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Manoj Kumar

Department of Entomology,
 Institute of Agricultural
 Sciences, Bundelkhand
 University, Jhansi,
 Uttar Pradesh, India

Pradeep Kumar

Department of Entomology,
 Institute of Agricultural
 Sciences, Bundelkhand
 University, Jhansi,
 Uttar Pradesh, India

Dr. Sarvendra Singh

Department of Agricultural
 Entomology, RMP PG College,
 Gurukul, Narsan, Haridwar,
 Uttarakhand, India

Akhilesh Kumar

JNKVV-KVK, College of
 Agriculture, Rewa,
 Madhya Pradesh, India

Arunendra Pandey

Department of Entomology,
 Institute of Agricultural
 Sciences, Bundelkhand
 University, Jhansi,
 Uttar Pradesh, India

Corresponding Author:

Dr. Sarvendra Singh

Department of Agricultural
 Entomology, RMP PG College,
 Gurukul, Narsan, Haridwar,
 Uttarakhand, India

Population dynamics of insect-pests of cauliflower in relation to weather factors

Manoj Kumar, Pradeep Kumar, Dr. Sarvendra Singh, Akhilesh Kumar and Arunendra Pandey

Abstract

Field experiments were conducted in *Rabi* season during 2021-22 at the Organic Agricultural Research farm Narayan Bagh, Department of Entomology, Institute of Agricultural Science, Bundelkhand University, Jhansi (U.P.). To study the seasonal incidence of different insect pests on cauliflower. The aphid population varied from 4.6 to 45/plant. Aphid first appeared during 48th MW (29-05 Dec.) with intensity of 4.6/plant, then the population gradually increased and attained peak during 2nd MW (10-16 Jan). After that, the population decreased up to 7th MW (14-20 Feb.) at the end of the season. The larval population of diamond back moth (DBM) varied from 2.9 to 7.00/plant. DBM first appeared during 50th MW (13-19 Dec.) with intensity of 2.9/plant, then the population gradually increased and attained peak during 2nd MW (10-16 Jan). After that, the population decreased up to 7th MW (14-20 Feb.) at the end of the season. when the prevailing maximum temperature, minimum temperature, morning relative humidity, evaporation, bright sunshine and wind velocity were 19.2 °C, 10.4 °C, 91.0%, 71.0%, 1.7 mm, and 2.9 Kmph respectively. The observation on larval count of leaf webber depicted in that the larval population ranged from 1.4 to 4.4/ plant. The incidence of leaf webber was noticed from 50th MW (13-19 Dec.) to (14-20) February 7th MW. The peak incidence was observed in 1st MW (03-09 Jan.) After that, the larval population decreased up to 7th MW (14-20 Feb.) (1.4/plant). The larval population of tobacco leaf eating caterpillar was recorded from 0.6 to 3.6/plant. The activity of tobacco leaf eating caterpillar initiated during 50th MW (13-19 Dec.) with gradual increase its population and reached its peak (3.6/plant) during 1st MW (03-09 Jan.) when the prevailing maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, evaporation, bright sunshine and wind velocity were 20.9 °C, 7.7 °C, 91.0%, 71.0%, 2.0 mm, and 3.1Kmph, respectively. After that, the larval population decreased up to 7th MW (14-20 Feb.) (0.6/plant).

Keywords: Cauliflower, seasonal incidence, insect pests, weather parameters

Introduction

Cauliflower (*Brassica oleracea* L. var. botrytis) is one of the most preferable, traditionally grown winter vegetable, requires cold and moist climate and is less hardy than cabbage. Cauliflower has a small thick stem, bearing whorl of leaves and branched tap root system. It is a rich source of nutrient including vitamin-A, vitamin-C, calcium, phosphorus, potassium, moisture, carbohydrates, protein, fat, fiber, and iron etc. Cauliflower is a native of southern Europe in the Mediterranean region and was introduced in India in 1822 from England. The major cauliflower producing states are Bihar, Uttar Pradesh, Orissa, West Bengal, Assam, Haryana, and Maharashtra, The cauliflower crop is attacked by various insect-pests. Among these the major insect-pest are cauliflower aphid (*Brevicoryne brassicae* L.) cabbage butterfly, (*Pieris brassicae* L.) diamond back moth (*Plutella xylostella* L.) and painted bug, (*Bagrada cruciferarum* Kirk) cabbage head borer, (*Hellula undalis* F.) and tobacco caterpillar, (*Spodoptera litura* F.) (Bhatia and Gupta, 2003; [1] and Meghana *et al.*, 2018 [2]). The damage caused to cauliflower by (*Brevicoryne brassicae* L.) is both direct and indirect. According to Khan *et al.*, (2015) [3] cabbage aphid cause 35-75 percent yield losses. Cabbage aphid also acts as the vector viruses causing blackening spot in cauliflower, cauliflower mosaic and cabbage viruses A and B (Kaul, 1998) [4]. The newly hatched larvae feed on outer epidermis of leaves giving cellophane like appearance, reported that a single caterpillar of *P. brassicae* reduces the yield to a maximum of 1.79 per cent at curd formation. The yield loss due to diamond back moth, (*Plutella xylostella*) in cauliflower was reported as 34.4 per cent. (Kaul, 1998) [4]. Painted bug (*Bagrada cruciferarum*) cause physical damage to the crop by feeding on both surfaces of the leaves and presumably insect saliva to aid in down the inner leaf tissue (Palumbo and Natwick, 2010) [5].

Materials and Method

Field experiments were conducted in *Rabi season* during 2021-22 at the Organic Agricultural Research Farm Narayan Bagh, Department of Entomology, Institute of Agricultural Science, Bundelkhand University, Jhansi (U.P.). The studies of seasonal incidence of different insect pests on cauliflower. The transplanting was taken in 174.8 m² area by adopting. Trial was laid out in a randomized block design consisting of untreated plot. The cauliflower seedlings 25 days old of Snow ball-16 variety was transplanted with spacing of 60 cm between row to row and 45 cm between plant to plant. Observations were made on five tagged plants and were randomly selected from net plot area and observed at each meteorological week from transplanted to harvest and

infestation of pests notice. The pest population of cauliflower aphid, DBM, leaf webber and tobacco leaf eating caterpillar was recorded number per plant.

Results and Discussion

Seasonal incidence of cauliflower insect pest

In the present investigation the crop was found to be infested mainly with aphid *Brevicoryne brassicae* L. diamond back moth *Plutella xylostela*, leaf webber *Crociodolomia binotalis*, tobacco leaf eating caterpillar *Spodoptera litura*, the observation was recorded at standard week during morning hours between 7.30 a.m. and 9.00 a.m. during 2021-22. Table 1. & Fig. 1.:

Table 1: Seasonal incidence of cauliflower aphid, Dimond back moth, Leaf webber, Tobacco leaf eating caterpillar and weather parameters during crop Period 2021-2022

| SMW | Date | NO. of aphid/plant | No. of larvae of diamond back moth/plant | No. of larvae of leaf webber/plant | No. of larvae of tobacco leaf eating caterpillar/plant | Temperature (°C) | | RH (%) | | Wind Velocity (Km/h) | Rainfall (mm) | Evaporation (mm) |
|-----|------------|--------------------|--|------------------------------------|--|------------------|------|--------|------|-----------------------|---------------|------------------|
| | | | | | | Max. | Man. | Max. | Man. | | | |
| 45 | 08-14 Nov. | 0 | 0 | 0 | 0 | 30.8 | 9.9 | 81 | 46 | 3.1 | 0 | 4.6 |
| 46 | 15-21 Nov. | 0 | 0 | 0 | 0 | 27.9 | 10.6 | 84 | 50 | 3.1 | 0 | 4 |
| 47 | 22-28 Nov. | 0 | 0 | 0 | 0 | 28.1 | 10.6 | 84 | 50 | 3.1 | 0 | 3.6 |
| 48 | 29-05 Dec. | 4.6 | 0 | 0 | 0 | 27.5 | 9.3 | 85 | 57 | 2.8 | 0 | 3.3 |
| 49 | 06-12 Dec. | 14.4 | 0 | 0 | 0 | 24.7 | 11.2 | 88 | 56 | 3.2 | 0 | 2.8 |
| 50 | 13-19 Dec. | 26.6 | 2.9 | 1.8 | 1 | 23.4 | 7.8 | 89 | 60 | 3 | 0 | 2.5 |
| 51 | 20-26 Dec. | 34.4 | 4.6 | 2.4 | 1.6 | 22.9 | 4.4 | 88 | 61 | 2.8 | 0 | 2.4 |
| 52 | 27-02 Jan. | 38.4 | 5.7 | 3.7 | 2.5 | 22.3 | 8.4 | 90 | 65 | 3.2 | 12 | 2.3 |
| 1 | 03-09 Jan. | 40.6 | 6.8 | 4.4 | 3.6 | 20.9 | 7.7 | 91 | 71 | 3.1 | 18 | 2 |
| 2 | 10-16 Jan. | 45 | 7 | 4 | 3 | 19.2 | 10.4 | 91 | 71 | 2.9 | 23.8 | 1.7 |
| 3 | 17-23 Jan. | 35.6 | 6.5 | 3.7 | 2.6 | 18.3 | 5.8 | 91 | 72 | 2.8 | 0 | 1.6 |
| 4 | 24-30 Jan. | 30 | 6.4 | 3.4 | 2.5 | 19.9 | 7.6 | 91 | 71 | 2.6 | 3.6 | 1.6 |
| 5 | 31-06 Far. | 24.4 | 5.4 | 3 | 2.3 | 26.4 | 7.3 | 89 | 59 | 2.9 | 0 | 3 |
| 6 | 07-13 Far. | 18.4 | 4.5 | 2.5 | 1.8 | 24 | 7.5 | 88 | 47 | 3.6 | 0 | 3.2 |
| 7 | 14-20 Far. | 11.6 | 3 | 1.4 | 0.6 | 25.8 | 8 | 87 | 46 | 4.4 | 0 | 3.7 |
| 8 | 21-27 Far. | 0 | 0 | 0 | 0 | 28 | 11.3 | 84 | 46 | 3.7 | 0 | 4.1 |

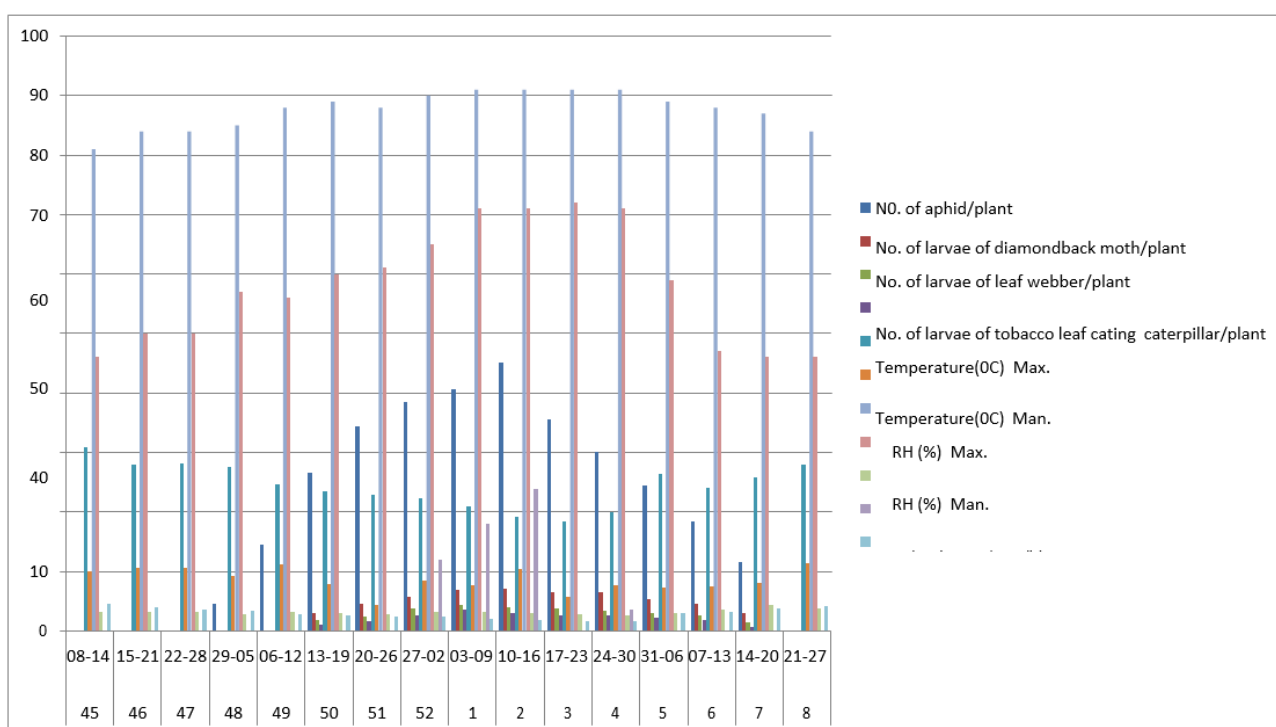


Fig 1: Seasonal incidence of cauliflower aphid, Dimond back moth, Leaf webber, Tobacco leaf eating caterpillar and weather parameters during crop Period 2021-2022

Aphid (*Brevicoryne brassicae* L.)

The observation regarding aphid population revealed that the population varied from 4.6 to 45/plant during 2021-22. Aphid first appeared during 48th MW (29-05 Dec.) with intensity of 4.6/plant. Then the population gradually increased and attained peak during 2nd MW (10-16 Jan) when the prevailing maximum temperature, minimum temperature, morning relative humidity, evaporation, bright sunshine and wind velocity were 19.2 °C, 10.4 °C, 91.0%, 71.0%, 1.7 mm, and 2.9 Kmph respectively. After that, the population decreased up to 7th MW (14-20 Feb.) at the end of the season. The data on seasonal incidence aphid. Present observation were more or less with the results of earlier workers (Gaikwad AD *et al.*, 2018) [6]. Aphid *Brevicoryne brassicae*, (maximum 24.88 aphid/plant in 51th SMW).

Diamond back moth (*Plutella xylostella*)

The observation regarding larval and pupal population of diamond back moth (DBM) revealed that the population varied from 2.9 to 7.00/plant during 2021-22. DBM first appeared during 50th MW (13-19 Dec.) with intensity of 2.9/plant. Then the population gradually increased and attained peak during 2nd MW (10-16 Jan) when the prevailing maximum temperature, minimum temperature, morning relative humidity, evaporation, bright sunshine and wind velocity were 19.2 °C, 10.4 °C, 91.0%, 71.0%, 1.7 mm, and 2.9Kmph respectively. After that, the population decreased up to 7th MW (14-20 Feb.) at the end of the season. The data on seasonal incidence diamond back moth (DBM). Present observation were more or less with the results of earlier workers (Gaikwad AD *et al.*, 2018) [6] diamond back moth *Plutella xylostella*, (maximum 7.82 larvae/plant in 2nd SMW).

Leaf webber (*Crociodomia binotalia*)

The observation on larval count of leaf webber depicted in that the larval population ranged from 1.4 to 4.4/ plant during 2021-22. During 2021-22, the incidence of leaf webber was noticed from 50th MW (13-19 Dec.) to (14-20) February 7th MW. The peak incidence was observed in 1st MW when the prevailing maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, evaporation, bright sunshine and wind velocity were 20.9 °C, 7.7 °C, 91.0%, 71.0%, 2.0 mm, and 3.1Kmph, respectively. After that, the larval population decreased up to 7th MW (14-20 Feb.) (1.4/plant). The data on seasonal incidence Leaf webber. Present observation were more or less with the results of earlier workers (Gaikwad AD *et al.*, 2018) [6] leaf webber *Crociodomia binotalia* (maximum 3.00 larvae/plant in 2nd SMW).

Tobacco Leaf eating caterpillar (*Spodoptera litura*)

The data on larval population of tobacco leaf eating caterpillar presented that the population from 0.6 to 3.6/plant during 2021-22. The activity of tobacco leaf eating caterpillar initiated during 50th MW (13-19 Dec.) with gradual increase its population and reached its peak (3.6/plant) during 1st MW (03-09 Jan.) when the prevailing maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, evaporation, bright sunshine and wind velocity were 20.9 °C, 7.7 °C, 91.0%, 71.0%, 2.0 mm, and 3.1Kmph, respectively. After that, the larval population decreased upto 7th MW (14-20 Feb) (0.6/plant). The data on seasonal incidence of tobacco eating caterpillar. Present observations were more or less with the results of earlier workers (Gaikwad AD *et al.*, 2018) [6] tobacco leaf eating

caterpillar *Spodoptera litura* (maximum 2.0 larvae/plant during 2nd SMW).

Conclusion

The aphid population varied from 4.6 to 45/plant. Aphid first appeared during 48th MW (29-05 Dec.) with intensity of 4.6/plant, then the population gradually increased and attained peak during 2nd MW (10-16 Jan). After that, the population decreased up to 7th MW (14-20 Feb.) at the end of the season. The larval population of diamond back moth (DBM) varied from 2.9 to 7.00/plant. DBM first appeared during 50th MW (13-19 Dec.) with intensity of 2.9/plant, then the population gradually increased and attained peak during 2nd MW (10-16 Jan). After that, the population decreased up to 7th MW (14-20 Feb.) at the end of the season. when the prevailing maximum temperature, minimum temperature, morning relative humidity, evaporation, bright sunshine and wind velocity were 19.2 °C, 10.4 °C, 91.0%, 71.0%, 1.7 mm, and 2.9 Kmph respectively. The observation on larval count of leaf webber depicted in that the larval population ranged from 1.4 to 4.4/ plant. The incidence of leaf webber was noticed from 50th MW (13-19 Dec.) to (14-20) February 7th MW. The peak incidence was observed in 1st MW (03-09 Jan.) After that, the larval population decreased up to 7th MW (14-20 Feb.) (1.4/plant). The larval population of tobacco leaf eating caterpillar was recorded from 0.6 to 3.6/plant. The activity of tobacco leaf eating caterpillar initiated during 50th MW (13-19 Dec.) with gradual increase its population and reached its peak (3.6/plant) during 1st MW (03-09 Jan.) when the prevailing maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, evaporation, bright sunshine and wind velocity were 20.9 °C, 7.7 °C, 91.0%, 71.0%, 2.0 mm, and 3.1Kmph, respectively. After that, the larval population decreased up to 7th MW (14-20 Feb) (0.6/plant).

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