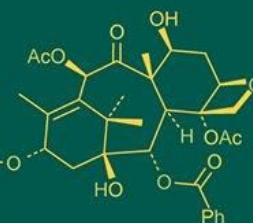
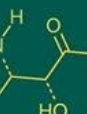
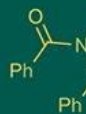


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Seasonal incidence of major insect pests on different *Brassica* species

RoshniDOI: <https://www.doi.org/10.33545/26174693.2025.v9.i5e.4338>**Abstract**

The studies on agro-ecological analyses of insect pest and their natural enemies in different Brassica species at Pantnagar revealed that mustard aphid (*Lipaphis erysimi*), mustard saw fly (*Athalia lugens*), flea beetle (*Phyllotreta cruciferae*) and a painted bug (*Bagrada hilaris*) are the major pests in different species. Their seasonal incidence on six different Brassica species (*Brassica juncea*, *Brassica campestris*, *B. rapa*, *B. nigra*, *B. alba* and *B. napus*) using eight varieties (BSH-1, YST-151, GSC-6, Varuna, PM-31, IJ-31, *B. alba* and *B. nigra*). The mustard aphid highest mean infestation was observed in *B. campestris* var. BSH-1 and lowest in *B. nigra*. *Athalia lugens* was found maximum in *B. napus* var. GSC-6 and the least in *B. juncea* var. Varuna. Maximum flea beetle incidence was observed in *B. campestris* var. BSH-1 and lowest in *B. juncea* var. PM-31. Maximum painted bug population was observed in *B. alba* and lowest in *B. rapa* var. YST-151.

Keywords: Agro-ecological analyses, *Brassica*, *Lipaphis erysimi*, *Athalia lugens*, *Phyllotreta cruciferae*, *Bagrada hilaris*, seasonal incidence

Introduction

Oilseed crops are considered as the backbone of agricultural economy since ancient times. The economically important mustard crop family Brassicaceae contains about 338 genera and 3702 species (Warwick *et al*, 2006) ^[15]. It has its origin in China and was first introduced in North East India (Shweta *et al*, 2017) ^[6]. The estimated area, production and yield of rapeseed-mustard worldwide is 36.68 mha, 72.42 mt and 1974 kg/ha, respectively (USDA, 2017-18) ^[14]. India is among the leading countries occupying third position in terms of rapeseed-mustard after China and Canada accounting for 19.8 and 9.8% of the total acreage and production worldwide (USDA, 2016-17) ^[13]. In India, *Brassica juncea* shares about 90% in area. Even after presence of good production technology, mustard crop fails to give potential yield in the country and suffers heavy yield losses due to various biotic and abiotic factors. Insect pests are the most important biotic factors responsible for reducing the crop yield. About 50 insect species have been found infesting rapeseed-mustard in India (Sharma and Singh, 2010) ^[8]. The insect pests found infesting rapeseed-mustard assumed to be of regional and sporadic significance include mustard aphid (*Lipaphis erysimi*), mustard saw fly (*Athalia lugens*), flea beetle (*Phyllotreta cruciferae*), painted bug (*Bagrada hilaris*), diamond back moth (*Plutella xylostella*), hairy caterpillar (*Spilosoma obliqua*), cabbage butterfly (*Pieris brassicae*) (Bakhetia *et al.*, 2002) ^[2]. The hemipteran mustard aphid (*Lipaphis erysimi*) belong to Aphididae, is the most serious pest of mustard causing substantial yield losses ranging from 35.4 to 96%, 30% seed weight loss and oil loss 2.75%. The nymphs and adult of mustard aphid suck the sap from leaves, stem, inflorescences and pods result in plant stunting, flower withering and deformed pod formation (Atwal and Dhaliwal, 1997) ^[1]. Thus, it becomes necessary to monitor mustard aphid regularly during the peak breeding season and IPM module has been prepared in this direction to effectively control the pest population. The mustard saw fly (*Athalia lugens*) belongs to Tenthredinidae attacks 12 species of cruciferous and occasionally 7 species of non-cruciferous plants. It attacks at seedling stage of mustard crop in its grub stage. It was observed attacking at about 15 days after germination of the mustard crop and its population reaches at its peak in the month of December after which it declined (Tripathi, 1963) ^[12]. The painted bug (*Bagrada hilaris*) is capable of causing 66 to 99% yield losses in *Brassica campestris* and 27 to 68% in *Brassica*

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juncea. A reduction of 0.063 to 0.064 gm seed weight per plant and 0.036 to 0.039% reduction in oil content were reported at every increase in unit bug per plant (Verma and Pandey, 1981) [9]. A thorough knowledge of seasonal activity of insect pest helps in developing efficient pest management strategies in a particular set of agro climatic conditions. That's why studies were taken up to ascertain the agro-ecological study of insect pests in different oilseed *Brassica* species.

Materials and Methods

The experiment was conducted at Crop Research Centre in Govind Ballabh Pant University of Agriculture and Technology, Pantnagar from seedling till pod filling stage of the mustard crop for the rabi season 2020-21. Six *Brassica* species (*Brassica juncea*, *B. nigra*, *B. alba*, *B. napus*, *B. campestris*, *B. rapa*) using eight varieties BSH-1, YST-151, Varuna, *B. nigra*, PM-31, GSC-6, *B. alba* and IJ-31. The experiment was laid down in RBD design having three replications and the varieties were sown in October last week (20 October, 2020).

Table 1: Classification of *Brassica* species under study

Brassica Species	Varieties
<i>Brassica campestris</i>	BSH-1
<i>Brassica juncea</i>	Varuna
	IJ-31
	PM-31
<i>Brassica nigra</i>	-
<i>Brassica alba</i>	-
<i>Brassica napus</i>	GSC-6
<i>Brassica rapa</i>	YST-151

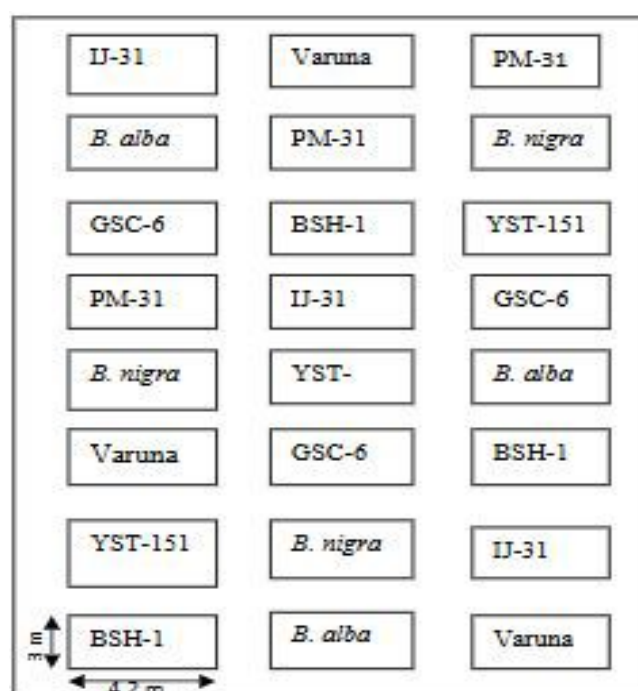


Fig. 1: Layout of an experimental field

Mustard aphid

The mustard aphid population was recorded from top 10 cm main shoot on five randomly selected tagged plants on weekly intervals from seedling till pod filling stage of the mustard crop.

Mustard saw fly, Painted bug and Flea beetle

Five places of one-meter square area in each plot were taken for the visual observation of larval population of mustard saw fly and adult population of painted bug and flea beetle. Population data of different insect pests was subjected to the analysis of variance (ANOVA) using simple RBD programme. The meteorological data at weekly intervals was obtained from the meteorological observatory at CRC

in Pantnagar and were correlated with the population of insect pest complex.

Results and Discussion

1. Mustard aphid (*Lipaphis eryimi*)

The first aphid incidence was recorded in December third week (51 SW) with the highest mustard aphid infestation was observed in *B. Campestris* var. BSH-1 (4.67 aphids/top 10 cm central shoot) followed by *B. juncea* var. IJ-31 (3.69 aphids/top 10 cm central shoot), GSC-6 and Varuna (3.47 aphids/top 10 cm central shoot), *B. rapa* var. YST-151 (3.40 aphids/top 10 cm central shoot), *B. alba*, *B. nigra* and the least was observed in *B. juncea* var. PM-31. The aphid population reached its peak in January fourth week. Singh *et*

al. (2009)^[9] also reported the first mustard aphid appearance in December third week.

The overall highest average mustard aphid population during the period of observation was noticed in BSH-1 (31.40 aphids/top 10 cm central shoot) followed by YST-151 (29.10 aphids/top 10 cm central shoot), GSC-6 (27.93

aphids/top 10 cm central shoot), Varuna (27.03 aphids/top 10 cm central shoot), PM-31 (25.37 aphids/top 10 cm central shoot), IJ-31 (22.17 aphids/top 10 cm central shoot), *B. alba* (8.47 aphids/top 10 cm central shoot) and the least infestation was observed in *B. nigra* (3.33 aphids/top 10 cm central shoot)

Table 1: Seasonal incidence of Mustard aphid population (Rabi 2020-21)

Brassica species/varieties Dates of observation	Aphid population per top 10 cm inflorescence shoot									
	18/12/20	23/12/20	28/12/20	02/01/21	07/01/21	12/01/21	17/01/21	22/01/21	27/01/21	Mean
<i>B. campestris</i> var. BSH-1	4.67	14.20	3.73	23.47	47.67	43.27	30.80	75.53	39.00	31.40
<i>B. rapa</i> var. YST-151	3.40	12.13	3.53	27.67	45.93	38.40	14.27	75.00	40.73	29.10
<i>B. juncea</i> var. Varuna	3.47	11.43	4.82	56.27	36.67	42.47	23.73	60.47	51.20	27.03
<i>B. nigra</i>	0.73	1.13	0.60	5.87	1.80	2.53	3.20	11.07	3.05	3.33
<i>B. juncea</i> var. IJ-31	3.60	11.93	6.80	18.00	26.13	15.87	14.93	69.93	31.67	22.12
<i>B. napus</i> var. GSC-6	3.47	9.43	5.36	8.87	52.40	38.33	13.13	75.80	63.87	27.93
<i>B. alba</i>	1.80	2.73	2.8	4.93	10.07	1.67	1.4	33.87	17.07	8.47
<i>B. juncea</i> var. PM-31	0.67	0.67	0.53	3.60	40.67	32.80	30.93	70.93	47.60	25.37
SE(m)	0.61	0.70	0.24	1.25	1.80	1.06	0.94	2.01	2.15	0.46
C.D. at 5%	1.86	2.14	0.75	3.83	5.51	3.25	2.87	6.15	6.57	3.41
CV	21.20	20.76	17.20	18.56	8.87	6.83	9.80	5.85	10.11	3.64

Aphid population in different *Brassica* species were correlated with different weather parameters like maximum and minimum temperature, maximum and minimum relative humidity, rainfall, sunshine and wind velocity which showed non significant negative correlation with maximum temperature which is in close proximity with the findings by Malik and Sachan (2013)^[4]; positive non-significant

correlation with minimum temperature except in *B. nigra* which showed non significant negative correlation and positive non significant correlation with maximum and minimum R.H. It showed non significant positive correlation with sunshine and wind velocity. Shah *et al.* (2015)^[10] also reported positive non significant correlation with sunshine and wind velocity.

Table 2: Correlation coefficient between average mustard aphid population in different *Brassica* species and weather parameters

Species/Variety	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Sunshine (hours)	Wind velocity (km/hr)
	Max.	Min.	Max.	Min.			
<i>B. campestris</i> var. BSH-1	-0.345	0.378	0.657	0.274	0.222	0.367	0.445
<i>B. rapa</i> var. YST-151	-0.372	0.254	0.651	0.146	0.121	0.020	0.267
<i>B. juncea</i> var. Varuna	-0.303	0.566	0.650	0.321	0.232	0.256	0.423
<i>Brassica nigra</i>	-0.361	0.128	0.449	0.001	0.195	0.361	0.177
<i>B. juncea</i> var. IJ-31	-0.338	0.165	0.607	0.127	0.277	0.192	0.235
<i>B. napus</i> var. GSC-6	-0.395	0.480	0.636	0.297	0.393	0.347	0.421
<i>Brassica alba</i>	-0.379	0.127	0.608	0.133	0.177	0.121	0.523
<i>B. juncea</i> var. PM-31	-0.403	0.533	0.673*	0.443	0.367	0.339	-0.368

*Significant at 5%

2. Mustard saw fly (*Athalia lugens*)

The first mustard saw fly incidence was observed in seedling stage i.e. first week of November (45th SW) with the highest pest population observed in *B. napus* var. GSC-6 (1.93 larvae/m²) followed by *B. juncea* var. Varuna and the least incidence was observed in *B. campestris* var. BSH-1

and *B. juncea* var. PM-31 (0.07 larvae/m²). The overall highest infestation during the observation period was observed in *B. napus* var. GSC-6 (1.76 larvae/m²) and the least infestation was observed in *B. juncea* var. Varuna (0.14 larvae/m²)

Table 3: Seasonal incidence of Mustard saw fly population (Rabi 2020-21)

Brassica species/varieties	Mustard Sawfly Larvae/m ²								
	8/11/20	13/11/20	18/11/20	23/11/20	28/11/20	3/12/20	8/12/20	13/12/20	Mean
<i>B. campestris</i> var. BSH-1	0.07	0.47	1.60	0.53	0.93	0.20	0.07	0.13	0.80
<i>B. rapa</i> var. YST-151	0.33	0.53	0.80	0.73	0.60	0.00	0.07	0.07	0.23
<i>B. juncea</i> var. Varuna	0.60	0.03	0.40	1.13	0.20	0.67	0.00	0.07	0.14
<i>B. nigra</i>	0.27	0.20	0.60	0.87	0.20	0.20	0.33	0.00	0.34
<i>B. juncea</i> var. IJ-31	0.40	0.87	0.27	0.47	0.73	0.07	0.33	0.07	0.40
<i>B. napus</i> var. GSC-6	1.93	0.13	1.20	1.53	0.33	0.20	0.13	0.13	1.76
<i>B. alba</i>	1.20	0.33	0.20	1.13	0.13	0.13	0.13	0.07	1.08
<i>B. juncea</i> var. PM-31	0.07	0.20	1.13	1.40	0.53	0.20	0.53	0.13	0.19
SE(m)	0.18	0.11	0.20	0.31	0.20	0.09	0.11	0.07	0.12
C.D. at 5%	0.55	0.35	0.62	NS	NS	0.27	NS	NS	0.40
CV	19.20	36.40	23.51	21.01	32.90	22.19	25.92	22.20	23.30

It showed positive non significant correlation with max. temperature and negative non significant correlation with minimum temperature. Likewise, it showed positive non significant correlation with max. R.H. and negative non significant correlation with minimum R.H. It showed

positive non significant correlation with wind, rainfall and sunshine. Pradhan *et al.* (2020) [7] also reported that the pest population showed positive non significant correlation maximum temperature and rainfall and negative non significant correlation with evening R.H.

Table 4: Correlation coefficients of average mustard saw fly population in different *Brassica* species with weather parameters

Species/Variety	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Sunshine (hours)	Wind velocity (km/hr)
	Max.	Min.	Max.	Min.			
<i>B. campestris</i> var. BSH-1	0.337	-0.239	0.607	-0.406	0.385	-0.328	0.232
<i>B. rapa</i> var. YST-151	0.445	-0.206	0.173	-0.452	0.221	0.432	0.124
<i>B. juncea</i> var. Varuna	0.063	-0.373	0.081	-0.339	0.343	0.212	0.147
<i>Brassica nigra</i>	0.193	0.144	0.194	-0.001	0.121	0.024	0.186
<i>B. juncea</i> var. IJ-31	0.639	-0.188	0.350	-0.181	0.232	0.327	0.265
<i>B. napus</i> var. GSC-6	0.284	-0.172	0.175	-0.395	0.124	0.220	0.402
<i>Brassica alba</i>	0.239	0.192	0.133	-0.299	0.213	0.232	0.325
<i>B. juncea</i> var. PM-31	0.162	-0.512	0.051	-0.139	0.126	0.563	0.196

* Significant at 5%

3. Flea beetle (*Phyllotreta cruciferae*)

The first appearance was observed in November second week (46 SW) i.e. in the seedling stage with the highest population reported in BSH-1 and *B. nigra* (2.27 beetles/m²) followed by IJ-31 and GSC-6 (2.13 beetles/m² each), Varuna (1.93 beetles/m²), YST-151 (1.53 beetles/m²), PM-31 (1.27 beetles/m²) and the least incidence was observed in

B. alba (0.80 beetles/m²). In BSH-1, the highest average flea beetle infestation (2.50 beetle/m²) was noticed during the period of observation whereas in PM-31, the least flea beetle infestation (1.50 beetles/m²) was observed during the observation period.

Statistically, no significant difference was observed among the mean flea beetle adult population in various species.

Table 5: Seasonal incidence of Mustard flea beetle population (Rabi 2020-21)

Brassica species/varieties/Dates of observation	Average No. of Flea Beetle Adults/m ²									
	8/11/20	13/11/20	18/11/20	23/11/20	28/11/20	3/12/20	8/12/20	13/12/20	18/12/20	Mean
<i>B. campestris</i> var. BSH-1	2.27	1.67	1.67	1.87	2.33	2.80	0.53	0.47	0.00	2.50
<i>B. rapa</i> var. YST-151	1.53	1.73	2.53	1.53	2.53	2.00	0.87	0.27	0.07	1.67
<i>B. juncea</i> var. Varuna	1.93	2.00	1.80	1.87	2.27	1.93	0.80	0.07	0.00	1.57
<i>B. nigra</i>	2.27	2.47	2.20	2.53	1.73	1.53	0.73	0.53	0.13	2.20
<i>B. juncea</i> var. IJ-31	2.13	2.40	1.87	2.47	1.93	2.00	0.67	0.33	0.07	1.90
<i>B. napus</i> var. GSC-6	2.13	2.00	2.13	2.40	1.87	1.80	0.47	0.33	0.07	1.98
<i>B. alba</i>	0.80	1.80	1.67	1.73	1.53	2.00	0.73	0.33	0.00	1.51
<i>B. juncea</i> var. PM-31	1.27	1.73	0.93	1.93	1.87	2.67	0.87	0.53	0.13	1.50
SE(m)	0.37	0.51	0.52	0.54	0.53	0.53	0.19	0.06	0.06	0.04
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV	22.56	21.04	22.01	32.14	50.00	35.00	24.18	26.89	32.19	23.32

It showed positive significant correlation with max. temperature and positive non significant correlation with minimum temperature. It showed negative non significant correlation with max. R.H. and negative significant correlation with minimum R.H. It showed positive non

significant correlation with rainfall and sunshine while negative non significant correlation with wind velocity. Ghosh *et al.* (2006) [3] also reported negative non significant correlation with mean R.H.

Table 6: Correlation coefficients of average Mustard flea beetle population in different *Brassica* species with weather parameters

Variety/Species	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Sunshine (hours)	Wind velocity (km/hr)
	Max.	Min.	Max.	Min.			
<i>B. campestris</i> var. BSH-1	0.754**	0.331	-0.237	-0.766	0.224	0.624	0.339
<i>B. rapa</i> var. YST-151	0.817*	0.379	-0.123	-0.733	0.464	0.336	-0.226
<i>B. juncea</i> var. Varuna	0.858*	0.423	-0.170	-0.743	0.226	0.234	-0.199
<i>Brassica nigra</i>	0.836	0.491	-0.007	-0.784	0.336	0.727	-0.665
<i>B. juncea</i> var. IJ-31	0.821*	0.401	-0.085	-0.762	0.356	0.342	-0.478
<i>B. napus</i> var. GSC-6	0.793*	0.363	-0.023	-0.776	0.082	0.654	-0.342
<i>Brassica alba</i>	0.764	0.285	-0.165	-0.695	0.367	0.266	-0.325
<i>B. juncea</i> var. PM-31	0.654*	0.212	-0.347	-0.619	0.399	0.934	0.236

* Significant at 5% Significant at 1%

4. Painted bug (*Bagrada hilaris*)

The painted bug was first observed in November second week (46 SW) with the highest population observed in *B. napus* var GSC-6 (1.40 bug/m²) followed by YST-151, IJ-31 (1.20 bugs/m²), PM-31, *B. alba*, Varuna and the least population was observed in BSH-1.

In *B. alba* and *B. juncea* var. Varuna, the highest (2.45 bug/m²) and the lowest pest population (0.34 bug/m²) was observed throughout the recording period, respectively. Statistically, no significant difference was observed among the mean flea beetle adult population in various species.

Table 7: Seasonal incidence of Mustard painted bug population (Rabi 2020-21)

Brassica species/varieties	Average No. of Painted Bug Adults/m ²								
	8/11/20	13/11/20	18/11/20	23/11/20	28/11/20	3/12/20	8/12/20	13/12/20	Mean
<i>B. campestris</i> var. BSH-1	0.53	1.20	2.40	1.87	1.67	2.00	0.53	0.00	1.67
<i>B. rapa</i> var. YST-151	1.20	1.20	2.00	1.40	1.53	1.93	0.87	0.07	1.12
<i>B. juncea</i> var. Varuna	0.73	1.13	1.80	0.87	0.87	1.53	0.80	0.00	1.34
<i>B. nigra</i>	1.53	1.47	1.73	1.67	1.67	2.00	0.73	0.07	1.98
<i>B. juncea</i> var. IJ-31	1.20	1.67	1.93	0.93	2.00	1.33	0.80	0.07	1.34
<i>B. napus</i> var. GSC-6	1.40	1.73	1.33	2.07	2.07	2.00	0.93	0.00	1.99
<i>B. alba</i>	0.87	2.00	1.27	2.00	1.00	2.67	1.27	0.07	2.45
<i>B. juncea</i> var. PM-31	1.20	2.47	1.20	1.67	2.07	1.60	1.07	0.07	1.32
SE(m)	0.24	0.37	0.46	0.48	0.57	0.53	0.14	0.05	0.08
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV	21.93	19.12	21.26	24.77	25.13	22.34	27.83	34.72	22.32

It showed positive non significant correlation with max. temperature and negative non significant correlation with minimum temperature. It showed positive non significant correlation with max. R.H. and negative non significant correlation with minimum R.H. It showed positive non significant correlation with rainfall except in YST-151 and

IJ-31 and positive non significant correlation with sunshine and wind velocity.

Tiwari and Sarwanan (2009) [11] also reported that the pest population showed positive non significant correlation with mean maximum temperature, rainfall and morning R.H.

Table 8: Correlation coefficients of average Mustard painted bug population in different *Brassica* species with weather parameters

Species/Variety	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Sunshine (hours)	Wind velocity (km/hr)
	Max.	Min.	Max.	Min.			
<i>B. campestris</i> var. BSH-1	0.476	-0.357	0.332	-0.408	0.332	0.399	0.234
<i>B. rapa</i> var. YST-151	0.700	0.051	-0.142	-0.446	0.356	0.676	-0.546
<i>B. juncea</i> var. Varuna	0.694	0.054	0.178	-0.354	0.267	0.112	-0.295
<i>Brassica nigra</i>	0.744	-0.120	0.219	-0.545	0.364	0.257	-0.177
<i>B. juncea</i> var. IJ-31	0.840**	0.090	0.361	-0.488	-0.379	0.324	0.594
<i>B. napus</i> var. GSC-6	0.674	-0.198	0.137	-0.351	0.245	0.185	0.597
<i>Brassica alba</i>	0.493	-0.057	-0.110	-0.098	0.067	0.101	-0.364
<i>B. juncea</i> var. PM-31	-0.769	-0.007	0.244	-0.272	0.022	0.673	-0.583

* Significant at 5%, ** Significant at 1%

Conclusion

The present experiment revealed seasonal incidence of four major insect pests in mustard crop at CRC in Pantnagar which includes mustard aphid, mustard saw fly, flea beetle and painted bug. It was noticed that flea beetle and painted bug were destructive from seedling till maturity stage. Mustard aphid was at its peak in reproductive stage while mustard saw fly was at its peak in vegetative stage. The overall highest average mustard aphid population during the period of observation was noticed in BSH-1 (31.40 aphids/top 10 cm central shoot) followed by YST-151 (29.10 aphids/top 10 cm central shoot), GSC-6 (27.93 aphids/top 10 cm central shoot), Varuna (27.03 aphids/top 10 cm central shoot), PM-31 (25.37 aphids/top 10 cm central shoot), IJ-31 (22.17 aphids/top 10 cm central shoot), *B. alba* (8.47 aphids/top 10 cm central shoot) and the least infestation was observed in *B. nigra* (3.33 aphids/top 10 cm central shoot). The overall highest mustard saw fly infestation during the observation period was observed in *B. napus* var. GSC-6 (1.76 larvae/m²) and the least infestation was observed in *B. juncea* var. Varuna (0.14 larvae/m²).

Statistically, no significant difference was observed among the mean flea beetle adult and painted bug population in various species. It may be helpful in determining most susceptible crop stage to a particular pest species, peak period of pests thus, helpful in developing pest management story.

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