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# Seasonal incidence of diamond back moth (*Plutella xylostella* Linn.) on cabbage and its correlation with different abiotic factors

**Ranjeet Singh Shyam, AK Awasthi, RKS Tomar and Sunil Kumar**

**Abstract**
The field experiment was conducted during *rabi* 2019-2020 at Horticultural farm of BTC College of Agriculture and Research Station, Bilaspur, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The studies on the seasonal incidence of diamond back moth, *Plutella xylostella* Linn. infesting cabbage crop revealed that the first appearance of the pest was started during second week of December and attended peak (5.8 larvae/plant) in the last week of January (5th SMW). The correlation studies revealed that maximum (r= -0.496), minimum (r= -0.484), and average (r= -0.534) temperature had significant negative correlation, while the other weather parameters showed non significant correlation with larval population of diamond back moth.

**Keywords:** Cabbage diamond back moth, seasonal incidence, correlation, abiotic factors

## Introduction
Cabbage (*Brassica oleracea var. capitata* Linn.) is one of the most important cruciferous vegetable grown throughout India and the world. India is the second largest producer of cabbage in the world after China. In India, West Bengal ranks first in cabbage production followed by Odisha, Bihar, Assam and Gujrat. The total area under cultivation of cabbage in India is 3.99 lac hectares with an annual production of 90.3 lac metric tons (Anonymous, 2017-18) [2].

The nutritional value present in per 100g of cabbage consists of carbohydrates 5.8 g, fat 0.1 g, protein 1.28 g, vitamins (Vitamin $B_1$ or thiamine 0.061 mg, $B_2$ or riboflavin 0.040 mg, vitamin $B_3$ or niacin 0.234 mg, vitamin $B_5$ or pantathonic acid 0.212 mg, vitamin $B_9$ or folate 43 mg, vitamin C 36.6 mg and vitamin K 76 mg), minerals (Mg 12 mg, Mn 0.16 mg, P 26 mg, Ca 40 mg, Fe 0.47 mg, K 170 mg, Na 18 mg, Zn 0.18 mg) (Anonymous, 2016) [3].

One of the major constraints of not attaining higher and quality yields of crucifers is the damage caused by insect pests. The major insect pests, which cause maximum yield losses in cabbage are diamond back moth (*Plutella xylostella* L), cabbage butterfly, (*Pieris brassicae L*), *cabbage aphid* (*Brevicoryne brassicae* L.), cabbage semilooper (*Trichoplusia ni*), leaf webber (*Crocidolomia binotalis*), cabbage head borer, (*Hellula undalis Fab.*). Diamond back moth is the most destructive pest in cabbage growing areas and the yield loss were reported up to 52% in India (Krishnamoorthy, 2004) [9]. The indiscriminate use of synthetic inorganic insecticides resulted in pest resistance along with adverse effect on non target organisms and control failures are now common even in certain cases, economical production of crucifers has become increasingly difficult (Regupathy, 1996) [12]. Hence, the present investigation were undertaken to study the seasonal incidence of diamond back moth on cabbage crop in the prevailing agroclimatic conditions of Chhattisgarh, which would enable for evolving a suitable management schedule against the pest.

## Materials and Methods
The experiment was conducted at Horticultural Farm of Barrister Thakur Chhedilal College of Agriculture and Research Station, Bilaspur, a constituent college of Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). To study the seasonal incidence of diamond back moth on cabbage and it's correlation with different weather parameters during *rabi* 2019-2020. The cabbage seedlings were transplanted in the plot size of 9.6 m × 9.45 m with planting distance of 60 cm × 45 cm during second week of November with following all the improved

recommended package of practices for raising the crop except plant protection measures.

To record the observation on diamond back moth infesting cabbage crop, ten plants were randomly selected and tagged from the plot. Weekly observations were taken after transplanting till its harvest. Diamond back moth larvae were recorded by visual counting method. The weekly meteorological data on temperature, relative humidity, rainfall and sunshine hours were also recorded for whole of the cropping season from the meteorological observatory located at BTC CARS, Bilaspur (C.G.). The obtained data were correlated with various abiotic factors and correlation coefficients were worked out as suggested by Snedecor and Cochran, 1967 [16]. The graphical representation was applied to depict the seasonal incidence of the diamond back moth

## Results and Discussion

The seasonal incidence of diamond back moth was observed on cabbage var. Golden acre starting from second week of December 2019 to first week of March 2020 at weekly interval (Fig 1). The first occurrence of diamond back moth was observed on cabbage during second week of December 2019 (50th SMW) at head initiation stage. The maximum population of diamond back moth (5.8 larvae/plant) was recorded during last week of January 2020 (5th SMW). During this period, the weather conditions prevailed were maximum (26.03ºC), minimum (10.71ºC) and average (18.37ºC) temperature, morning (83.71%), evening (55.43%) and average (69.57%) relative humidity, rainfall (0.00 mm) and sunshine (6.73 hours). Bhagat (2018) [6], Sachan (1972) [13], Anonymous (1972) [4], Raju and Sivaprakasham (1989) [11], Krishnaian K. and Jagamohan (1983) [8], Bhatia and Verma (1995) [7] and Patel *et al.* (2005) [10] were reported the first appearance of diamond back moth in the month of the December.

Correlation co-efficient was worked out between the number of diamond back moth larvae and the weather factors *viz*. temperature (maximum and minimum), relative humidity (morning and evening), rainfall and sunshine hours (Table 1). The result revealed that the significant negative correlation with maximum temperature (r = -0.496), minimum temperature (r = -0.484), average temperature (r = -0.534), while rest of the weather factors were not found to be significantly correlated. The regression equation between diamond back moth and maximum temperature (y = -0.323x + 10.62, $R^2$ = 0.246) depicts that at every unit increase in maximum temperature, the infestation level decreases by 0.323 units (Fig. 2), for minimum temperature (y = -0.376x + 6.543, $R^2$ = 0.234) depicts that at every unit increase in minimum temperature, the infestation level decreases by 0.376 units (Fig. 3), for average temperature (y = -0.412x + 9.969, $R^2$ = 0.285) depicts that at every unit increase in average temperature, the infestation level decrease by 0.412 units (Fig. 4). The correlation studies showed that the incidence of diamond back moth was affected only by temperature, which indicated that the rise in temperature declined the population of diamond back moth.

The present finding are in conformity with Sharma *et al.* (2017) [15] who reported that diamond back moth showed significantly negative correlation with maximum and minimum temperature and non-significant correlation with relative humidity. Bana (2011) [5] and Sharma (2016) [14] was recorded that diamond back moth showed significant negative correlation with maximum and minimum temperature while non-significant positive correlation with relative humidity and sunshine hours. Appasaheb (2015) [1] was observed that the diamond back moth showed non-significant correlation with rainfall and relative humidity.

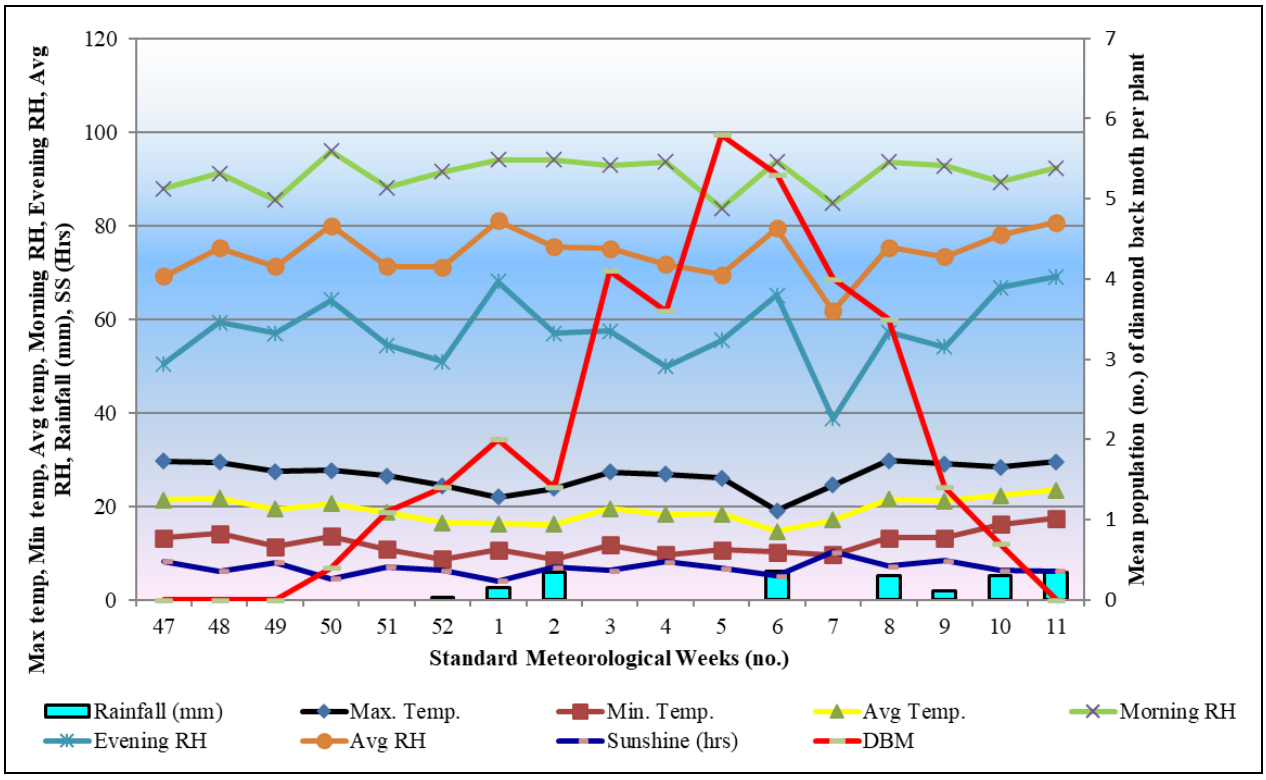


**Fig 1:** Seasonal incidence of diamond back moth on cabbage during *rabi* 2019-2020

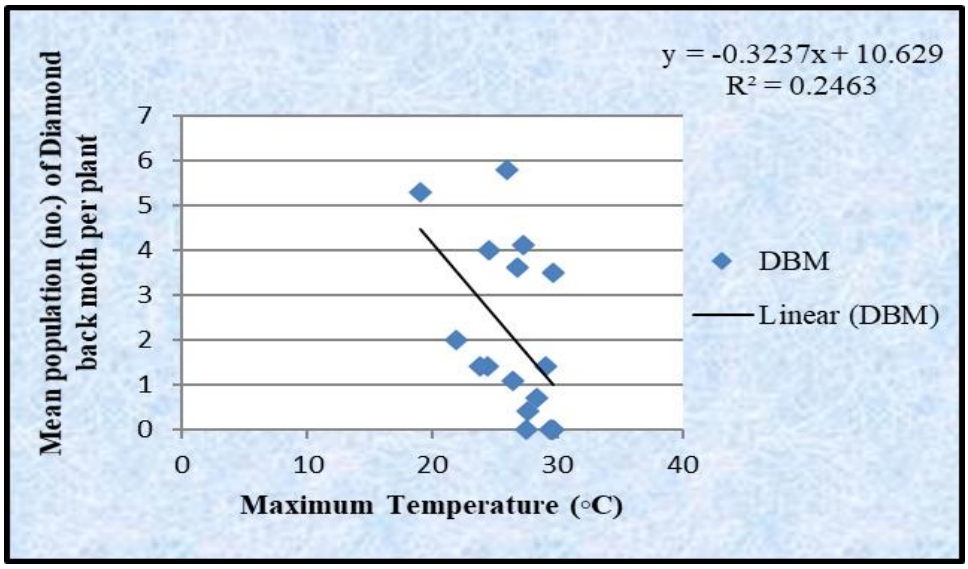


**Fig 2:** Regression of DBM infestation on maximum temperature (ºC)

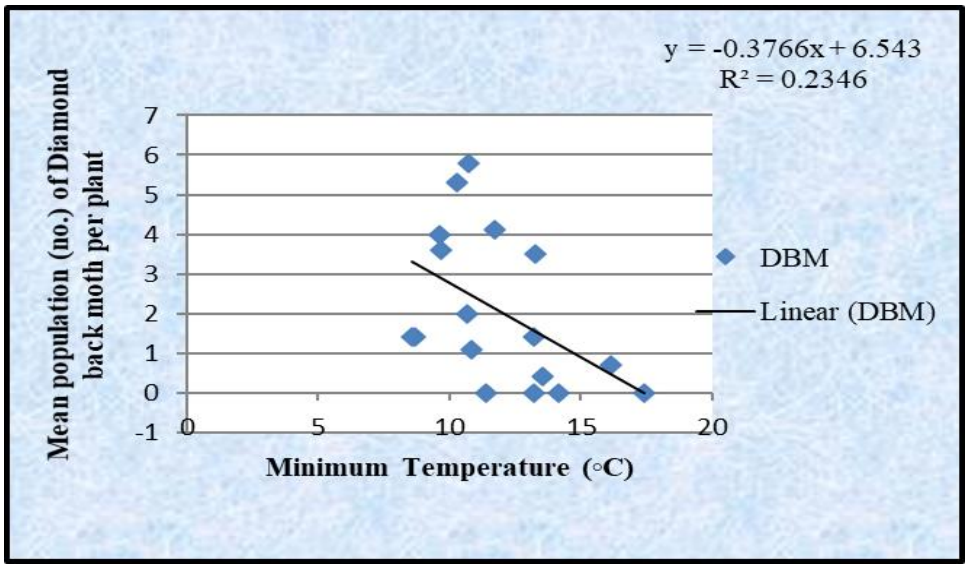


**Fig 3:** Regression of DBM infestation on minimum temperature (ºC)

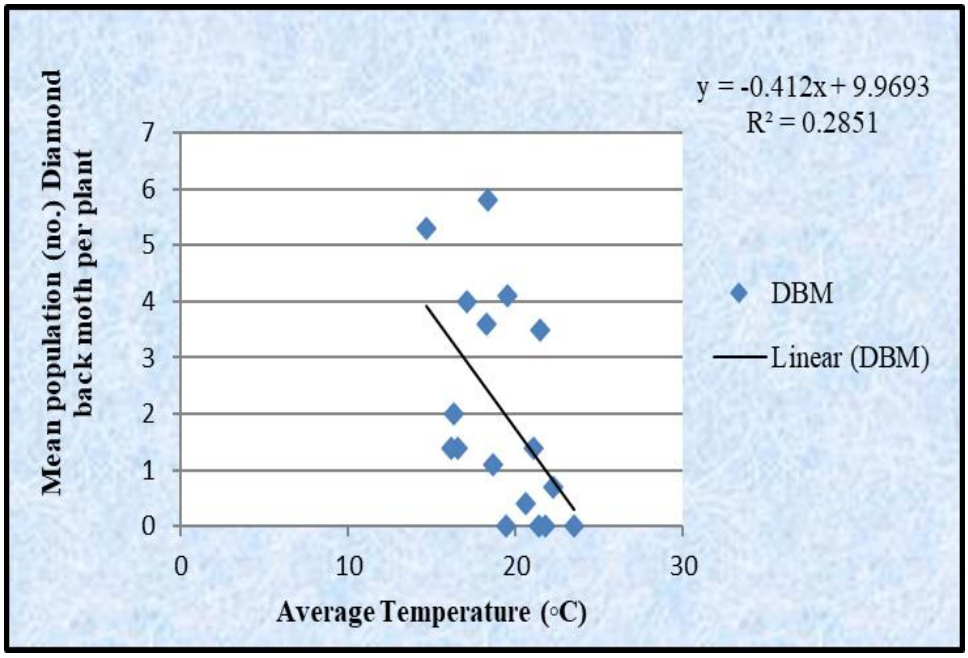


**Fig 4:** Regression of DBM infestation on average temperature (ºC)

**Table 1:** Simple correlation coefficient (r) between different meteorological parameters and larval population of diamond back moth

| Meteorological parameters | Diamond back moth | |
|---|---|---|
| | r | $b_{yx}$ |
| Maximum Temperature (°C) | -0.496* | -0.323 |
| Minimum Temperature (°C) | -0.484* | -0.376 |
| Average Temperature (°C) | -0.534* | -0.412 |
| Morning RH (%) | -0.095 ns | - |
| Evening RH (%) | -0.238 ns | - |
| Average RH (%) | -0.219 ns | - |
| Rainfall (mm) | 0.042 ns | - |
| Sunshine (Hrs.) | 0.072 ns | - |

ns = non significant,*Significant at 5% **Significant at 1%

## Conclusion

The seasonal incidence studies of the pest revealed that the first appearance of diamond back moth (0.4 larvae/plant) was noticed during second week of December 2019 (50th SMW) at vegetative stage and observed gradual increase in the larval population which attended peak (5.8 larvae/plant) in the last week of January (5th SMW) and remained active up to first week of March 2020 (10th SMW) at head maturation stage of the crop.

The correlation studies between the diamond back moth and various weather parameters showed significant negative correlation with maximum (r= -0.496), minimum (r= -0.484) and average (r= -0.534) temperature, while, other weather parameters were found non significant correlation with the larval population of the pest.

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