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	22.4	7.5	93	77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	21.1	9.7	89	80	7.8	9.0	0.0	1.5	0.8	1.2	0.0	0.5	0.0	0.0	0.0	0.7	0.0	0.8	0.0	1.0	0.0	3.1	0.0	0.9	0.0
2	23.1	8.2	85	78	0.0	5.0	0.0	0.9	1.8	2.3	0.3	0.8	0.9	2.3	0.4	0.6	1.0	1.6	0.7	0.9	1.0	2.7	0.8	1.2	1.0
3	25.0	9.6	92	72	3.0	13.2	2.9	1.8	1.2	3.1	1.0	1.0	1.0	5.8	1.1	1.0	0.9	3.8	1.9	1'2	1.2	6.3	2.8	0.7	1.5
4	21.6	7.7	89	81	0.0	20.1	37.3	0.7	1.3	12.2	21.6	0.9	1.0	12.3	32.1	0.6	0.8	10.3	21.7	0.4	0.9	14.2	27.6	0.2	1.1
5	22.3	8.4	90	82	7.2	20.2	58.8	2.0	1.4	18.3	23.6	1.2	1.7	10.3	56.3	1.1	1.0	11.6	25.7	1.0	1.2	18.4	48.3	0.9	1.4
6	23.8	8.9	92	73	0.0	12.8	82.7	1.9	2.5	10.2	17.2	1.6	2.4	12.3	71.4	1.3	2.1	12.3	39.6	1.1	2.8	17.1	77.3	1.0	3.0
7	25.4	9.7	88	68	1.0	8.3	42.7	2.8	2.9	11.3	15.3	1.9	2.5	13.1	43.2	2.0	2.5	7.6	41.7	1.2	3.0	14.2	56.2	2.1	3.1
8	25.7	11.0	89	77	0.5	10.4	34.2	2.7	2.8	10.0	10.7	2.0	2.1	9.6	34.2	2.1	1.8	9.3	27.3	1.4	2.9	9.2	26.7	2.2	2.9
9	26.4	12.1	90	71	37.8	9.6	10.2	1.0	1.6	6.3	8.3	0.9	1.3	7.2	10.1	0.8	0.9	10.2	9.3	1.1	0.7	7.3	21.7	1.0	1.1
10	25.9	13.3	91	72	0.5	1.0	8.3	0.6	1.2	2.2	7.4	0.4	1.3	1.4	9.1	0.6	1.0	6.1	0.7	0,7	0.9	9.4	2.7	0.3	1.2
11	29.4	14.4	88	73	0.0	0.0	12.3	0.1	0.9	1.0	9.6	0.0	0.2	0.9	11.6	0.0	0.0	1.3	3.4	0.0	0.0	2.3	10.3	0.1	0.7
12	29.6	13.9	89	65	0.0	-	14.3	-	1.1	-	2.0	-	1.1	-	14.9	-	1.2	-	10.6	-	0.7	-	11.3	-	0.9
13	31.7	17.2	84	58	3.0	-	2.7	-	0.7	-	1.0	-	0.7	-	10.1	-	0.9	-	0.2	-	0.6	-	5.7	-	1'0
14	33.0	15.4	83	58	0.0	-	0.7	-	0.8	-	0.1	-	0.2	-	0.7	-	0.0	-	0.0	-	0.0	-	0.3	-	0.7

SMW- Standard Meteorological week,* T: Timely sowing, *L: Late sowing, CC- Coccinellid

Table 5.3.8: Population dynamics of mustard aphids on *Brassicas* at SK Nagar, 2019-20

SMW	Meteorological observations						Number of aphids/10cm top twig of *Brassica*									
	Temperature (^{0}C)		Relative Humidity (%)		Rain fall (mm)	BSS (hour)	DRMRIJ-31		T-27		GSC-6		BSH-1		GDM-4	
	MAX	MIN	MAX	MIN (%)			T	L	T	L	T	L	T	L	T	L
50	27.1	9.5	49	42	4	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	25.7	10.7	53	40	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	25.8	6.9	48	26	0.0	8.6	2.1	0.0	0.0	0.0	1.4	0.0	2.1	0.0	1.0	0.0
1	24.3	9.3	54.7	39.6	0.0	8.4	2.5	0.0	0.0	0.0	3.1	0.0	4.8	0.0	3.4	0.0
2	24.0	8.0	52.2	37.7	0.0	6.9	6.7	4.0	0.0	0.0	5.3	0.0	6.0	0.0	6.6	0.0
3	23.6	7.3	45.7	28.5	0.0	9.3	9.2	16.0	2.8	4.7	9.0	6.5	13.3	15.1	6.6	11.0
4	27.8	10.4	47.4	27.6	0.0	9.8	16.5	37.5	8.2	14.3	23.1	27.2	35.3	40.0	16.3	28.1
5	25.8	6.4	45.7	24.7	0.0	9.9	9.6	53.4	11.9	25.9	15.1	53.3	18.6	60.3	14.4	62.4
6	27.6	8.4	52.0	28.1	0.0	10.2	6.8	180.2	14.2	74.2	20.8	98.0	10.1	145.3	7.5	132.9
7	32.5	11.5	58.2	21.8	0.0	10.2	0.0	356.8	210.2	287.1	232.9	379.5	0.0	370.6	0.0	362.9
8	35.3	12.1	62.3	20.0	0.0	9.9	0.0	56.2	16.7	93.2	20.6	105.8	0.0	92.1	0.0	101.2
9	34.5	13.2	66.6	24.4	0.0	9.9	0.0	49.5	0.0	76.5	0.0	78.4	0.0	63.8	0.0	48.5
10	32.1	13.0	68.4	41.6	0.0	9.7	0.0	8.5	0.0	28.7	0.0	27.7	0.0	9.2	0.0	8.4
11	32.5	12.7	62.1	34.0	0.0	9.8	0.0	0.0	0.0	4.9	0.0	4.4	0.0	0.0	0.0	0.0
12	35.5	16.9	66.1	35.5	0.0	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	36.0	16.3	67.6	34.5	3.0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SMW- Standard Meteorological week, * T: Timely sowing, L: Late sowing

Table 5.3.9 (A): Population dynamics of coccinellids and honey bees on *Brassicas* at Bharatpur, Rajasthan

SMW	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	RF (mm)	DRMRIJ-31				GSC-6				T- 27				BSH-1			
	Max.	Min.	Max.	Min.			Coccinellids (Grub+adults)/ plant		Honey bees visits/ plant		Coccinellids (Grub+adults)/ plant		Honey bees visits/ plant		Coccinellids (Grub+adults)/ plant		Honey bees visits/ plant		Coccinellids (Grub+adults)/ plant		Honey bees visits/ plant	
							T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
44	32.4	18.2	83.4	67.5	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	28.8	16.1	83.2	69.7	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	28.5	16.6	87.5	71.3	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	26.5	12.9	89.6	78.4	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	24.2	14.0	90.4	80.4	2.4	11.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	22.4	8.3	90.1	77.1	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	19.1	9.0	92.0	82.4	2.8	18.6	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.5	0.0
51	15.4	6.2	91.4	80.2	2.7	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.9	0.0
52	11.7	3.8	92.5	79.1	2.0	0.0	0.0	0.0	0.5	0.1	0.0	0.0	0.7	0.1	0.0	0.0	1.2	0.1	0.0	0.0	1.1	0.1
1	19.2	6.9	94.0	80.8	2.8	0.0	0.0	0.0	0.8	0.3	0.0	0.0	1.1	0.2	0.0	0.0	1.7	0.4	0.0	0.0	1.6	0.2
2	19.0	7.1	88.7	75.8	5.4	2.5	0.1	0.0	1.0	0.5	0.2	0.0	1.4	0.2	0.3	0.0	2.0	0.7	0.2	0.0	1.9	0.4
3	16.1	8.1	94.6	81.2	3.0	15.3	0.3	0.2	1.3	0.8	0.4	0.7	1.7	0.7	0.6	0.9	2.5	1.0	0.3	0.5	2.2	1.1
4	20.8	5.6	89.2	73.2	7.1	0.0	0.5	0.6	1.5	1.0	0.7	1.0	1.9	1.0	0.9	1.2	2.9	1.4	0.6	0.8	2.6	1.6
5	20.6	4.9	89.8	72.8	8.1	0.0	0.8	1.0	1.8	1.2	1.1	103	2.4	1.5	1.1	1.6	3.1	1.7	0.9	1.2	3.0	2.0
6	21.5	4.2	88.2	73.2	7.5	0.0	1.1	1.3	2.1	1.5	1.3	1.5	2.9	1.8	1.4	2.0	3.5	2.5	1.2	1.4	3.4	2.4
7	26.6	6.8	83.9	71.7	9.5	0.0	1.4	1.6	1.4	1.8	1.8	2.0	3.1	2.1	2.2	2.4	3.9	2.9	1.5	1.7	3.7	3.0
8	25.5	11.4	88.0	77.5	6.2	0.0	1.6	2.0	0.5	2.1	2.1	2.4	2.0	2.4	2.3	2.7	2.4	3.4	1.8	2.0	2.2	3.2
9	27.9	14.2	89.3	81.1	7.0	1.1	2.0	2.2	0.2	1.0	2.4	2.5	0.6	2.9	2.5	3.2	1.9	3.7	2.0	2.4	1.0	3.7
10	24.6	12.6	90.1	82.3	5.9	27.9	2.3	2.5	0.1	0.8	2.7	3.0	0.5	3.3	3.1	3.5	1.0	4.1	2.5	2.9	0.1	3.0
11	27.8	14.9	87.8	81.1	7.7	0.0	2.6	3.0	0.0	0.4	3.1	3.5	0.2	2.5	3.4	3.8	1.0	2.5	2.8	3.3	0.0	1.4
12	33.0	16.9	87.2	74.4	7.0	1.9	3.0	3.3	0.0	0.2	3.4	3.9	0.1	1.4	3.6	4.1	0.7	1.4	3.1	3.6	0.0	0.8
13	31.6	18.7	92.5	74.9	6.6	3.1	3.3	3.5	0.0	0.1	3.5	4.0	0.0	0.6	3.9	4.4	0.4	0.6	3.5	4.0	0.0	0.3
14	35.3	21.0	73.6	63.0	11.4	0.0	2.0	2.1	0.0	0.0	2.5	2.6	0.0	0.2	2.8	3.0	0.1	0.2	2.1	2.5	0.0	0.1
	39.2	24.3	67.3	50.6	8.2	0.0	1.0	1.5	0.0	0.0	1.1	1.5	0.0	0.0	1.9	2.1	0.0	0.0	1.1	1.2	0.0	0.0

SMW- Standard Meteorological week, * T: Timely sowing, L: Late sowing

Table 5.3.9 (B): Population dynamics of mustard aphid and painted bug on *Brassicas* at Bharatpur

SMW	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	RF (mm)	DRMRIJ-31				GSC-6				T- 27				BSH-1			
	Max.	Min.	Max.	Min.			No of aphids/ 10 central twig		No of painted bugs/ mrl		No of aphids/ 10 central twig		No of painted bugs/ mrl		No of aphids/ 10 central twig		No of painted bugs/ mrl		No of aphids/ 10 central twig		No of painted bugs/ mrl	
							T	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L
44	32.4	18.2	83.4	67.5	3.3	0.0	-	-	0.0	0.0			0.0	0.0			0.0	0.0	-	-	0.0	0.0
45	28.8	16.1	83.2	69.7	3.2	0.0	-	-	0.1	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
46	28.5	16.6	87.5	71.3	2.7	0.0	-	-	0.2	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
47	26.5	12.9	89.6	78.4	4.0	0.0	-	-	0.5	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
48	24.2	14.0	90.4	80.4	2.4	11.6	-	-	0.8	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
49	22.4	8.3	90.1	77.1	6.5	0.0	-	-	1.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
50	19.1	9.0	92.0	82.4	2.8	18.6	0.0	0.0	1.9	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
51	15.4	6.2	91.4	80.2	2.7	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0
52	11.7	3.8	92.5	79.1	2.0	0.0	0.4	0.1	0.0	0.0	0.5	0.1	0.0	0.0	0.1	0.1	0.0	0.0	6.7	1.0	0.0	0.0
1	19.2	6.9	94.0	80.8	2.8	0.0	1.5	0.5	0.0	0.0	1.2	0.2	0.0	0.0	0.3	0.4	0.0	0.0	14.5	2.1	0.0	0.0
2	19.0	7.1	88.7	75.8	5.4	2.5	4.7	1.1	0.0	0.0	4.4	0.5	0.0	0.0	0.7	0.9	0.0	0.0	21.0	5.4	0.0	0.0
3	16.1	8.1	94.6	81.2	3.0	15.3	10.4	2.0	0.0	0.0	7.9	1.0	0.0	0.0	1.1	1.3	0.0	0.0	65.1	13.7	0.0	0.0
4	20.8	5.6	89.2	73.2	7.1	0.0	19.5	14.5	0.0	0.0	25.1	11.5	0.0	0.0	2.6	2.0	0.0	0.0	79.0	35.6	0.0	0.0
5	20.6	4.9	89.8	72.8	8.1	0.0	39.9	29.2	0.0	0.0	61.5	23.2	0.0	0.0	4.1	3.7	0.0	0.0	97.4	90.1	0.0	0.0
6	21.5	4.2	88.2	73.2	7.5	0.0	75.1	34.9	0.3	0.5	97.3	37.5	0.3	0.1	7.4	5.9	0.2	0.1	111.3	117.5	0.3	0.2
7	26.6	6.8	83.9	71.7	9.5	0.0	86.7	53.1	0.7	0.9	113.1	84.1	0.6	0.5	11.1	9.3	0.6	0.4	121.5	134.2	0.6	0.4
8	25.5	11.4	88.0	77.5	6.2	0.0	97.2	43.5	1.0	1.4	122.4	99.3	1.0	1.2	18.4	12.1	1.1	1.7	137.2	175.1	1.2	1.0
9	27.9	14.2	89.3	81.1	7.0	1.1	115.1	95.0	1.4	2.5	142.7	117.5	1.5	1.9	21.1	17.6	1.6	2.0	69.1	83.4	1.5	2.6
10	24.6	12.6	90.1	82.3	5.9	27.9	51.5	41.0	1.9	2.9	175.1	126.1	2.0	2.2	29.2	21.5	2.0	2.9	32.5	39.1	1.9	2.9
11	27.8	14.9	87.8	81.1	7.7	0.0	37.2	23.7	2.3	3.1	81.5	71.8	2.7	3.0	17.4	13.4	2.5	3.4	10.2	8.5	2.1	3.6
12	33.0	16.9	87.2	74.4	7.0	1.9	18.3	9.2	2.7	3.7	38.6	25.4	3.2	3.8	8.1	6.2	3.2	4.0	3.7	2.4	2.7	4.4
13	31.6	18.7	92.5	74.9	6.6	3.1	7.0	0.7	3.0	4.2	15.2	5.3	3.9	4.4	4.0	2.1	3.9	4.6	1.2	0.6	3.0	5.1
14	35.3	21.0	73.6	63.0	11.4	0.0	0.4	0.2	3.8	5.5	1.1	0.2	4.3	5.2	1.0	0.5	4.5	5.1	0.3	0.0	3.5	5.7
	39.2	24.3	67.3	50.6	8.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SMW- Standard Meteorological week**,** * T: Timely sowing, L: Late sowing,

Table 5.3.9 (C): Population dynamics of mustard leaf miner on *Brassicas* at Bharatpur, Rajasthan

SMW	Temperature (^{0}C)		R.H. (%)		Sun shine (hrs)	RF (mm)	DRMRIJ-31		GSC-6		T- 27		BSH-1	
	Max.	Min.	Max.	Min.			Number of leaf miner larvae/ plant							
							*T	L	T	L	T	L	T	L
44	32.4	18.2	83.4	67.5	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	28.8	16.1	83.2	69.7	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	28.5	16.6	87.5	71.3	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	26.5	12.9	89.6	78.4	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	24.2	14.0	90.4	80.4	2.4	11.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	22.4	8.3	90.1	77.1	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	19.1	9.0	92.0	82.4	2.8	18.6	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
51	15.4	6.2	91.4	80.2	2.7	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.2	0.0
52	11.7	3.8	92.5	79.1	2.0	0.0	0.2	0.0	0.4	0.0	0.9	0.0	0.5	0.0
1	19.2	6.9	94.0	80.8	2.8	0.0	0.6	0.0	0.7	0.0	1.2	0.1	1.0	0.1
2	19.0	7.1	88.7	75.8	5.4	2.5	0.8	0.2	1.0	0.1	1.5	0.2	1.3	0.3
3	16.1	8.1	94.6	81.2	3.0	15.3	1.1	0.9	1.5	0.3	1.9	0.3	2.0	1.1
4	20.8	5.6	89.2	73.2	7.1	0.0	1.3	2.0	2.1	0.6	2.3	1.5	2.4	1.7
5	20.6	4.9	89.8	72.8	8.1	0.0	1.7	2.3	2.5	1.1	2.8	2.4	3.1	3.2
6	21.5	4.2	88.2	73.2	7.5	0.0	2.5	3.4	2.9	1.5	3.5	3.0	3.7	3.8
7	26.6	6.8	83.9	71.7	9.5	0.0	3.0	4.1	4.0	2.9	4.0	3.6	4.3	4.5
8	25.5	11.4	88.0	77.5	6.2	0.0	3.4	4.6	4.8	3.7	4.0	4.1	3.5	4.5
9	27.9	14.2	89.3	81.1	7.0	1.1	3.5	3.8	4.4	4.1	4.6	2.5	3.1	5.0
10	24.6	12.6	90.1	82.3	5.9	27.9	3.2	2.3	3.6	4.8	3.1	1.9	2.5	3.8
11	27.8	14.9	87.8	81.1	7.7	0.0	2.8	1.1	2.1	6.3	2.4	1.2	1.4	2.5
12	33.0	16.9	87.2	74.4	7.0	1.9	1.7	0.7	1.3	7.5	1.0	0.6	0.6	1.2
13	31.6	18.7	92.5	74.9	6.6	3.1	0.8	0.2	0.4	8.1	0.5	0.3	0.2	0.5
14	35.3	21.0	73.6	63.0	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SMW- Standard Meteorological week, * T: Timely sowing, L: Late sowing,

Table 5.3 (B): Monitoring of mustard aphid on yellow sticky traps during 2019-20

Std week	Mean mustard aphid (alate) population per trap							
	MOR	HSR	KAN	SKN	PTN	LDH	DHO	BPR
40	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	0	0.0	0.0	0.0	0.0	9.0	0.0	0.0
44	0	0.0	0.0	0.0	0.0	36.0	0.0	0.0
45	0	0.0	0.0	0.0	0.0	38.6	0.0	3.1
46	0	0.0	0.0	0.0	0.0	61.2	0.0	1.1
47	0	0.0	0.0	0.0	0.0	59.4	0.0	4.1
48	0	0.0	0.0	0.0	0.0	22.1	0.0	9.8
49	0	0.0	0.0	0.0	0.0	27.2	0.0	26.4
50	0	0.0	0.0	0.0	0.0	16.2	0.0	3.8
51	0	0.4	0.0	5.6	0.0	16.3	0.0	67.3
52	0	2.4	0.0	17.0	0.0	10.2	0.0	71.3
1	1.5	5.8	0.0	105.8	0.0	19.6	0.0	139.4
2	1.0	8.7	0.0	71.4	0.0	19.8	0.0	7.5
3	0.8	4.5	0.0	230.0	16.40	19.2	0.0	0.0
4	2.1	10.2	0.0	345.2	28.00	14.8	0.0	0.0
5	25.8	4.1	0.0	317.4	49.60	16.4	0.0	0.0
6	35.4	11.4	11.6	742.8	131.4	22.0	5.2	0.0
7	87.4	13.3	27.9	1523.6	240.4	20.0	15.4	0.0
8	110.2	31.8	34.6	1158.6	177.8	66.5	52.0	0.0
9	48.9	25.7	38.3	1367.6	209.0	163.2	76.6	0.0
10	25.7	96.5	6.6	1233.8	242.4	235.4	121.0	0.0
11	76.4	59.3	0.0	328.6	228.0	387.7	16.6	0.0
12	45.8	64.0	0.0	44.8	0.0	Lockdown	0.0	0.0
13	10.8	28.8	0.0	0.0	0.0		0.0	0.0
14	0.52	0.0	0.0	0.0	0.0		0.0	0.0

Table 5.4.1: Effect Bio-intensive IPM module preparation for management of mustard aphid at Delhi, 2019-20

Treatments	Mustard aphid population/10 cm twig				Yield (kg/ha)	IBCR
	I st spray		II nd spray			
	Before One day	After 10 days	Before One day	After 10 days		
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/l followed by its second spray after 10 days and further third spray on need basis	33.2	14.6	48.6	77.0	1708.3	35.2
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/l after 10 days of azadirachtin application	11.3	4.8	47.3	99.3	1777.7	68.5
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	17.6	3.4	69.7	96.7	1918.0	50.7
T_4 Azadirachtin followed by application of *Verticillium lecanii* @ 2g/l after 10 days of azadirachtin application	5.5	4.3	-28.3	97.0	1833.3	44.7
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	16.3	4.9	-46.7	104.5	1777.7	55.4
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	17.4	1.4	84.8	119.3	2013.8	74.4
T_7 Control (Water spray)	9.7	5.1	11.6	153.7	1472.2	70.3
F- probability	**0.160**	**0.080**	**0.540**	**<0.001**	<0.001	**<0.001**
LSD (P = 0.05)	**NS**	**NS**	**NS**	**27.04**	151.98	**15.51**
IBCR: Incremental benefit cost ratio						

Table 5.4.2: Effect of bio-intensive IPM module preparation for management of mustard aphid at Dholi (2019-20)

Treatments	Mustard aphid population before spray	Mustard aphid population/10 cm twig (after 10 days of spray)	Yield (kg/ha)	IBCR
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/l followed by its second spray after 10 days and further third spray on need basis	16.6	6.2	710.00	6.46
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/l. after 10 days of azadirachtin application	18.4	6.0	788.00	6.72
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	11.2	5.6	652.00	6.40
T_4 Azadirachtin followed by application of *Verticillium laecanii* @ 2g/l after 10 days of azadirachtin application	15.6	5.1	776.00	7.42
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	13.7	3.0	852.00	7.58
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	11.8	2.8	880.00	7.86
T_7 Control (Water spray)	11.2	22.4	566.00	-
CD at 5%	**3.4**	**2.6**	**90.2**	-

Table 5.4.3: Efficacy of bio-intensive module preparation for management of mustard aphid at Hisar during 2019-20

Treatments	Aphid population/10 cm top twig			Yield Kg/ha	IBCR (10/7) 11
	1st Spray				
	Pre count	5 DAS	10 DAS		
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/l followed by its second spray after 10 days and further third spray on need basis	49.8	7.85	1.1	1620.5	3.4
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/l after 10 days of azadirachtin application	51.8	7.25	9.8	1586.4	3.8
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	54.1	8.95	10.3	1576.2	5.1
T_4 Azadirachtin followed by application of *Verticillium laecanii* @ 2g/l after 10 days of azadirachtin application	50.4	9.6	9.9	1604.3	4.1
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	41.8	10.8	9.5	1594.5	5.4
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	36.4	4.6	0.8	1687.4	12.8
T_7 Control (Water spray)	42.4	36.65	28.4	1298.2	
CD at 5%	**N.S.**	**2.61**	**4.87**	**56.73**	
NS=Non-significant; DAS- Days after spray					

Table 5.4.4 : Efficacy of bio–intensive IPM module preparation for management of mustard aphid at Kanpur 2019-20

Treatments	Mustard aphid population/10 cm twig				Yield (kg/ha)	IBCR
	I st spray		II nd spray			
	Before One day	After 5 days	Before One day	After 5 days		
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/l followed by its second spray after 10 days and further third spray on need basis	36.13	18.0	21.83	10.30	1322	6.94
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/l after 10 days of azadirachtin application	46.06	13.2	15.10	6.73	1534	11.54
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	39.93	23.10	28.13	14.30	1243	11.32
T_4 Azadirachtin followed by application of *Verticillium lecanii* @ 2g/l after 10 days of azadirachtin application	41.40	12.2	13.26	6.03	1613	11.16
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	38.50	21.13	23.60	11.43	1349	12.14
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	41.20	11.30	8.73	1.56	1904	44.35
T_7 Control (Water spray)	39.80	46.46	50.9	53.60	581	-
CD at 5%	**NS**	**0.947**	**0.80**	**0.68**	**476.49**	
CV %	**11.52**	**12.11**	**9.81**	**11.22**	**19.63**	
IBCR: Incremental benefit cost ratio						

Table 5.4.5: Efficacy of bio-intensive IPM module preparation for management of mustard aphid at Ludhiana during 2019-20

Treatments	Aphid population/ plant		Reduction over control (%)	Yield (kg/ ha)	IBCR
	Before spray	5 Days after spray			
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/l followed by its second spray after 10 days and further third spray on need basis	55.7	32.1	63.1	1730.6	9.97
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/l after 10 days of azadirachtin application	51.3	38.1	56.2	1688.9	11.31
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	48.5	44.5	48.9	1616.7	12.35
T_4 Azadirachtin followed by application of *Verticillium laecanii* @ 2g/l after 10 days of azadirachtin application	48.9	41.1	52.8	1588.9	8.27
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	53.8	40.1	53.9	1658.3	14.06
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	51.4	16.4	81.1	1788.9	40.87
T_7 Control (Water spray)	48.3	87.1	--	1316.7	0.00
CD (p=0.05)	**NS**	**10.6**	**--**	**263.0**	**--**
IBCR: Incremental benefit cost ratio					

Table 5.4.6: Efficay of bio-intensive IPM odule preparation for management of mustard aphid at Morena, 2019-20

Treatments	Dose	Aphid population /10 cm. top twig					IBCR
		Before spray	3 DAS	7 DAS	10 DAS	Yield (kg/ha)	
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis	2.5 lit	48.4	42.9	27.8	24.5	2942	3.7
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application	2.5 lit	62.1	36.2	32.4	24.6	2788	2.8
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	2.0 lit	54.6	36.4	26.4	46.1	2604	3.1
T_4 Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application	2.5 lit + 1 kg	46.3	40.9	30.1	28.4	2473	2.4
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	2 kg	50.3	38.6	36.0	36.4	2577	2.9
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	2.0 lit	43.2	48.4	28.7	26.8	2799	3.3
T_7 Control (Water spray)	-	32.1	46.8	42.6	38.9	2083	2.0
CD at 5%	**-**	**2.26**	**2.53**	**2.37**	**2.51**		
IBCR: Incremental benefit cost ratio							

Table 5.4.7: Efficacy of bio-intensive IPM module for management of mustard aphid at Pantnagar, 2019-20

Treatments	Mustard aphid population/10 cm twig				Yield (kg/ha)	IBCR
	I st spray		II nd spray			
	Before One day	After 5 days	Before One day	After 5 days		
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis	79.33	55.20	33.26	17.75	1523	0.64
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application	75.00	49.08	28.13	12.80	1725	2.55
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	75.67	44.65	20.03	6.08	1614	2.54
T_4 Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application	72.00	40.50	21.75	5.87	1682	2.67
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	82.96	41.50	19.43	13.05	1798	5.74
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	74.83	41.11	19.44	8.55	1596	5.05
T_7 Control (Water spray)	67.78	93.68	104.88	102.39	1369	0.64
CD (p=0.05)		**8.84**		**7.19**		

Table 5.4.8: Efficacy of bio-intensive IPM module for management of mustard aphid at Shillongani, 2019-20

Treatments	Mean aphid population (1st spray)		Mean aphid population (2nd spray, 10 days after 1st spraying)		Yield (kg/ha)	*IBCR
	1 DBS*	5 DAS**	1 DBS	5 DAS		
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis	61.70	18.73	24.47	10.97	812.67	1.75
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application	58.77	26.60	32.83	19.93	633.93	1.52
T_3 *Beauveria bassiana* @ 2 g/lfollowed by its second application after 10 days	58.13	28.40	33.37	17.67	594.67	1.54
T_4 Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application	55.07	29.73	32.87	21.93	593.07	1.41
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	57.63	30.03	37.50	24.90	517.97	1.23
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	66.10	8.10	10.50	9.23	1005.80	3.00
T_7 Control (Water spray)	64.87	72.97	77.93	78.97	484.47	
SEm(±)	**2.36**	**1.64**	**1.50**	**1.53**	**18.59**	
$CD_{0.05}$	**4.68**	**3.34**	**2.97**	**3.04**	**36.82**	
CV(%)	**14.09**	**13.67**	**11.63**	**13.87**	**-**	
*** DBS: Day before spray, DAS: Days after spray, IBCR: Incremental benefit cost ratio**						

Table 5.4.9: Efficacy of bio-intensive IPM module against mustard aphid at SK Nagar, 2019-20

Treatment	Aphid Population /10 cm top twig						Yield (kg/ha)	IBCR
	1st spray			2nd spray				
	Before spray	3rd day	10 DAS	Before spray	5 DAS	10 DAS		
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis	9.57	18.20	62.50	62.50	115.60	277.90	1216	2.41
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application	10.70	16.47	58.37	58.37	114.30	267.23	1183	2.48
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	14.00	20.27	63.90	63.90	119.53	258.23	922	0.37
T_4 Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application	11.87	15.07	60.60	60.60	112.53	264.23	1227	2.84
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	12.87	15.20	62.60	62.60	107.40	271.33	1104	2.12
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	12.00	11.67	35.27	35.27	16.10	60.70	1268	4.12
T_7 Control (Water spray)	11.93	17.87	65.10	65.10	142.90	286.57	883	
C.D. at 5%	**NS**	**4.37**	**8.79**	**8.79**	**7.67**	**24.89**	**214.0**	
C.V.%	**14.74**	**14.82**	**8.38**	**8.79**	**4.10**	**5.74**	**10.79**	

Table 5.4.10 : Efficacy of bio-intensive IPM module against mustard aphid at Bharatpur, 2019-20

Treatment	Aphid Population /10 cm top twig							Mean Reduction (%)	Yield (Kg/ha)	Increase in yield over control (%)	IBCR
	1st spray										
	Before spray	3rd DAS	Reduction over control (%)	7th DAS	Reduction (%)	10th Day	Reduction (%)				
T_1 Azadirachtin 300 ppm (CIB registered formulation) @ 5 ml/lit.followed by its second spray after 10 days and further third spray on need basis	38.0	16.0	58.0	10.6	72.02	7.2	81.2	70.5	2817	64.54	12.28
T_2 Azadirachtin followed by application of *Beauveria bassiana* @ 2g/lit. after 10 days of azadirachtin application	42.0	21.4	49.0	15.1	64.1	10.1	10.5	75.0	62.7	2781	14.24
T_3 *Beauveria bassiana* @ 2 g/l followed by its second application after 10 days	34.0	23.8	30.0	20.1	41.0	14.6	57.1	42.7	2665	55.67	18.60
T_4 Azadirachtin followed by application of *Verticillium laecanii* @ 2g/lit. after 10 days of azadirachtin application	29.0	23.2	20.0	18.9	35.0	15.9	45.1	33.4	2646	54.50	13.12
T_5 *Verticillium laecanii* @ 2g/l followed by its second application after 10 days	40.0	25.6	36.0	18.8	53.0	13.6	66.0	51.7	2698	57.59	19.24
T_6 Dimethoate 30 EC @ 1 ml/l followed by its second application after 10 days	30.0	10.5	65.0	7.0	75.0	1.8	94.0	78.0	2910	69.98	41.67
T_7 Control (Water spray)	45.0	51.0	-	68.0	-	75.0	-	-	1717	-	-
C.D. at 5%	**2.92**	**1.70**	**-**	**1.28**	**-**	**1.66**	**--**	**-**	**180.94**	**-**	**-**
C.V.%	**4.55**	**2.31**	**-**	**1.42**	**-**	**2.74**	**-**	**-**	**248.42**	**-**	**-**

Table 5.5.1: Bio-efficacy of newer insecticides against mustard aphid at Delhi, 2019-20

Treatments	Mustard aphid population/10 cm twig				Yield (kg/ha)	IBCR
	Ist spray		IInd spray			
	Before One day	After 10 days	Before One day	After 10 days		
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	33.2	14.6	48.6	77.0	2166.6	35.2
T_2 Thiamethoxam 25 WG @ 0.2 g/L	11.3	4.8	47.3	99.3	1930.5	68.5
T_3 Acetamaprid 20 SP @ 0.1 g/L	17.6	3.4	69.7	96.7	1930.5	50.7
T_4 Dimethoate 30 EC @ 1 ml/L	5.5	4.3	-28.3	97.0	1777.7	44.7
T_5 Clothianidine 50 WDG @ 0.12 g/L	16.3	4.9	-46.7	104.5	1930.5	55.4
T_6 Control	17.4	1.4	84.8	119.3	1416.6	74.4
F- probability	**0.160**	**0.080**	**0.540**	**<0.001**	<0.001	**<0.001**
LSD (P = 0.05)	**NS**	**NS**	**NS**	**27.04**	121.96	**15.51**

Table 5.5.2: Bio-efficacy of newer insecticides against mustard aphid at Dholi, 2019-20

Treatments	Mustard aphid population before spray	Mustard aphid population/10 cm twig (after 10 days of spray)	Yield (kg/ha)	IBCR
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	18.6	7.4	734.00	7.17
T_2 Thiamethoxam 25 WG @ 0.2 g/L	11.2	4.8	812.00	7.76
T_3 Acetamaprid 20 SP @ 0.1 g/L	10.2	3.1	668.00	6.46
T_4 Dimethoate 30 EC @ 1 ml/L	8.3	4.0	762.00	7.04
T_5 Clothianidine 50 WDG @ 0.12 g/L	8.0	4.2	891.00	7.86
T_6 Control	11.4	21.4	565.00	-
CD at 5%	2.8	1.2	88.6	-

Table 5.5.3: Bio-efficacy of newer insecticides against mustard aphid at Hisar, 2019-20

Treatments	Aphids/10 cm top twig			Yield (Kg/ha)	IBCR
	1st Spray				
	Pre count	5 DAS	10 DAS		
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	46.4	5.4	0.0	1812.8	18.7
T_2 Thiamethoxam 25 WG @ 0.2 g/L	35.2	7.1	0.0	1827.6	19.7
T_3 Acetamaprid 20 SP @ 0.1 g/L	51.7	8.2	0.0	1722.9	20.7
T_4 Dimethoate 30 EC @ 1 ml/L	65.1	8.3	0.0	1688.4	14.9
T_5 Clothianidine 50 WDG @ 0.12 g/L	49.8	3.2	0.0	1744.8	7.0
T_6 Control	61.1	55.4	26.8	1239.0	
CD (p=0.05)	N.S.	10.73		87.53	

Table 5.5.4: Bio-efficacy of newer insecticides against mustard aphid at Kanpur, 2019-20

Treatments	Mustard aphid population/10 cm twig			Yield (kg/ha)	IBCR
	Before first spray	After 7 days	After 14 days		
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	38.93(6.26)	9.36(3.05)	2.70(1.59)	1772	71.44
T_2 Thiamethoxam 25 WG @ 0.2 g/L	42.33(6.50)	11.36(3.37)	3.16(1.76)	1640	64.88
T_3 Acetamaprid 20 SP @ 0.1 g/L	41.90(6.49)	13.56(3.68)	4.57(2.12)	1454	71.00
T_4 Dimethoate 30 EC @ 1 ml/L	42.13(6.46)	10.60(3.25)	2.73(1.62)	1752	71.40
T_5 Clothianidine 50 WDG @ 0.12 g/L	46.90(6.84)	13.20(3.62)	5.53(2.35)	1428	18.68
T_6 Control	40.70(6.37)	43.66(6.65)	53.66(7.32)	687	
CD(p=0.05)	**NS**	**0.344**	**0.613**	**319.208**	
CV %	**6.173**	**4.775**	**12.115**	**12.360**	

Table 5.5.5 Bio-efficacy of newer insecticides against mustard aphid at Ludhiana, 2019-20

Treatments	No of aphids/ 10 cm central twig					Yield (kg/ha)	IBCR
	BS*	3DAS	7DAS	10DAS	14DAS		
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	56.7	15.2	0.0	0.0	0.0	1788.9	45.5
T_2 Thiamethoxam 25 WG @ 0.2 g/L	64.6	13.2	0.0	0.0	0.0	1827.8	49.6
T_3 Acetamaprid 20 SP @ 0.1 g/L	49.7	21.2	16.5	19.0	11.7	1544.4	28.3
T_4 Dimethoate 30 EC @ 1 ml/L	57.1	24.9	19.5	16.1	20.9	1488.9	19.9
T_5 Clothianidine 50 WDG @ 0.12 g/L	55.6	15.9	0.0	0.0	0.0	1791.7	26.1
T_6 Control	62.3	72.7	74.5	78.6	53.6	1258.3	
CD(p=0.05)	**NS**	**7.8**	**8.3**	**4.4**	**11.9**	**275.5**	

Table. 5.5.6:- Bio efficacy of newer-insecticides against mustard aphid at Morena, 2019-20

Treatments	Number of aphids/ 10 cm top twig				Yield (kg/ha)	IBCR
	24hrs Before spray	3 DAS	7 DAS	10 DAS		
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	25.2	28.3	20.8	30.4	2213	3.1
T_2 Thiamethoxam 25 WG @ 0.2 g/L	26.6	26.9	19.7	21.6	2617	3.4
T_3 Acetamaprid 20 SP @ 0.1 g/L	38.2	25.7	21.2	26.5	2083	3.0
T_4 Dimethoate 30 EC @ 1 ml/L	24.3	20.9	18.4	28.9	2382	3.3
T_5 Clothianidine 50 WDG @ 0.12 g/L	28.2	33.4	25.2	24.9	2434	3.2
T_6 Control	29.4	36.8	43.6	42.8	1692	1.8
CD at 5%	**1.98**	**1.81**	**1.77**	**1.40**		

Table.5.5.7: Bio-efficacy of newer insecticides against mustard aphid at Pantnagar, 2019-20

Treatment	Number of aphids/ 10 cm central twig				Yield (kg/ha)	IBCR
	Before spray	3 DAS*	7 DAS	10 DAS		
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	67.43	37.4	24.18	10.86	1167	-1.04
T_2 Thiamethoxam 25 WG @ 0.2 g/L	71.8	42.2	23.14	10.31	1373	7.97
T_3 Acetamaprid 20 SP @ 0.1 g/L	70.6	38.1	28.23	10.44	1119	1.33
T_4 Dimethoate 30 EC @ 1 ml/L	72.26	33.8	18.65	6.06	1468	21.68
T_5 Clothianidine 50 WDG @ 0.12 g/L	69.3	32.3	16.54	4.52	1048	-5.23
T_6 Control	70.27	92.2	116.3	96.81	944	
CD at 5%		**2.552**	**6.065**	**3.312**		
DAS: Days after spray						

Table 5.5.8: Bio-efficacy of newer insecticides against mustard aphid at Shillongani, 2019-20

Treatments	Number of aphids/ 10 cm central twig				Yield (kg/ha)	IBCR
	1 DBS*	7 DAS**	14 DAS	21 DAS		
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	60.15	8.40	11.55	13.58	1024.23	3.15
T_2 Thiamethoxam 25 WG @ 0.2 g/L	90.27	26.17	26.08	38.80	882.48	2.70
T_3 Acetamaprid 20 SP @ 0.1 g/L	79.20	21.87	16.73	24.50	810.95	2.51
T_4 Dimethoate 30 EC @ 1 ml/L	77.33	19.13	17.10	26.40	989.10	3.04
T_5 Clothianidine 50 WDG @ 0.12 g/L	77.87	26.80	26.65	38.57	757.80	2.08
T_6 Control	83.80	84.20	66.08	79.07	498.40	
SEm(+)	**2.23**	**1.42**	**1.25**	**1.13**	**21.73**	
$CD_{0.05}$	**4.49**	**2.80**	**2.47**	**2.24**	**43.03**	
CV(%)	**12.54**	**12.69**	**11.95**	**9.33**	**-**	
*** DBS= Days before spray , **DAS= Days after spray**						

Table 5.5.9. Bio-efficacy of newer insecticides against mustard aphid at SK Nagar, 2019-20

Treatments	Aphid Population /10 cm top twig						Yield (kg/ha)	IBCR
	1st spray			2nd spray				
	Before spray	5 DAS	10 DAS	Before spray	5 DAS	10 DAS		
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	9.23	4.30	25.80	25.80	17.17	20.13	1247	4.39
T_2 Thiamethoxam 25 WG @ 0.2 g/L	10.73	3.87	27.53	27.53	40.73	48.80	1114	2.82
T_3 Acetamaprid 20 SP @ 0.1 g/L	8.20	4.57	32.93	32.93	27.30	28.10	1099	2.83
T_4 Dimethoate 30 EC @ 1 ml/L	10.83	3.80	34.23	34.23	21.70	25.07	1190	3.32
T_5 Clothianidine 50 WDG @ 0.12 g/L	13.37	4.63	26.80	26.80	25.63	47.63	1221	2.88
T_6 Control	9.88	14.17	49.17	49.17	105.73	283.00	880	
CD at 5%	**NS**	**2.83**	**5.93**	**5.93**	**7.63**	**7.86**	**232.02**	
CV (%)	**36.14**	**26.04**	**9.82**	**9.82**	**10.43**	**5.65**	**11.19**	
*DAS: Days after spray								

Table 5.5.10. Bio-efficacy of newer insecticides against mustard aphid at Bharatpur, 2019-20

Treatment	Aphid Population /10 cm top twig							Mean Reduction (%)	Yield (Kg/ha)	Increase in yield (%)	IBCR
	1st spray										
	Before spray	3rd DAS	Reduction (%)	7th DAS	Reduction (%)	10th Day	Reduction (%)				
T_1 Imidacloprid 17.8 SL @ 0.25 ml/L	38.0	14.8	61.2	12.3	67.6	6.5	83.0	70.6	2209	30.94	17.92
T_2 Thiamethoxam 25 WG @ 0.2 g/L	11.0	17.9	57.3	15.7	62.7	10.9	74.0	64.7	1905	12.92	7.70
T_3 Acetamaprid 20 SP @ 0.1 g/L	35.0	24.2	31.0	19.3	45.0	15.1	56.9	44.3	1872	10.97	8.35
T_4 Dimethoate 30 EC @ 1 ml/L	30.0	9.1	69.7	6.8	77.2	2.2	92.8	79.9	2315	37.23	21.94
T_5 Clothianidine 50 WDG @ 0.12 g/L	37.0	21.5	42.0	15.5	58.0	9.3	75.0	58.3	2044	21.13	5.27
T_6 Control	40.0	46.0	-	75.2	-	65.0	-	-	1687	-	-
CD at 5%	5.45	1.25	-	1.93	-	4.28	-	-	317.58	-	-
CV (%)	**12.58**	**1.11**	-	**2.77**	-	**15.93**	-	**793.83**	-	-	-

Table 5.6.1: Survey and Surveillance of insect pests and their natural enemies in rapeseed-mustard at Kanpur

Insects	Districts	Time interval											
		Location	Oct.	Nov.		Dec		Jan		Feb		March	
			IInd*	Ist	IInd	Ist	IInd	Ist	IInd	Ist	IInd	Ist	IInd
Painted bug/m row	Farukhabad	1.	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.	3.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Jashwantnagar	1.	2.6	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Varanasi	1.	4.3	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.	2.6	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Allahabad	1.	2.9	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fatehpur	1.	4.2	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Kanpur	1.	3.9	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.	2.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aligarh	1.	4.6	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aphid/10 cm top twig	Farukhabad	1.	0.0	0.0	0.0	0.0	0.0	0.0	4.3	12.3	44.3	12.2	0.0
		2.	0.0	0.0	0.0	0.0	0.0	0.0	1.2	18.2	35.1	31.3	0.0
	Jashwantnagar	1.	0.0	0.0	0.0	0.0	0.0	0.0	3.6	28.9	56.0	16.6	0.0
	Varanasi	1.	0.0	0.0	0.0	0.0	0.0	0.0	16.0	24.4	66.6	23.4	0.0
		2.	0.0	0.0	0.0	0.0	0.0	0.0	8.9	37.3	56.8	28.6	0.0
	Allahabad	1.	0.0	0.0	0.0	0.0	0.0	0.0	9.8	33.8	63.7	37.7	0.0
	Fatehpur	1.	0.0	0.0	0.0	0.0	0.0	0.0	5.6	14.6	32.2	23.6	0.0
	Kanpur	1.	0.0	0.0	0.0	0.0	0.0	0.0	5.7	11.3	57.4	12.4	0.0
		2.	0.0	0.0	0.0	0.0	0.0	0.0	8.6	23.3	46.3	12.6	0.0
	Aligarh	1.	0.0	0.0	0.0	0.0	0.0	0.0	7.1	15.8	41.3	28.1	0.0
Saw fly/ Plant	Farukhabad	1.	0.0	1.2	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.	0.0	2.6	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Jashwantnagar	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Varanasi	1.	1.4	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.	2.6	2.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Allahabad	1.	0.0	2.3	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fatehpur	1.	2.6	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Kanpur	1.	0.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.	0.0	2.6	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aligarh	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leaf miner/plant	Farukhabad	1.	0.0	0.0	0.0	0.0	0.0	0.0	3.9	12.0	22.3	24.0	0.0
		2.	0.0	0.0	0.0	0.0	0.0	0.0	2.0	14.6	19.0	23.3	0.0
	Jashwantnagar	1.	0.0	0.0	0.0	0.0	0.0	0.0	4.3	11.0	17.5	22.4	0.0
	Varanasi	1.	0.0	0.0	0.0	0.0	0.0	0.0	4.6	20.3	22.0	26.9	0.0
		2.	0.0	0.0	0.0	0.0	0.0	0.0	5.7	14.6	21.6	24.6	0.0
	Allahabad	1.	0.0	0.0	0.0	0.0	0.0	0.0	3.3	12.3	23.4	25.3	0.0
	Fatehpur	1.	0.0	0.0	0.0	0.0	0.0	0.0	2.0	8.9	16.6	20.4	0.0
	Kanpur	1.	0.0	0.0	0.0	0.0	0.0	0.0	2.6	10.3	16.8	18.6	0.0
		2.	0.0	0.0	0.0	0.0	0.0	0.0	3.0	14.6	22.6	26.6	0.0
	Aligarh	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	12.6	18.6	0.0
***Coccinella*/plant**	Farukhabad	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	7.4	2.3	0.0
		2.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.6	1.0	0.0
	Jashwantnagar	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	3.4	2.6	0.0
	Varanasi	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	5.3	1.6	0.0
		2.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	4.3	2.6	0.0
	Allahabad	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	3.6	1.6	0.0
	Fatehpur	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	3.3	2.0	0.0
	Aligarh	1.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.5	1.0	0.0

Table 5.6.2: Survey of insect-pests at farmers' fields at Ludhiana

Month	Fortnight	(Number of aphids/10cm top twig)	Cabbage caterpillar (larvae/plant)	*Coccinella*/plant (Grubs+Adults)
Dec	**II**	0.0	0.0	0.0
Jan	**I**	0.0	0.0	0.0
	II	0.0	0.0	0.0
Feb	**I**	0.0	0.0	0.0
	II	6.4	0.0	0.0
Mar	**I**	36.8	0.0	0.0
	II	45.4	0.0	0.0

5.6.3 Survey and surveillance of insect pests and their natural enemies in rapeseed-mustard at Pantnagar

Table.5.6.3 (A): Mean population of mustard aphid in rapeseed mustard at different locations (Pantnagar, 2019-20)

Locations/ Date of Observation	Pantnagar	Narayanpur	Haldwani	Dineshpur	Pathharchatta
13.1.2020	13.2	14.5	12.7	10.5	11.3
27.1.2020	24.2	27.3	20.2	20.8	24.3
10.2.2020	35.5	50.2	44.3	48.2	42.8
24.2.2020	76.3	81.2	78.3	78.9	76.0
3.3.2020	135.0	145.2	140.8	141.3	142.4

Table.5.6.3 (B): Mean population of natural enemies (*Coccinella* spp.) in rapeseed mustard at different locations (Pantnagar, 2019-20)

Locations/ Date of Observation	Pantnagar	Narayanpur	Haldwani	Dineshpur	Pathharchatta
13.1.2020	0.0	0.0	0.0	0.0	0.0
27.1.2020	0.0	0.0	0.0	0.0	0.0
10.2.2020	1.0	0.4	0.2	0.2	0.4
24.2.2020	1.5	0.9	1.0	0.8	1.1
3.3.2020	2.3	1.7	1.9	1.5	1.9

Table 5.6.4: **Location wise population trend of major insect-pests in rapeseed and mustard at Shillongani (2019-20)**

Insect pests	Location(L)	1st FN	2nd FN	1st FN	2nd FN	1st FN	2nd FN
Mustard aphid (no./10cm twig)	L-1	0.0	0.0	13.2	21.5	23.5	20.2
	L-2	0.0	0.0	15.3	15.6	23.2	7.2
	L-3	0.0	0.0	0.0	4.5	15.6	8.3
	L-4	0.0	0.0	1.8	8.6	15.8	11.2
	L-5	0.0	0.0	20.7	32.5	42.6	31.7
	L-6	0.0	0.0	19.8	21.6	39.5	25.3
	L-7	0.0	0.2	17.3	41.5	52.3	41.3
	L-8	0.0	0.3	19.2	31.6	35.1	-
	L-9	0.0	0.0	26.2	27.2	28.2	-
Mustard sawfly larvae (no./plant)	L-1	0.0	1.6	2.4	0.1	0.1	
	L-2	0.3	1.9	2.0	0.5	0.6	
	L-3	0.0	0.7	1.2	1.3	0.8	
	L-4	0.0	0.8	1.7	1.3	0.1	
	L-5	0.1	0.0	1.0	1.4	1.0	
	L-6	0.2	0.0	1.1	0.8	0.7	0.0
	L-7	0.1	1.5	0.9	0.7	0.0	0.0
	L-8	0.0	0.7	1.1	1.0	0.0	-
	L-9	0.0	0.9	1.2	1.1	0.0	-
	L-10	0.1	1.5	1.	1.2	0.0	-
Coccinellids (no./plant)	L-1	0.0	0.0	1.2	3.5	4.1	0.7
	L-2	0.0	0.0	1.6	3.2	5.2	1.0
	L-3	0.0	0.0	0.0	1.0	3.2	1.1
	L-4	0.0	0.0	1.0	1.2	3.7	0.9
	L-5	0.0	0.0	2.5	3.5	4.5	2.1
	L-6	0.0	0.0	3.0	4.3	6.1	2.0
	L-7	0.0	0.1	0.1	3.3	4.5	1.0
	L-8	0.0	0.4	1.4	2.7	5.1	-
	L-9	0.0	0.7	1.3	4.3	5.6	-
	L-10	0.0	0.0	1.5	2.7	3.7	-
Tachanid fly (no./m^2)	L-1	0.0	0.0	1.0	0.0	0.2	0.0
	L-2	0.2	0.1	0.3	0.2	0.2	0.1
	L-3	0.0	0.0	0.2	0.1	1.2	0.2
	L-4	0.0	0.0	0.0	0.4	0.4	0.0
	L-5	0.0	0.0	0.0	0.4	1.4	0.0
	L-6	0.3	0.3	0.4	0.1	0.0	0.1
	L-7	0.1	0.2	0.7	0.3	0.0	0.0
	L-8	0.0	0.0	1.0	0.0	0.1	-
	L-9	0.0	0.1	1.3	0.0	0.1	-
	L-10	0.2	0.1	0.0	0.0	0.2	-

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

Table: 5.6.5 Survey and surveillance of insect-pests and their natural enemies in rapeseed-mustard at SK Nagar, 2019-20

Visited village	Location	Month	Fortnight	Number of aphids/10cm top twig	*Coccinelid* beetles/plant
Bhadali	1	December	I	0.0	0.0
Kuchawada	1		II	0.0	0.0
Jegol	1	January	I	5.5	0.0
Rampura	1		II	8.8	0.0
		February	I	23.3	3.7
			II	16.3	6.1
		March	I	6.8	5.4
			II	4.0	4.4
		April	I	0.0	0.0
			II	0.0	0.0