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## Seasonal incidence of major insect pests, natural enemies on cauliflower and their correlation with weather parameters

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**Abstract**

Field experiments was conducted in *Rabi* season during 2017-18 at the farm of Department of Agricultural Entomology, Vasanttrao Naik Marathwada Krishi Vidyapeeth, Parbhani. (Maharashtra) to study the seasonal incidence of major insect pests on cauliflower and their correlation with weather parameters. The incidence Aphid *B. brassicae* (maximum 120 per leaf during 51<sup>st</sup> SMW), diamondback moth *P. xylostella* (maximum 7.82 larvae/plant in 2<sup>nd</sup> SMW), leaf webber *C. binotalis* (maximum 3.00 larvae/plant in 2<sup>nd</sup> SMW), tobacco leaf eating caterpillar *S. litura* (maximum 2.0 larvae/plant during 2<sup>nd</sup> SMW), Green semilooper *Trichoplusia ni* (maximum 1.06 larvae/plant in 3<sup>rd</sup> SMW), Tussock moth *Orygia* spp (maximum 0.85 larvae/plant in 2<sup>nd</sup> SMW) and Head borer *Hellula undalis* (maximum 2.50 per cent in 8<sup>th</sup> SMW). The peak activity of maggots of syrphid fly and mummified aphids were observed 4.52/plant and 24.88/plant during 52<sup>nd</sup> and 51<sup>st</sup> SMW respectively. the correlation of aphids, diamondback moth, leaf webber, semilooper, tussock moth and head borer were significant with minimum temperature, evening relative humidity, minimum temperature, maximum temperature, max. and min. temperature and maximum temperature respectively. correlation of syrphid fly and mummified aphid were significant with minimum temperature and evening relative humidity.

**Keywords:** Cauliflower, correlation, insect pests, natural enemies, seasonal incidence

**1. Introduction**

Cauliflower 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 [6]. Cauliflower *Brassica oleracea* var. *botrytis* Linnaeus is a native of southern Europe in the mediterranean region and was introduced in India in 1822 from England [3] The major cauliflower producing states are Bihar, Uttar Pradesh, Orissa, West Bengal, Assam, Haryana and Maharashtra. In Maharashtra, the area under cauliflower is 13,000 ha with total production of 259.69 thousand MT and average productivity of 20.49 MT/ha [1]. Among the yield limiting factors, insect pests are great one and sometimes cause complete failure of the crop. The insect pests namely, aphid (*Brevicoryne brassicae* Linn. and *Lipaphis erysimi* Kalt.), diamondback moth (*Plutella xylostella* Linn.), cabbage borer (*Hellula undalis* Fab.), cabbage looper (*Trichoplusia ni* Hub.), leaf webber (*Crociodolomia binotalis* Zell.), painted bug (*Bagrada cruciferarum* Kirk.), cabbage butterfly (*Pieris brassicae* Linn.) and tobacco caterpillar (*Spodoptera litura* Fab.) are important. Diamondback moth is a most devastating pest of cole crops in the area of Punjab, Haryana, Himachal Pradesh, Uttar Pradesh, Bihar, Maharashtra, The present studies on seasonal incidence of major insect pests of cauliflower would give an idea about their peak period of activity and may be helpful in developing pest management strategy against them. With this objective in this study an attempt was made to study the incidence of major insect pest of cauliflower and their correlation with weather parameters.

**2. Material and methods**

Field experiments were conducted in *Rabi* season during 2017-18 at the farm of Department of Agricultural Entomology, Vasanttrao Naik Marathwada Krishi Vidyapeeth, Parbhani. (Maharashtra) to study the seasonal incidence of major insect pests on cauliflower and their correlation with weather parameters. the seedlings of cauliflower were transplanted in 100 m<sup>2</sup>

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area by adopting 60 cm x 60 cm spacing. the experiment was conducted in unprotected plot which was non-replicated and the plot size was 10 m x 10 m which was divided in four quadrants. *INDAM-9803* variety was used. The observations were recorded at weekly interval starting from 10 days after transplanting following the standard procedure

### 2.1 Insect pests

**Aphid:** The number of aphids was recorded weekly from each plant from randomly selected 5 plants in each quadrates. The observations were recorded from 3 leaves on each plant. Leaf webber, diamondback moth, tobacco leaf eating caterpillar, semilooper and tussock moth: The numbers of larvae of above pests per plant from randomly selected 5 plants in each quadrate were recorded weekly. Head borer: Total number of infested plants by head borer in each quadrate was recorded.

### 2.2 Natural enemies of insect pests

**Syrphid fly:** The maggots per plant from 5 randomly selected plants from each quadrate were recorded weekly. Mummified aphid: The number of mummified aphids due to parasitization were recorded from 3 leaves of 5 randomly selected plants in each quadrate.

## 3. Results and Discussion

The data on seasonal incidence of major insect pests and natural enemies infesting cauliflower in relation to weather parameters is presented in Table No.1.

**3.1 Aphid *Brevicoryne brassicae*:** incidence of aphids initiated from 47<sup>th</sup> MW (2.42/leaf) with gradual increase and reached its peak in 51<sup>th</sup> MW (120.00/leaf) Dewanda and Khan reported that the severity of aphid incidence was found to be higher in winter season as compared to monsoon season [5]. The present findings are more or less in accordance with above researchers.

**3.2 Diamondback moth *Plutella xylostella*:** incidence of DBM during 50<sup>th</sup> MW (10-16 Dec.) with intensity of 0.55/plant. Then the population gradually increased and attained peak during 2<sup>nd</sup> MW (08-14 Jan.) SMW. Dalve *et al.* reported that the pest population of *Plutella xylostella* (Linnaeus) on cabbage appeared from third week December which gradually increased and attained a peak of 8.9 larvae per plant during the fourth week of January. The pest was more active during the month of January [4].

**3.3 Leaf webber *Crociodolomia binotalis*:** incidence of leaf webber was found (0.09/plant) during 50<sup>th</sup> MW and attained peak (3.00/plant) during 2<sup>nd</sup> MW. Badjena and Mandal who reported that insect attended the peak (25.6 larvae/ 10 plants) during the third week of January [2].

**3.4 Tobacco leaf eating caterpillar *Spodoptera litura*:** incidence of larvae of tobacco leaf eating caterpillar first appeared during 51<sup>st</sup> MW (0.40/plant).then attained peak (2.00/plant) during 3<sup>rd</sup> MW. Badjena and Mandal indicated that the incidence of *Spodoptera litura* was noticed from fourth week of November to third week of February [2].

**3.5 Green semilooper *Trichoplusia ni*:** incidence of semilooper was first observed during 51<sup>th</sup> MW (0.04/plant). Thereafter the population gradually increased from 52<sup>nd</sup> MW

and attained its peak (1.06/plant) during 3<sup>rd</sup> MW. Nale *et al.*, observed that the peak activity of semilooper (0.5 larvae/plant) on cabbage during third week of Feb (7<sup>th</sup> MW) [10].

**3.6 Tussock moth *Orgyia* spp:** the pest incidence initiated during 50<sup>th</sup> MW with intensity of 0.55/plant and gradually increased attaining peak (0.85/plant) during 2<sup>nd</sup> MW. The literature regarding tussock moth on cauliflower was not found, hence it is not possible to discuss.

**3.7 Head borer *Hellula undalis*:** The incidence initiated from 50<sup>th</sup> MW then after in 6<sup>th</sup> MW population remain same, after that population gradually increased and attained its peak at the end of crop season during 8<sup>th</sup> MW with intensity 2.50 per cent. Patait *et al.*, revealed that the population of *Hellula undalis* (Fabricius), on cabbage varied from 0.6 to 3.2 larvae/quadrate during winter seasons 2006-07 [11].

**3.8 Maggot of syrphid fly:** maggots were recorded the first time during 48<sup>th</sup> MW. the population increased gradually and attained its peak (4.52/plant) during 52<sup>nd</sup> MW. Mandal and Patnaik reported that the peak activity of *I. scutellaris* was observed during January [8].

**3.9 Mummified aphid:** mummified aphid noticed from 49<sup>th</sup> MW with gradual increase and reached its peak (24.88/plant) in 51<sup>th</sup> MW.

## 4. Correlation between weather parameters and major insect pests of cauliflower

The incidence of major insect pests of cauliflower and natural enemies were correlated with weather parameters is presented in Table No.2.

**4.1 Aphid *Brevicoryne brassicae*:** population of aphid showed negatively significant correlation with minimum temperature ( $r=-0.644^*$ ). Association of *Brevicoryne brassicae* with all other weather parameters were non-significant. The present investigations are in agreement with Singh *et al.*, who indicated a negative relationship with maximum, minimum and mean temperature, evening and average relative humidity, wind velocity [13].

**4.2 Diamondback moth *Plutella xylostella*:** the correlation between DBM and evening relative humidity ( $r=-0.591^*$ ) was negatively significant. Other parameters was minimum temperature ( $r=-0.190$ ), morning relative humidity ( $r=-0.053$ ), and wind velocity ( $r=-0.098$ ) showed negative and non-significant correlation. Dalve *et al.*, revealed that among the different weather parameters, evening relative humidity exhibited highly significant negative correlation ( $r=-0.6852$ ) with *P. xylostella*. Whereas, remaining all the weather parameters showed non-significant correlation with *P. xylostella* [4].

**4.3 Leaf webber *Crociodolomia binotalis*:** Correlation of leaf webber larval population with minimum temperature ( $r=-0.612^*$ ) was negatively significant. All other parameters Morning relative humidity ( $r=0.055$ ), maximum temperature ( $r=-0.436$ ), bright sunshine ( $r=0.209$ ) showed non-significant correlation with Leaf webber. Patait *et al.*, reported that the population of *C. billotalis* was affected positively due to the action of afternoon relative humidity and maximum

temperature and negatively by the action of relative humidity and minimum temperature <sup>[11]</sup>.

**4.4 Tobacco leaf eating caterpillar *Spodoptera litura***

Correlation between all-weather parameters and *Spodoptera litura* was non-significant. The correlation of morning relative humidity ( $r=0.146$ ), evaporation ( $r=0.032$ ), bright sunshine ( $r=0.306$ ) was positive whereas correlation rainfall ( $-0.191$ ), maximum temperature ( $r=-0.263$ ), minimum temperature ( $r=-0.244$ ), evening relative humidity ( $r=-0.149$ ) and wind velocity ( $r=-0.206$ ) was negative with *Spodoptera litura* population. Raja *et al.*, revealed that the population of *S. litura* was influenced positively by relative humidity (morning and evening) and rainfall and negatively by temperature (maximum and minimum) <sup>[12]</sup>.

**4.5 Green semilooper *Trichoplusia ni*:**

Association of semilooper with all-weather parameters was non-significant except Maximum temperature ( $r=-0.515^*$ ) was negative significant. The present findings are more or less in the line of the earlier researchers such as Patait *et al.*, who observed that the population of *Trichoplusia ni* to the maximum extent was influenced positively by forenoon relative humidity and negatively by minimum temperature <sup>[11]</sup>.

**4.6 Tussock moth *Orgyia spp.*:** The correlation of larval population of tussock moth with maximum temperature ( $r=-0.579^*$ ) and minimum temperature ( $r=-0.609^*$ ) were

negatively significant while correlation between remaining weather parameters and *Orgyia spp.* was non-significant

**4.7 Head borer *Hellula undalis*:**

correlation of head borer with evening relative humidity ( $r=-0.628^*$ ) was negatively significant. However, maximum temperature ( $0.576^*$ ) and evaporation ( $0.645^*$ ) were positively significant. All other weather parameters were non-significant. Patait *et al.*, who revealed that relative humidity and maximum temperature showed positive and negative effect on the population of *H. undalis* <sup>[11]</sup>.

**4.8 Maggot of syrphid fly:**

correlation of syrphid fly maggot with minimum temperature ( $r=-0.695^*$ ), was significant. All other weather parameters were non-significant. Mishra and Singh carried out studies on the seasonal incidence of some insect pests associated with the cabbage during December 2010 and reported that the predators were very much seasonal and their numerical abundance coincides with the pest <sup>[9]</sup>.

**4.9 Mummified aphid:**

mummified aphid population was correlated negatively significant with minimum temperature ( $r=-0.683^*$ ), evening relative humidity ( $r=-0.648$ ) and evaporation ( $r=-0.539$ ). Positively significant correlation was noticed with aphid population ( $r=0.882^*$ ) Laisvune and Laimutis observed the highest parasitism in the periods when the number of aphids on the plants was the lowest <sup>[7]</sup>.

**Table 1:** Seasonal incidence of major insect pests of cauliflower and natural enemies

MW	Duration	No. of aphids / leaf	No. Of larvae of DBM /plant	No. of larvae of leaf webber / plant	No. of larvae of tobacco leaf eating caterpillar / plant	No. of larvae of semilooper / plant	No. of larvae of tussock moth / plant	Head Borer Infestation (%)	No. of maggots of syrphid fly / plant	No. of mummified aphids / plant
47	19 Nov-25 Nov	2.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	26 Nov.-02 Dec.	3.67	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00
49	03-09 Dec.	15.32	0.00	0.00	0.00	0.00	0.00	0.00	1.20	6.32
50	10-16 Dec.	95.27	0.50	0.09	0.00	0.00	0.55	0.05	1.37	13.83
51	17-23 Dec.	120.00	0.65	1.9	0.40	0.04	0.65	0.05	3.20	24.88
52	24-31 Dec.	100.00	0.90	2.00	0.50	0.06	0.80	0.40	4.52	23.43
1	01-07 Jan.	98.00	2.50	2.6	0.50	0.40	0.80	0.60	4.18	22.74
2	08-14 Jan.	29.18	7.82	3.00	1.8	0.73	0.85	0.85	3.41	14.34
3	15-21 Jan.	40.40	5.20	2.15	2.0	1.06	0.45	1.00	3.15	15.22
4	22-28 Jan.	45.50	3.00	1.62	0.8	0.53	0.25	1.50	2.70	16.20
5	29 Jan.-04 Feb.	18.45	2.10	0.95	0.10	0.20	0.1	1.80	2.52	11.92
6	05-11 Feb.	14.12	0.50	0.9	0.10	0.00	0.00	2.00	2.33	10.22
7	12-18 Feb.	13.88	0.00	0.5	0.00	0.00	0.00	2.00	1.18	9.87
8	19-25 Feb.	12.00	0.00	0.00	0.00	0.00	0.00	2.50	1.00	8.43

**Table 2:** Correlation of weather parameters with insect pests and natural enemies on cauliflower during *Rabi*-2017.

Weather parameters	Correlation coefficient ('r' value)								Mummified aphid
	Aphid	Diamondback moth larva	Leaf webber larva	Tobacco leaf eating caterpillar	Semilooper	Tussock moth larva	Head borer larva	Maggot of syrphid fly	
Rainfall (mm)	-0.205	0.105	-0.167	-0.191	-0.183	-0.261	0.351	-0.550	-0.533
Maximum temperature (°C)	-0.523	0.195	-0.436	-0.263	-0.515*	-0.579*	0.576*	0.472	0.456
Minimum temperature (°C)	-0.644*	-0.190	-0.612*	-0.244	-0.207	-0.609*	0.129	-0.695*	-0.683*
Morning relative humidity (%)	0.073	-0.053	0.056	0.146	0.191	0.108	-0.298	0.493	0.485
Evening relative humidity (%)	-0.188	-0.591*	-0.296	-0.149	-0.144	-0.177	-0.628*	-0.690*	-0.648*
Evaporation (mm)	-0.510	0.402	-0.345	0.032	0.149	-0.491	0.645*	-0.554*	-0.539*
Bright sunshine (hrs)	0.136	0.130	0.209	0.306	0.149	0.222	0.076	0.524	0.522
Wind velocity (Km/hr)	-0.141	-0.098	-0.251	-0.206	-0.173	-0.318	0.093	-0.552*	-0.510

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