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EFFICACY OF INSECTICIDES AGAINST DIAMOND BACK MOTH IN CAULIFLOWER

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ABSTRACT

Efficacy of insecticides against diamond back moth in cauliflower revealed that among all the treatments significantly lower larval population and higher yield was obtained with chlorantranilip role 18.5 SC @ 0.006%. It was at par with spinosad 45 SC @ 0.009% followed by emamectin benzoate 5 WSG @ 0.002% and flubendiamide 39.35 SC @ 0.096%. Maximum avoidable loss of 45.24% and higher yield (19.98 t/ ha) was obtained with chlorantraniliprole followed by spinosad. Maximum cost benefit in terms of ICBR was observed with spinosad 45 SC @ 0.009% (1:9.93) followed by emamectin benzoate 5 WSG @ 0.002% (1:8.64).

Key words: *Plutella xylostella*, cauliflower, chlorantraniliprole, spinosad, emamectin benzoate, flubendiamide, yield, loss, cost benefits

The major pests causing appreciable damage to the cauliflower are diamond back moth *Plutella xylostella* (L.); cabbage aphid *Lipaphis erysimi* (Kaltenbach), *Brevicoryne brassicae* (L.); leaf webber *Crocidolomia binotalis* (Zeller); cabbage borer *Hellula undalis* (F.); cabbage butterfly *Pieris brassicae* (L.); cabbage semilooper *Trichoplusia ni* (F.); tobacco caterpillar *Spodoptera litura* (F.); cabbage head eating caterpillar *Helicoverpa armigera* (Hubner); painted bug *Bagrada cruciferarum* (Kirkaldy), mustard sawfly *Athalia lugens proxima* (Klug) and flea beetle *Phyllotreta cruciferae* (Goeze)) (Yadav and Malik, 2014). Among these, *P. xylostella* is a notorious pest, damaging severely to cruciferous crops, is distributed widely, and causes annual losses of about US $16.0 million in India (Mohan and Gujar, 2003). DBM is known to cause yield loss from 31% (Abraham and Padmanabhan, 1968) to 100% (Calderson and Hare, 1986) and 53-80% (Chelliah and Srinivasan, 1986). Many insecticides have been found effective against this pest but it has developed resistance due to its injudicious use or residues in vegetables. The present study evaluates the efficacy of some new insecticides.

MATERIALS AND METHODS

The field experiment was carried out at the College farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during *rabi* 2016-17. The experiment was laid out in a randomized block design and replicated thrice. The cultivar 'Snowball-16' was transplanted on 10th November, 2016 with spacing of 60 x 45 cm and plot size of 3.6 x 4.5 m. Commercially available formulation of insecticides were sprayed with knapsack sprayer with hallow cone nozzle. The first spray was applied at two months after transplanting. Second and third sprays continued thereafter at 15 days interval. Ten plants/ plot were selected randomly and pre-count of live larvae were recorded a day before treatment and post count 3rd, 7th, 10th and 14th day after treatments. Efficacy of insecticides was calculated on basis of surviving larval population/ plant after treatment. While, recording yield data marketable heads were taken in account. Yield obtained from net plot was converted in to t/ ha. Data on number of larva was converted in to square root transformation. Then data of larval population and yield were subjected to ANOVA and the yield increase in treated plots/ avoidable loss was worked out. Cauliflower curds from net plot area were harvested and recorded in kg/ plot were converted to t/ ha. In order to assess the economics, Incremental Cost Benefit-Ratio (ICBR) was worked out. For these, net realization was worked out for all insecticidal treatments by deduction the cost of protection from the gross realization of produce. Net gain over control was calculated by deducting the realization of control from realization of each treatment. ICBR from each treatment was calculated by dividing net gain over control by total cost of plant protection.

RESULTS AND DISCUSSION

Non-significant difference in larval population among treatments was observed before spraying. All

Table 1. Efficacy of insecticides against diamond back moth on cauliflower

S. No	Treatment	Pre-count	Mean larval population/ plant After first spray					Mean larval population/ plant After second spray					Mean larval population/ plant After third spray					Over all pooled	Yield (tonne/ ha)	% yield increase over control	% avoidable loss
			3 DAS	7 DAS	10 DAS	14 DAS	Pooled	3 DAS	7 DAS	10 DAS	14 DAS	Pooled	3 DAS	7 DAS	10 DAS	14 DAS	Pooled				
T1	Emamectin benzoate 5 WSG @ 0.002 %	1.89 (3.13)	1.45 (1.63)	1.35 (1.33)	1.23 (1.03)	1.33 (1.30)	1.34 (1.29)	1.08 (0.67)	1.03 (0.57)	0.96 (0.43)	1.01 (0.53)	1.02 (0.54)	0.89 (0.30)	0.77 (0.10)	0.73 (0.03)	0.77 (0.10)	0.79 (0.12)	1.05 (0.61)	18.84	72.21	41.93
T2	Spinosad 45 SC @ 0.009 %	1.92 (3.23)	1.36 (1.37)	1.25 (1.07)	1.08 (0.67)	1.23 (1.03)	1.22 (1.01)	0.96 (0.43)	0.91 (0.33)	0.84 (0.20)	0.89 (0.30)	0.90 (0.31)	0.79 (0.13)	0.71 (0.00)	0.71 (0.00)	0.73 (0.03)	0.73 (0.04)	0.96 (0.41)	19.11	74.68	42.75
T3	Indoxacarb 14.5 SC @ 0.01 %	1.86 (3.03)	1.61 (2.13)	1.51 (1.83)	1.39 (1.47)	1.45 (1.63)	1.49 (1.72)	1.28 (1.17)	1.22 (1.00)	1.12 (0.77)	1.16 (0.87)	1.19 (0.93)	1.05 (0.60)	0.93 (0.37)	0.89 (0.30)	0.89 (0.30)	0.94 (0.38)	1.20 (0.96)	16.34	49.36	33.04
T4	Lambda-cyhalothrin 5 SC @ 0.005 %	1.86 (3.03)	1.50 (1.80)	1.54 (1.90)	1.66 (2.30)	1.70 (2.43)	1.60 (2.05)	1.37 (1.40)	1.42 (1.53)	1.52 (1.83)	1.55 (1.93)	1.46 (1.63)	1.27 (1.13)	1.31 (1.23)	1.38 (1.43)	1.40 (1.50)	1.33 (1.29)	1.47 (1.65)	14.11	28.97	22.44
T5	Flubendiamide 39.35 SC @ 0.0096 %	1.88 (3.10)	1.48 (1.73)	1.43 (1.57)	1.31 (1.23)	1.39 (1.47)	1.40 (1.46)	1.15 (0.83)	1.11 (0.73)	1.03 (0.57)	1.08 (0.67)	1.09 (0.69)	0.93 (0.37)	0.79 (0.13)	0.75 (0.07)	0.77 (0.10)	0.81 (0.16)	1.10 (0.71)	18.48	68.92	40.80
T6	Chlorantraniliprole 18.5 SC @ 0.006 %	1.96 (3.40)	1.15 (0.83)	1.05 (0.60)	0.89 (0.30)	1.11 (0.73)	1.05 (0.60)	0.82 (0.17)	0.77 (0.10)	0.73 (0.03)	0.82 (0.17)	0.78 (0.11)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.85 (0.22)	19.98	82.63	45.24
T7	Difenthuron 50 WP @ 0.05 %	1.85 (2.97)	1.67 (2.33)	1.49 (1.73)	1.54 (1.90)	1.59 (2.07)	1.57 (1.98)	1.45 (1.63)	1.31 (1.23)	1.34 (1.30)	1.40 (1.47)	1.37 (1.38)	1.28 (1.17)	1.08 (0.67)	1.11 (0.73)	1.15 (0.83)	1.15 (0.83)	1.37 (1.37)	14.42	31.80	24.13
T8	Control	1.96 (3.37)	1.92 (3.20)	2.06 (3.77)	2.05 (3.73)	2.08 (3.87)	2.02 (3.60)	1.96 (3.40)	1.91 (3.20)	1.97 (3.43)	2.00 (3.57)	1.96 (3.34)	1.88 (3.07)	1.79 (2.73)	1.87 (3.03)	1.74 (2.57)	1.81 (2.80)	1.93 (3.24)	18.84	72.21	41.93
	S.E.m ±	0.17	0.11	0.12	0.11	0.12	0.6	0.09	0.09	0.09	0.10	0.04	0.07	0.08	0.07	0.08	0.03	0.04	0.86	-	-
	C.D at 5 %	NS	0.34	0.35	0.33	0.36	0.16	0.29	0.27	0.28	0.29	0.13	0.23	0.23	0.23	0.23	0.11	0.13	2.62	-	-
	S.E.m ± (P×T)	-	-	-	-	-	0.11	-	-	-	-	0.09	-	-	-	-	0.76	0.04			
	C.D at 5 % (P×T)	-	-	-	-	-	NS	-	-	-	-	NS	-	-	-	-	NS	0.12			
	C.V %	15.57	12.96	13.76	13.59	14.07	13.6	13.07	12.53	13.56	13.42	13.18	11.80	13.19	12.63	13.05	12.65	12.33	9.04	-	-

DAS = Days after spraying. Figure in parentheses original values, and outside √x + 0.5 transformed values

the treatments were significantly superior over control after first spray of insecticides, and chlorantraniliprole 18.5 SC @ 0.006% (0.60 larvae/ plant) proved to be superior. The pooled data after second spray too revealed the superiority of chlorantraniliprole (0.11 larvae/ plant) which was at par with spinosad 45 SC @ 0.009% (0.31 larvae/ plant). More or less similar trend was observed after third spray. The pooled data of three sprays revealed that all the insecticidal treatments were found significantly superior over control. Among the all treatments chlorantraniliprole 18.5 SC @ 0.006% (0.22 larvae per plant) recorded significantly lowest larval population. It was at par with the spinosad 45 SC @ 0.009% (0.41 larvae/ plant) (Table 1). The present findings are in agreement with those of Vaseem et al. (2014) on chlorantraniliprole, and spinosad and indoxacarb. Dotasara et al. (2017) reported that spinosad was the best, followed by flubendiamide and chlorantraniliprole.

The treatment of chlorantraniliprole 18.5SC @ 0.006% recorded the significant highest yield of cauliflower curds (19.98 t/ha), at par with spinosad 45SC @ 0.009% (19.11 t/ha), emamectin benzoate 5 WSG @ 0.002% (18.84 t/ha) and flubendiamide 39.35 SC @ 0.0096% (18.48 t/ha). These results agree with those of Vaseem et al. (2014) on chlorantraniliprole @ 50 ml/ha followed by spinosad @150 ml/ha. The data on avoidable losses revealed that losses to the extent of 22.44 to 45.24% could be avoided with insecticides-chlorantraniliprole 18.5SC @ 0.006% gave maximum avoidable loss of 45.24%. Maximum net realization (1,87,677 Rs/ha) was found with chlorantraniliprole 18.5SC @ 0.006% followed by spinosad 45 SC 0.009% (1,83,627 Rs/ha) (Table 2).

Thus, chlorantraniliprole 18.5SC @ 0.006%, spinosad 45SC @ 0.009%, emamectin benzoate 5WSG @ 0.002% and flubendiamide 39.35SC @ 0.0096% were found to be the most effective insecticides against diamond back moth.

Table 2. Economics of insecticides on cauliflower

S. No.	Treatment	Cost of insecticides Rs/ha (3 spray)	Total Cost (Rs/ha)	Curd Yield (t/ha)	Gross realization Rs/ha	Net realization (Rs/ha)	Net gain (Rs/ha)	ICBR
1.	Emamectin benzoate 5 WSG@ 0.002% 600g	5520	8193	18.84	188400	180207	70807	1: 8.64
2.	Spinosad 45 SC @ 0.009% 300 ml	4800	7473	19.11	191100	183627	74227	1: 9.93
3.	Indoxacarb 14.5 SC @ 0.01% 1050 ml	3675	6348	16.34	163400	157052	47652	1: 7.51
4.	Lambda-cyhalothrin 5 SC @ 0.005%1500 ml	750	3423	14.11	141100	137677	28277	1: 8.26
5.	Flubendiamide 39.35 SC @ 0.0096% 375 ml	6750	9423	18.48	184800	175377	65977	1: 7.00
6.	Chlorantraniliprole 18.5SC@0.006%,525 ml	9450	12123	19.98	199800	187677	78277	1: 6.46
7.	Difenthiuron 50 WP @ 0.05% 1500 g	5400	8073	14.42	144200	136127	26727	1: 3.31
8.	Control		-	10.94	109400	109400		

Labour cost Rs/ha (3 spray)0 Rs. 2673

REFERENCES

Abraham E V, Padmanaban M D. 1968. Bionomics and control of the diamond back moth, *Plutella xylostella* (L.). Indian Journal of Agriculture Science 38: 513-519.

Calderson J I, Hare C J. 1986. Control of DBM in South East Asia by profenophos. Proceedings of First International Workshop. pp. 289-295.

Chelliah S, Srinivasan K. 1986. Bioecology and management of diamond back moth in India. Diamond back moth management. Talekar N S, Griggs T D (eds.). Proceedings of 1st International Workshop 1985, AVRDC, Taiwan. pp. 63-76.

Dotasara S K, Agrawal N, Singh N, Swami D. 2017. Efficacy of some new insecticides against diamond back moth (*Plutella xylostella* L.) on cauliflower. International Journal Current Microbiology and Applied Science 6(5): 1958-1963.

Mohan M, Gujar G T. 2003. Local variation in susceptibility of the diamond back moth, *Plutella xylostella* (Linneaus) to insecticides and detoxification enzymes. Crop Protection 22: 495-505.

Pradhan, S. 1969. Insect pest of crops. National book trust, New Delhi, India, 88 pp.

Vaseem M, Singh H, Kumar K, Ali M. 2014. Efficacy of newer insecticides against diamond back moth (*Plutella xylostella* L.) on cabbage under poly house condition. Journal of Experimental Zoology India 17(2): 487-489.

Yadav N K, Malik Y P. 2014. The efficacy of insecticides against diamond back moth. Vegetable Science 41(1): 71-73.

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