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Efficacy of Econeem with Microbial Insecticides against *Helicoverpa armigera* (Hubner) in Cotton

S. LINGAPPA, RAJENDRA HEGDE AND S. S. UDIKERI

Department of Agricultural Entomology
University of Agricultural Sciences, Dharwad - 580 005

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Abstract : Field investigations were carried out to evaluate the efficacy of econeem (a neem based formulation) alone and a in combination with HaNPV and Bt against the bollworm, *Helicoverpa armigera* (Hubner) in cotton. Econeem @ 10 ppm/ha and along with Bt proved equally effective as that of monocrotophos in reducing bollworm egg incidence. The larval load in econeem 10 ppm/ha, econeem (5 ppm/ha) + Bt, econeem (5 ppm/ha) + HaNPV and monocrotophos remained statistically on par. thus providing to be equal in their efficacy. Econeem in combination with microbial pesticides reduced the boll damage to an extent of 70.36 to 71.99 per cent and recorded maximum kapas yield.

Introduction

Cotton is an important commercial crop of Karnataka. Insect pests were not a threat to cotton production before 1960, as its cultivation was confined to rainfed parts of Northern Karnataka. However, insects became a major constraint when the cotton cultivation was extended to project areas, that too more aggressive when interspecific hybrids were introduced to irrigated, assured rainfall and non-traditional areas (Lingappa *et al*., 1993). Among the insect pests attacking cotton crop, bollworms are the major.

Among the bollworms, the American bollworm, *Helicoverpa armigera* is a regular pest of cotton and posing threat to cotton production. Due to indiscriminate use of insecticides, particularly synthetic pyrethroids, *H. armigera* has developed resistance to many of them at several locations of the country (Dhingra *et al*., 1988, Phokela *et al*., 1990 and Armes *et al*., 1992). Therefore, it has become necessary to look into alternate methods of pest control to judiciously integrate them and to develop an effective Integrated Pest Management (IPM) package for cotton.

Neem can become the best alternative to synthetic insecticides (Jotwani and Srivastava, 1981; Bambarkar, 1990 and Schumutterer, 1990). Several neem-based formulations are introduced into the market by various firms with varying concentrations of azadirachtin. They can be combined with other ecofriendly measures to increase the efficacy. Considering such an importance of neem formulations, Econeem (a neem-based formulation containing 0.3% azadirachtin introduced by M/s. P. J. Margo Pvt. Ltd., Bangalore) was tested singly and in combination with HaNPV and Bt against the bollworm on cotton.

Material and Methods

A field experiment was conducted at Main Research Station, Dharwad on the high yielding cotton hybrid DCH-32 during 1994-95. Randomised block design with four replications and eight treatments (Table 1) was adopted. The plot size was of 40.27 sq.m with 90 x 60 cm plant spacing. Treatments were imposed from 55 days after sowing and subsequent sprays

were made at an interval of 15 days. Insecticidal treatments were given five times with the help of a high volume knapsack sprayer @ 1000 l/ha.

Five plants per replication were selected and tagged. Number of eggs and larvae of bollworm were counted on these selected plants. The number of fruiting bodies damaged (shed and retained on plant) and healthy were recorded. The percentage of fruiting bodies damaged was computed and subjected to statistical analysis after arcsin transformation. The number of good opened bolls (GOBs) and bad opened bolls (BOBs) on five tagged plants were recorded at each picking and mean values per plant were subjected to statistical analysis. Cotton yield per plot was recorded separately and was computed to q/ha. The yield was analysed statistically to discriminate the treatment superiority in registering higher yield.

Results and Discussion

The incidence of bollworm varied significantly among treatments. The egg and larval incidence were maximum in untreated control (1.86 and 1.37 per plant) followed by econeem at 5 ppm per ha (Table 1). The product at 7.5 ppm per ha and endosulfan were equally effective. The botanical along with NPV and Bt failed to establish superiority over endosulfan. On the other hand, the former two remained on par with econeem at 10 ppm per ha. Monocrotophos recorded minimum number of eggs and was significantly superior to other treatments except econeem at 10 ppm per ha and the product along with Bt. The reduction in egg abundance varied from 32.80 per cent to 58.06 per cent in various treatments. The larval load in econeem at 10 ppm, econeem at 5 ppm + Bt, econeem at 5 ppm + NPV and monocrotophos remained statistically on par, thus all providing to be equal in their efficacy. The botanical at 7.5 ppm and endosulfan proved to be equitoxic. The reduction in bollworm incidence in econeem at 10 ppm per ha, econeem + NPV, econeem + Bt and monocrotophos treatments was around 47 per cent as against 35.77 in econeem at 7.5 ppm and 37.23 per cent in endosulfan.

Damage to fruiting bodies was highest in the untreated control followed by endosulfan and econeem at 5 ppm where the latter two remained on par (Table 2). The botanical at two higher dosages reduced the damage significantly over other treatments but were, however, inferior to econeem at 5 ppm when used in combination with microbial pesticides. NPV and Bt along with econeem reduced the damage to the maximum extent (70.36 to 71.99%).

Good opened bolls were maximum and significant superiority was noticed when the botanical was mixed either with NPV or Bt (Table 2). However, these two treatments did not establish their superiority over standard chemical check., monocrotohpos. Econeem when used alone recorded same number of GOBs at higher two dosage levels. Interestingly, a similar trend was seen in the case of BOBs also.

Econeem at 5 ppm along with NPV and Bt emerged as most effective treatments by recording maximum yield of cotton (Table 2). The treatments in the order of decreasing effectiveness were monocrotophos and econeem at 10 ppm, econeem at 7.5 ppm and endosulfan and econeem at 5 ppm. Untreated control recorded lowest *kapas* yield. While per cent increase in yield in the best treatments (Econeem at 5 ppm + Bt and econeem at 5 ppm + NPV) was to the extent of 188.3 - 185.6, it was

Table 1. Bioefficacy of econeem along with microbial insecticides on cotton bollworm incidence and damage

Treatment details	Egg (No./ plant)	Reductin over control (%)	Larvae (No./ plant)	Reduction over control (%)	Damage to fruiting bodies (%)	Reduction over control (%)
1. Econeem at 5.0 ppm/ha	1.25 e	32.80	1.14 c	16.79	21.40 d	30.29
2. Econeem at 7.5 ppm/ha	0.97 d	47.85	0.88 b	35.77	17.30 c	43.65
3. Econeem at 10.0 ppm/ha	0.80 ab	56.99	0.72 a	47.45	15.40 bc	49.84
4. Econeem at 5 ppm + NPV at 500 LE/ha	0.88 bc	52.69	0.70 a	48.91	9.10 a	70.36
5. Econeem at 5 ppm + Bt at 2 kg/ha	0.86 abc	53.76	0.72 a	47.45	8.60 a	71.99
6. Monocrotophos at 2.50 ml/l	0.78 a	58.06	0.71 a	48.18	15.00 b	51.14
7. Endosulfan at 2.75 ml/l	0.93 cd	50.00	0.86 b	37.23	20.50 d	33.22
8. Untreated control	1.86 f	--	1.37 d	--	30.70 e	--

Note : Means followed by same letter/s are not significantly different

Table 2. Effect of econeem in combination with Bt and NPV on yield attributes and yield of cotton

Treatment details	GOB (No./ plant)	BOB (No./ plant	Yield		Increased over control (%)
			Kg/plot	Q/ha	
1. Econeem at 5.0 ppm/ha	16.20 d	9.20 e	3.70 d	9.18	67.52
2. Econeem at 7.5 ppm/ha	20.60 bc	11.06 cd	4.46 c	11.08	102.1
3. Econeem at 10.0 ppm/ha	21.30 b	12.21 bc	4.92 b	12.22	122.81
4. Econeem at 5 ppm + NPV at 500 LE/ha	24.23 a	15.65 a	6.30 a	15.64	185.58
5. Econeem at 5 ppm + Bt at 2 kg/ha	24.70 a	15.80 a	6.36 a	15.79	188.32
6. Monocrotophos at 2.50 ml	23.15 ab	12.62 b	5.08 b	12.61	130.29
7. Endosulfan at 2.75 ml/l	18.30 cd	10.47	4.22 c	10.48	91.06
8. Untreated control	9.18 e	5.48 f	2.21 e	5.48	--

Note : Means followed by same letter/s are not significantly different

130.3 in monocrotophos and 122.8 in econeem at 10 ppm per ha. Studies on the combined use of neem and microbial agents against the bollworm in cotton are scanty. However, Rabindra *et al.* (1994) reported increased effectiveness of neem when mixed with HaNPV against the pest on pigeonpea.

Econeem at 5 ppm in combination with either Bt or NPV proved most effective in lowering egg and larval incidence, reducing damage to fruiting bodies, enhancing number of GOB and resulting in higher cotton yield despite higher BOB. Econeem alone at 10 ppm proved to be superior over endosulfan in all the evaluation parameters.

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