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Population dynamics of diamond back moth (*Plutella xylostella* Linn.) on winter cabbage

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Abstract

First incidence of Diamond back Moth was started in second week of February. Infestation of the pest increased gradually and reached peak in first week of March and thereafter declined subsequently in coming Meteorological weeks. Minimum temperature, Morning relative humidity and Rainfall showed significantly positive correlation where as Maximum temperature and Bright Sunshine hours showed non significantly negative correlation with the population of Diamond back Moth.

Keywords: population dynamics, diamond back moth, minimum temperature, morning relative humidity, sunshine hours

Introduction

Among the cruciferous vegetables, Cabbage (*Brassica Oleracea* L. Var. Capitata) is the most popular and grown throughout India. It is the most common winter vegetable. It is one of the cool season herbaceous green leafy vegetables belonging to the family, Brassicaceae grown worldwide due to its palatability and taste in addition to antioxidant, anti-inflammatory and antibacterial properties. It is used as salad, boiled and dehydrated vegetable as well as in cooked curries and pickles. This crop due to lack of competition, it is very remunerative to the growers. Main edible part is head or curd. Leaf is good source of Protein (1.6%), Vitamins (A, B and C). Sulphur, Amino acids, Minerals, Calcium, Iron, Magnesium, Phosphorous and Potassium. Low amount of calories, 2.4% Fat, 0.2%, Carbohydrate, Hanif *et. al.* (2006) ^[1]. Insect pests, diseases and weeds are the major constraints limiting agricultural Productivity and growth. It is estimated that herbivorous insects eat about 26 per cent of the Potential food Production (Singh and Sharma, 2004) ^[2]. A General View of the Pest Problem of Cabbage in India reveals that this crop is attacked by number of insect pests viz. Cabbage butterfly (*Pieris brassicae* Linn.), Diamond back Moth (*Plutella xylostella* Linn.) Tobacco leaf eating caterpillar (*Spodoptera litura* Fab.) and cabbage head borer (*Hellula undalis* Fab.) Rao and Lal, (2005) ^[3]. Out of these pests, Diamond back Moth (*Plutella xylostella* Linn.) is considered to be the most destructive pest (Mahla *et. al.* 2005) ^[4]; Kumar *et. al.* (2007) ^[5]. In India, diamond back moth has national importance on cabbage as it causes 50-80% annual loss in the marketable yield (Ayalew, 2006) ^[6]. Sachan and Srivastava (1972) ^[7] reported that the diamond back Moth incidence commences from September and gradually increases upto January reaching its peak by February.

Materials and Methods

The experiment was laid out in unprotected plot size 5.0mX5.0m in Rabi Season of 2020 at the Research farm of Nalanda College of Horticulture, Noorsarai (Nalanda). The experimental land was ploughed once and harrowed twice before transplanting the seedlings. Cabbage Seedlings of Variety, NS-22(F₁ Hybrid) were grown in raised beds in the field. The healthy and vigorous seedlings of 30 days old were transplanted in the main field. Transplanting was done on the flat beds with 50cm X 45cm. spacing on 14th December 2020. Protective irrigation was given immediately after transplanting. Thinning and gap filling of seedlings was done within a week of transplanting. Population of Diamond back Moth per plant was recorded at weekly interval since transplanting.

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Results and Discussion

The observations on incidence of Diamond back Moth on Cabbage during IInd trial of the experiment were recorded and are presented in Table 1. The data revealed that the first appearance of Diamond back Moth was started in second week of February (0.75 larvae per plant) i.e. (6th Meteorological week). The infestation of the pest increased gradually and reached peak in first week of March (1.99 larvae per plant) i.e. (09th Meteorological week).

The relation between weather parameters and percent incidence of Diamond back Moth on Cabbage was studied, path analysis was performed to the correlation. Combined effects as well as direct and indirect effects of weather parameters on incidence of diamond back Moth on cabbage during rabi seasons of 2020 were worked out.

The results of direct-indirect effects and correlation between insect pests and abiotic factors in Cabbage are presented in Table 2. It is observed from the data that Minimum temperature, Morning relative humidity and Rainfall Showed Significantly positive correlation with the population of Diamond back Moth where as Maximum temperature and Bright Sunshine hours showed non-significantly negative correlation with the Population of Diamond back Moth on Cabbage .

These results are in confirmation with those obtained by Mohan (1994) who found that Diamond back Moth was prevalent from December to May with it's peak activity during April in Nilgiri hills of Tamilnadu. Venkateswarlu *et. al.* (2011) [9] reported that peak incidence of diamond back moth was observed during 1st week of March. Among different abiotic factors, maximum and minimum temperature had significantly positive correlation where as morning and evening relative humidity showed significantly negative correlation with DBM Population. Hemchandra and Singh, 2007 [10] also indicated the maximum abundance of DBM during March for consecutive few years at Manipur condition. He also reported that higher temperature, lower relative humidity, lower total rainfall, longer duration of Sunshine

hours and higher wind speed seem to favour the pest population build up. Sarkar *et. al.* (2007) [11] reported that DBM was the most abundant during January-February when the maximum and minimum temperature varied from 21.1 to 31.4 °C and 7.9 to 19.9 °C respectively under west Bengal condition. Patel, 2002 [12] also reported similar findings that the *Plutella xylostella* was abundant in December to March with a population peak in February which are more or less in accordance with the finding of the present investigation. Devi *et. al.* (2004) [13] reported *Plutella xylostella* appeared in February end and it's population peaked in Mid-April. This supports the findings of the present investigation.

Table 1: Population dynamics of Diamond Back Moth of Cabbage in Rabi Season 2020.

Obs. No.	Date of obs.	Meteo. Weeks	Diamond back moth/Plant
1	27-01-2020	04	0.00 (0.70)
2	03-02-2020	05	0.00 (0.70)
3	10-02-2020	06	0.75 (1.11)
4	17-02-2020	07	1.42 (1.38)
5	24-02-2020	08	1.93 (1.55)
6	03-03-2020	09	1.99 (1.57)
7	10-03-2020	10	1.58 (1.44)
8	17-03-2020	11	0.79 (1.13)
9	24-03-2020	12	0.37 (0.93)
10	31-03-2020	13	0.00 (0.70)

The average Population - (0.88) throughout Season.

Table 2: Combined direct and indirect effect of the abiotic factors on the population of Diamond back Moth of Cabbage in Rabi Season 2020.

Abiotic Factor	Temp.		% RH		Rainfall (mm)	Wind speed km/hr	Bright Sunshine hrs.
	Max.	Min.	Morn.	Even.			
Diamond back Moth	-0.092	0.417*	0.535*	0.270	0.436*	-0.149	-0.072

*Significant at 5 percent level.

Conclusion

The highest population of Diamond Back moth was noticed in first week of March in Rabi season of 2020. The population of the pest declined gradually in subsequent meteorological weeks. Minimum temperature , Morning relative humidity and Rainfall showed significantly positive correlation with the population of Diamond back moth where as Maximum temperature and Bright sunshine hours showed non-significantly negative correlation with the population of Diamond back moth on cabbage during IInd trial of the project.

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