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Seasonal incidence of different insect pests and natural enemy with relation to weather factors in mustard crop

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Abstract

The experiment was carried out at the experimental Organic Agricultural Research farm Narayan Bagh, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (U.P.) during *Rabi* season of 2021-22. During the study Mustard aphid, *Lipaphis erysimi* (Kalt.) was the major pest found infesting this crop in Jhansi area of Bundelkhand region. The population of mustard aphid, *Lipaphis erysimi* (Kalt.) appeared on 14th November and continued till last week of 23th March. The number of aphid per plant varied from 28.05-45.33 whereas the mustard aphid population was low during the month of 17th January to 20th March and varied between 26.12 to 2.5 aphid/plant. During this period mean temperature and relative humidity ranged from 5.8 to 18.3 and 72.0 to 9 percent, respectively. Mustard sawfly was observed during 48th SMW 1st week of December, 2021 and active until 10th SMW 2nd week of March 2022. Highest population (1.01/plant) was observed during the 2th SMW 2nd week of January 2022, when the maximum temperature and minimum temperature were 19.2 °C and 10.4 °C with 91% and 71% maximum and minimum, relation humidity, respectively and 23.8 rainfalls. Painted bug was observed during 49th SMW 2nd week of December, 2021 and active until 11th SMW 3rd week of March 2022. Highest population (6.9/plant) was observed during the 1st SMW 1st week of January 2022 when the maximum temperature and minimum temperature were 20.9 °C and 7.7 °C with 91% and 71% maximum and minimum relation humidity, respectively and 18 rainfalls. Ladybird beetle, *C. transversalis* was observed during 1st SMW 1st week of January 2021 and was found to be active till 11th SMW 3rd week of March 2022 and maximum population of 1.75 plant was observed during the 8th SMW. last week of Feb. 2022 when the maximum temperature and minimum temperature were 28 °C and 11.3 °C with 84% and 46% maximum and minimum relative humidity, respectively and 0 mm rainfall.

Keywords: Mustard aphid, mustard sawfly, painted bug, lady bird beetle, mustard, weather parameters

Introduction

Rapeseed-mustard (*Brassica juncea*) is an important oilseed crop which is grown in sub-tropical as well as tropical countries in the world. India is the second largest producer of this crop in the world. Rapeseed-mustard is a most important edible oilseed crop in Northern India. In India rapeseed-mustard is grown during *Rabi* season under rain-fed as well as irrigated. Extreme and irrational use synthetic chemicals for improved plant protection and plant productivity cause several adverse impacts on the ecosystem. More than 43 species of insect pests have been reported to infest rapeseed-mustard crop in India, of which sawfly (*Athalia lugens proxima*), aphid (*Lipaphis erysimi*), painted bug (*Bagrada hilaris*) and leaf miner (*Phytomyza horticola*) are the important ones (Singh *et al.* 2000) [10]. Mustard crop attacked by painted bug, mustard saw fly, mustard aphid, potato aphid, leaf miner, flea beetle, diamond-back moth, bihar hairy caterpillar, cabbage buter fly and tobacco caterpillar Among them, Mustard aphid, *Lipaphis erysimi* (Kalt.) is the most destructive pest. Among the aphids, mustard aphid, *Lipaphis erysimi* (Kalt.) is predominant and is a key pest and may cause up to 90- 96% yield loss, 31% seed weight loss and 5-6% reduction in oil content (Bakhetia and Sekhon, 1989) [3]. Such losses may go up to 100% in certain mustard growing region (Singh and Sachan, 1999) [9]. The loss in grain weight varies greatly within Brassica; being 35.0-73.3% under different agro climatic regions with a mean loss of 54.2% on all India basis (Dhaliwal *et al.*, 2004) [5].

Materials and Methods

The field experiment on different Mustard insect pest population studies with different abiotic factors was carried out during *Rabi* season 2021-22 at B. U. campus, Jhansi, UP, India

Experiment was laid out in RBD design. The total plot size was kept (Gross) and 2 m × 2.10 m (Net) with spacing 40 cm × 15 cm (plant × row) with mustard, Kala Sona variety. Observations were made on five tagged plants and were randomly selected from net plot area of each plot and observed at each meteorological week from sowing up to harvest and infestation of pests notice. The pest population of mustard aphid, mustard sawfly, painted bug and lady bird

beetle was recorded number per plant. The harvested crops of each plot were carefully observed after each picking to ascertain crop infestation by mustard aphid. The observation will be recorded at weekly interval of the crop.

Results and Discussion

Seasonal incidence, natural enemy and relation of abiotic factors on mustard crop depicted in Table 1. & Fig. 1.:

Table 1: Seasonal Incidence of mustard aphid, mustard sawfly, Painted bug, Ladybird beetle and weather parameters during crop Period 2021-2022.

SMW	Date	Aphid/10 cm twig	Sawfly/plant	Painted bug	Ladybird beetle/plant	Temperature (°C)		RH (%)		Wind Velocity (Km/h)	Rainfall (mm)	No. of Rainy days hrs/day	Evaporation on (mm)
						Max.	Min.	Max.	Min.				
45	08-14 Nov.	0	0	0	0	30.8	9.9	81	46	3.1	0	0	4.6
46	15-21 Nov.	0	0	0	0	27.9	10.6	84	50	3.1	0	0	4
47	22-28 Nov.	1.5	0	0	0	28.1	10.6	84	50	3.1	0	0	3.6
48	29-05 Dec.	2.5	0.15	0	0	27.5	9.3	85	57	2.8	0	0	3.3
49	06-12 Dec.	4.17	0.25	1.25	0	24.7	11.2	88	56	3.2	0	0	2.8
50	13-19 Dec.	9.5	0.41	2.75	0	23.4	7.8	89	60	3	0	0	2.5
51	20-26 Dec.	18.5	0.47	4.32	0	22.9	4.4	88	61	2.8	0	0	2.4
52	27-02 Jan.	28.05	0.58	6.31	0	22.3	8.4	90	65	3.2	12	1	2.3
1	03-09 Jan.	45.33	0.75	6.9	0.33	20.9	7.7	91	71	3.1	18	2	2
2	10-16 Jan.	42.12	1.01	6.2	0.5	19.2	10.4	91	71	2.9	23.8	1	1.7
3	17-23 Jan.	26.12	0.69	5.55	0.95	18.3	5.8	91	72	2.8	0	0	1.6
4	24-30 Jan.	20.71	0.47	4.65	1.05	19.9	7.6	91	71	2.6	3.6	1	1.6
5	31-06 Far.	15.71	0.35	4.6	1.11	26.4	7.3	89	59	2.9	0	0	3
6	07-13 Far.	11.12	0.25	5.9	1.38	24	7.5	88	47	3.6	0	0	3.2
7	14-20 Far.	9.71	0.15	1.12	1.52	25.8	8	87	46	4.4	0	0	3.7
8	21-27 Far.	7.12	0.11	1.01	1.75	28	11.3	84	46	3.7	0	0	4.1
9	28-06 Mar.	5.2	0.9	0.65	1.5	28.5	11.3	84	45	4.8	0	0	4.6
10	07-13 Mar.	3.1	0.5	0.12	1.25	30	12.6	81	44	5.1	0.4	0	4.7
11	14-20 Mar.	2.5	0	0.5	0.5	35.5	16	80	38	4.4	0	0	5.9
12	21-27 Mar.	0	0	0	0	38	17.4	79	38	4.2	0	0	0

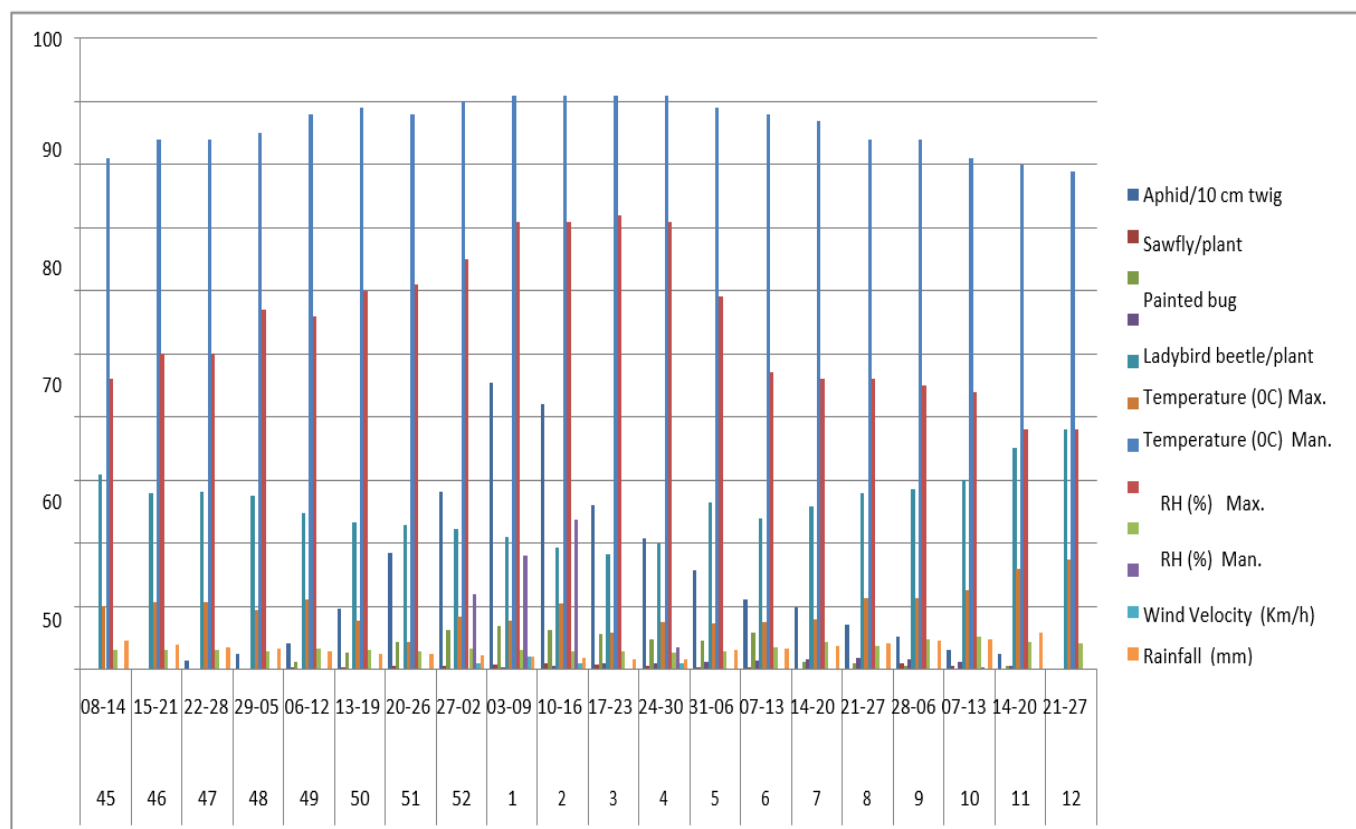


Fig 1: Seasonal Incidence of Mustard aphid, Mustard sawfly, Painted bug, Ladybird beetle and weather parameters during crop Period 2021-2022.

Seasonal Incidence of mustard aphid, *Lipaphis erysimi* (Kalt.)

The population of mustard aphid (*Lipaphis erysimi* Kalt.) along with meteorological observation during Rabi season 2021-22 has been presented in (Table-1). The data showed that the population of mustard aphid (*Lipaphis erysimi* Kalt.) appeared on 22th November and continued till last week of 20th March. The pest population recorded as number of aphid per tagged plant. The number of aphid per plant varied from 28.05-45.33 whereas the mustard aphid population was low during the month of 17th January to 20th March and varied between 26.12 to 2.5 aphid/plant. During this period mean temperature and relative humidity ranged from 5.8 to 18.3 and 72.0 to 91%, respectively. The pest population increased from 22th November and reached its peak (45.33/plant) 1st week of January. During this period the weather parameters like mean temperature and relative humidity ranged from 7.7 °C to 20.9 °C and 71.0 to 91.0 percent, respectively. During this period mean temperature and relative humidity ranged from 18.3 to 28.1 and 50.0 to 91.0 percent, respectively. The Population of pest suddenly decreased in last month of January to march. The Population was slightly less in the absence of rains. The Population of pest suddenly decreased from second week of January (45.33) to march (2.5) period with mean temperature and relative humidity ranged from 7.7 to 20.9 and 71.0 to 91 percent, respectively to mean temperature and relative humidity ranged from 16.0 to 35.2 and 38.0 to 80 percent. The present findings are in conformity with the observations of Uttam *et al.* 1993, [11] who reported the mustard aphid population reached at peak in February. The present findings are agree with the observations of Ansari and Lal, 2008 [1], who reported the mustard aphid cause the varying levels of infestation on different *Brassica* species in different crop seasons. The correlation study between mustard aphid population and weather parameters revealed that the maximum temperature was significantly positive correlated with mustard aphid population while maximum and minimum relative humidity were found to be negatively correlated. The mustard aphid population showed significant positive correlation with maximum, minimum temperature and rainfall.

Seasonal Incidence of mustard sawfly, *Athalia lugens proxima* (Klug.)

Mustard sawfly was observed during 48th SMW 1st week of December, 2021 and active until 10th SMW 2st week of March 2022 (Table-1). Highest population (1.01/plant) was observed during the 2th SMW 2nd week of January 202 when the maximum temperature and minimum temperature were 19.2 °C and 10.4 °C with 91% and 71% maximum and minimum, relation humidity, respectively and 23.8 rainfalls. However, Bhatt and Bhapodra 2004 [4] from Gujarat also observed that the infestation of mustard sawfly commented in December and kept fluctuating the crop season.

The minimum temperature ($r = -0.625$) was the most dominate factor which shows negative but significant correlation with in insect population. A negative and non-significant correlation observed with morning relative. Humidity ($r = -0.328$), evening relation humidity ($r = -0.525$) and rainfall ($r = -0.552$). However, a positive correlation of sawfly was registered with maximum temperature ($r = -0.461$) which was found to be non-significant. Patel 2005 [8] also revealed that morning relative humidity and evening

relative humidity had a negative and non-significant correlation ($r = -0.354, -0.327$) with sawfly population. However, the temperature had a negative correlation with *A. lugens proxima* as reported by Manzar *et al.* 1999 [7]. Similarly, Bhatt and Bapodra, 2004 [4] also reported that mustard sawfly population had negative correlation with minimum temperature.

Seasonal Incidence of Painted bug (*Bagrada hilarias*)

Painted bug was observed during 49th SMW 2nd week of December, 2021 and active until 11th SMW 3rd week of March 2022. Highest population (6.9/plant) was observed during the 1st SMW 1st week of January 2022 when the maximum temperature and minimum temperature were 20.9 °C and 7.7 °C with 91% and 71% maximum and minimum, relation humidity, respectively and 18 rainfall.

In nature, the distribution and abundance of living organisms is determined by combined effect of different components of ecosystem. Among the various abiotic factors temperature, humidity, rainfall, intensity of light and other physical factors play a vital role in population fluctuation of any pest species and have a direct influence on their abundance (Atwal and Bains 1974) [2].

Seasonal Incidence of Ladybird beetle, (*Coccinella transversalis*)

Ladybird beetle, *C. transversalis* was observed during 1th SMW 1st week of January 2021 and was found to be active till 11th SMW 3rd week of March 2022 and maximum population of 1.75 plant was observed during the 8th SMW last week of Feb. 2022, when the maximum temperature and minimum temperature were 28 °C and 11.3 °C with 84% and 46% maximum and minimum relative humidity, respectively and 0 mm rainfall. The findings were in confirmation of earlier reports as reported by Varmora *et al.*, 2010 [12], who reported that the activity of Coccinellids initiated from 1st week of January (0.22 beetle/plant) and reached to its peak (1.20 beetle/plant) in 2nd SMW. According to Kashyap *et al.* 2018 [6] maximum temperature ($r = 0.334$), minimum temperature ($r = 0.476$) and rainfall ($r = 0.479$) exhibited a positive and non-significant correlation with ladybird beetle population whereas, morning RH ($r = -0.480$) and evening RH were found to be negatively correlated ($r = -0.480, -0.321$ respectively).

Conclusion

The population of mustard aphid, *Lipaphis erysimi* (kalt.) appeared on 14th November and continued till last week of 23th March. Mustard sawfly was observed during 48th SMW 1st week of December, 2021 and active until 10th SMW 2st week of March 2022. Highest population (1.01/plant) was observed during the 2th SMW 2nd week of January 2022, when the maximum temperature and minimum temperature were 19.2 °C and 10.4 °C with 91% and 71% maximum and minimum, relation humidity, respectively and 23.8 rainfall. Painted bug was observed during 49th SMW 2nd week of December, 2021 and active until 11th SMW 3rd week of March 2022. Ladybird beetle, *C. transversalis* was observed during 1th SMW 1st week of January 2021 and was found to be active till 11th SMW 3rd week of March 2022 and maximum population of 1.75 plant was observed during the 8th SMW. last week of Feb. 2022 when the maximum temperature and minimum temperature were 28 °C and 11.3

°C with 84% and 46% maximum and minimum relative humidity, respectively

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