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## Influence of weather parameters on the population of different cabbage pests in organic cabbage field

**Neelam Yadav, Neerja Agrawal and Renu Yadav**

### Abstract

The field study was conducted during the Rabi season of 2017-2018 in organic cabbage field for observation of cabbage pests with abiotic factors. Population dynamic of cabbage pests was highly affected by weather parameters like temperature (maximum and minimum), relative humidity (maximum and minimum) and sunshine hours. The data recorded on the incidence of cabbage pests population at weekly intervals revealed that the highest population of *Plutella xylostella* 4.67 larvae /plants, *Brevicoryne brassicae* 22.67 aphid/plant, *Hellula undalis* 0.67 larvae/plant, *Spodoptera litura* 0.67 larvae /plant and *Athalia proxima* was 5.34 larvae/plant was recorded during 52<sup>nd</sup> SW, 14<sup>th</sup> SW, 10<sup>th</sup> SW, 11<sup>th</sup> SW and 9<sup>th</sup> SW respectively. Data calculated on correlation coefficient to estimate the relationship between the numbers of cabbage pests associated with weather parameters.

**Keywords:** Weather parameters, cabbage, pests, Rabi season, organic cabbage field

### 1. Introduction

Pest insects are frequently held in check by natural means. The level of this control is influenced by the supply of food, the activity of parasitic organisms, including entomophagous insects and disease pathogens, and weather. India is the second largest producer of vegetables in the world next only to China. Among the crucifers, cabbage (*Brassica oleracea* L. var. capitata) is the most popular winter vegetables grown throughout India. In India, cabbage crop occupies an area of 433.9 ha with a production of 8573.3 MT and this is one of the most ravaged cruciferous vegetables by insect pests. Earlier in India, 37 insects' pests were reported in cabbage viz., Diamond back moth (*Plutella xylostella*), Mustard aphid (*Lipaphis erysimi*), Cabbage semilooper (*Trichoplusiani*), Tobacco caterpillar (*Spodoptera litura*), cutworm (*Agrotis ipsylon*) etc. The information on seasonal abundance was however, generated by many workers Sachan and Srivastava, (1972) [8], Sharma (2004) [9], Shukla and Kumar (2004) [11], Wagle *et al.* (2005) [12] from different regions of India. Recently status of insect pest of a particular crop is shifting under changing climate scenario. Therefore, up-to-date knowledge of the seasonal abundance of insect pests at different growth stages of cabbage crop will be helpful in evolving proper management schedule. The importance of weather in this connection is well illustrated by the work of Andrewartha and Birch (1954) [1]. As weather influence the population, the present investigations were undertaken to study the association of climatic parameters with the population build-up of different cabbage pests, in order to understand the pest ecology better.

### 2. Materials and Methods

The present study was based on the infestation of pests of cabbage crop in the organic field. The pests of cabbage were recorded by direct visual counting method, ten plants were selected randomly population of pests were recorded from 3 leaves i.e. top, middle and bottom at weekly interval on standard meteorological week basis. Finally, average population of pest per ten plants was worked out. Meteorological data were collected from Department of Agronomy CSAUAT, Kanpur to correlate pests incidence in organic cabbage. The observations of pests' population were recorded starting from the first week after transplanting till harvest of the crop. With a view to study the impact of weather parameters on the pest, a simple correlation between pest population and weather parameters was worked out Weekly data of the pests were correlated with the prevailing climatic factors such as maximum temperature, minimum

temperature and relative humidity prevailing in the field by computing correlation coefficient (r) with a view to study the combined qualitative impact of different weather parameters on the pests and predators population on cabbage crop during rabi season, 2017-2018.

### 3. Results and Discussion

The data recorded on seasonal abundance of cabbage pests during Rabi season of 2017-2018 are presented in table 1. The data presented in Table-1 indicates that there were six insect pests recorded during experiment Rabi season, 2017-2018. Incidence of insect pests was recorded from 46<sup>th</sup> to 11<sup>th</sup> SW during the period of study. The major pests recorded were Diamond back moth (*Plutella xylostella* Linn.) and Cabbage aphids (*Brevicoryne brassicae*) while Head borer (*Hellula undalis*), Tobacco caterpillar (*Spodoptera litura*), Mustard sawfly (*Athalia proxima*) and Grasshopper were recorded as minor pests. It is evident from Table- 1 that population of DBM first appeared in the 49<sup>th</sup> SW and reached its peak (4.67) in the 52<sup>nd</sup> SW when the maximum and minimum temperature were 21°C and 6.8°C respectively with 81.5 per cent relative humidity and 3.0 hours of sunshine. Thereafter, the population showed a decreasing trend. In organic Cabbage field one spray of Nimbolin 0.3% was done in 52<sup>nd</sup> SW and after that second spray was done in 2<sup>nd</sup> SW of Bt 0.5 % followed by third spray of NSKE 0.15% in 9<sup>th</sup> SW. These results coincide with the findings of Meena and Sharma (2003) [5] who reported the diamondback moth larvae found damaging the cabbage from early November till the end of January with peak activity. The peak larval incidence continued till the end of first week of February, and thereafter sudden decline was recorded. Chaudhuri *et al.* (2001) [2] reported that the larval population of diamondback moth shows the positive correlation with average temperature, relative humidity and total rainfall but negative correlation with average sunshine hours per day.

The Cabbage aphid (*Brevicoryne brassicae*) was the second major pest recorded during the period of study. It is evident from the Table -1 that population of cabbage aphid first appeared in the 1<sup>st</sup> SW and reached its peak (67.00) in the 9<sup>th</sup> SW when the maximum and minimum temperature were 30.3 °C and 12.1 °C respectively with 63.3 per cent relative humidity and 5.6 hours of sunshine. (Yadav and Agrawal 2018) [13]. The population showed a decreasing trend thereafter (Table 1). Incidence of minor pests' viz., *Spodoptera litura*, *Hellula undalis*, *Athalia proxima* and Grasshopper was recorded and it was found that *Hellula undalis* appeared in the 2<sup>nd</sup> SW and reached its peak on 3<sup>rd</sup> SW with 0.34 and 0.67 larvae per plant respectively. (Reddy *et al.* 2016) [7]. As regards *Spodoptera litura*, it appeared in 50<sup>th</sup> SW with 0.3 larvae /plant and the population did not increase thereafter. Kumar *et al.* (2007) [3] found various pests on cabbage with the population fluctuation being affected by the weather parameters. In Varanasi, population of tobacco caterpillar larvae had significant negative correlation with maximum temperature, minimum temperature and sunshine hrs./day during rabi seasons of both the years 2013-14 and 2014-15 which are in accordance with Rao *et al.* (2003) [6] whereas, with relative humidity the pest population is non-significant. The little variations observed may be due to changes in agro-climatic conditions. *Athalia proxima* appeared in the 50<sup>th</sup> SW with 3.0 larvae/plant after which it started decreasing and it vanished after 7<sup>th</sup> SW. There was fluctuating incidence of grasshopper with maximum Adult/plant in 2<sup>nd</sup> SW. It is evident from Table 2 that *Plutella xylostella* had a significant positive correlation (r= 0.5178) with sunshine while *Athalia proxima* had a negative correlation (r= -0.4953) with minimum temperature during Rabi 2017-18 in organic field of cabbage. Similar results were observed by the Shah *et al.* (2013) [10] and Mandal & Patnik, (2008) [4].

**Table 1:** Incidence of insect pests on cabbage crop in organic field during Rabi season, 2017-2018 (Mean of 10 plants)

Sr. No.	Standard Meteorological Week	<i>Plutella xylostella</i> larvae	<i>Brevicoryne brassicae</i>	<i>Hellula undalis</i> larvae	<i>Spodoptera litura</i> larvae	<i>Athalia proxima</i> larvae	Grass hopper Adult	Temperature		Relative humidity		Sun Shine (hrs/day)
								Max. Temp. (°C)	Min. Temp (°C)	Max. Rh (%)	Min. Rh (%)	
1	46	0.0	0.0	0.0	0.0	0.0	0.0	29.5	13.2	86	43	2.5
2	47	0.0	0.0	0.0	0.0	0.0	0.34	26.3	9.8	68	39	2.7
3	48	0.0	0.0	0.0	0.0	0.0	0.0	26.7	7.6	87	38	2.8
4	49	2.67	0.0	0.0	0.0	0.0	0.34	25.2	10.5	81	45	4.8
5	50	1.34	0.0	0.0	0.34	0.34	0.34	24.6	10.5	92	45	2.5
6	51	1.0	0.0	0.0	0.0	4.67	0.34	23.2	8.2	89	53	2.3
7	52	4.67	0.0	0.0	0.0	1.34	0.0	21	6.8	97	66	3
8	1	2.67	1.34	0.0	0.0	0.0	0.0	17.1	5.6	98	69	2.2
9	2	1.34	6.0	0.34	0.0	5.34	0.67	20.3	5.3	97	61	1.4
10	3	2.67	4.0	0.67	0.0	0.67	0.34	22.4	6.5	93	53	5.4
11	4	1.34	5.34	0.0	0.6	1.34	0.0	21.6	5.7	92	62	7.5
12	5	4.0	8.34	0.0	0.34	1.0	0.0	25.4	9.8	88	50	6.5
13	6	1.67	20.67	0.34	0.0	1.0	0.0	23.2	8.4	83	47	8.7
14	7	3.0	22.67	0.0	0.34	0.34	0.0	24.3	11.2	87	56	6.5
15	8	3.0	56.0	0.0	0.0	0.0	0.67	30.3	12.1	84	42	5.6
16	9	4.34	67.0	0.0	0.0	0.0	0.34	30.7	14.6	85	45	8
17	10	4.34	1.34	0.0	0.0	0.0	0.0	30.5	13.9	72	36	8.5
18	11	3.0	0.0	0.0	0.0	0.0	0.0	33.2	15.7	61	30	8.9

**Table 2:** Simple Correlation coefficient (r) between pest populations on cabbage crop in organic field with weather parameters during Rabi season 2017-18.

S. No	Pest (Scientific name)	Temperature (°C)		Relative Humidity (%)		Sunshine Hrs./day
		Max. temp	Min. temp	Max. RH	Min. RH	
1	<i>Plutella xylostella</i>	0.1243	0.2744	0.0027	0.1412	0.5178*
2	<i>Brevicoryne brassicae</i>	0.3567	0.3686	0.0021	-0.0955	0.4027
3	<i>Athalia proxima</i>	-0.4545*	-0.4953*	0.4051	0.4412	-3.688

\*, \*\*and \*\*\* denote significant at 5%, 1% and 0.1% level of significance, respectively

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