

MANAGEMENT OF COTTON PESTS USING SEED TREATING INSECTICIDE AND PYRETHROIDS AT DIFFERENT LOCATIONS OF BANGLADESH

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ABSTRACT

A seed treating insecticide Gaucho and the spray of a synthetic pyrethroid Ripcord 10 EC were used against cotton jassid, white fly, spotted bollworm and aphid at three locations viz. Dinajpur, Jessore and Gazipur of Bangladesh. The effect of Gaucho and Ripcord at different threshold level and farmer's management practices on the incidence of pest population were similar. At different locations number of spray varied with the incidence of pest threshold which effects the yield and benefit cost ratio. The results showed that seed treatment with Gaucho and foliar spray of Ripcord at all threshold levels gave significantly higher yield and profitable benefit cost ratio.

Key words: Cotton pests, seed treatment, pyrethroid

INTRODUCTION

About 162 species of insects are recorded attacking cotton crops, among those jassid, aphid and spotted bollworm (*Earias insulana*) are the most destructive one in Bangladesh (Anonymous, 1999). Jassid, also commonly known as leaf hopper suck sap from the leaves causing phytotoxic symptoms known as "hopper burn" resulting in complete desiccation of the plants (Narayan and Singh, 1994). Cotton aphids are commonly found at lower leaf surface on the terminal and other plant parts. They feed by sucking sap from phloem tissue and severe infestations seriously causes stunting of the plants and reduce yields (Bohmfolk *et al.*, 1996). Bollworm larvae damage squares, flowers, green bolls, tender shoots resulting about 30 to 40% reduction of yield (Anonymous, 2003). The management of insect pests is an integral part of an economic production system and increases producers' profits. Crop protection with chemicals is desirable and unavoidable part of integrated pest management (Mohyuddin *et al.*, 1997). Synthetic pyrethroids have been extensively used to control cotton pests and Imidacloprid as a seed-dresser insecticide is effective against sucking pests of cotton. Insecticides as seed treatment / dresser emerged most promising, low cost, selective and less polluting with least interference in natural equilibrium. Seed dressing and spray formulations of many insecticides have been widely accepted for the management of cotton pests (Vastrad, 2003). Therefore, in this study a seed treating insecticide and a pyrethroid was evaluated to know their efficacy for the control of cotton pests.

MATERIALS AND METHODS

The experiment was conducted during August to December 2005 and 2006 at three regional cotton research, training and seed multiplication farm namely Dinajpur, Jessore and Gazipur. The soil was sandy loam with pH 4.5 to 5.5. At all the station, previous crop was sunhemp as a green manure. The Land was prepared at field condition by deep ploughing and harrowing followed by laddering and irrigation was done as needed. The field layout was done after final land preparation. The experiment was conducted in randomized complete block design using the cotton variety CB-9. The plot size was 10 × 10 m. The spacing between block-to-block and plot-to-plot were 1.5 and 1m and respective footpath was 2 m. Seeds were sown on 1st week of August 2005 and 2006, at the rate of 15 kg / ha in a north-south row. The seeds were sown by hand keeping a distance of 45 cm

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from plant to plant and row-to-row distance was 90 cm. Necessary intercultural operations like mulching, weeding and fertilizer application were done properly. The experiment was conducted with seed treating chemical, Gaucho @ 6 g / kg seed and foliar spraying of synthetic pyrethroid Ripcord 10 EC @ 3 ml/L water. Spraying was done on 1st, 2nd, 3rd and all observed threshold level of pests by using a knapsack sprayer. An observation was made on the traditional farmer's management practice which was done by foliar spraying of chemical insecticides Asataf 75 SP and Ripcord 10 EC. To estimate the incidence of pests, sampling was done from the cotton field throughout the cotton growing season (August to November). It was done by weekly scouting taking 5 plants randomly from each replication. Plants were examined for jassid, white fly, aphid and spotted bollworm. The presence of aphid was estimated on a scale 0 - 4 ('0' no aphid, '1' few aphids, '2' one leaf or growing point infested, '3' more than one leaf or growing point infested, '4' entire plant heavily infested). Newly growing parts with two fully expanded leaves were examined for sucking pests. A scouting form was used during estimation of the pests. Variable cost and net return was calculated as per Tague and Shelstad (1981). The benefit cost ratio was calculated by dividing the net return by total variable cost. Data of the different parameters were analyzed by ANOVA and the mean values were separated by Duncan's Multiple Range Test (DMRT).

RESULTS

At Dinajpur station, the effects of Gaucho and spray number of pyrethroid did not significantly affect the incidence of pest population. The incidence of jassid, white fly spotted bollworm and aphid grade varied from 0.23 – 0.28, 0.23 – 0.28, 0.10 – 0.17 and 1.11 – 1.33, respectively. But the treatments showed significant effect on the production of yield. The highest amount (1900 kg / ha) of yield (seed cotton) was produced when seeds were treated with Gaucho, and pyrethroid was sprayed 5 times (at all threshold level).

Table 1. Effect of seed treatment and pyrethroid on the mean incidence of cotton pests at Dinajpur station for the years 2005 and 2006

Number of spray	Number of insects / plant			Aphid grade	Yield (Kg/ha)
	Jassid	White fly	Bollworm		
1	0.28 a	0.28 a	0.17 a	1.33 a	984 b
2	0.26 a	0.26 a	0.16 a	1.21 a	1313 ab
3	0.25 a	0.25 a	0.14 a	1.20 a	1700 a
5 (All threshold)	0.23 a	0.23 a	0.10 a	1.11 a	1900 a
11 (Farmer's practice)	0.24 a	0.24 a	0.13 a	1.18 a	1550 ab

Means within a column followed by the same letter(s) are not significantly different by DMRT ($p \leq 0.05$)

Table 2 showed the results obtained from Jessore station where the incidence of jassid, white fly, spotted bollworm and aphid grade varied from 0.02 – 0.04, 0.19 – 0.28, 0.20 – 0.38 and 1.24 – 1.44, respectively. The results showed that the effect of seed treating chemical and pyrethroid were statistically similar with farmer's practice. Table 2 showed that seed treatment and pyrethroid spray have significant effect on the production of yield. Seeds treated with Gaucho and pyrethroid sprayed for 5 times (at all threshold level) produced the highest (1279 kg / ha) amount of yield.

At Gazipur station (Table 3), the incidence of jassid, white fly, spotted bollworm and aphid grade varied from 0.80 – 1.30, 1.30 – 1.60, 0.18 – 0.22 and 0.18 – 0.37, respectively. The results revealed that seed treating chemical and pyrethroid did not show significant effect on the incidence of sucking and chewing pests of cotton. However, the production of yield was significantly different and the highest (780 kg / ha) amount of yield was produced in the farmer's practice.

Table 2. Effect of seed treatment and pyrethroid on the mean incidence of cotton pests at Jessore station for the years 2005 and 2006

Number of spray	Number of insects / plant			Aphid grade	Yield (Kg/ha)
	Jassid	White fly	Bollworm		
1	0.04 a	0.28 a	0.38 a	1.44 a	600 b
2	0.03 a	0.27 a	0.29 a	1.41 a	774 ab
3	0.02 a	0.24 a	0.23 a	1.24 a	1077 a
6 (All threshold)	0.03 a	0.20 a	0.20 a	1.29 a	1279 a
12 (Farmer's practice)	0.03 a	0.19 a	0.24 a	1.40 a	982 ab

Means within a column followed by the same letter(s) are not significantly different by DMRT ($p \leq 0.05$)

Table 3. Effect of seed treatment and pyrethroid on the mean incidence of cotton pests at Gazipur station for the years 2005 and 2006

Number of spray	Number of insects / plant			Aphid grade	Yield (Kg/ha)
	Jassid	White fly	Bollworm		
1	1.30 a	1.60 a	0.22 a	0.37 a	456 b
2	1.25 a	1.50 a	0.20 a	0.28 a	600 ab
3	1.20 a	1.40 a	0.19 a	0.25 a	750 a
5 (All threshold)	1.09 a	1.30 a	0.18 a	0.20 a	763 a
13 (Farmer's practice)	0.80 a	1.48 a	0.20 a	0.18 a	780 a

Means within a column followed by the same letter(s) are not significantly different by DMRT ($p \leq 0.05$)

Benefit cost ratio of seed treatment and pyrethroid used for controlling cotton pests at Dinajpur station in the year 2005 and 2006 have presented in Table 4. Results showed that total variable cost and net return ranged from 3060 – 6300 and 24492 - 46900 Tk. respectively. Seeds treated with Gaucho and pyrethroid sprayed for 5 times (All threshold) accounted the highest variable cost and net return. The benefit cost ratio varied from 6.02 – 9.17. The lowest benefit cost ratio was found to the farmer's practice, whereas the highest ratio was found when seeds were treated with Gaucho and pyrethroid was sprayed for 3 times.

Table 4. Polled benefit cost ratio of seed treatment and spraying pyrethroids at Dinajpur station for the years 2005 and 2006

Number of spray	Variable cost (Tk.)			Return (Tk.)		Benefit cost ratio
	Insecticide	Labor	Total	Gross	Net	
1	2910	150	3060	27552	24492	8.00
2	3570	300	3870	36764	32894	8.50
3	4230	450	4680	47600	42920	9.17
All threshold	5550	750	6300	53200	46900	7.44
Farmer's practice	4530	1650	6180	43400	37220	6.02

Insecticide: Gaucho – 25000Tk./Kg, Pyrethroid-1100Tk./l, Asataf-850Tk/l, Seed cotton: 28Tk./kg, Labor: 2 labor/spray/ha (75 Tk./labor), Gaucho: 90g/ha

Table 5. Polled benefit cost ratio of seed treatment and spraying pyrethroids at Jessore station for the years 2005 and 2006

Number of spray	Variable cost (Tk.)			Return (Tk.)		Benefit cost ratio
	Insecticide	Labor	Total	Gross	Net	
1	2910	150	3060	16800	13740	4.49
2	3570	300	3870	21672	17802	4.60
3	4230	450	4680	35812	31132	6.65
5 (All threshold)	6210	900	7110	30156	23046	3.24
Farmer's practice	5040	1800	6840	27496	20656	3.02

Insecticide: Gaucho – 25000Tk./Kg, Pyrethroid-1100Tk./l, Asataf-850Tk/l, Seed cotton: 28Tk./kg, Labor: 2 labor/spray/ha (75 Tk./labor), Gaucho: 90g/ha

Table 5 showed the polled benefit cost ratio obtained from Jessore station stated that total variable cost and net return ranged from 3060 – 7110 and 13740 – 31132 Tk. respectively. Seeds treated with Gaucho and pyrethroid sprayed for 5 times (All threshold) accounted the highest variable cost and the highest net return obtained when seeds were treated with Gaucho and pyrethroid was sprayed for 3 times. The lowest benefit cost ratio (3.02) was found to the treatment of farmer's practice, whereas the highest ratio (6.65) was obtained when seeds were treated with Gaucho and pyrethroid was sprayed for 3 times.

Polled benefit cost ratio obtained from Gazipur station presented in Table 6. Table showed that total variable cost and net return ranged from 3060 – 9630 and 9708 - 16320 Tk, respectively. Farmer's practice showed the highest variable cost, whereas seeds treated with Gaucho and pyrethroid sprayed for 3 times (All threshold) accounted the highest net return. The treatment farmer's practice showed lowest (1.27) benefit cost ratio and the highest (3.49) ratio was obtained when seeds were treated with Gaucho and pyrethroid was sprayed for 3 times.

Table 6. Polled benefit cost ratio of seed treatment and spraying pyrethroids at Gazipur station for the years 2005 and 2006

Number of spray	Variable cost (Tk.)			Return (Tk.)		Benefit cost ratio
	Insecticide	Labor	Total	Gross	Net	
1	2910	150	3060	12768	9708	3.17
2	3570	300	3870	16800	12930	3.34
3	4230	450	4680	2100	16320	3.49
5 (All threshold)	5550	750	6300	21364	15064	2.39
Farmer's practice	7680	1950	9630	21840	12210	1.27

Insecticide: Gaucho– 25000Tk./Kg, Pyrethroid-1100Tk./l, Asataf-850Tk/l, Seed cotton: 28Tk./kg, Labor: 2 labor/spray/ha (75 Tk./labor), Gaucho: 90g/ha

DISCUSSION

Cotton plants provide maximum food and good habitat for all types of sucking and chewing pests (Kabir and Khan, 1980). So, this crop needs insecticidal management to combat the worsen situation (Atwal and Dhaliwal, 2005). In this study, cotton seeds were treated with chemical insecticide, Gaucho @ 6 g / kg and synthetic pyrethroid Ripcord 10 EC were sprayed at 1st, 2nd, 3rd and all threshold level for controlling jassid, white fly, spotted bollworm and aphid of cotton at three locations of Bangladesh. The results obtained in this study with seed treating insecticide and foliar spray of synthetic pyrethroid showed their enthusiasm in reduction of pests as well as farmer's management practice.

Findings of the study indicated that seed treatment with Gaucho and spraying of synthetic pyrethroid Ripcord 10 EC are confident and prudent enough to control the pests. The results are in agreement with Dandle *et al.* (2001) who reported that dressing of cotton seeds with Imidacloprid 70 WS showed promising against cotton pests. In another study Patil *et al.* (2004) reported that seed treatment by insecticide Thiamethoxam 70 WS and 35 FS keep cotton crop free from sucking pests for at least 45 days and also safe to natural enemies. In this study, though the effect of seed treating chemical Gaucho and foliar spray of synthetic pyrethroid Ripcord 10 EC on the incidence of pest population found statistically similar but at all tree locations they showed lower number of pest threshold which significantly effect on the production of yield. Lower number of threshold level also required lower number of spray and accounted lower variable cost which gave profitable benefit cost ratio. Synthetic pyrethroids, with their combination of favourable properties, may have an importance comparable with organochlorine compounds, organophosphates and carbamates that are used on a large scale. The result in this study is not only an effective, but also an economical pest management option. Threshold spray usually justifies the use of control measures and resulted more profit (Ali and Karim, 1990). Therefore, application of these products in the threshold level might uphold a positive impact to control the sucking and chewing pests of cotton.

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