



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 360-362
© 2022 TPI
www.thepharmajournal.com
Received: 25-01-2022
Accepted: 08-05-2022

CM Ola
Ph.D. Scholar,
Department of Entomology,
College of Agriculture, Swami
Keshwanand Agriculture
University, Bikaner, Rajasthan,
India

VS Acharya
Associate Professor,
Department of Entomology,
College of Agriculture, Swami
Keshwanand Agriculture
University, Bikaner, Rajasthan,
India

HL Deshwal
Professor & Head,
Department of Entomology,
College of Agriculture, Swami
Keshwanand Agriculture
University, Bikaner, Rajasthan,
India

SS Bhadu
YP, Cazri, Jodhpur, Rajasthan,
India

Corresponding Author:
CM Ola
Ph.D. Scholar,
Department of Entomology,
College of Agriculture, Swami
Keshwanand Agriculture
University, Bikaner, Rajasthan,
India

Effect of abiotic factors on seasonal incidence of diamond back moth, *Plutella xylostella* (L.) on cabbage, *Brassica oleracea* var. *capitata* (L.) in Arid Ecosystem

CM Ola, VS Acharya, HL Deshwal and SS Bhadu

Abstract

The present investigations were conducted at Experimental Farm, College of Agriculture, Bikaner (Rajasthan) during *rabi*, 2015-16 and 2016-17. The *P. xylostella* damage was first appeared in the mid of December (50 SMW) and reached to its peak in the 3rd and 4th week of January thereafter population started declined. A correlation studies abiotic factors with RH and temperature indicated a significant positive correlation between larval population of diamondback moth with relative humidity (R.H) of evening whereas, temperature had negative significant correlation with the larval population of diamondback moth during both the years.

Keywords: *Plutella xylostella*, arid ecosystem, *Brassica oleracea* var. *capitata*

Introduction

Cabbage, *Brassica oleracea* var. *capitata* L. is one of the important cruciferous vegetable crops grown mostly in winter season occupy an important position in meeting the dietary requirement of most of the people all over the world. Cabbage (*Brassica oleracea*) is grown as an annual vegetable crop for its dense-leaved heads. It is grown for its edible enlarged terminal buds, which is a rich source of Ca, P, Na, K, S vitamin A, vitamin C, and dietary fiber. The total area under cabbage cultivation in India is 395 thousand hectares with an annual production of 8807 thousand tonnes (Anonymous 2016-17a) ^[1]. In Rajasthan the cabbage occupies a total area of 1.4 million hectares with a production of 7.0 million tonnes annually (Anonymous 2016-17b) ^[2]. The productivity level of cabbage is much lower than its potential attributing to many causes including DBM.

Cabbage crop is attacked by a number of insect pests *viz.*, tobacco caterpillar, *Spodoptera litura* (Fab.); diamondback moth, *Plutella xylostella* (L) painted bug, *Bagrada cruciferarum* (Kirk.) and flea beetle, *Phyllotreta cruciferae* (Goeze) etc. (Chaudhuri *et al.*, 2001, and Rao and Lal, 2005) ^[5, 10] from transplanting to harvest of the crop. Out of these, diamondback moth, *P. xylostella* are reported as major pests causing significant losses (Sharma, 2004 and Shukla and Kumar, 2004) ^[12, 13]. Krishnamoorthy (2004) ^[7] reported 52 per cent losses in yield due to the attack of only diamondback moth.

The knowledge of seasonal incidence of DBM at different growth stages of cabbage crop is helpful in evolving proper management schedule for effective control of insect pests. The information on seasonal incidence was however, generated by many workers (Sachan and Srivastava, 1972, Sharma, 2004, Shukla and Kumar, 2004 and Wagle *et al.*, 2005) ^[15, 11, 13, 14] in different regions of India, but in arid region of Rajasthan, it is lacking. The present investigation was conducted to understanding of the role played by the abiotic factors in the incidence of DBM on cabbage crop in the arid region, which ultimately help the cabbage growers for better return in terms of yield as well as income.

Materials and Methods

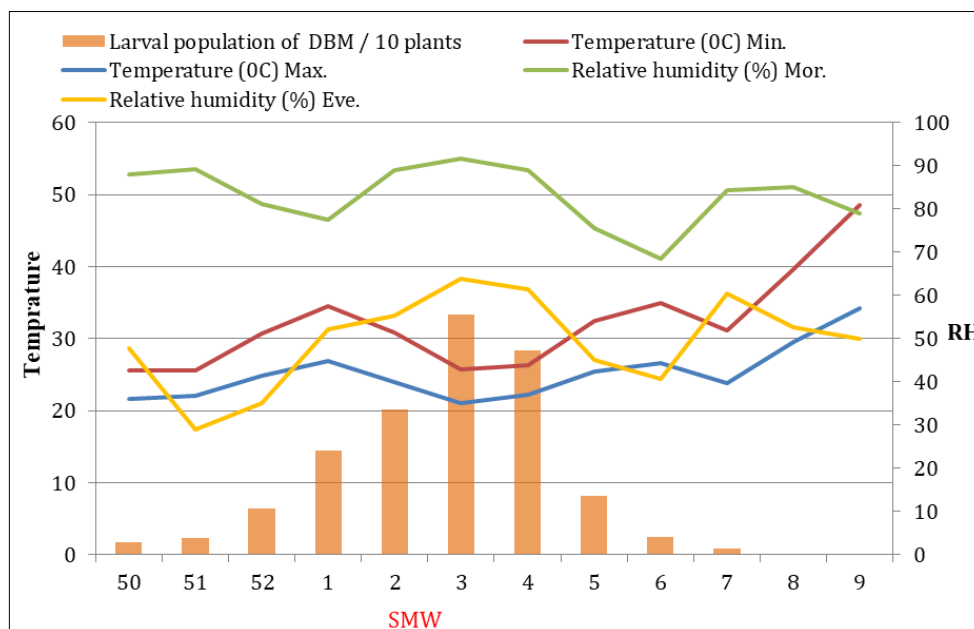
The present investigations were conducted at Experimental Farm, College of Agriculture, Bikaner (Rajasthan) during *rabi*, 2015-16 and 2016-17. Bikaner is located in Agro Climatic Zone I C [Hyper Arid Partially Irrigated Western Plain Zone] of Rajasthan and Agro Climatic Zone XIV (Western Dry Region) of India. The climate of this zone is typically arid, which is characterized with low rainfall and wide range of temperature in summer and winter. During the summers, temperature may go as high as 48 °C, while in winters, it may fall as low as 2-3 °C. The annual rainfall of this tract is 250 mm though 80 percent of this rainfall is received from July to September.

The relative humidity varies between 11 to 89 percent and frost is not uncommon during winter.

In order to study the incidence of diamondback moth and to work out their correlation with prevailing weather parameters, an experiment was laid out in plots of 9 x 9 m² size. Cabbage seedling was transplanted on 7th November during *rabi*, 2015-16 and 2016-17. The observation on the incidence of DBM was recorded at appearance on plants till harvesting during both the years.

Results

The larval population of diamondback moth during 2015-16 first appeared in the mid of December (50 SMW) and reached to its peak (33.42 larva/10 plants) in the 3rd week of January (3rd SMW) when temperature was at 21.10 °C maximum and 4.60 °C minimum & RH was 91.80 percent during morning and 63.80 percent during evening, thereafter population started declining (Fig 1).

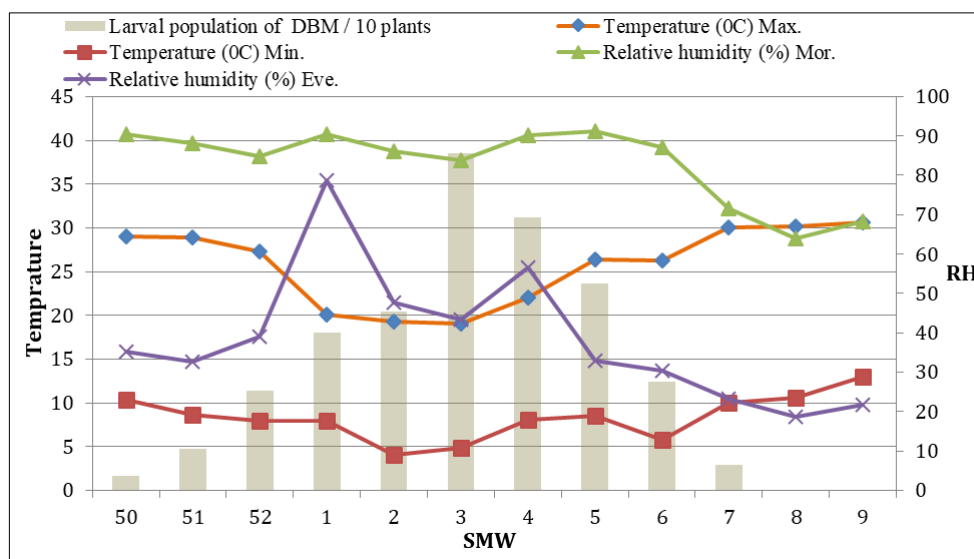


M.W. = Standard Meteorological Weeks

Fig 1: Incidence of diamond back moth of cabbage during Rabi, 2015-16

During *Rabi*, 2016-17, the pest was first noticed in the 3rd week of December (50th SMW) and their intensity was highest in the 4th week of January, *i.e.* 4th SMW (31.20

larva/10 plants) at 22.00 °C maximum and 8.10 °C minimum temperatures, when 90.10 percent relative humidity during morning and 56.70 during evening (Fig 2).



S.M.W. = Standard Meteorological Weeks

Fig 2: Incidence of diamond back moth of cabbage during Rabi, 2016-17

The correlation studies revealed that during *Rabi* 2015-16 the larval population of diamondback moth had non-significant negative correlation with maximum, minimum temperatures and rainfall, respectively, whereas, non-significant positive

correlation ($r = 0.449$) with relative humidity during morning and significant positive correlation ($r = -0.577$) with relative humidity during evening.

Table 1: Correlation coefficient (r = value) diamond back moth and abiotic factors during 2015-16 and 2016-17

Years	Temperature (°C)		Relative humidity (%)	
	Max.	Min.	Mor.	Eve.
2015-16	-0.481	-0.432	0.449	0.577*
2016-17	-0.857*	-0.710*	0.541	0.586*

* Significant at 5% level

During 2016-17, the larval population of diamondback moth had significant negative correlation ($r = -0.857$, $r = -0.710$ and $r = 0.586$) maximum & minimum temperatures and significant positive correlation with relative humidity during evening whereas, correlation was non-significant positive ($r = 0.541$ and $r = 0.429$) with relative humidity during morning. The correlation studies showed that the incidence of diamondback moth was affected only by temperature, which indicated that the when rise in temperature population of diamondback moth declined.

Discussion

Diamondback moth was recorded as a major pest of cabbage at differed growth stages of the crop. The present finding are agreement with the findings of Sharma (2004)^[12] and Bana and Jat (2012)^[3] who reported diamondback moth as regular and major pest of cabbage. The infestation of DBM on cabbage crop was started from second week of December and reached at peak in the third week of January (45.75 and 42.50 larvae/10 plants respectively), during both the years, thereafter, the population was started declining. It is in partial in partially agreement with the finding of Goud *et al.* (2006)^[6] and Bhagat *et al.* (2018)^[4] who reported that the infestation of DBM started from third week of November and reached to peak in the last week of January to first week of February. The results of correlation studies, which showed decrease with the increases in temperature, whereas increase population with increase relative humidity. The present finding are in conformity of results by Shukla and Kumar (2004)^[13], Sharma *et al.* (2017)^[11] and Bhagat *et al.* (2018)^[4], who reported that diamondback moth population was negatively correlated with mean temperature, significantly positively correlated with relatively humidity. Contrary to this Chaudhuri *et al.* (2001)^[5] and Mishra *et al.* (2018)^[9] who reported a significant positive correlation between the population of diamondback moth and temperature. It can be concluded the infestation of diamondback moth was started from the mid of December and reached to maximum in the third & fourth week of January during 2015-16 & 2016-17, respectively. The larval population of diamondback moth had negative correlation with temperature and positive significant correlation with evening relative humidity.

References

1. Anonymous. National Horticulture Board, 2016-17a. www.nhb.com.
2. Anonymous. Directorate of Horticulture, Government of Rajasthan, Jaipur, Rajasthan, 2017b.
3. Bana JK, Jat BL, Bajya DR. Seasonal incidence of major pests of cabbage and their natural enemies. *Indian Journal of Entomology*. 2012;74 (3):236-240.
4. Bhagat P, Yadu YK, Sharma GL. Seasonal incidence and effect of abiotic factors on population dynamics of diamondback moth (*Plutella xylostella* L.) on cabbage (*Brassica oleracea* var. *Capitata* L.) crop. *Journal of*

5. Entomology and Zoology Studies. 2018;5(2):2001-2003.
6. Chaudhari N, Ghosh S, Senapati SK. Incidence of insect pests of cabbage in relation to prevailing climate conditions of terai region. *Indian Journal of Entomology*. 2001;63(4):421-428.
7. Goud CR, Rao SRK, Chiranjeevi CH. Influence of weather parameters on the population build up of diamondback moth, *Plutella xylostella* (L.) infesting cabbage. *Pest management in Horticulture Ecosystem*. 2006;12(1):103-106.
8. Krishnamoorthy A. Biological control of diamondback moth, *Plutella xylostella* (Linn.). Indian scenario with reference to past and future strategies. In: Kirk, A.A., Bordat, D. (Eds). *Proceedings of the International Symposium, 21-24 October, 2002, Montpallier, France, CIRAD, 2004, 204-211pp.*
9. Kumar G, Anandhi P, Varma S, Elamathi S. Seasonal occurrence of *Brevicoryne brassicae* and natural enemies on cabbage. *Annals of Plant Protection Sciences*. 2009;17(2):476-478.
10. Mishra R, Mhaske BM, Patil NM, Desale SB. Influence of abiotic factor on the seasonal incidence of major insect pest on cauliflower. *Journal of Entomology and Zoology Studies*. 2018;(5):2085-2088.
11. Rao SRK, Lal OP. Seasonal incidence of mustard aphid, *Lipaphis erysimi* (Kalt) and diamondback moth, *Plutella xylostella* (L.) on cabbage. *Journal of Insect Science*. 2005;18(2):106-110.
12. Sharma P, Kumawat KC, Jhumar L. Seasonal abundance of diamondback moth and natural enemies on cabbage. *Journal of Entomology and Zoology Studies*. 2017;5(3):176-179.
13. Sharma SK. Eco-safe management of major insect pests of cabbage, *Brassica oleracea* var. *capitata* Linn. Ph.D. Thesis, Submitted to Rajasthan Agricultural University, Bikaner, 2004.
14. Shukla A, Kumar A. Seasonal incidence of diamondback moth, *Plutella xylostella* (L.) in relation to abiotic factors in cabbage. *Plant Protection Bulletin*. 2004;56(3+4):37-38.
15. Wagle BKS, Saravanan L, Sudha JP, Gupta P. Seasonal incidence of cabbage aphid, *Brevicoryne brassicae* (L.) and its natural enemies in relation to weather parameters on cabbage. Paper presented in National Conference on Applied Entomology at RCA, Udaipur during 26-28 September, 2005, 22-23.
16. Sachan JN, Srivastava BP. Studies of the seasonal incidence of insect pests of cabbage. *Indian Journal of Entomology*, 1972;34(2):123-129.