

Original Research Article

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Seasonal Incidence of Insect Pests on Rapeseed-Mustard

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ABSTRACT

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Study on seasonal incidence of insect pests on rapeseed-mustard was conducted on the Oilseed Farm Kalyanpur, Kanpur during rabi, 2018-19. The occurrence of three major insects were recorded viz., Mustard sawfly *Athalia lugens proxima* Klug which was observed at seedling stage, whereas painted bug *Bagrada cruciferarum* Kirkaldy was observed at two different crop stages: firstly at seedling stage and secondly at maturity stage and mustard aphid *Lipaphis erysimi* Kalténbach appeared from flowering to pod bearing stage of mustard crop. The cloudy weather condition and temperature from 8-32°C favoured the insect pests multiplication. Out of the six *Brassica* species, viz Urvashi, GSC-6, BSH-1, T-27, YST-151 and DRMR IJ-31; T-27 was least attacked by the mustard aphid.

Introduction

The family brassicaceae (cruciferae) is one of the 10 most economically important plant families consisting of about 3500 species and 360 genera (Warwick *et al.*, 2000). *Brassica* species play an important role in the world agriculture as oilseed, vegetable, forage, condiments and biodiesel. *Brassica* crops contribute both to the economies and health of

populations (via anti-oxidants, vitamins, anti-carcinogenic compounds etc.) around the world.

India account for 19.8 and 9.8 percent of the total acreage and production (USDA 2016-17). Rapeseed–mustard crops in India are grown in diverse agro climatic conditions ranging from north-eastern / north western hills to down south under irrigated/rainfed,

timely/late sown, saline soils and mixed cropping. Among various biotic factors responsible for reducing the yield of mustard, insect pests are the major one. According to Bakhetia and Sekhon (1989), 38 insect pests are known to be associated with rapeseed-mustard crop in India.

On the basis of their economic importance, the insect pests of mustard crop may be grouped into key pest: aphid, *Lipaphiserysimi* (Kaltenbach), major pests: sawfly, *Athalialugens proxima* (Klug), painted bug, *Bagrada cruciferarum* Kirkaldy and leaf miner, *Chromatomyia horticola* Goureau, minor pests: bihar hairy caterpillar, *Spilosoma obliqua* Walker, cabbage butterfly, *Pieris brassicae* Linnaeus, flea beetle, *Phyllotreta Cruciferae* Goeze and green aphid, *Myzus persicae* Sulzer, new pests: leaf webber, *Crocidolomia binotalis* Zeller, borer, *Hellulaundalis* Fabricius and whitefly, *Bemisia tabaci* Gennadius.

Among these, aphid, *L. erysimi* is most important key pest in all the mustard growing regions of the country. The mustard aphid is the most destructive pest in rapeseed mustard. The infestation of mustard aphid occurs in the field from December to February. Both the adults and nymphs of this aphid cause damage to mustard plants from seedling to maturity, but maximum damage is caused at flowering stage (Ahmed and Jalil, 1993).

The aphids suck sap from leaves, flower-buds, flowers, pod and twigs of the plants. They also secrete sticky honeydew which act as a medium for sooty mold development and reduce the photosynthetic efficiency of the plants. In case of severe infestation, leaves become curled, plant fails to develop pods, the young pods when developed fail to become mature and cannot produce healthy seeds. As a result, plants lose their vigour and growth becomes stunted (Morzia and Huq, 1991).

Materials and Methods

The experiment was conducted during *rabi* season 2018-19 at Oilseed Farm, Kalyanpur, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. Geographically it is situated between 26°21' east longitude at a height of 125.1 meter above mean sea level. The region is subtropical with semi-arid climate. Six different mustard varieties were selected for recording the population dynamics of mustard aphid; viz. *Urvashi*, GSC-5, BSH-1, T-27, YST-151, IJ-31. The design used was randomized block design (RBD) under three replications (plot size 4.2 x 3 m²) on second week of November 2018.

The data on meteorological parameters viz., minimum and maximum temperature (°C), relative humidity (%), rainfall (mm) and sunshine (hours) of study period, collected from department of Agronomy of the University.

S.No.	Insect-pests	Mode of observation
1.	Mustard sawfly	No. of grubs on 10 randomly selected plants/plot
2.	Painted bug	No. of nymph and adults/m row
3.	Mustard aphid	No. of aphids on 10 cm central top twigs of 10 randomly selected plants per plot

Results and Discussion

Based on regular monitoring of insect pests during *rabi* 2018-19, three insect pests namely mustard sawfly *Athalialugensproxima* Klug, painted bug *Bagrada hilaris* Kirkaldy and mustard aphid, *Lipaphiserysimi* Kalt. were infesting rapeseed mustard at different growth stages.

Mustard sawfly

It is obvious from the Table 1 that the incidence of mustard sawfly on *Urvashi* was recorded as 1.6 grubs/ plant in 45th Standard Meteorological Week (SMW) and found till 48th SMW. The peak population of insect was observed in 46th SMW as 2.3 grubs/plant. The population of mustard sawfly on GSC-6 was 1.0 grub/plant in 45th SMW. The population of insect increased to a level of 2.3 grubs/plant in 46th SMW. Thereafter, the population of mustard sawfly declined and was not observed beyond 48th SMW.

The population of mustard sawfly on BSH-1 was recorded from 45th to 48th SMW. Its highest population, 3.6 grubs/plant was observed on 46th SMW. The population of mustard sawfly on YST-151 was observed from 45th to 48th SMW with peak population, 2.6 grubs/plant during 46th SMW. The population of mustard sawfly was not found 49th week onwards. The incidence of mustard sawfly on T-27 was recorded from 46th to 48th SMW. The peak population of this insect, 1.3 grubs/plant was observed in 46th SMW. The mustard sawfly was observed on DRMR IJ-31 from 45th to 48th SMW. The highest population of mustard sawfly was observed, 2.6 grubs/plant in 46th SMW.

The mustard sawfly appeared at early stage of crop growth numbering from 0.3 to 3.6 grubs/plant on different *Brassica* spp. during crop season. Mustard sawfly was found attacking *Brassica* oilseed at early stage of crop growth, which was found in accordance with early records (Manjar, 1996).

The weather conditions influenced the incidence of mustard sawfly in the present studies had the support of studies of the past by several workers (Jat *et al.*, 2006; Singh *et al.*, 2008). The finding of present study suggests that temperature ranging from

26.6°C-28.3°C was found conducive for its multiplication.

Painted bug

It is apparent from the Table 2 that the painted bug was observed on *Brassica* crops at two distinct phases of crop growth, firstly it appeared at seedling stage and Secondly at pod bearing to maturity stage, skipping the Flowering stage of crop growth. Periodically during First phase the insect was recorded from 45th to 48th SMW, whereas in second phase, it occurred from 8th to 12th SMW.

The population of painted bug on *Urvashi* ranged from 0.0 to 2.0 bugs/meter row with maximum population 2.6 bugs/meter row in the 46th SMW during early stage of crop growth. During second phase of attack, the population of painted bug varied from 0.6 to 4.0 bugs/meter row with peak population of 4.0 bugs/meter row in 12th SMW.

The climatic condition prevailed during second phase of attack by painted bug were found to be more favourable than first phase of attack. The population of painted bug on GSC-6 was recorded from 45th to 48th SMW during first phase of attack and it ranged from 0.7 to 2.6 bugs/meter row with peak population 2.6 bugs/meter row during 46th and 47th SMW. During second phase of attack, the population of painted bug was observed from 8th to 12th SMW and it varied from 1.0 to 4.5 bugs/meter rows with peak population of 4.5 bugs/meter row in 12th SMW.

The population of painted bug on BSH-1 was recorded from 45th to 48th SMW during first phase of attack and it ranged from 0.3 to 3.6 bugs/meter row with peak population 3.6 bugs/meter rows during 47th SMW. During second phase of attack, the population of painted bug was observed from 8th to 12th SMW and it varied from 1.6 to 5.6 bugs/meter

row with peak population of 5.6 bugs/meter row in 12th SMW. During first phase of attack on YST-151 the population of painted bug was observed from 45th to 48th SMW and it ranged from 1.0 to 3.0 bugs/meter row with peak population 3.0 bugs/meter row during 47th SMW. The population of painted bug was observed from 8th to 12th SMW during second phase of attack and it varied from 0.3 to 4.3 bugs/meter row with peak population of 4.3 bugs/meter row in 12th SMW. The population of painted bug on T-27 was recorded from 45th to 48th SMW during first phase of attack and it ranged from 0.3 to 2.6 bugs/meter row with peak population 2.6 bugs/meter row during 47th SMW.

During second phase of attack, the population of painted bug was observed from 8th to 12th SMW and it varied from 2.0 to 3.3 bugs/meter row with peak population of 3.3 bugs/meter row in 12th SMW. During first phase of attack on DRMR IJ-31 the population of painted bug was observed from 45th to 48th SMW and it ranged from 1.3 to 3.0 bugs/meter row with peak population 3 bugs/meter row during 47th SMW. The population of painted bug was observed from 8th to 12th SMW during second phase of attack and it varied from 2.0 to 4.2 bugs/meter row with peak population of 4.2

bugs/meter row in 12th SMW. The painted bug is a serious pest of cruciferous plants. This insect was observed as more destructive at the seedling and pod formation stages of mustard crops Vora *et al.*, (1985).

Mustard aphid

The data regarding population of mustard aphid are given in Table 3 the incidence of mustard aphid was observed from 2nd SMW to 12th SMW on different *Brassica* spp. Depending upon varying period of flowering of different varieties. Out of the six varieties, the incidence of mustard aphid was first recorded on BSH-1 and YST-151 during the second SMW.

The population of mustard aphid on *Urvashi* was recorded from 4th to 12th SMW. The peak population of mustard aphid, 79.6 aphids/10cm central twig/plant was observed in 8th SMW. The occurrence of mustard aphid on GSC-6 was recorded from 4th to 12th SMW. The peak population of mustard aphid, 80.0 aphids/10cm central twig/plant was observed in 8th SMW. The population of mustard aphid on BSH-1 was recorded from 2nd to 11th SMW.

Table.1 Occurrence of mustard sawfly on different *Brassica* sp. during *rabi*, 2018-19

Standard Meteorological Week (SMW)	No. of sawfly/Plant <i>Brassica</i> Spp.						Weather Parameters					
	<i>Urvashi</i>	GSC-6	BSH-1	YST-151	T-27	DRMR IJ-31	Temp (°C) Max.	Temp (°C) Min.	RH(%) Mor.	RH(%) Eve.	Rainfall (mm)	Sunshine (Hours)
45	1.6	1.0	0.6	0.3	0.0	2.0	28.3	12.8	82	44	0.0	6.5
46	2.3	2.3	3.6	2.6	1.3	2.6	29.5	10.6	84	34	0.0	8.1
47	0.6	1.6	2.3	1.9	0.6	2.3	28.5	11.3	80	34	0.0	8.7
48	0.3	0.3	0.6	1.0	0.3	1.6	26.6	11.6	90	43	0.0	5.3

Table.2 Occurrence of painted bug on different *Brassica* sp. during *rabi*, 2018-19

Standard Meteorological Week (SMW)	Painted bug/m row						Weather Parameters					
	<i>Brassica</i> Spp.						Temp(°C)		RH(%)		Rainfall	Sunshine
	<i>Urvashi</i>	GSC-6	BSH-1	YST-151	T-27	DRMR IJ-31	Max.	Min.	Mor.	Eve.	(mm)	(Hours)
45	1.2	1.1	0.3	1.3	0.3	1.3	28.3	12.8	82	44	0.0	6.5
46	1.6	2.6	2.6	1.5	1.3	1.5	29.5	10.6	84	34	0.0	8.1
47	2.0	2.6	3.6	3.0	2.6	3.0	28.5	11.3	80	34	0.0	8.7
48	0.0	0.7	1.0	1.0	0.3	1.6	26.6	11.6	90	43	0.0	5.3
08	0.6	1.0	1.6	0.3	1.6	2.0	26.1	12.3	87	50	0.0	5.5
09	1.4	2.3	1.7	2.6	2.0	2.3	22.6	10.5	87	52	9.1	4.5
10	2.6	4.0	3.3	3.5	2.6	2.6	27.4	12.0	79	41	0.0	9.6
11	3.9	4.2	3.6	4.0	2.6	3.3	29.2	13.2	80	38	0.0	9.0
12	4.0	4.5	5.6	4.3	3.3	4.2	32.2	15.8	63	39	0.0	10.2

Table.3 Occurrence of mustard aphid on different *Brassica* sp. during *rabi*, 2018-19

Standard Meteorological Week (SMW)	No. of aphids/10cm central twig						Weather Parameters					
	<i>Brassica</i> Spp.						Temp(°C)		RH(%)		Rainfall	Sunshine
	<i>Urvashi</i>	GSC-6	BSH-1	YST-151	T-27	DRMR IJ-31	Max.	Min.	Mor.	Eve.	(mm)	(Hours)
2	0.0	0.0	0.8	0.8	0.0	0.0	21.4	7.5	87	43	0.0	4.9
3	0.0	0.0	8.5	11.2	0.0	0.0	23.1	6.0	83	39	0.0	8.0
4	16.0	12.4	28.9	26.6	2.0	12.2	19.6	10.6	84	61	13.5	3.2
5	38.4	42.1	58.0	44.6	7.9	19.3	21.3	8.3	85	50	0.0	8.5
6	34.2	36.6	44.7	32.1	6.0	12.6	22.1	10.0	90	55	10.5	5.1
7	68.5	72.2	145.4	136.8	9.2	33.8	12.3	11.6	89	57	1.7	5.4
8	79.6	80.0	261.5	211.0	11.3	190.7	26.1	12.3	87	50	0.0	5.5
9	58.3	61.4	180.0	79.6	7.4	72.3	22.6	10.5	87	52	9.1	4.5
10	46.0	32.2	157.6	12.4	5.7	54.9	27.4	12.0	79	41	0.0	9.6
11	12.2	18.3	22.0	0.0	0.2	20.3	29.2	13.2	80	38	0.0	9.0
12	6.3	5.4	0.0	0.0	0.0	4.4	32.2	15.8	63	39	0.0	10.2

The maximum population of mustard aphid, 261.5 aphids/10cm central twig/plant was observed in 8th SMW. The infestation on BSH-1 was comparatively very much greater than other varieties namely, *Urvashi*, GSC-6, YST-151, T-27, DRMR IJ-31. The incidence of mustard aphid on YST-151 was recorded from 2nd to 10th SMW. The maximum population of mustard aphid, 211.0 aphids/10cm central twig/plant was observed in 8th SMW.

The population of mustard aphid on T-27 was recorded from 4th to 11th SMW. The highest population of mustard aphid, 11.3 aphids/10cm central twig/plant was observed in 8th SMW. The infestation on T-27 was comparatively very much lesser than other varieties namely, *Urvashi*, GSC-6, BSH-1, YST-151, DRMR IJ-31. The occurrence of mustard aphid on DRMR IJ-31 was recorded from 4th to 12th SMW. The peak population of mustard aphid, 190.7 aphids/10cm central twig/plant was observed in 8th SMW.

Singh *et al.*, (2009) at Kanpur in Uttar Pradesh studied the influence of environmental factors on the population fluctuation of aphid, *L. erysimi* and reported that the infestation commenced from 3rd week of December (0.2 aphid/10 cm twig) and reached at peak during 2nd week of February (292.0 aphids/10 cm twig). During the peak period of aphid population, maximum temperature, minimum temperature and morning relative humidity were 24.7 to 24.8 °C, 10.6 to 14.5 °C and 83.6 to 94.7 per cent, respectively. Singh and Lal (2012) noticed that the natural appearance of mustard aphid population was started from 2nd week of January during the both year and reached its peak in 8th SMW with 219.07/10cm terminal shoot and 199.10/10cm terminal shoot during 2009-2010 and 2010-2011. Studies indicated that mustard aphid incidence was higher when maximum and minimum temperature ranged

between 9.30 to 25.9°C and 8.20 to 25.2°C, relative humidity during hours 64.75 and 67.6 per cent, rainfall 0.4 and 1.4 mm and sunshine hours 7.50 and 7.20 during 2009-2010 and 2010- 2011, respectively. Altogether three insect pests viz. mustard sawfly, painted bug and mustard aphid were found attacking at different growth stages of rapeseed and mustard. Mustard sawfly was seen during early stage of crop growth whereas painted bug was observed during two different phases of the crop and mustard aphid was mainly observed during flowering stage and was seen till pod bearing stage.

The incidence of all three insect pests was observed from first appearance till last appearance by taking continuous observations during the crop growth period on different *Brassica* crops. All the insect pests showed a varying trend with different period of incidence with different peak populations during different Standard Meteorological Weeks. Along with the crop stage and variety, weather conditions had a major role in appearance of insect pests. The cloudy weather condition and temperature from 8-32°C favoured the insect pests multiplication. Out of the six *Brassica* species, viz *Urvashi*, GSC-6, BSH-1, T-27, YST-151 and DRMR IJ-31; T-27 was least attacked by the mustard aphid. It was evident from the present study that T-27 was comparatively more tolerant to mustard aphid.

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