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POPULATION DYNAMICS OF MAJOR LEPIDOPTERAN PESTS ON CAULIFLOWER

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ABSTRACT

A field experiment on the population dynamics of major lepidopteran pests on cauliflower revealed the maximum incidence of diamond back moth (*Plutella xylostella* L), leaf webber (*Crocidolomia pavonana* F), leaf eating caterpillar (*Spodoptera litura* F) and semilooper (*Trichoplusia ni* Hubner) on 7th, 4th, 6th and 5th standard meteorological week (5.30, 3.90, 7.20 and 2.90 larvae/ plant, respectively). The correlation of incidence of larvae of diamond back moth and leaf eating caterpillar showed a highly significant positive correlation with bright sunshine hours (r = 0.699 and 0.772, respectively). Evening relative humidity showed a highly significant negative correlation (r = -0.687 and -0.749, respectively). Maximum and minimum temperature and morning vapour pressure exhibited a highly significant negative correlation with the leaf webber (r = -0.696, -0.866 and -0.826, respectively). The incidence of semilooper showed a significant negative correlation with minimum temperature and morning vapour pressure (r = -0.698 and -0.605, respectively).

Key words: Diamondback moth, leaf webber, leaf eating caterpillar, semilooper, *Plutella xylostella*, *Crocidolomia pavonana*, *Spodoptera litura*, *Trichoplusia ni* correlation coefficient, sunshine hours, temprature, vapour pressure

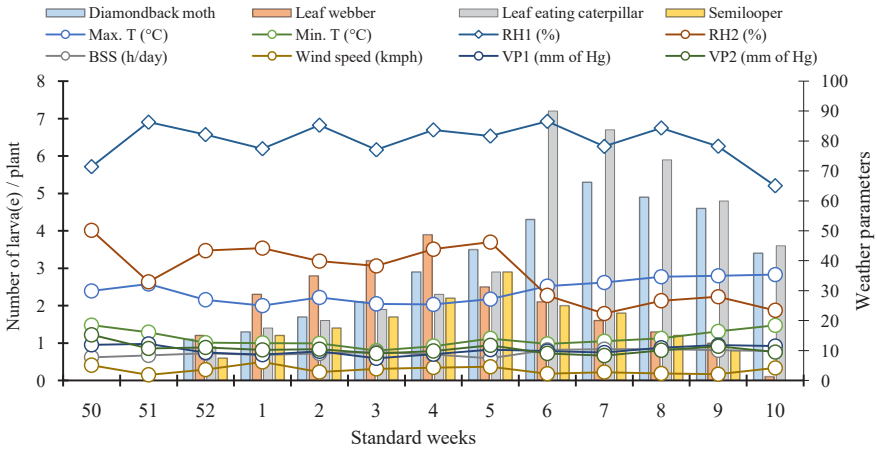
Cauliflower (*Brassica oleracea* var. *botrytis*) an important vegetable and India accounts for 36.67% of total production (Anonymous, 2021). Cauliflower is attacked by as many as 24 insect pests (Devjani and Singh, 2012). Diamond back moth (*Plutella xylostella* L), cabbage head borer (*Hellula undalis* F), cabbage butterfly (*Pieris brassicae* L), leaf webber (*Crocidolomia pavonana* F), leaf eating caterpillar (*Spodoptera litura* F) and semilooper (*Trichoplusia ni* Hubner) are important pests. Both biotic and abiotic factors affect these lepidopteran pests in cauliflower. The weather factors influence seasonal population dynamics. The determination of population dynamics is a prerequisite for IPM strategies. This study evaluates the population dynamics of major lepidopteran pests infesting cauliflower so as to develop an effective IPM strategy (Gaikwad et al., 2018).

MATERIALS AND METHODS

A field experiment was carried out at the Main Vegetable Research Station, Anand Agricultural University, Anand, Gujarat, India (22º03'N, 72º05'E) during rabi, 2022-23. Cauliflower cv. Pusa snowball KT–25 seedlings were raised in a nursery and transplanted after 30 days in a main plot of 18 x 12 m during rabi, 2022, at a spacing of 60 x 45 cm adopting all the recommended practices except insecticidal application. The number of larvae of the lepidopteran pests from randomly selected 10 plants in each quadrate were recorded at weekly intervals starting from one week after transplanting and continued up to harvest. The data on weather parameters such as bright sunshine (hrs), wind speed (km/ hr), maximum and minimum temperature (ºC), morning and evening relative humidity (%), morning and evening vapour pressure (mm of Hg) recorded at the Agricultural Meteorological Observatory, AAU, Anand, were correlated with incidence. SPSS software was used to study the correlation analysis.

RESULTS AND DISCUSSION

The results revealed that incidence of *P. xylostella, C. pavonana, S. litura* and *T. ni* were the major lepidopteran pests observed causing damage up to 70-80%. The larvae of *P. xylostella* started in the 4th week of December (52nd SMW) and reached its peak (5.30 larvae/ plant) during the 3rd week of February (7th SMW) (Fig. 1). Badjena and Mandal (2005) reported a peak level of larvae (56 larvae/ 10 plants) during the 1st week of February. Gaikwad et al. (2018) observed an initial intensity of 0.55 larvae/ plant during the 50th SMW and a peak level during 2nd SMW. Anjali and Pandya (2019) observed its emergence during the 50th SMW and its peak level in the 1st SMW. Rajput et al. (2021) reported the initial incidence during 49th SMW (0.80, 0.60 larva/ plant during 2018-19 and 2019-20,



Weather Parameters	Correlation co-efficient (r)			
	P. xylostella	*C. pavonana*	*S. litura*	*T. ni*
Bright sunshine hours (BSS), h/ day	0.699**	-0.05	0.772**	-0.029
Maximum Temperature (MaxT), ºC	0.488	-0.696**	0.545	-0.434
Minimum Temperature (MinT), ºC	-0.129	-0.866**	-0.126	-0.698**
Wind Speed (WS), km/ h	-0.384	0.204	-0.465	0.068
Morning relative humidity (RH_1), %	0.047	0.409	0.114	0.443
Evening relative humidity (RH_2), %	-0.687**	0.305	-0.749**	0.129
Morning vapour pressure (VP_1), mm of Hg	-0.053	-0.826**	-0.024	-0.605*
Evening vapour pressure (VP_2), mm of Hg	-0.529	-0.413	-0.548	-0.377

*Significant at p=0.005 **Significant at p=0.001

Fig. 1. Population dynamics of major lepidopteran pests of cauliflower and weather parameters

respectively). The maximum larval incidence (6.30 and 5.80 larvae/ plant during 2018-19 and 2019-20, respectively) was observed during 5th SMW. A similar result was reported by Singh et al. (2023) on cabbage and cauliflower, The correlation coefficient analysis indicates a highly significant positive correlation between larvae and bright sunshine hours (r = 0.699**); but showed non-significant negative correlations with minimum temperature (r = -0.129), wind speed (r = -0.384), morning and evening vapour pressure (r = -0.053 and -0.529, respectively). Evening relative humidity exhibited a highly significant negative correlation (r = -0.687**). The studies by Dalve et al. (2009), Tanweer et al. (2016) and Gaikwad et al. (2018) showed a significant negative correlation with evening relative humidity. *P. xylostella* showed a non-significant negative correlation with minimum temperature (Rajput et al., 2021). Sultana et al. (2019) and Kumar et al. (2022) reported positive correlations between maximum temperature.

The infestation of *C. pavonana* started in the 4th week of December (52nd SMW) with an incidence of 1.20 larvae/ plant, and peak occurred during the 4th week of January (4th SMW) with 3.90 larvae/ plant. Gaikwad et al. (2018) and Kumar et al. (2023) showed a similarity in their observations. Wind speed, morning and evening relative humidity revealed non-significant positive correlations (r = 0.204, 0.409 and 0.305, respectively). While, maximum (r = -0.696**) and minimum temperature (r = -0.866**) and morning vapour pressure (r = -0.826**) exhibited a highly significant negative correlation. The findings are similar to those of Gaikwad et al. (2018) and Isaq et al. (2023), significant negative correlation with minimum temperature.

The infestation of *S. litura* started in the 4th week of December (52nd SMW) with an incidence of 0.90 larvae/ plant; peak was recorded during the 2nd week of February (6th SMW) with 7.20 larvae/ plant. Khan and Talukder (2017) reported the highest peak in February (1.57 larvae/ plant). Gaikwad et al. (2018) reported a peak in the 3rd SMW (2.00/ plant). Present findings are in line with Singh et al. (2023) who reported the maximum population of *S. litura* larvae in Pataudi, with densities of 5.03 and 4.88 larvae/ 10 plants on

cabbage and cauliflower, respectively. Pushpalatha et al. (2023) observed the peak level of *S. litura* larvae during the 3rd SMW (12.1 larvae/meter of row length). Kumar et al. (2023) observed the initial population during the 50th SMW and its peak (3.6 larvae/ plant) was during the 1st SMW. There was a highly significant positive correlation with bright sunshine hours (r = 0.772**). However, minimum temperature, wind speed, morning and evening vapour pressure exhibited a negative correlation (r = -0.126, -0.465, -0.024, -0.548, respectively), but results were found non-significant; and evening relative humidity (r = -0.749**) showed a highly significant negative correlation. These significant positive correlation with bright sunshine hours (r = 0.772) exists and highly significant negative correlation with evening relative humidity (r = -0.749) Gaikwad et al. (2018) reported a non-significant positive correlation between morning relative humidity and larval inidence, while minimum temperature and wind speed exhibited non-significant negative correlations. Sultana et al. (2019) observed a positive correlation between temperature and *S. litura* in cabbage. Pushpalatha et al. (2023) found a non-significant positive correlation between *S. litura* and maximum relative humidity, while maximum temperature was significantly and positively associated.

The incidence of *T. ni* started with a peak in the 4th week after transplanting; observed in the 1st week of February (5th SMW), i.e., 2.90 larvae/ plant. Gaikwad et al. (2018) stated that semilooper incidence in cauliflower was first noticed during the 51st SMW (0.04 larvae/ plant) and its peak (1.06 larvae/ plant) was during the 3rd SMW. Correlation between weather parameters and the semilooper showed that wind speed, morning and evening relative humidity (r = 0.068, 0.443, 0.129, respectively) had a positive non-significant correlation; minimum temperature had a highly significant negative correlation (r = -0.698**). Morning vapour pressure had a significant negative correlation (r = -0.605*) whereas, maximum temperature, evening vapour pressure and bright sunshine hours had a negative correlation (r = -0.434, -0.377, -0.029, respectively), but results were found non-significant. Present findings are in line with Patait et al. (2008), who reported that incidence *T. ni* was significantly and negatively affected by the minimum temperature.

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AUTHOR CONTRIBUTION STATEMENT

Anitha conducted the study and prepared the manuscript; Ravi Kalasariya is the advisor for the research work.

CONFLICT OF INTEREST

No conflict of interest.

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