

Original Research Article

Population Dynamics of Insect-Pests on *Brassica* species in different Dates of Sowing

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ABSTRACT

A total of seven species of insect-pests have been found to infest *Brassica* species of these 3 belonged to the orders Hemiptera, 2 to Lepidoptera, and one each to the order Hymenoptera, Coleoptera. Among these, *Lipaphis erysimi* Kalt. has been found to occur continuously in a sizeable population causing a noticeable damage from flowering to maturity stage of the crop, while mustard sawfly, *Athalia lugens proxima* Klug. and flea beetle, *Phyllotreta cruciferae* Goeze occurred during seedling stage and painted bug, *Bagrada cruciferarum* damaged the crop during seedling to maturity stage at a low level of population causing negligible damage.

Keywords

Insect-pest, date of
sowing, aphid,
mustard, Brassica

Introduction

Rapeseed-mustard is the main oilseed crop sown during the *Rabi* season in India. It is planted on more than 80% of oilseeds. Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana and Gujarat are the leading states for mustard crop accounting for more than 70% of the total mustard area in the country. Even after the availability of good production technology mustard crop is unable to give potential yield in the country. This is because *Brassica* crops suffer heavy loss in yield due to various biotic and abiotic factors. Among the biotic constraints, insect-pests are one of the most important biotic factors in reducing the crop yield. About 50 insect species have been found infesting rapeseed-mustard in India About 50 insect species have been

found infesting rapeseed-mustard in India. Out of many insect pests, saw fly (*Athalia proxima lugens*), leaf miner (*Chromatomyia horticola*), painted bug (*Bagrada hilaris*), flea beetle (*Phyllotreta cruciferae*), diamond back moth (*Plutella xylostella*), cabbage butterfly (*Pieris brassicae*), mustard aphid (*Lipaphis erysimi*) and Green peach aphid (*Myzus persicae*) are considered important which causes considerable yield losses (Patel and Singh 2016).

Since a long time the insect-pests of the cop are being controlled with application of broad spectrum insecticide in a very injudicious way. Thus indiscriminate use of insecticides for the control of insects- pest led to the problems of insect-pest resistance to insecticides, resurgence of pests and hazards

to humans, non-target animals and environment. Therefore, a strategy of integrated pest management by integrating ecologically compatible options is more economic, eco-friendly to sustainable crop production. Integrated pest management is essentially an ecological approach of pest management rather than pest control which requires the knowledge of the population fluctuation of insect-pests in the agro-ecosystem. Thus the population dynamics of the insect pests may be the strong basis to know the status of pest occurrence with time of incidence along with population level. Population dynamics is the study of how and why population fluctuates temporally and spatially in the agroecosystem. Therefore, the present study is formulated to observe the population dynamics of insect fauna on *Brassica* species in different dates of sowing which could be useful in saving the farmer from the possible yield losses of mustard crop.

Materials and Methods

Eight varieties of rapeseed-mustard from different *Brassica* species including *B. rapa* (BSH-1), *B. rapa* (YST-151), *B. carinata* (Kiran), *B. nigra* (Surya), *B. juncea* (Varuna), *B. napus* (GSC-6), *B. alba* (PSB-1) and *E. sativa* (T-27) were taken for the studies during *Rabi* season 2018-19. The experiments were laid down in Randomized Block Design (RBD) with three replications. Each crop variety of *Brassica* species was treated as one treatment.

The field experiment for population dynamics of insect pests was carried out in five different dates of sowing at fifteen days of interval, as October 3 (First sowing), October 18 (Second sowing), November 3 (Third sowing), November 18 (Fourth sowing) and December 3 (Fifth sowing). The size of plot for each treatment in all replications was

taken as 4.2m x 3m with row to row and plant to plant space of 30 and 10 cm, respectively. During experimentation all the recommended agronomic practices were followed to raise the healthy crop except the plant protection measures.

To study the population dynamics of the insects associated with the rapeseed-mustard, the weekly observations on various insect pests were started to record at 7 DAS (Date after sowing) to harvest of the crop. For observations, ten plants were randomly selected in each unprotected plot and tagged as mark of identification to record data on aphid population. The aphid populations were counted on 10 cm terminal shoot length of inflorescence on the selected plants as described by Patel and Singh (2017).

Five places of one meter square area in each plot were taken for observation on larval population of mustard sawfly, cabbage butterfly and diamond back moth; nymphal and adult population of painted bug and flea beetle. The population of green peach aphid was recorded on three leaves *viz.*, top, middle and lower leaf on 10 plants selected randomly Patel and Singh (2017).

Results and Discussion

Mustard Saw fly (*Athalia lugens proxima*)

The appearance of sawfly was noticed during seedling stage to rosette stages. One month duration from 3rd October to 3rd November was found optimum time period to plant the rapeseed-mustard crop to escape the incidence of sawfly. The least population of mustard sawfly was observed on *E. sativa*, *B. carinata* and *B. napus* as compared to other *Brassica* species during the study. Patel *et al.*, (2018) observed that incidence of grubs population of *A. lugens proxima* were started at 20 day after sowing (DAS).

Flea beetle (*Phyllotreta cruciferae*)

The incidence of *P. cruciferae* was noticed at seedling stage on *Brassica* species in different five dates of sowing. Third date of sowing (18th November) was found optimum to escape the attack of mustard flea beetle.

The least population of *P. cruciferae* was observed on *B. carinata* and *B. juncea* as compared to other *Brassica* species during the investigation. Patel *et al.*, (2017) concluded that the flea beetle was quite active during October, November and December infesting the early vegetative stage with respect to different sowing date.

Painted bug (*Bagrada cruciferarum*)

The incidence of *B. cruciferarum* was noticed at seedling to maturity stage. Best suited date to escape the attack of *B. cruciferarum* was from second (18th October) and fourth (18th November) date of sowing. Low population of the pest was found on *B. napus* followed by *B. carinata* while high on *B. nigra* followed by *E. sativa* in all five date of sowing during the experimental year. Patel *et al.*, (2017) reported that all different sown brassica spp. the infestation of the *B. cruciferarum* occurs in two distinct phases with a peak at seedling and maturity stage of the crop.

Mustard aphid (*Lipaphis erysimi*)

The appearance of mustard aphid, *L. erysimi* was recorded from flowering stages on *Brassica* species. First date of sowing (3rd October) was found optimum to avoid the attack of mustard aphid and yield-loss. It was concluded that low population of mustard aphid was observed on *E. sativa*, *B. carinata* and high on *B. rapa* cv. BSH-1 and *B. rapa* cv. YST-151 in all five dates of sowing during the year of investigation. In general, the mustard aphid population was found to

fluctuate throughout the season with an erratic pattern of occurrence on all *Brassica* species. Patel and Singh (2017) concluded that in general there is advancement in the arrival of aphids from December to January.

Green peach aphid (*Myzus persicae*)

Slightly high population of *M. persicae* as compared to other species of aphid was observed only on *B. carinata* in different dates of sowing during the year of investigation. Patel and Singh (2017) observed that the time - period from first week of January to last week of February was found favourable for build-up of population of green peach aphid on *Brassica* crop

Cabbage Butterfly (*Pieris brassicae*)

Low population of *P. brassicae* was observed on *Brassica* species only in two dates of sowing during 2018-19. Lal and Bhajan (2004) reported that cabbage butterfly as emerging serious pest of Brassica oilseeds in Eastern Uttar Pradesh and other parts of India.

Diamond back moth (*Plutella xylostella*)

Low population of *P. xylostella* was noticed only on *B. napus* and *B. carinata* in fourth (18th November) and fifth (3rd December) date of sowing during Rabi 2018-19. Amongst pest complex of about seven species of insect-pests have been found to infest *Brassica* species. Among these, *Lipaphis erysimi* Kalt. has been found to occur causing a noticeable damage from flowering to maturity stage of the crop, while mustard sawfly, *Athalia lugens proxima* Klug. and flea beetle, *Phyllotreta cruciferae* Goeze occurred during seedling stage and painted bug, *Bagrada cruciferarum* damaged the crop during seedling to maturity stage. Sporadic occurrence with low population of green peach aphid, *Myzus persicae* have been found only on *B. carinata*.

Table.1 Population dynamics of insect-pests on *Brassica* species at different dates of sowing during *Rabi* 2018-19

<i>Brassica</i> species	DOS	Population of different insect-pests						
		Mustard Saw fly (larvae/m ²)	Flea beetle (beetles/m ²)	Painted bug (bugs/m ²)	Mustard aphid (aphids per 10cm CSL)	Green peach aphid (aphids/ 3 leaves)	Cabbage Butterfly (larvae/m ²)	Diamond back moth (larvae/m ²)
<i>B. rapa</i> cv. BSH-1	D1	0.4	3.23	1.39	186.8	-	-	-
	D2	0.2	4.06	0.71	186.5	-	2.0	-
	D3	0.0	4.85	0.54	300.5	-	0.3	-
	D4	3.0	0.33	0.0	261.8	-	-	-
	D5	0.4	0.55	0.0	137.3	-	-	-
<i>B. rapa</i> cv. YST- 151	D1	0.2	2.95	1.25	263.0	-	-	-
	D2	0.1	6.46	0.55	216.2	-	-	-
	D3	0.2	4.47	1.07	424.7	-	0.6	-
	D4	0.0	1.33	0.0	362.6	-	-	-
	D5	0.6	1.33	1.11	203.0	-	-	-
<i>B. juncea</i> cv. Varuna	D1	0.2	2.71	1.43	194.3	-	-	-
	D2	0.3	4.99	0.38	185.6	-	-	-
	D3	0.1	6.80	0.74	297.5	-	0.8	-
	D4	0.0	0.55	0.0	172.0	-	-	-
	D5	0.4	0.55	0.0	141.6	-	-	-
<i>B. napus</i> cv. GSC-6	D1	0.0	2.47	0.46	160.8	-	-	-
	D2	0.2	5.59	0.13	117.6	-	1.3	-
	D3	0.0	5.42	0.63	206.0	-	0.5	-
	D4	0.0	1.66	0.52	186.8	-	7.2	7.2
	D5	0.0	0.0	0.0	92.6	-	-	-
<i>B. carinata</i> cv. Kiran	D1	0.6	1.37	0.31	48.8	93.68	40.0	-
	D2	0.0	3.79	0.53	45.3	134.8	-	-
	D3	0.2	2.85	1.10	82.8	112.5	18.6	-
	D4	0.0	1.33	0.27	103.5	77.6	3.0	3.0

	D5	0.8	1.10	0.44	52.5	114.2	27.1	27.1
<i>B. nigra</i> cv. Surya	D1	0.1	3.85	1.42	66.2	-	-	-
	D2	0.3	7.26	0.53	72.3	-	-	-
	D3	0.0	6.37	1.65	150.9	-	-	-
	D4	4.6	1.33	1.72	119.3	-	-	-
	D5	0.4	0.55	0.0	52.5	-	-	-
<i>E. sativa</i> cv. T-27	D1	0.1	2.75	1.14	17.5	-	-	-
	D2	0.1	6.39	0.41	27.0	-	-	-
	D3	0.0	12.75	0.15	51.6	-	-	-
	D4	0.0	7.10	1.97	56.5	-	-	-
	D5	0.0	0.0	1.67	23.0	-	-	-
<i>B. alba</i> cv. PSB-1	D1	0.2	2.94	3.42	74.0	-	-	-
	D2	0.3	4.39	0.58	164.2	-	2.4	-
	D3	0.0	8.85	0.96	150.9	-	-	-
	D4	2.3	2.44	0.89	119.3	-	-	-
	D5	0.0	0.0	2.22	52.3	-	-	-
CD at 5%		0.44	1.37	0.36	46.61	17.72	3.99	2.15
Sem		0.14	0.45	0.12	15.13	5.75	1.29	0.70
CV		220.22	81.94	91.34	65.67	273.01	311.00	473.54

DOS=Date of sowing, D1=3rd October, D2=18th October, D3=3rd November, D4=18th November, D5=3rd December

Among them, *Myzus persicae* was found at vegetative stage whereas Cabbage butterfly, *Pieris brassicae* and diamond back moth, *Plutella xylostella* were found in irregular occurrence with low abundance. The status of all seven insect-pests on *Brassica* species was observed as minor with irregular occurrence while *L. erysimi* as a regular key pest.

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