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Research Article

EVALUATION OF EMAMECTIN BENZOATE AGAINST DIAMOND BACK MOTH IN CABBAGE

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Abstract- Vegetables play an important role in the soil fertility buildup, human nutrition and economy of the marginal and sub-marginal farmers due to less investment, shorter duration of crops and low inputs requirement. In most of the areas of the state cabbage farmers, face severe insect infestation due to its slow growth in the initial stage and lack of insect control measures. A field experiment was carried out during 2012-13 and 2013-14 at Breeders Seed Production farm (BSP), JNKVV, Jabalpur and two spray of insecticide were applied on 30 days after transplanting on 10 days interval. Ten plants were selected randomly per treatment per replication and number of Diamond back moth (DBM) larvae head^{-1} was counted before sprays as well as on third, fifth, seventh and tenth day after each spraying. Based on two years of study it was clear that Emamectin Benzoate 5% SG @ all doses gave good control of DBM in Cabbage along with significant increase in yield. It also did not produce any phyto-toxic symptoms on cabbage. Therefore, results revealed that the Emamectin Benzoate 5% SG @ 10 g *a.i.* ha^{-1} (200 g formulation ha^{-1}) can be recommended for sufficient protection against DBM along with increase in head yield without any adverse effect on the crop.

Keywords- Emamectin Benzoate, Cabbage, *Plutella xylostella*, Yield, Phytotoxicity

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Introduction

Cabbage is one of the important vegetable crops grown in India. Vegetables play an important role in human nutrition. It also helps in increasing the economy of the marginal and sub-marginal farmers due to less investment coupled with shorter duration of the crop. In India, the area under cabbage cultivation is 372 thousand hectare with 8534 thousand MT productions and average yield of 22.9 MT ha-1, during 2012-13. In Madhya Pradesh, it is grown in about 19.28 thousand hectare with a production of 567 thousand metric tons, an average productivity of 29.41 MT ha-1 [1]. Among the insect pests, Plutella xylostella L., (Plutellidae: Lepidoptera) and cabbage aphid, Brevicoryne brassicae L. (Aphididae: Hemiptera) are the most important pests causing severe yield loss to cabbage every year. In India, reported 50-80 per cent loss in marketable yield of cabbage due to attack of P. xylostella [2]. In most of the areas of the state cabbage farmers face severe insect infestation due to its slow growth in the early crop stage and lack of insect control measures. Chemical insect management in cabbage has been found effective and economical. An attempt was made to find out an effective insect management strategy based on insecticide.

MaterialsandMethods

A field experiment was carried out during 2012-13 and 2013-14 at BSP farm, JNKVV, Jabalpur to evaluate the performance of Emamectin Benzoate 5% SG in cabbage var. Supreeya against DBM. The trial was carried out with eight treatments and replicated thrice following the Randomized Block Design (RBD). Plot size was kept 5m x 5m with row x plant spacing of 60 x 45 cm. Observation was recorded at primordial stage of the crop. Insecticide first (30) and second (40) days after transplanting were applied using Knapsack sprayer fitted with hollow cone nozzle. Post treatment count was recorded at 3, 5, 7 and 10 days after application of the treatments. Average larval population for each treatment was also calculated to find out the overall efficacy of the different doses of the insecticide. Ten plants were selected randomly and number of DBM larvae head-1 was counted before sprays as well as on third, fifth, seventh and tenth days after each spraying. Percent reduction/increase (+) in larval counts treatment wise over control was computed as suggested [3]. Cumulative yield leaving aside border rows was recorded. The data were transformed and subjected to analysis of variance. The phytotoxicity studies were undertaken 15 DAT as per guidelines of CIB, Govt. of India on 0-10 scale, EWRC system [4]. The yield of Cabbage heads from individual plots were separately recorded and expressed in q ha-1 [5].

Results and Discussion

The mean data on efficacy of Emamectin Benzoate 5% SG against DBM of cabbage for the first year (2012-13) have been placed in [Table-1]. The pre-treatment count on larval population before first spray showed no significant difference among the various plots (6.83 to 7.33 larvae plant-1). All the insecticidal treated plots gave significantly better protection of pest compared to untreated control plots. Larval population in all the treatments at 10 days after treatment (DAT) (first and second spray) was significantly lower than untreated control (14.03 and 18.13 larvae plant-1). Among the treatments the lowest larval population (1.93 and 0.00 larvae plant-1) was recorded in the plots treated with T5 (Emamectin benzoate 5% SG @ 20 g a.i. ha-1) 10 days after 1st and 2nd spray, respectively, followed by T4 (2.67 and 0.00 larvae plant-1), T3 (3.03 and 0.17 larvae plant-1), T2 (3.23 and 0.87 larvae plant-1), T7 (3.73 and 1.67 larvae plant-1) and T6 (4.03 and 1.87 larvae plant-1) at 10 days after 1st and 2nd spray, respectively which were the next better treatments and were at par with each other. Treatments, T5 and T4 recorded 100 % reduction in DBM larvae at 10 DAT and T3 (96.08 %) recorded the sufficient reduction in DBM larvae of over 90.93 % at 10 DAT after second spray which was statistically at par with T7 (90.31 %). This treatment was found to be closely followed by T2 (94.88 %). Untreated control (T8) recorded least larval reduction at all the intervals. Results of second year (2013-14) were almost similar to that of first year results, presented in [Table-2]. Minimum larval population of DBM in cabbage was significantly lower than control. In T5 (2.47 and 0.20 larvae plant-1) with 98.38 % reduction of DBM at 10 DAT, T4 (2.53 and 0.27 larvae plant-1) with 97.82%, T3 was next better treatment with a population of 2.80 and 0.60 larvae plant-1 with 95.18 % reduction of DBM at 10 days after 1st and 2nd spray, respectively, which is at par over the T7 (3.00 and 0.90 larvae plant-1) reducing 92.89% DBM at 10 DAT. All the treatments found significantly lower population of DBM larvae and reduction percentage of DBM at 10 days after 1st and 2nd spray, respectively, and they were at par each other over untreated control (11.50 and 13.13 larvae plant-1). Emamectin benzoate @ 7.50 g a.i. ha-1 was found effective against brinjal shoot and fruit borer and diamondback moth while lower dose of 5.00 g a.i. ha-1 against okra fruit borer [6]. Similarly, [7] reported that Emamectin Benzoate 5% SG @ 150 g and 200 g a.i. ha-1 was found to be effective in suppressing the P. xylostella larval population as compared to other insecticides with higher cabbage yield. They also reported that Emamectin Benzoate was found to be very effective for controlling DBM on vegetable bok choi [8].

Table-1 *Effect of different treatments of Emamectin Benzoate 5% SG against DBM (2012-13)*

S. No.	Treatments	Dosage (g *a.i.* ha^{-1})	Pre-treatment count (larvae head^{-1})	Number of Diamond Back Moth (DBM) larvae head^{-1} at 10 days after treatment		% reduction of DBM at 10 days after treatment	
				1st Spray	2nd Spray	1st Spray	2nd Spray
T_1	Emamectin Benzoate 5% SG	5	7.23	4.47 (2.22)	3.03 (1.88)	67.70	83.125
T_2	Emamectin Benzoate 5% SG	7.5	6.87	3.23 (1.93)	0.87 (1.17)	75.44	94.88
T_3	Emamectin Benzoate 5% SG	10	7.33	3.03 (1.88)	0.71 (1.09)	78.40	96.08
T_4	Emamectin Benzoate 5% SG	15	6.97	2.67 (1.78)	0.00 (0.71)	79.99	100
T_5	Emamectin Benzoate 5% SG	20	6.83	1.93 (1.55)	0.00 (0.71)	85.29	100
T_6	Emamectin Benzoate 5% SG (MISSILE)	7.5	7.23	4.03 (2.13)	1.87 (1.43)	70.88	89.54
T_7	Emamectin Benzoate 5% SG (MISSILE)	10	6.97	3.73 (2.05)	1.67 (1.47)	72.04	90.31
T_8	Untreated Control	-	7.33	14.03 (3.80)	18.13 (4.33)	--	--
	SEm ±	-	0.07	0.06	0.03		
	CD(p=0.05)	-	NS	0.19	0.09		

Figures in parenthesis are √X + 0.5 values, NS- Non significant.

Table-2 *Effect of different treatments of Emamectin Benzoate 5% SG against DBM (2013-14)*

S. No.	Treatments	Dosage (g *a.i.* ha^{-1})	Pre-treatment count (larvae head^{-1})	Number of Diamond Back Moth (DBM) larvae head^{-1} at 10 days after treatment		% reduction of DBM at 10 days after treatment	
				1st Spray	2nd Spray	1st Spray	2nd Spray
T_1	Emamectin Benzoate 5% SG	5	6.33	4.93 (2.24)	3.67 (2.04)	54.83	70.55
T_2	Emamectin Benzoate 5% SG	7.5	6.50	3.07 (1.77)	0.75 (1.12)	72.60	94.14
T_3	Emamectin Benzoate 5% SG	10	6.33	2.80 (1.69)	0.60 (1.05)	74364	95.18
T_4	Emamectin Benzoate 5% SG	15	6.30	2.53 (1.62)	0.27 (0.60)	76.71	97.82
T_5	Emamectin Benzoate 5% SG	20	6.30	2.47 (1.60)	0.20 (0.52)	77.26	98.38
T_6	Emamectin Benzoate 5% SG (MISSILE)	7.5	6.37	3.53 (1.90)	1.20 (1.30)	67.86	90.43
T_7	Emamectin Benzoate 5% SG (MISSILE)	10	6.43	3.00 (1.76)	0.90 (1.18)	72.94	92.89
T_8	Untreated Control	-	6.67	11.50 (3.46)	13.13 (3.69)	--	--
	SEm ±	-	0.08	0.04	0.06		
	CD(p=0.05)	-	NS	0.12	0.19		

Figures in parenthesis are √X + 0.5 values, NS- Non-significant.

Cabbage Yield (q/ha)

The data recorded on cabbage head yield during both the years revealed that it significantly varied in different treatments in [Table-3]. Highest head yield (274.45 and 329.52 q ha-1) was recorded from the treatment T5 (Emamectin Benzoate 5% SG @ 20 g a.i. ha-1) in the both years. Pooled data of both the years revealed that maximum yield obtained from T5 (301.99 q ha-1) followed by T4 (Emamectin Benzoate 5% SG @ 15 g a.i. ha-1) (301.25 q ha-1), T3 (Emamectin Benzoate 5% SG @ 10 g a.i. ha-1) (296.75 q ha-1) and T2 (Emamectin Benzoate 5% SG @ 7.5 g a.i. ha-1) (291.73 q ha-1) which was at par over the Emamectin Benzoate 5% SG (MISSILE) @ 10 g a.i. ha-1) (290.74 q ha-1). Whereas, lowest head yield (234.55 q ha-1) was recorded under untreated plot (T8) due to highest infestation with DBM. Maximum increase in yield 28.51 q ha-1 was obtained from T5 followed by T4, T3, T2, T7, T6 and T1 over control plot. Based on two years of study it is cleared that Emamectin Benzoate 5% SG @ all doses gave good control of DBM in cabbage along with significant increase in yield. It also did not produce any phytotoxic symptoms on cabbage. [9-12].

Table-3 *Effect of different treatments of Emamectin Benzoate 5% SG against DBM with respect to yield of cabbage (2012-14)*

S. No.	Treatments	Dosage (g *a.i.* ha^{-1})	Yield (q ha^{-1})			% increase in yield over control		
			2012-13	2013-14	Pooled	2012-13	2013-14	Pooled
T_1	Emamectin Benzoate 5% SG	5	232.50	275.40	253.95	5.47	10.75	8.11
T_2	Emamectin Benzoate 5% SG	7.5	268.15	315.30	291.73	21.65	26.79	24.22
T_3	Emamectin Benzoate 5% SG	10	272.50	321.00	296.75	23.62	29.08	26.35
T_4	Emamectin Benzoate 5% SG	15	273.75	328.75	301.25	24.18	32.20	28.19
T_5	Emamectin Benzoate 5% SG	20	274.45	329.52	301.99	24.50	32.51	28.51
T_6	Emamectin Benzoate 5% SG (MISSILE)	7.5	260.50	309.42	284.96	18.18	24.43	21.31
T_7	Emamectin Benzoate 5% SG (MISSILE)	10	265.00	316.48	290.74	20.21	27.26	23.74
T_8	Untreated Control	-	220.43	248.67	234.55	-	-	-
	SEm ±	-	15.87	10.33				
	CD(p=0.05)	-	NS	31.64				

Figures in parentheses are angular transformed value, NS- Non significant.

Assessment of phytotoxicity or crop injury in cabbage

The results of the phytotoxic effect of Emamectin Benzoate 5% SG on cabbage presented in [Table-4] revealed that cabbage plants sprayed with Emamectin Benzoate 5% SG *viz;* 7.5, 10, 15, and 20 g a.i. ha-1 did not show any phytotoxic effects like epinasty, hyponasty, leaf injury, wilting, vein clearing and necrosis during both the season. Therefore, the present findings revealed that Emamectin Benzoate 5% SG @ 10 g a.i. ha-1 was found to be best for effective control of DBM along with increase in head yield without any adverse effect on the crop.

Table-4 *Phytotoxic effect of Emamectin Benzoate 5% SG on cabbage during first season (2012-2014)*

Treatments	Dosage (g *a.i* ha^{-1})	Phytotoxicity rating					
		Leaf tip injury	Wilting	Vein Clearing	Necrosis	Epinasty	Hyponasty
Emamectin Benzoate 5% SG	7.5	0	0	0	0	0	0
Emamectin Benzoate 5% SG	10	0	0	0	0	0	0
Emamectin Benzoate 5% SG	15	0	0	0	0	0	0
Emamectin Benzoate 5% SG	20	0	0	0	0	0	0
Control	-	0	0	0	0	0	0

Conflict of Interest: None declared

References

[1] Anon (2012) National Horticulture Production Database MoA, GoI 2-3.
[2] Satpathy S., Kumar A., Singh A. K. and Pandey P. K. (2005) *Annals of Plant Protection Science,* 13, 88-90.
[3] Henderson C. F. and Tilton E. W. (1955) *Journal of Econ. Entomol,* 48,157-161.
[4] Rao V. S. (1983) Principles of weed science. Oxford and IBH Publishing Pvt ltd; 224–225.
[5] Panse V. G. and Sukhatme P. U. (1978) Statistical Methods for Agricultural Workers, *Indian Council of Agriculture Research,* New Delhi.
[6] Shivalingaswamy T.M., Kumar Akhilesh, Satpathy S. and Rai A. B. (2008) Progressive Horticulture, IIVR, Shahanshahpur, Varanasi. 40(2), 193 – 197.
[7] Prasad K. and Devappa V. (2006) *Pestology,* 30 (2), 23-25.
[8] Craig S.E., Dennis M. D., Stephen M. W. and Jack A. Norton (1996) Florida vegetable production proc. *Fla. State Hort. Soc.* 109,205-207.
[9] Paliwal S. (2000) *M. Sc. (Agri.) Thesis*, MPUAT, Udaipur.
[10] Murthy K. S. and Ram G. M. (2002) In *Resources management in plant protection during twenty first century*, Hyderabad, India 2, 165-168.
[11] Arora R.K., Kalra U.K. and Rohilla H.R. (2003) *Indian Journal of Entomology*, 65 (1), 43-48.
[12] Mahmoudvand M., Garjan A.S. and Abbasipour H. (2011) *Journal of Agricultural Research* 71(2), 202.