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SEASONAL INCIDENCE OF DIAMONDBACK MOTH (*PLUTELLA XYLOSTELLA* L.) ON CABBAGE

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KEYWORDS

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ABSTRACT

Field studies were carried on seasonal incidence of Diamondback moth(*Plutella xylostella*L.) on cabbage,in Vegetable Research Farm of Institute of Agricultural Sciences, Banaras Hindu University, Varanasi during *rabi,* 2013-2014 and 2014-2015.The results revealed that incidence of diamondback moth (DBM) was started from the 46th standard week and reached maximum in the 4th standard week (6.21 larvae/plant) during *rabi* 2013-14 and 5th standard week (7.11 larvae/plant) during 2014-15. The correlation studies in this paper represents the incidence of diamondback moth had significant negative correlation with maximum and minimum temperatures and significant negative correlation with sunshine hours which reflects that the rise in temperature or sunshine hours declines the population of diamondback moth.

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INTRODUCTION

Among the crucifers, Cabbage (*Brassica oleracea* L. var. *capitata*) is the most popular winter vegetables grown throughout India. The area under cabbage cultivation in India is around 3.79 lakh hectare with 85.97 lakh tones production and average yield of 22.7 T/ha during 2014-15 (Anon, 2015). It is generally used as cooked vegetables either alone or is mixed with potato, peas or other vegetable as fried or in curry form. It is also eaten raw as salad, stewed or boiled items in continental form (Hazra *et al.,* 2011). It is rich in minerals and vitamins A, B1, B2 and C. Although the crop has got huge domestic demand, a number of limiting factors have been attributed for its low productivity and one of the chief constraints in the production of cabbage is damage caused by pest complex right from germination till harvesting. Maison (1965) listed 51 insect pests which damage cruciferous crops throughout the world. In India, a total of 37 insect pests have been reported to feed on cabbage (Lal, 1975) viz., tobacco caterpillar, - *Spodoptera litura* (F.); diamondback moth, *Plutella xylostella* (L.); cabbage leafwebber, *Crocidolomia bionotalis* (Zell); aphids, *Brevicornye brassicae* (L.) and *Lipaphiserysimi* (Kalt); painted bug, *Bagrada cruciferarum* (Kirk.) and flea beetle, *Phyllotreta cruciferae* (Goeze) from sowing to harvest. Among these insect pests, diamond back moth, *Plutella xylostella* L. (Plutellidae: Lepidoptera) is the most important pest causing severe yield loss to cabbage every year.The information on seasonal incidence on cabbage was however, generated by many workers (Sachan and Srivastava, 1972; Sharma, 2004; Shukla and Kumar, 2004; Wagle *et al.*, 2005; Venkateswarlu *et al.*, 2011 and Vanlaldiki *et al.*, 2013) from different regions of India.Recently status of insect pests of a particular crop is shifting under changing climate scenario. The severity of the incidence of pests is also greatly influenced by the prevailing climatic conditions which vary from region to region. Therefore, up to date knowledge of seasonal incidence of insect pests at different growth stages of cabbage crop will be helpful in evolving proper management schedule. By knowing seasonal incidence and by studying bio-efficacy of insecticides enables us to devise an intelligent and practical manipulation of control factors for sound pest management strategy. Hence, the present investigations on seasonal incidence of major leaf eating caterpillar *Plutella xylostella* L. on cabbage in relation to weather parameters were undertaken and the results presented herein paper.

MATERIALS AND METHODS

The experiment was carried out under field conditions at the Vegetable Research Farm of Institute of Agricultural Sciences, Banaras Hindu University, and Varanasi during *rabi*, 2013-2014 and 2014-2015. Seedlings of cabbage variety 'Golden Acre' were transplanted in 3rd week of November with spacing 60 x 45cm. No insecticides were applied during the entire crop growth and the crop was subjected to natural pest infestation. Irrigation was given as and when necessary. Weeding was carried out at 30 and 60 days after sowing.

Observations

The larval populations of diamondback moth (DBM) were recorded by direct visual

counting method (Lal, 1998), ten plants were selected randomly from each plot and the total larval population of the pest was counted at weekly interval. Weather data were collected from the metrological observatory available at Vegetable Agricultural Research Farm, BHU, Varanasi for correlating with the population fluctuation of DBM.

Statistical analysis

Weekly data of pest population were correlated with the prevailing climatic factors such as maximum temperature, minimum temperature, relative humidity, sunshine hours prevailing in the field by computing correlation coefficient (r) studies with a view to study the combined qualitative impact of the above weather parameters on the pest population during both the years.

RESULTS AND DISCUSSION

Seasonal incidence of Diamondback moth, *Plutella xylostella* (L.)

During *rabi*, 2013-14, the larval population of diamondback moth first appeared in the 46th standard week and reached to peak (6.21 larvae/plant) in the 4th standard week, at 20.5°C maximum and 11.8°C minimum temperatures, 79 per cent relative humidity and zero hours of sunshine per day but thereafter the population started declining (Table 1, Fig. 1). During *rabi*, 2014-15, the pest was first noticed again in the

Table 1: Effect of different abiotic factors on the abundance of *P. xylostella* population during *Rabi* season of 2013-14

Standard Meteorological week	Mean diamondback moth larval population/plant	Max temperature (°C)	Min temperature (°C)	R.H. (%)	Sunshine (hrs./day)
44	0	29.6	17.3	78	7.9
45	0	27.7	15.5	72	7.6
46	0.16	26.2	11.5	69	8.0
47	2.01	26.7	10.3	66	8.5
48	2.89	26.4	13.6	66	8.1
49	3.5	25.4	13.7	67	8.3
50	3.87	24.0	10.7	68	8.3
51	4.13	23.5	11.5	70	7.5
52	5.11	22.1	10.4	67	7.8
1	6.01	20.7	11.3	75	6.9
2	6.17	18.0	10.7	80	2.0
3	6.13	18.1	10.6	85	0.6
4	6.21	20.5	11.8	79	0.0
5	5.81	19.7	13.3	76	4.7
6	4.1	24.9	12.3	63	9.2
7	3.21	20.4	11.0	69	4.4
8	2.14	23.6	12.3	73	7.7
9	0.98	23.9	15.6	78	3.6
10	0.52	27.0	13.6	65	8.1
11	0.42	28.5	15.9	69	8.4

Table 2: Effect of different abiotic factors on the abundance of *P. xylostella* population during *Rabi* season of 2014-15.

Standard Meteorological week	Mean diamondback moth larval population/plant	Max temperature (°C)	Min temperature (°C)	R.H.%	Sunshine (hrs./day)
44	0	30.4	18.0	63	6.9
45	0	26.1	16.3	63	7.2
46	0.42	27.5	13.6	61	5.5
47	1.41	26.9	11.1	63	7.2
48	2.28	27.9	12.0	67	7.4
49	3.01	24.5	11.0	66	5.5
50	3.12	21.3	11.5	74	3.0
51	3.81	19.3	8.2	74	3.8
52	4.25	18.0	6.2	80	2.9
1	4.41	20.0	13.4	86	2.8
2	5.11	14.5	8.3	84	1.8
3	5.81	14.6	7.9	83	1.1
4	6.13	20.0	11.8	82	3.3
5	7.11	10.3	10.3	75	5.2
6	6.21	11.0	11.0	72	6.7
7	5.11	13.1	13.1	68	6.9
8	4.32	29.3	16.3	68	7.2
9	2.11	25.6	17.4	76	3.2
10	0.87	28.1	14.0	59	9.5
11	0.59	28.2	16.4	64	7.0

Table 3: Correlation coefficient between, larval populations of *P. xylostella* with weather parameters

S. No.	Year	Temperature (°C) Maximum	Minimum	Relative humidity (%)	Sunshinehrs./day
1	*Rabi*, 2013-14	-0.868*	-0.650*	0.345	- 0.543*
2	*Rabi*, 2014-15	-0.858*	-0.601*	0.736*	-0.503*

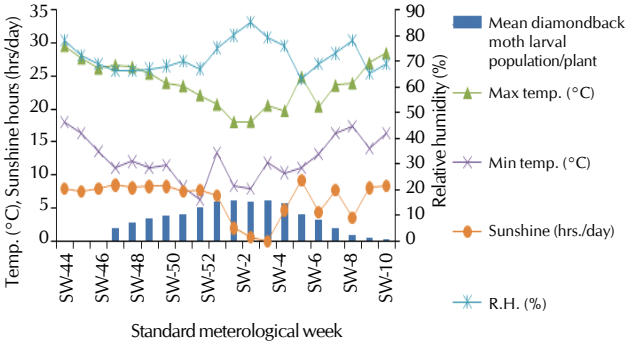

Figure 1: Influence of abiotic factors on the incidence of diamondback moth on cabbage during *Rabi*, 2013-2014

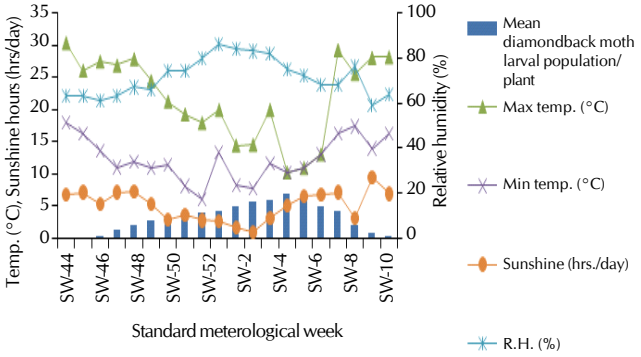

Figure 2: Influence of abiotic factors on the incidence of diamondback moth on cabbage during *Rabi*, 2014-2015

46th standard week and their intensity was highest in the 5th standard week of February (7.11 larvae/plant) at 10.3°C maximum and 10.3°C minimum temperatures with 75 per cent relative humidity and 5.2 hours of sunshine per day. These results obtained in the investigation were supported with the findings of T. Badjena and Mandal, 2005, who reported that the incidence of *Plutella xylostella* appeared during fourth week of November (48th standard week), gradually increased in number reached peak during first week of February (5th standard week) and then gradually decreased. The maximum population of diamondback moth in the month of March was also reported by Devjani and Singh (1999); Kumar *et al*. (2007) and Venkateswarlu *et al*. (2011) and Vanlaldiki *et al*. (2013)which are in close conformity with the present findings.

Correlation studies between diamondback moth and various weather parameters on cabbage

The correlation studies (Table-3) revealed that during 2013-14 the larval population of diamondback moth had significant negative correlation with maximum and minimum temperatures (r = -0.868 and r = -0.650) whereas, non-significant positive correlation with relative humidity (r = 0.345) and significant negative with sunshine hours (r = -0.543). During 2014-15 (Table-3), the larval population of diamondback moth also had significant negative correlation with maximum and minimum temperatures (r = -0.858 and r = -0.601) and non-significant positive correlation with relative humidity and significant negative correlation with sunshine hours (r = 0.736 and r = -0.503 respectively). The correlation studies showed that the incidence of diamondback moth was mostly affected by temperature and sunshine hours, which indicated that the rise in temperature or sunshine hours declines the population of diamondback moth.The little variations observed may be due to changes in agro-climatic conditions.The present findings are in conformity with Shukla and Kumar (2004) and Bana et al. (2012) who reported that diamondback moth population was negatively correlated with maximum and minimum temperature, Contrary results were also reported by Sharma (2004) and Chaudhuri et al. (2001) who reported non -significant positive and significant positive correlation, respectively between the population of diamondback moth and temperature.

REFERENCES

Anonymous 2015. Horticultural Statistics at a Glance 2015, Ministry of Agriculture and Farmers Welfare, Govt. of India, p. 69.

Badjena, T. and Mandal, S. M. A. 2005. Seasonal incidence of major insect pests and predators in cauliflower. *Annals of Plant Protection Sci*. **13:** 472-473.

Bana, J. K., Jat, B. L. and Bajya, D. R. 2012. Seasonal incidence of major pests of cabbage and their natural enemies. *Indian J. Entomology*. ***74*(3):** 236-240.

Chaudhuri, N., Ghosh, S. and Senapati, S. K. 2001. Incidence of insect pests of cabbage in relation to prevailing climate conditions ofterrai region. *Indian J. Entomology*. **63(4):** 421-428.

Devjani, P. and Singh, T. K. 1999. Field density and biology of diamondback moth, *Plutella xylostella* L. (Lepidoptera:Yponomeutidae) on cauliflower in Manipur. *J. Advanced Zoology*. **20(1):** 53-55.

Goudegnon, A. E., Kirk, A. A. and Bordat, D. 1999. Status of *P. xylostella* (L.) and *Cotesia plutellae* (Kurdjumov) in Benin. In: Proceedings of the Fifth International Conference of Pests in Agriculture, Part 3, Montpellier, France, 7-9 Dec. 1999. pp. 679-687.

Hazra, P., Chattopadhyay, A., Karmakar, K. and Dutta, S. 2011. Modern Technology in Vegetable Production. New India Publishing Agency. *Pitam Pura,* New Delhi. pp. 155-156.

Kumar, P., Prasad, C. S. and Tiwari, G. N. 2007. Population intensity of insect pests of cabbage in relation to weather parameters. *Annals of Plant Protection Sciences*. **15:** 245-246.

Lal, O. P. 1975. A Compendium of insect pest of vegetables in India. *Bulletin of Entomological Research*. **16:** 31-56.

Lal, O. P. 1998. Notes summer school on "Advance Technologies in

Important Vegetable Crops, including Cole Crops", I.A.R.I. New Delhi, May. **4-24:** 63-66.

Maison, B. L. 1965. Insect pest of crucifers and their control. *Annual Review of Entomology*.**10:** 233-256.

Sachan, J. N and Srivastava, B. P. 1972. Studies of the seasonal incidence of insect pests of cabbage. *Indian J. Entomology*. **34 (2):**123-129.

Sharma, S. K. 2004. Eco-safe management of major insect pests of cabbage, *Brassica oleracea var. capitata* Linn. *Ph.D. Thesis, Submitted to Rajasthan Agricultural University, Bikaner.*

Shukla, A. and Kumar, A. 2004. Seasonal incidence of diamondback moth, *Plutella xylostella* (L.) in relation to abiotic factors in cabbage. *Plant Protection Bulletin*. **56(3 + 4):** 37-38.

Vanlaldki, H., Premjit Singh, M. and Robert Lalrinsanga. 2013. Effect of staggared planting on the seasonal abundance of diamondback moth (*Plutella xylostella* Linn.) on cabbage under north eastern hill zone, Imphal. *The Bioscan*. **8(4):** 1211-1215.

Venkateswarlu, V., Sharma, R. K., Chander, S. and Singh, D. D. 2011. Population dynamics of major insect pests and their natural enemies in cabbage. *Annals of Plant Protection Sciences*. **19(2):** 272-277.

Wagle, B. K. S., Saravanan, L., Sudha, J. P. and Gupta, P. 2005. Seasonal incidence of cabbage aphid, *Brevicoryne brassicae* (L.) and its natural enemies in relation to weather parameters on cabbage. *National Conference on Applied Entomology,* RCA, Udaipur, 26-28 September, 2005. pp. 22-23.