

## Monitoring of Arthropod Complex associated with Rapeseed- mustard crop in Kashmir Himalayas

### Abstract

Arthropod complex of mustard was studied and about eight species of insects-pests at Mountain Research centre for field crops (MRCFC) during Rabi 2020 -21 was recorded. The mustard aphid, *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 flea beetle, *Phyllotreta cruciferae* Goeze occurred during seedling stage and shield bug *Carpocoris sp* damaged the crop during seedling to maturity stage at a low level of population causing negligible damage. Sporadic occurrence with low population of cabbage aphid, *Brevicoryne brassicae*, Mustard aphid, *Lipaphis erysimi*(Kalt.) and mustard leaf miner, *Chromatomyia horticola* have been found only on leaves. Among them, *Brevicoryne brassicae* is found at flowering stage. Cabbage butterfly, *Pieris brassicae* is found in irregular occurrence with high abundance. The status of all eight insect-pests on *Brassica* species was observed as minor with irregular occurrence while *L. erysimi* as a regular key pest.

Key words;- Arthropod,Rapeseed,Mustard insects,Kashmir,Crop

### INTRODUCTION

Rapeseed-mustard is a major oilseed crop grown in India next to soybean in terms of production and ranked first in terms of oil yield among all oilseed crops. It is grown on an area of about 6.4 m ha with a production of 8.02 MT and productivity is 1262 kg/ ha (Patel and Singh, 2017a). It has an oil content ranging from 35 to 45%. India occupied world's fourth largest edible oil economy ranked after the U.S., China and Brazil and contributes 6% of global vegetable oil production and 10% of edible oils. Rapeseed-mustard is the main oilseed crop sown during the *rabi* season in India. Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana and Gujarat are the leading states for mustard crop accounting for more than 70% of total mustard area of the country. In India, *Brassica juncea*, among *Brassica* species shares about 90% in area. Even after 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 (Patel and Singh, 2017a). About 50 insect species have been found infesting rapeseed-mustard in India. Hence, there is a great scope to study on insect-pests of rapeseed-mustard in Kashmir valley where we have temperate type of climate different than rest of the country.

**Material and Methods:-** The study was conducted during rabi 2020-21 and 2021-22 in the Field and Laboratory of the Section of Entomology, Mountain research centre for field crops (MRCFC) Khudwani Kulgam SKUAST-K. The mustard *Brassica juncea*, variety Shalimar sarson -1 was collected from Breeding Centre and seeds were sown on 30 October in rows. The distance from row to row was 45 cm. Intercultural operations such as weeding etc were done whenever necessary but no pest management practices were done in the field. Fertilizers were applied according as SKUAS-K Package and practices.

**Observation, collection and identification of free living arthropods:** Free-living insects were collected from Germination/seedling to siliqua maturation stages using a 30 cm diameter sweep net having 1.5 mm mesh, and attached with a 1.5 m long rod. Every week sweeping was done in between 09.00 to 11.00 h of the day, and each sample was consisted of 30 sweeps encompassing an area from ground level to the top of the plants. The pollinators

were collected during bloom of the crop. The collected insects were brought to the Entomology Laboratory of MRCFC Khudwani for identification and counting. They were killed by storing in a freezer for a few hours, mounted on points, dried and morphotyped. Insects were identified up to species or genus level and also separated as pest, predator, pollinator and unknown categories.

### Results & Discussion:-

Six insect-pests were recorded during the cropping season at different stages of *Brassica* species of which 3 belonged to Hemiptera, 1 to Lepidoptera, one each to the order Coleoptera and Diptera in Kashmir valley (Table 1). It was observed that the insect-pest species infested different parts viz., leaves, shoot, flower and pod. Major pest which caused significant damage was *Cabbage butterfly*, *Leaf miner* and *Mustard aphid*. During the course of investigation, three natural enemies viz., *Coccinella septempunctata*, *Apanteles glomeratus* and *Diaeretiella rapae* were found to be associated with insect-pest of rapeseed-mustard irrespective to the insect pest (Table 3). The abundance of insect pollinators recorded from mustard field during bloom of same experiment revealed 6 insect pollinators (Table-2) belonged to 3 orders. The highest mean relative abundance of *Apis cerana* (11.71%) followed by *Apis mellifera* (7.04%) and least 3.74% of *Erstalis arbustorum*. The Photographs of insect pests pollinators are listed in Table 2 and fig-1. Table 4 showed that the abundance, richness and diversity of pest, predator, pollinator and other category of insects varied from  $0.8 \pm 0.1$  to  $7.0 \pm 1.6$ ,  $0.3 \pm 0.1$  to  $0.5 \pm 0.2$  and  $0.5 \pm 0.3$  to  $6.4 \pm 1.6$  per 30 sweeps, respectively and the results differed significantly. The richness and abundance of pollinators were significantly higher compared to pests, predators and other category. The pests revealed the highest diversity compared to predators, pollinators and other category. Several studies have shown that different insect pests infest rapeseed-mustard at different locations in India. Rai (1976) reported a total of 24 insect pests from India, out of which *L. erysimi*, *A. lugens proxima* and *B. cruciferarum* were referred as the major pests while flea beetles, *P. cruciferae* Goeze and cabbage butterfly, *P. brassicae* L., *M. persicae* Sulzer and *P. xylostella* Lin. were considered as minor pest. The total number of insect pests on rapeseed-mustard increased and stood at 38 (Bakhetia and Sekhon, 1984), of which 15 are considered economically important. In 1991, the number of insect pests increased to 40 (Bakhetia and Arora, 1993). Present, more than 43 species of insect pests have been reported to infest rapeseed mustard in India, in which about a dozen species are considered as major pests (Purwar *et al.*, 2004). Choudhury and Pal (2006) reported fourteen insect including natural enemies on rapeseed-mustard. Out of which, *L. erysimi* was categorized as major pest. Singh *et al.* (2007) reported 21 insect species during the various crop stages. Nowadays, mustard aphid is observed as a national insect-pest (AICRP, 2015).

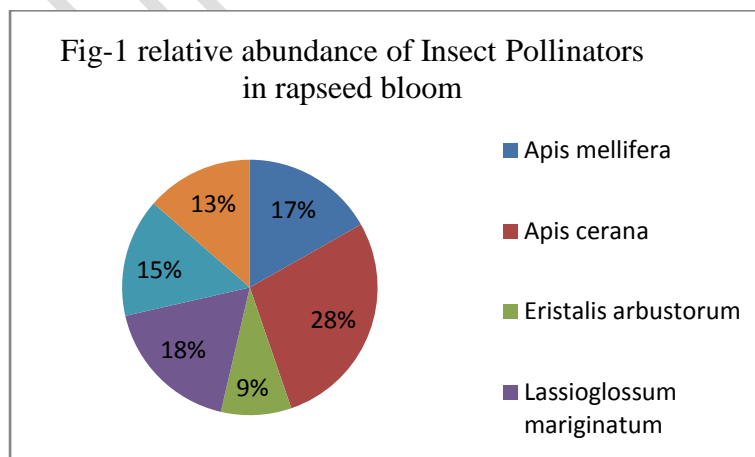


Table.1 Insect pest complex associated with mustard in MRCFC Khudwani Kashmir during rabi 2020-21

Common name	Scientific name	Order	Family	Feeding site	% Incidence		Mean	Status
					2020	2021		
Mustard aphid	<i>Lipaphis erysimi</i> (Kalt.)	Aphididae	Hemiptera	Leaf/Flowering stage	7.69	8.69	8.19	+++
Cabbage butterfly	<i>Peries brassicae</i>	Lepidoptera	Pieridae	Leaf	11.53	10.54	11.03	+++
Flea beetle	<i>Phyllotreta cruciferae</i> (Goeze)	Coleoptera	Chrysomelidae	Leaf	5.76	6.22	5.99	++
Pea leaf miner	<i>Phytomyza horticola</i>	Diptera	Agromyzidae	Leaf	9.61	10.69	10.15	++
Cabbage aphid	<i>Brevicoryne brassicae</i> (Linn.)	Hemiptera	Aphididae	Leaf/Flowering stage	7.22	8.12	7.67	+++
Shield Bug	<i>Carpocoris sp.</i>	Pentatomidae	Hemiptera	leaf	0.34	0.24	0.29	+
<b>C.D.(P=0.05)</b>					2.34	2.67		

Table-2 Insect Pollinator complex of Mustard in MRCFC Khudwani Kashmir during rabi 2020-21

Scientific Name	Order	Family	Relative abundance (%)		Mean
			2020	2021	
<i>Apis mellifera</i>	Hymenoptera	Apidae	6.54	7.55	7.04
<i>Apis cerana</i>	Hymenoptera	Apidae	11.21	12.21	11.71
<i>Eristalis arbustorum</i>	Diptera	Syrphidae	3.73	3.76	3.74
<i>Lassioglossum marginatum</i>	Hymenoptera	Halictidae	7.47	7.44	7.45
<i>Adrena spp.</i>	Hymenoptera	Andrenidae	6.54	6.04	6.29
<i>Eristalis tenax</i>	Diptera	Syrphidae	5.60	5.78	5.69
<b>C.D.(P=0.05)</b>			2.97	1.89	

Table 3. Natural enemies associated with insect-pests of rapeseed-mustard in MRCFC Khudwani during rabi 2020-21

Scientific name	Order and family	Host	Relative abundance	Economic status
-----------------	------------------	------	--------------------	-----------------

<i>Coccinella septempunctata</i>	Coleoptera Coccinellidae	<i>Lipaphis erysimi</i> , <i>Myzus persicae</i> , <i>Brevicoryne brassicae</i>	+++++	Major
<i>Apanteles glomeratus</i>	Hymenoptera Braconidae	<i>Pieris brassicae</i>	++	Low
<i>Diaeretiella rapae</i>	Hymenoptera Braconidae	<i>Lipaphis erysimi</i> , <i>Myzus persicae</i> , <i>Brevicoryne brassicae</i>	++	Low

Table-4 Average richness, abundance and diversity of arthropod fauna of mustard

	<b>Pests</b>	<b>Natural Enemy (Parasitoids/predators)</b>	<b>Pollinators</b>
Abundance	7.0 ± 1.6	1.0 ± 0.5	3.0 ± 8.5
Richness	1.8 ± 0.43	0.5 ± 0.2	6.4 ± 1.6
Diversity	0.8 ± 0.1	0.3 ± 0.1	0.5 ± 0.3





Fig 2- Some insect pests of rape seed mustard In Kashmir Valley.1,Shield bug,2 *Lipaphis erysimi* 3, *Pieris brassicae* 4, *Phytomyza horticola*

#### References:-

Patel, S. and Singh, C. 2017a. Development of weather based forewarning model for mustard aphid, *Lipaphis erysimi* (Kalt.) in Tarai region of Uttarakhand. *J. Agrometeorol.*, **19**: 382.

Patel, S. and Singh, C. 2017b. Seasonal dynamics of *Lipaphis erysimi* (Kalt.): Arrival, peak and migration pattern in tarai region of Uttarakhand. *J. Exp. Zool. India.*, **20**: 1573-75.

Patel, S., Singh, C.P. and Yadav, S.K. 2017a. Seasonal incidence of mustard flea beetle, *Phyllotreta cruciferae* on Brassica species in relation to weather parameters at different dates of sowing. *J. Ent. Zool. Stud.*, **5**: 673-77.

Patel, S., Yadav, S.K. and Singh, C.P. 2017b. The incidence of painted bug, *Bagrada hilaris* (Burmeister) on Brassica spp. and *Eruca sativa* with respect to the date of sowing. *J. Ent. Zool. Stud.*, **5**: 774-76.

Patel, S., Yadav, S.K. and Singh, C.P. 2017c. Bio-efficacy of insecticides against *Lipaphis erysimi* (Kalt.) in mustard ecosystem. *J. Ent. Zool. Stud.*, **5**: 1247-50.

Patel, S., Yadav, S.K. and Singh, C.P. 2018. Foraging behaviour of mustard sawfly, *Athalia lugens proxima* Klug. on rapeseed-mustard. *J. Experim. Zool.*, **21**:379-81.

AICRP. 2015. Annual Progress Report. National Research Centre on Rapeseed-Mustard, Bharatpur - 321303, Rajasthan, India.

Bakhetia, D.R.C. and Arora, R. 1993. Changing scenario of insect pests and pest management in rapeseedmustard. *In: Pests and Pest Management in India - The Changing Scenario.* Sharma, H.C. and Rao,

M.V. (Eds). *National Seminar in Changing Scenario in Pest and Pest Management in India* held during 31 Jan - 1 Feb. at Hyderabad, pp. 56-59.

Patel, S., Yadav, S.K. and Singh, C.P. 2018. Foraging behaviour of mustard sawfly, *Athalia lugens proxima* Klug. on rapeseed-mustard. *J. Experim. Zool.*, **21**: 379-81.

Purwar, J.P., Singh, R.K. and Mall, P. 2004. Eco-friendly management of insect pests in rapeseed-mustard. *Indian Farmers Digest.*, **37**: 34-35.

Rai, B.K. 1976. Pests of oilseed crops in India and their control. ICAR, New Delhi, p. 121.

Singh, R., Singh, D. and Rao, V.U.M. 2007. Effect of abiotic factors on mustard aphid (*Lipaphis erysimi* Kalt.) on Indian Brassica. *Indian J. Agric. Res.*, **41**: 67-70.

Yadav, S.K. and Patel, S. 2017. Insecticidal and repellent activity of some plant extracts against *Myzus persicae* (Sulzer) and *Brevicoryne brassicae* (Linnaeus). *J. Ent. Zool. Stud.*, **5**: 1434-39.

UNDER PEER REVIEW