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Seasonal incidence of cabbage insect pest

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Abstract
An experiment was conducted to observe the seasonal incidence of cabbage insect pests *viz*., diamond back moth, cabbage head borer, cabbage leaf webber, cabbage aphid and lady bird beetle on cabbage during *Rabi* season, 2021-22 at Organic Research Farm Kargua Ji, Department of Entomology, Institute of Agricultural Science, Bundelkhand University Jhansi, (Utter Pradesh). Major activity period of diamond back moth (*Plutella xylostella*) population appeared during 49th SMW and the peak incidence during 3rd SMW (9.0 larva/plant) and cabbage head borer (*Hellula undalis*) caterpillar population initiated during 51th SMW and reach its peak incidence 2nd SMW (5.0 larva/plant) respectively while cabbage leaf webber (*Crocidolomia binotalis*) appeared from 48th SMW to 8th SMW with peak incidence in 1th SMW (4.3 larva/plant). Cabbage aphid (*Brevicoryne brassica*) were observed from 49th SMW to 8th SMW with peak incidence in 5th SMW (41.0 larva/plant) and lady bird beetle (*Coccinella septempunctata*) appeared from 49th SMW to 8th SMW with peak incidence 4th SMW (1.0 larva/plant) respectively.

Keywords: Cabbage, incidence, DBM, head borer, leaf webber, aphid. lady bird beetle, SMW

Introduction
Cabbage (*Brassica oleracea* var. *capitata*) Cultivar group member white cabbage red cabbage savoy cabbage is small leafy biennial producing a compact globular mass of smooth or crinkled leaves wrapped over each other known as head the edible members of this family are called cruciferous vegetable that outer leaves are generally larger than the inner. The stem is short and stout plants flower generally after winter. Cabbage species are native to the Mediterranean region cabbage is one of the oldest vegetables known and has been cultivated for over 4000 years it was originally found growing wild on the seashores of southern Europe England and den mark. Cabbages one of the most popular winter vegetable in India considering its commercial value this crop is now a day grown round the year. Cabbage leaves are low in calories 27 percent, fat 0.1 percent and carbohydrates 4.6 percent is good sources of protein 1.3 percent which contains all essential containing amino acids Cabbage is an excellent source of minerals such as calcium 39 mg, iron 0.8mg, magnesium 10mg, sodium 14.1mg potassium 114mg and phosphorus 44mg. It is a rich source of vitamin A 2000 I.U., B1 50 I.U. and C 124 mg/100gm**.** (Krishna *et al.* 2018) [3] It has substantial amounts of B carotene pro vitamin A ascorbic acid Riboflavin niacin and thiamine ascorbic acid content varies from 30-65 mg per 100g fresh weight flavor in cabbage leaves is due to the glycoside sinigrin cabbage contain goitrogens which cause enlargement of thyroid gland. India second position in the world cabbage production and Utter Pradesh ranks eight position in cabbage production among all states. In India, it is cultivated in 397.00 thousand ha area with 9207 MT production and the volume of cabbage production in India is estimated to have amount to about 9.59 million metric tons (Anonymous 20200) [1]. In Utter Pradesh the total area of cabbage is 10.8 thousand ha with 338.26 thousand MT productions (Anonymous 2021) [2]. (Sain, *et al.* 2017) [13] In India recorded 37 insect pests in cabbage crop. Range of insect pest have been reported to feed on cabbage which include Diamondback moth *Plutella xylotella* L. Aphid *Brevicoryne brassica* L. cabbage butterfly *Pieris rapae* L. Leaf webber *Crocidolomia binotalis* Zell. Tobacco caterpillar *Spodoptera litura* F. Cabbage green semilooper *Tricho plusi*. Flea beetle *Phyllotreta cruiciferae* G. Painted bug *Bagrada cruciferarum.* Cabbage head borer *Hellula undalis* F. (Bhagat *et al.* 2018) [14] in India diamondback moth has national importance on cabbage as it causes 50-80% annual loss in the marketable yield also reported that there is 52% loss in yield due to the attack of diamondback moth.

The knowledge of the seasonal incidence of insect pests at different growth stages of cabbage crop will be helpful in evolving proper management schedule. The information on seasonal

incidence was however, generated by many workers [6, 7, 8, 13, 18] from different regions of India. Hence, investigations on seasonal incidence of cabbage insect pest in relation to weather parameters were undertaken and the results are presented herein.

Materials and Methods

The Experiment was carried out in organic research farm Kargua Ji Institute of Agricultural Sciences Department of Entomology, Bundelkhand University Jhansi Uttar Pradesh during *Rabi* season, 2021-2022. It is situated at 78º36^{E} Longitude and 25º47^{NL}atitude and is about 178.37 m above mean sea level. The climate is subtropical and semi-arid. The preparation of field was done by tractor drawn cultivator followed by two cross-harrowing to pulverize the soil. Finally, the field was levelled with leveler and then channels were prepared according to the layout (three replication and net plot size 2.0 x 2.60) of the experiments. The seedling were grown on raised nursery beds and transplanted after 29 days in the laid out field. The variety golden a care used for seed sowing. Seeds were sown on 15.10.2021 in *Rabi* season 2021-2022. Transplanting was done in the field at the spacing of 60cm × 45cm on 14.11.2021 in *Rabi* 2021-2022. Protective irrigation was given immediately after transplanting. The observations of major insect pest on cabbage crop were recorded on 5 plants selected randomly one plot twice in a standard week. Observations on different insects were recorded as following diamond back moth, aphid, leaf webber, cabbage head borer and lady bird beetle.

The observation was started transplanting and continues till maturity of the crop. The population of cabbage insect pest was recorded by counting the number of larvae\plant. Population of insect was recorded by counting the number of nymphs and adults per leaves (top, middle and bottom) plant. The data recorded on major insect pests and meteorological parameters used for statistical analysis. To infer the results of seasonal incidence was worked out between populations of insect pests.

Results and Discussion

Seasonal incidence of cabbage insect pest

Diamondback moth (*Plutella xylostella* L.)

The observation regarding larval population of diamondback moth (DBM) revealed that the population varied from 0.5 to 9.0/plant during 2021-22. DBM first appeared during 49th SMW (6-12 Dec.) with intensity of 0.5/plant. Then the population gradually increased and attained peak during 3rd SMW (17-23 Jan.) when the maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and rainfall were 18.3 °C, 5.8 °C, 91.0%, 72.0% and 0.00 mm respectively. After that, the population decreased up to 8th SMW (21-27 Feb.) at the end of the season. The data on seasonal incidence diamondback moth (DBM) depicted in (Table 1 and Figuer 1)

Present observations were more or less similar with the results of earlier workers (Kumar and Prasad *et al*.) have reported the *p. xylostella* damage was active throughout the year with a varying degree of infestation. It was recorded from a minimum of 0.32 per cent (Fed.) to maximum of 5.98 per cent (March). (Sharma and Kumawat *et al*.) The infestation of diamondback moth started from the third week of November and reached peak (45.2 larvae/ 10 plant) in the first week of January. (Awasthi and Tomar *et al*.) DBM infesting cabbage crop revealed that the first appearance of the pest was started during 2nd week of December and attended peak (5.8 larvae/plant) in the last week of January (5th SMW**)** (Singh *et al.*) the peak population of DBM (9.00/plant). First fortnight of February.

Cabbage head borer (*Hellula undalis* F.)

The observation on larval count of cabbage head borer depicted in that the larval population ranged from 2.5to 5.0/plant during 2021-22. The activity of cabbage head borer caterpillar initiated during 51th SMW (20-26 Dec.) with gradual increase its population and reach its peak (5.0/plant) 2 SMW (10-16 Jan.) when the maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and rainfall were 19.2 °C, 10.4 °C, 91%, 71% and 23.8 mm, respectively. After that, the larval population decreased up to 8th (21-27 Feb.) (0.9/plant) The data on seasonal incidence of cabbage head borer caterpillar depicted in (Table 1 and Figure 1)

Present observation were more or less similar with the results of earlier workers (Gopika *et al*,) have reported peak activity of cabbage head borer was noticed during 5th SMW (5.8 larvae/plant). (Yadav *et al*,) have reported on the incidence of cabbage pests' population at the highest population of *Hellula undalis* 0.67 larvae/plant was recorded during 10th SMW respectively.

Cabbage leaf webber (*Crocidolomia binotalis* Z.)

The observation on larval count of cabbage leaf webber depicted in that the larval population ranged from 0.5 to 4.3/plant during 2021-22. The incidence of cabbage leaf webber was noticed from 48th SMW (29-5 Dec.) to 8th SMW (21-27 Feb.). The peak incidence was observed in 1th SMW when the maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and rainfall were 27.5 °C, 9.3 °C, 85%, 57% and 0.00 mm, respectively. After that, the larval population decreased up to 8th SMW (21-27 Feb.) (0.5/plant). The data on seasonal incidence cabbage leaf webber depicted in (Table 1 and Figure 1)

Present observations were more or less similar with the results of earlier workers (Gaikwad *et al*.) have reported leaf webber *C. binotalis* (maximum 3.00 larvae/plant in 2nd SMW). (Pawar *et al*,) have reported leaf webber on mustard revealed that the pest was active from 3rd week of November to 4th week of December the pest population ranged between 1.10 to 9.0 larvae per plant throughout the season. (Singh *et al.*) the peak population of leaf webber (3.07/leaf). Second fortnight of January.

Cabbage aphid (*Brevicoryne brassica* L.)

Trend of incidence of cabbage aphid population ranged from 5.0 to 9.1/plant during 2021-22. The incidence of cabbage aphid was noticed from 49th SMW (6-12 Dec.) to 8th SMW (21-27 Feb.). The peak incidence was observed in 5th SMW when the maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and rainfall were 26.4 °C, 7.3 °C, 89%, 59% and 0.00 mm respectively. After that, the cabbage aphid population decreased up to 8th SMW (21-27 Feb.) (0.5/plant). The data on seasonal incidence cabbage aphid depicted in (Table 1 and Figure 1)

Present observation were more or less similar with the results of earlier workers (Swaminathan and Kumar *et al*.) have reported infestation by aphid and DBM (rabi, 2016-17)

initiated in December and reached their peak mean populations during February to March.

Ladybird beetle (*Coccinella septempunctata* L.)

The observation on ladybird beetle (grub and adult) on cabbage indicated that the population ranged from 0.4 to 1.0/plant during 2021-22. Ladybird beetle appeared with intensity of 0.4/plant and increased gradually attaining peak (1.0/plant) 4th SMW when the maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and rainfall were 19.9 °C, 7.6 °C, 91%, 71% and 3.6 mm respectively. After that, the population declined and sustained up to 8th SMW (21-27 Feb.). The data on seasonal occurance of ladybird beetle depicted in (Table 1 and Figure 1).

Present observations were more or less similar with the results of earlier workers (Bhede and bhosle *et al*.) have reported leaf webber *C. binotalis* (maximum 3.00 larvae/plant in 2nd SMW). (Pawar *et al*,) have reported leaf webber on mustard revealed that the pest was active from 3rd week of November to 4th week of December the pest population ranged between 1.10 to 9.0 larvae per plant throughout the season. (Singh *et al.*) the peak population of leaf webber (3.07/leaf). Second fortnight of January.

Table 1: Seasonal incidence of cabbage insect pest with meteorological data during in *Rabi* season 2021-22

SMW	No of Insects /Plant					Temperature (°C)		RH (%)		Wind Velocity	Rainfall	No. of Rainy days	Evaporation on
	Diamond back moth	Cabbage Head Borer	Cabbage Leaf Webber	Cabbage Aphid	Lady bird beetle	Max.	Man.	Max.	Man.	(Km/h)	(mm)	hrs/ day	(mm)
44	0.0	0.0	0.0	0.0	0.0	30.5	12.6	82	52	3.4	0	0	4.8
45	0.0	0.0	0.0	0.0	0.0	30.8	9.9	81	46	3.1	0	0	4.6
46	0.0	0.0	0.0	0.0	0.0	27.9	10.6	84	50	3.1	0	0	4
47	0.0	0.0	0.0	0.0	0.0	28.1	10.6	84	50	3.1	0	0	3.6
48	0.0	0.0	0.5	0.0	0.0	27.5	9.3	85	57	2.8	0	0	3.3
49	0.5	0.0	0.7	5.0	0.4	24.7	11.2	88	56	3.2	0	0	2.8
50	0.9	0.0	2.0	7.4	0.4	23.4	7.8	89	60	3	0	0	2.5
51	2.3	2.5	2.3	16.7	0.5	22.9	4.4	88	61	2.8	0	0	2.4
52	3.1	2.6	3.7	18.8	0.7	22.3	8.4	90	65	3.2	12	1	2.3
1	4.3	4.3	4.3	19.4	0.7	20.9	7.7	91	71	3.1	18	2	2
2	7.2	5.0	2.0	20.5	0.7	19.2	10.4	91	71	2.9	23.8	1	1.7
3	9.0	3.9	1.7	26.7	0.8	18.3	5.8	91	72	2.8	0	0	1.6
4	8.9	2.3	1.1	32.1	1.0	19.9	7.6	91	71	2.6	3.6	1	1.6
5	8.5	2.1	1.1	41.0	1.0	26.4	7.3	89	59	2.9	0	0	3
6	8.5	1.3	1.0	13.7	0.8	24	7.5	88	47	3.6	0	0	3.2
7	4.0	1.3	0.9	11.9	0.7	25.8	8	87	46	4.4	0	0	3.7
8	3.1	0.9	0.5	9.1	0.7	28	11.3	84	46	3.7	0	0	4.1
Overall mean	3.5	1.5	1.3	13.1	0.5	0	0	0	0	0	0	0	0

Sourse of meteorological data IGFRI Jhansi (U. P)

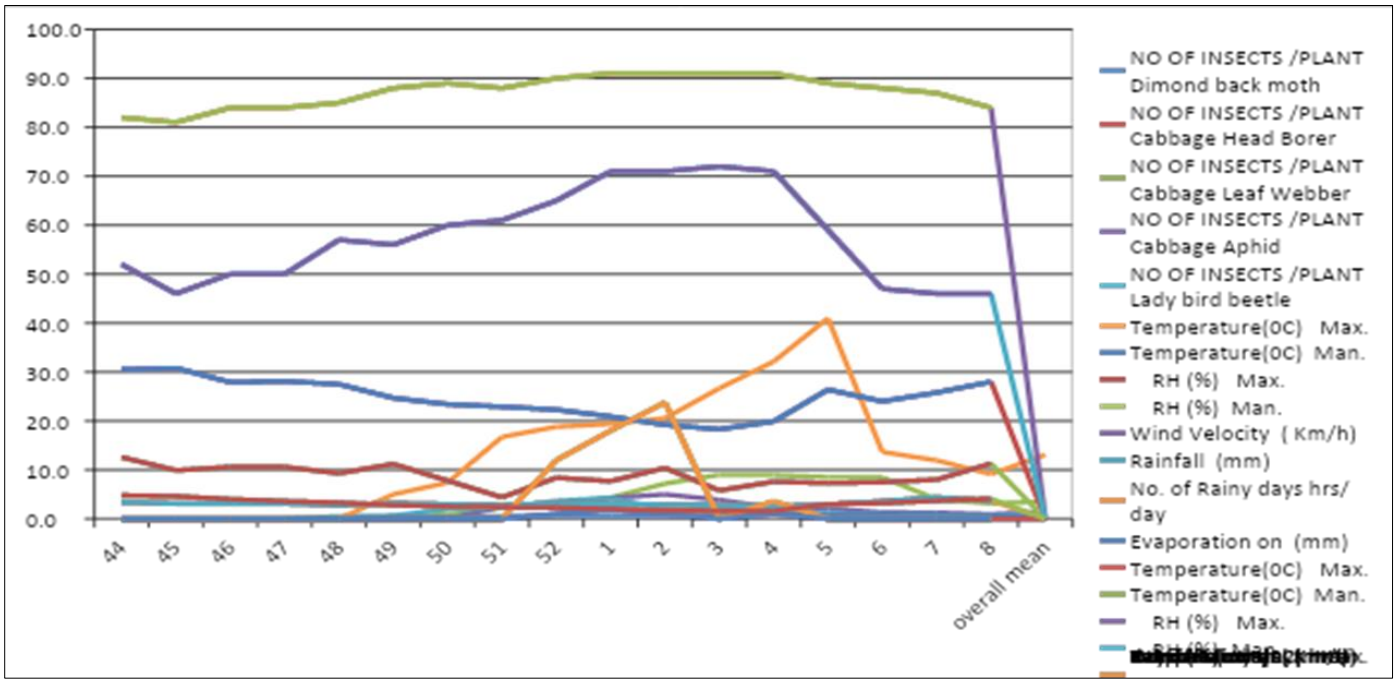

Fig 1: Seasonal incidence of cabbage insect pest with meteorological data during in *Rabi* season 2021-22

Conclusion

On the basis of result and discussion of the present investigation the following recommendations conclusions are proposed. The highest population of DBM was noticed 3rd SMW (17-23 Jan.) in *Rabi* season of during 2021-22. Maximum infestation of cabbage head borer was observed in 2nd SMW (10-16 Jan). Maximum population of cabbage leaf webber was recorded in 1st SMW of (Jan.). Infestation of cabbage aphid was highest in 5th SMW (Jan-Feb.). Maximum population of Ladybird beetle was recorded in 4th SMW (Jan.).

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