Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-7: 3251-3258

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-7 pp. 3251-3258**
Journal homepage: http://www.ijcmas.com

Original Research Article

Efficacy of Different Insecticides against Diamond Back Moth, *Plutella xylostella* Linn. On Cabbage

Jitendra Kumar Sahu[1*], Devendra Upadhayay[2], Vikas Singh[1] and Bharti Jha[2]

[1]Department of Entomology, College of Agriculture, I.G.K.V., Raipur, India
[2]Department of Horticulture, College of Agriculture, I.G.K.V., Raipur, India
**Corresponding author*

A B S T R A C T

Studies were conducted at experimental research farm of Department of Horticulture, I.G.K.V. Raipur, (C.G.). The result of trial revealed that, among all the treatments E2Y45 20 SC @ 40 g a.i./ha was found most effective as significantly reduced the larval population as well as higher yield of healthy, total heads. The next effective treatment was E2Y45 20 @12.5 g a.i./ha and cartap hydrochloride 50% SC @ 375 ml/ha. The other concentration of E2Y45 20 SC @ 10 g a.i./ha, E2Y45 20 SC @ 7.5 g a.i./ha, E2Y45 20 SC @ 5 g a.i./ha and cypermethrin 25 EC @ 375 ml/ha were intermittent, however, much better than the untreated control. These treatments though were at par with each other in most of the parameters, like reduction in larval population, number and yield of cabbage heads, percentage head damage and per cent larval mortality etc.

Keywords

Diamond Back Moth, Efficacy, and Insecticides

Introduction

Diamond back moth is important pest in terms of the extent of damage caused to Cole crops.

This pest causes an average of 52 per cent loss to marketable yields of cabbage (Kumar *et al.,* 1983). Diamond back moth can destroy the entire cauliflower or cabbage crop (Gujar, 1999).

The extensive and indiscriminate use of pesticides led to the development of resistance to most of the frequented used chemicals causing control failures of DBM not only in India but also round the globe. Consequently, the use of eco-friendly materials such as botanical and animal origin insecticides emerged as a superior alternate to the synthetic insecticides.

Materials and Methods

For spraying on individual plot, measured quantity of spray material of particular concentration was taken in a hand operated knapsack sprayer to which a fine nozzle was attached. Before and after preparation of solution and sprayings of individual insecticide, sprayer and measuring cylinder were thoroughly washed with clean water. During crop growth period after the emergence of diamond back moth two sprays were given within fifteen days interval. Population of larval were taken one day before of each spraying from 5 randomly selected plants from each plot as the pre-treatment - counts for first spraying. The post treatment observations were taken after 1, 3, 5, 7, 10 days of each spray to assess the efficacy of the insecticidal treatments. At harvest, yield and the total

number of healthy and damaged heads were recorded from each treatment.

Results and Discussion

To find out the effective chemical control measure against diamond back moth, and its affect on natural enemies population, a field experiment was conducted using different insecticide (Table 2, 3, 4 and 5).

The result of the insecticidal management trial indicate that, among all the treatments E2Y45 20 SC @ 40 g a.i./ha was found effective as it not only significantly reduced the larval population in the consecutive days after spraying but also gave significantly higher yield of healthy, total heads and lowest damage heads. The per cent increase yield over control in this treatment was also very high and per cent damage heads were lowest. The next effective treatment after E2Y45 20 SC @ 40g a.i. /ha was E2Y45 20 @12.5 g a.i./ha and cartap hydrochloride 50% SC @ 375 ml/ha. The other concentration of E2Y45 20 SC @ 10 g a.i./ha, E2Y45 20 SC @ 7.5 g a.i./ha, E2Y45 20 SC @ 5 g a.i./ha and cypermethrin 25 EC @ 375 ml/ha were intermittent, however, much better than the untreated control. These treatments though were at par with each other in most of the parameters, like reduction in larval population, number and yield of cabbage heads, percentage head damage and per cent larval mortality etc.

The results regarding to the efficacy of different insecticides on the population of natural enemies at various days after application of different treatments showed that, application of various insecticides did not affect significantly the population of natural enemies. However although, numerically low population has been observed in higher doses of insecticides i.e. E2Y45 @ 20 SC 40 g a.i./ha and some other treatments. But overall result showed that there is no any adverse effect of different doses of insecticides to the natural enemies. The results are closely confirmed with the finding of Paikra (2007), Ameta and Bunker (2008).

Table.1 Name of insecticides, their formulation and doses used under field condition

Treatments	Insecticides	Doses in g a.i./ha and ml/ha
T1	E2Y45 20 SC (Technical grade molecules)	5 g a.i./ha
T2	E2Y45 20 SC	7.5 g a.i./ha
T3	E2Y45 20 SC	10 g a.i./ha
T4	E2Y45 20 SC	12.5 g a.i./ha
T5	E2Y45 20 SC	40 g a.i./ha
T6	B.t.k. 8L (Halt)	1000 g /ha
T7	Cartap hydrochloride 50 % SC	375 ml/ha
T8	Neem (Azadirachtin 0.15% EC)	2500 ml/ha
T9	Cypermethrin 25 EC	375 ml/ha
T10	Untreated control	-

Table.2 Effects of different insecticides on larval population of diamond back moth under field condition (first spray)

Treatments	Insecticides	Dose	Pre-treatment population (Larvae/ plant)	Post treatment larval population/plant					
				1st day	3rd day	5th day	7th day	10th day	15th day
T1	E2Y45 20 % SC	5 g a. i./ha	2.73 (1.79)*	1.27 (1.32)	1.20 (1.30)	1.13 (1.27)	1.00 (1.22)	0.80 (1.14)	1.27 (1.32)
T2	E2Y45 20 % SC	7.5 g a. i./ha	2.80 (1.81)	1.13 (1.27)	1.07 (1.25)	1.00 (1.22)	0.93 (1.19)	0.87 (1.16)	1.00 (1.22)
T3	E2Y45 20 % SC	10 g a. i./ha	2.73 (1.79)	1.07 (1.250	1.00 (1.22)	0.93 (1.19)	0.80 (1.13)	0.73 (1.10)	1.20 (1.30)
T4	E2Y45 20 % SC	12.5 g a. i./ha	2.87 (1.83)	1.00 (1.22)	0.87 (1.16)	0.80 (1.14)	0.73 (1.10)	0.67 (1.07)	1.33 (1.35)
T5	E2Y45 20 %SC	40 g a. i./ha	2.87 (1.83)	0.93 (1.19)	0.73 (1.10)	0.73 (1.10)	0.67 (1.07)	0.53 (1.01)	1.27 (1.32)
T6	B.t.k. 8L (Halt)	1000 g a. i./ha	2.80 (1.81)	1.20 (1.30)	1.13 (1.27)	1.07 (1.25)	1.00 (1.22)	0.93 (1.09)	1.07 (1.24)
T7	Cartap Hydrochloride 50 % SC	375 ml/ha	2.67 (1.77)	1.07 (1.25)	1.00 (1.22)	0.93 (1.19)	0.8 (1.14)	0.87 (1.16)	1.13 (1.27)
T8	Neem (Azadirachtine 0.15 % EC)	2500 ml/ha	2.80 (1.81)	1.67 (1.47)	1.53 (1.42)	1.40 (1.37)	1.27 (1.32)	1.20 (1.30)	1.27 (1.32)
T9	Cypermethrin 25 % EC	375 ml/ha	2.73 (1.79)	1.47 (1.40)	1.33 (1.35)	1.27 (1.32)	1.13 (1.27)	1.00 (1.22)	1.13 (1.27)
T10	Untreated control	-	2.60 (1.76)	2.67 (1.77)	2.73 (1.77)	2.73 (1.79)	2.67 (1.77)	2.67 (1.77)	2.67 (1.77)
SEm ±			0.02	0.03	0.02	0.04	0.03	0.03	0.03
CD at 5 %			NS	0.09	0.08	0.11	0.09	0.09	0.10

*Figures in parentheses are square root transformed values

Table.3 Effects of different insecticides on larval population of diamond back moth under field condition (second spray)

Treatments	Insecticides	Dose	Pre-treatment population (Larvae/plant)	Post treatment larval population/plant		
				1st day	3rd day	5th day
T1	E2Y45 20 % SC	5 g a. i./ha	1.27 (1.32)*	1.07 (1.25)	0.80 (1.13)	0.53 (1.01)
T2	E2Y45 20 % SC	7.5 g a. i./ha	1.00 (1.22)	1.00 (1.22)	0.73 (1.10)	0.40 (0.94)
T3	E2Y45 20 % SC	10 g a. i./ha	1.20 (1.30)	0.93 (1.19)	0.67 (1.07)	0.33 (0.91)
T4	E2Y45 20 % SC	12.5 g a. i./ha	1.33 (1.35)	0.80 (1.14)	0.53 (1.01)	0.27 (0.87)
T5	E2Y45 20 %SC	40 g a. i./ha	1.27 (1.32)	0.67 (1.10)	0.40 (0.94)	0.17 (0.81)
T6	B.t.k. 8L (Halt)	1000 g a. i./ha	1.07 (1.24)	1.00 (1.22)	0.80 (1.14)	0.40 (0.94)
T7	Cartap Hydrochloride 50 % SC	375 ml/ha	1.13 (1.27)	0.93 (1.19)	0.73 (1.10)	0.33 (0.90)
T8	Neem (Azadirachtine 0.15 % EC)	2500 ml/ha	1.27 (1.32)	1.13 (1.27)	0.93 (1.19)	0.80 (1.14)
T9	Cypermethirin 25 EC	375 ml/ha	1.13 (1.27)	1.07 (1.25)	0.80 (1.14)	0.60 (1.04)
T10	Untreated control	-	2.67 (1.77)	2.73 (1.79)	2.67 (1.77)	2.67 (1.77)
SEm ±			0.10	0.02	0.02	0.03
CD at 5 %			NS	0.06	0.07	0.09

*Figures in parentheses are square root transformed values.

Table.4 Effects of different insecticides on natural enemies population of cabbage crop under field condition (first spray)

Treatments	Pre-treatment population (natural enemies/ plant			Post treatment population of natural enemies/plant														
				1st day			3rd day			5th day			7th day			10th day		
	RV	LBD	Spi.	RV	LBD	Spi.	RV	LBD	Spi.	RV	LBD	Spi.	RV	LBD	Spi.	RV	LBD	Spi.
T1	0.73 (1.10)	0.67 (1.07)	0.60 (1.04)	0.47 (0.97)	0.27 (0.86)	0.27 (0.87)	0.73 (1.07)	0.67 (1.07)	0.60 (1.04)	0.87 (1.16)	0.53 (1.07)	0.47 (0.98)	0.33 (0.91)	0.67 (1.01)	0.33 (0.91)	0.47 (0.98)	0.53 (1.04)	0.47 (0.98)
T2	0.60 (1.03)	0.73 (1.10)	0.47 (0.97)	0.40 (0.94)	0.20 (0.83)	0.13 (0.83)	0.60 (1.03)	0.73 (1.10)	0.47 (0.97)	0.40 (0.93)	0.67 (1.13)	0.33 (0.90)	0.53 (1.01)	0.80 (1.01)	0.47 (0.97)	0.47 (0.98)	0.53 (0.94)	0.53 (1.01)
T3	0.87 (1.16)	0.47 (0.98)	0.53 (1.01)	0.47 (0.97)	0.33 (0.90)	0.27 (0.87)	0.87 (1.16)	0.47 (0.98)	0.53 (1.01)	0.67 (1.07)	0.53 (1.07)	0.47 (0.97)	0.20 (0.82)	0.67 (0.98)	0.53 (1.01)	0.47 (0.98)	0.47 (0.86)	0.53 (1.01)
T4	0.80 (1.13)	0.60 (1.04)	0.40 (0.94)	0.60 (1.04)	0.33 (0.91)	0.13 (0.79)	0.80 (1.13)	0.60 (1.04)	0.40 (0.94)	0.40 (0.93)	0.53 (1.00)	0.60 (1.04)	0.13 (0.78)	0.53 (1.01)	0.47 (0.97)	0.40 (0.94)	0.53 (1.07)	0.53 (1.01)
T5	0.53 (1.01)	0.73 (1.04)	0.53 (1.01)	0.33 (0.90)	0.20 (0.83)	0.20 (0.83)	0.53 (1.01)	0.73 (1.10)	0.53 (1.01)	0.47 (0.96)	0.40 (1.04)	0.40 (0.94)	0.27 (0.87)	0.60 (1.01)	0.53 (1.01)	0.47 (0.97)	0.53 (0.94)	0.60 (1.04)
T6	0.40 (0.97)	0.73 (1.10)	0.33 (0.97)	0.60 (1.04)	0.47 (0.97)	0.27 (0.83)	0.40 (0.93)	0.73 (1.10)	0.33 (0.94)	0.60 (1.03)	0.80 (1.01)	0.40 (0.93)	0.60 (1.04)	0.53 (0.98)	0.47 (0.98)	0.47 (0.98)	0.47 (0.98)	0.47 (0.96)
T7	0.80 (1.14)	0.80 (1.10)	0.33 (0.91)	0.33 (0.92)	0.07 (0.75)	0.33 (0.91)	0.80 (1.14)	0.80 (1.13)	0.33 (0.91)	0.40 (0.93)	0.73 (1.10)	0.53 (1.01)	0.40 (0.94)	0.73 (1.01)	0.53 (1.01)	0.33 (0.91)	0.53 (0.90)	0.47 (0.98)
T8	0.53 (1.01)	0.53 (1.13)	0.40 (0.94)	0.40 (0.94)	0.27 (0.91)	0.40 (0.94)	0.53 (1.01)	0.53 (1.01)	0.40 (0.94)	0.40 (0.93)	0.60 (0.98)	0.47 (0.97)	0.40 (0.94)	0.53 (0.98)	0.47 (0.97)	0.33 (0.90)	0.47 (0.86)	0.40 (0.94)
T9	0.53 (1.01)	0.67 (1.01)	0.40 (0.94)	0.27 (0.89)	0.20 (0.79)	0.27 (0.86)	0.53 (1.01)	0.67 (1.07)	0.40 (0.94)	0.27 (0.85)	0.53 (1.10)	0.40 (0.87)	0.60 (1.04)	0.73 (1.04)	0.47 (0.97)	0.47 (0.94)	0.60 (0.86)	0.53 (1.01)
T10	0.53 (1.01)	0.67 (1.07)	0.53 (1.01)	0.67 (1.07)	0.53 (1.07)	0.53 (1.01)	0.53 (1.01)	0.67 (1.07)	0.53 (1.01)	0.60 (1.04)	1.00 (1.10)	0.47 (0.97)	0.60 (1.04)	0.73 (1.07)	0.60 (1.01)	0.60 (1.04)	0.73 (0.98)	0.60 (1.04)
SEm ±	0.08	0.08	0.07	0.10	0.08	0.07	0.09	0.07	0.07	0.13	0.06	0.09	0.06	0.04	0.08	0.06	0.07	0.06
CD (5 %)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

*Figures in parentheses are square root transformed values

Note - T1 E2Y45 20 SC5 g a.i./ha, T2 E2Y45 20 SC 7.5 g a.i./ha, T3 E2Y45 20 SC 10 g a.i./ha, T4 E2Y45 20 SC 12.5 g a.i./ha, T5 E2Y45 20 SC 40 g a.i./ha, T6 B.t.k. 8L (Halt) 1000 g /h, T7 Cartap hydrochloride 50 % SP 375 ml, T8 Neem (Azadirachtine 0.15% EC 2500 ml/ha T9 Cypermethrin 25 EC 375 ml/ha, T10 Untreated control, RV= Rove beetle, LBD= Lady bird beetle and Spi.= Spider

Table.5 Effects of different insecticides on natural enemies population of cabbage crop under field condition (Second spray)

Treatments	Pre-treatment population (natural enemies/			Post treatment larval population/plant								
				1st day			3rd day			5th day		
	RV	LBD	Spi.	RV	LBD	Spi.	RV	LBD	Spi.	RV	LBD	Spi.
T1	0.60 (1.04)	0.60 (0.86)	0.27 (0.87)	0.20 (0.83)	0.27 (0.94)	0.33 (0.90)	0.13 (0.79)	0.40 (0.91)	0.33 (0.91)	0.87 (0.83)	0.33 (0.91)	0.40 (0.94)
T2	0.27 (0.86)	0.40 (0.86)	0.53 (1.01)	0.13 (0.79)	0.27 (0.98)	0.27 (0.87)	0.40 (0.94)	0.47 (0.94)	0.33 (0.91)	0.40 (0.94)	0.40 (0.94)	0.27 (0.87)
T3	0.27 (0.86)	0.27 (0.91)	0.53 (1.00)	0.33 (0.90)	0.33 (0.94)	0.33 (0.91)	0.27 (0.86)	0.40 (0.90)	0.47 (0.98)	0.67 (0.90)	0.33 (0.91)	0.33 (0.90)
T4	0.47 (0.97)	0.67 (0.86)	0.13 (0.78)	0.20 (0.83)	0.27 (0.87)	0.33 (0.91)	0.27 (0.86)	0.27 (0.91)	0.33 (0.87)	0.40 (0.87)	0.27 (0.87)	0.33 (0.94)
T5	0.47 (0.98)	0.40 (0.98)	0.40 (0.94)	0.27 (0.87)	0.47 (0.91)	0.40 (0.94)	0.33 (0.91)	0.33 (0.93)	0.40 (0.94)	0.47 (0.97)	0.40 (0.94)	0.40 (0.94)
T6	0.27 (0.86)	0.47 (0.83)	0.47 (0.98)	0.27 (0.87)	0.20 (0.91)	0.40 (0.94)	0.27 (0.86)	0.40 (0.87)	0.40 (0.94)	0.60 (0.86)	0.27 (0.87)	0.33 (0.90)
T7	0.47 (0.97)	0.33 (0.98)	0.33 (0.91)	0.33 (0.91)	0.47 (0.97)	0.40 (0.94)	0.33 (0.91)	0.47 (0.87)	0.33 (0.87)	0.40 (0.91)	0.27 (0.87)	0.33 (0.91)
T8	0.33 (0.90)	0.27 (0.91)	0.27 (0.86)	0.27 (0.86)	0.33 (0.94)	0.40 (0.94)	0.20 (0.83)	0.40 (0.86)	0.33 (0.91)	0.40 (0.83)	0.27 (0.87)	0.40 (0.94)
T9	0.33 (0.90)	0.27 (0.94)	0.53 (1.01)	0.27 (0.86)	0.40 (0.94)	0.40 (0.94)	0.40 (0.94)	0.40 (0.91)	0.47 (0.98)	0.27 (0.90)	0.33 (0.90)	0.40 (0.97)
T10	0.33 (0.89)	0.47 (0.98)	0.33 (0.90)	0.33 (0.91)	0.47 (1.01)	0.53 (1.01)	0.60 (1.04)	0.53 (0.94)	0.60 (1.04)	0.60 (0.91)	0.40 (0.94)	0.47 (1.01)
SEm ±	0.07	0.08	0.07	0.08	0.06	0.06	0.08	0.08	0.03	0.10	0.08	0.07
CD at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

*Figures in parentheses are square root transformed values

Note - T1 E2Y45 20 SC5 g a.i./ha, T2 E2Y45 20 SC 7.5 g a.i./ha, T3 E2Y45 20 SC 10 g a.i./ha, T4 E2Y45 20 SC 12.5 g a.i./ha, T5 E2Y45 20 SC 40 g a.i./ha, T6 B.t.k. 8L (Halt) 1000 g /h, T7 Cartap hydrochloride 50 % SP 375 ml, T8 Neem (Azadirachtine 0.15% EC 2500 ml/ha T9 Cypermethrin 25 EC 375 ml/ha, T10 Untreated control, RV= Rove beetle, LBD= Lady bird beetle and Spi.= Spider

Table.6 Mean yield of cabbage in different treatments

S. No.	Treatments	Dose	Mean yield of cabbage (kg/plot)			Overall mean yield of cabbage kg/plot	Percentage increase yield over control	Overall mean yield of cabbage q/ha	Percentage avoidable losses
			First picking	Second picking	Third picking				
1	E2Y45 20 % SC	5 g a. i./ha	7.33	8	8	23.33	4.58	165.61	36.38
2	E2Y45 20 % SC	7.5 g a. i./ha	7.33	9.5	7.33	24.17	27.16	180.03	22.64
3	E2Y45 20 % SC	10 g a. i./ha	9.67	10.5	9.67	29.84	57.05	417.78	4.45
4	E2Y45 20 % SC	12.5 g a. i./ha	10.17	11.03	9.47	30.67	61.42	452.59	1.79
5	E2Y45 20 %SC	40 g a. i./ha	11.83	10.83	8.57	31.23	64.37	476.35	
6	B.t.k. 8L (Halt)	1000 g a. i./ha	8.23	7.83	9.4	25.47	34	234.54	18.48
7	Cartap Hydrochloride 50 % SC	375 ml/ha	12.83	8.57	8.17	29.57	55.63	406.46	5.32
8	Neem (Azadirachtin 0.15 % EC)	2500 ml/ha	8.5	7.5	7.5	23.5	23.68	152.07	24.75
9	Cypermethrin 25 EC	375 ml/ha	7.6	8.5	7.8	23.9	25.79	168.85	23.47
10	Untreated control	-	6.83	6.67	6.37	19.87		145.09	39.16
SEm ±			0.72	0.63	0.67				
CD at 5 %			2.15	1.86	1.98				

*Figures in parentheses are square root transformed value

E2Y45 20 SC is a new technical grade molecule and not much work has been done in the past with this insecticide. But this finding was in accordance with the findings of Paikra (2007). These findings however, are being discussed in light of the research work conducted to manage diamond back moth by using other insecticides.

In the present study cartap hydrochloride proved its high efficacy against DBM as it reduced maximum larval population and gave higher yield and lesser avoidable loss next to be best treatment found in the study. Azadirachtin was found least effective against DBM. These findings were in accordance with the findings of Cheng *et al.*, (1996), Nagesh and Verma (1997), Lal and Meena (2001), Rao and Lal (2001) and Patel (2002).

Among the nine tested insecticides, E2Y45 20 SC @ 40 g a.i./ha was found to be the best effective not only controlling the diamond back moth but also recorded maximum yield and minimum per cent head damage and lower doses of E2Y45 20 SC i.e. 5, 7.5, 10 and 12.5 g a.i./ha were comparatively less effective than the aforesaid treatments. The present finding showed that application of various insecticides did not affect significantly the population of natural enemies.

References

Ameta, O.P. and Bunker, O.P. 2008. Efficacy of NNI 001 (Flubendiamide) 480 SC against the diamondback moth, *Plutella xylostella* L. in cabbage and its effect on natural enemies under field conditions. *Pestology*, 32 (6):21-24.

Cheng, E.Y., Chen, C. and Kao, C.H. 1996. Management of resistant diamond back moth and other crucifer pests, in Taiwan. *Journal of Agricultural Research China*, 89 (8): 1321.

Gujar, G.T., 1999. Farmers fight against diamondback moth. *Pesticides World*, 5 (2)64-65.

Kumar, H.K., Srinivasan, K. and Suman, C.L. 1983.Optimum control strategy of cabbage.pests from a chemical control trial. *Progressive Horticulture*, 18: 104-110

Lal, O. P. and Meena, R. K. 2001. Effects of certain insecticides against diamond back moth (*Plutella xylostella* L.) on cabbage under field condition. *Pesticide Research Journal*, 13 (2): 242-246.

Nagesh, M., and Verma, S. 1997. Bioefficacy of certain insecticides against diamond back moth (*Plutella xylostella* L.*)* on cabbage. *Indian Journal of Entomology*, 59 (4): 411-414.

Paikra, M.K. 2007. Influence of weather parameters, assessment of yield losses and insecticidal management of diamond back moth (*Plutella xylostella* L.) on cabbage. M.Sc. (Ag.) Thesis. Dept. of Entomology. I.G.A.U., Raipur (C.G.).

Patel, P.R. 2002. Studies on diamond back moth (*Plutella xylostella* L.) with special reference to its management through new chemical insecticide on cabbage crop. M.Sc. (Ag.) Thesis. Dept. of Entomology. I.G.A.U., Raipur (C.G.).

Rao Koteshwara, S.R. and Lal, O.P. 2001. Efficacy of different insecticides against diamond back moth (*Plutella xylostella* L.) on cabbage. *J. Ent. Res*., 25(2):161-164.