

EFFECT OF INSECTICIDES ON BOLL ROT DISEASE (*Xanthomonas campestris* pv. *malvacearum* (F. F. Smith) AND AGRONOMIC CHARACTERS OF COTTON IN BANGLADESH

M.N. Rasel¹, M.S. Hasan², Mottakina Akter¹ Md. Faruk Hossain²
and S.M. Abul Hossain³

ABSTRACT

The study was carried out in the “Regional Cotton Research and Seed Multiplication Centre, Sadarpur, Dinajpur” during the year 2006-2007. Asataf 75SP, Admire 200 SL, Imitaf 20 SL, Dursban 20 EC, Chloropyriphos 20 EC, Actara 25 WG, Marshal 20 EC, Chloropyriphos 20 EC were applied at recommend dosages to observe the effect of insecticides on boll rot diseases (*Xanthomonas campestris* pv. *malvacearum* (F. F. Smith)) and agronomic characters of cotton. Findings of the study indicated that the new group insecticides such as Admire 200SL, Actara 25 WG and Imitaf 20 SL (all belong to the group neonicotenoides) were found effectiveness against the boll rot disease of cotton. When these three insecticides were applied the numbers of infested boll/plant were 1.33, 1.67, 2.33, respectively compared to 5.33 in control plot. The number of boll/plant were 35.33, 35.33, 32.00, respectively and 12.00 in the control. Individual boll weight were 3.92, 3.83, 3.83 gm, respectively and in the control it was 3.08 gm. The plant height were found 95.00, 96.67, 93.33 cm, respectively which was 66.67 cm, in control. Considering the variable costs like insecticide and labour Admire 200 SL and Actara 25 WG provided the maximum BCR of 7.80 and 7.38, respectively.

Keywords: *Insecticides, cotton, boll rot diseases, agronomic characters.*

INTRODUCTION

Cotton (*Gossypium spp.*) a major agricultural crop (Jiskani and Wagan, 2001), is known as the silver fiber (Menon and Chang, 2007) and also used as dual purpose crop providing fiber and oil (Mallah, *et al*, 1997). It grows in more than 60 countries of the world and a major crop of African tropics, Australia, China, Egypt, India, Mexico, Pakistan, Soviet Union, Sudan, United States, and warmer regions of Central and South America (Jiskani and Wagar, 2001). Two types of cottons, viz., American cotton (*Gossypium hirsutum* L.) and deshi cotton (*G. arboreum* L.) are commonly grown in the Indian sub-continent (Singh and Lal, 1984; Atwal and Dhalaiwal, 2005). These two species of cotton are also grown in Bangladesh but in Bangladesh cotton (*G. arboreum* L.) is known as the hilly cotton (CBD, 2008). Bangladesh had a glorious historical record to grow superfine quality of cotton. The world famous ‘Muslin’ was greeted in every corner of the earth. There are 152 yarn and textile mills in Bangladesh. Every year 0.6 to 0.7 million bales of medium and long staple cotton fiber are used in these mills (Anon. 2001). About 14803.64 ha (36565 acres) were under American cotton cultivation in the year 1998-1999 but the total yield was only 3633 metric tons (25950 bales), which hardly fulfill only 3.7-4.0% of the total national requirement of cotton in Bangladesh (Anon. 2002).

Boll rot diseases of cotton were considered as most severe and destructive of cotton (Jiskani and Wagar, 2001). Symptoms of this disease is angular to irregular black spots develop on young cotton bolls. On these, the spots become sunken, and in hot, humid weather the bacteria may invade and rot the bolls and cause them to drop or to become distorted (Agrios, 1997). The disease

¹Department of Entomology, Faculty of Agriculture, Hajee Mohammad Danesh Science & Technology University, Dinajpur 5200. ²Department of Pathology, Faculty of Agriculture, Hajee Mohammad Danesh Science & Technology University, Dinajpur 5200, ³ Regional Cotton Research Centre, Sadarpur, Dinajpur 5200.

is caused by *Xanthomonas campestris* pv. *malvacearum* (F. F. Smith). It is an aerobic, Gram-negative, short motile rod, and provided with a single polar flagellum (Mehrotra and Aggarwal, 2003). The bacteria are disseminated from the leaf stem lesions to the bolls where the spots are formed by wind-blown rain (Pandey, 1989). This disease is an externally as well as internally seed-borne in nature (Verma, 1995). This disease transmit mechanically through the insect pests, *Earias* spp. and *Dysdercus koeningii*, (Mehrotra and Aggarwal, 2003). Mangement of insect pests by treatment of seed with sulphuric acid and organo mercurial compounds, Vitavax-200, Streptomycin sulphate (Mehrotra and Aggarwal, 2003). Besides this mangement of insect pests, spraying of insecticides is also reduced the disease incidence (Chopra, 1998).

An insecticide highly protects the crop plants and allows them to grow in a healthy environment. As a result, number of bolls, plant height and individual boll weight are superior compared to unprotected crop. So, insecticides increase vigour and help to develop good agronomic characters and boll rot disease also decrease. But it is seen from the review and literatures such type of information have a great lack in Bangladesh. So, a study was under taken to know the effect of Asataf 75SP, Admire 200SL, Imitaf 20 SL, Dursban 20EC, Chloropyriphos 20EC, Actara 25WG and Marshal 20 EC on boll rot disease and agronomic characters and to reduce the escalating cost of cotton cultivation.

MATERIALS AND METHODS

The study was conducted in the “Regional Cotton Research, Training and Seed Multiplication Farm, Sadarpur, Dinajpur” during the period from August 2006 to February 2007. The study was conducted in randomized complete block design (RCBD) with 8 treatments and 3 replications. The plot size was 5.4m x 5m. The spacing between block to block and plot to plot was 1.5 m and 1m, respectively and footpath was 2m. Seeds were sown in rows on the 3 August 2006; at the rate 15 kg/ha. A distance of 45 cm from plant to plant and 90 cm from row to row distance was maintained with depth of 1 cm to 1.5cm of the soil and these were covered with loose soil. A popular variety (CB-10) used this experiment. Application of fertilizers and intercultural operations such as mulching, weeding and irrigation etc were done as recommended for cotton crop in Bangladesh (Anonymous, 2008). Counts of boll rot disease were done after 2 weeks of DAS. In each replication 5 plants were selected randomly for the examination. Scouting was done once in a week and on the same day in each week. The scouting plants were selected along in a zigzag method throughout the field, so that a representative sample was obtained. Cotton was harvested from the inner rows of the plots excluding the border rows to give the yield/ha. The cotton from the bulk areas was bulked up. All cotton weighed at the same time to avoid the hygroscopic effects. Variable cost and net return was calculated as per Tague and Shelstad (1981) and Ali and Karim (1990). The benefit cost ratios were calculated by dividing the net return by total variable costs of each treatment. Data obtained in the field from each treatment were analyzed by one way ANOVA (Analysis of Variance) and the mean values were separated by DMRT.

RESULTS AND DISCUSSIONS

Effects of insecticides on boll rot diseases: From the Table 1, it reveals that the treatment Admire 200 SL, Imitaf 20 SL and Actara 25 WG provided better protection and the numbers of bolls are less infected from this treatment compared to others. The level of infection ranges from 1.33-5.33. Maximum infection was found in the control and minimum in the Admire 200 SL treated plot but significant differences are existed between the treatments. So, an interaction is found between the toxicity of the insecticide and diseases and better the protection of crop. It assumes that the secondary infection causes from the insect bite and ultimately, leads to boll rot at the end. So, insecticide can reduce the indiscriminate attack of the diseases.

Effect of insecticides on agronomic characters of cotton: It is clear that the treatment Admire 200 SL, Imitaf 20 SL and Actara 25WG protected the crop from disease at young and allows them to grow in a healthy environment. As a result, number of bolls, plant height and individual boll

weight were significantly superior compared to other treatments. All treatments prove their efficacy significantly compared to control. Better nourishment and protection enhances crop yield. The similar result was found by Hossain *et al.* (2004).

Table 1. Effect of insecticides on agronomic characters of cotton

Treatments	Dose/ha	No. of spray	No. of infected boll/plant	No. of boll/plant	Individual boll weight (gm)	Plant height (cm)	Yield kg/ha
Asataf 75SP	600 gm	6	4.33b	23.33 bc	3.67ab	78.33bc	1250c
Admire 200 SL	200 ml	3	1.33e	35.33 a	3.92a	95.00a	1700ab
Imitaf 20 SL	200 ml	4	2.33cd	32.00 a	3.83ab	93.33a	1633.33b
Dursban 20 EC	1.4 litre	6	3.67b	24.33 bc	3.58b	83.33ab	1216.67c
Chloropyriphos 20 EC	1.4 litre	6	2.67c	25.33 b	3.58b	85.00ab	1245c
Actara 25 WG	200gm	3	1.67de	35.33 a	3.83ab	96.67a	1760a
Marshal 20 EC	1.4 litre	6	2.67c	20.67 c	3.58b	83.67ab	1175c
Control (water)	200 litre	6	5.33a	12.00 d	3.08c	66.67c	308.33d
LSD (5%)			0.97	4.58	0.28	14.93	115.34

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

Effect of insecticides on yield of seed cotton: In Table1 also revealed Imitaf 20 SL, Admire 200 SL and Actara 25 WG provided better protection and better harvested ensuring higher yield compared to other treatments. Yield from Actara 25 WG and Admire 200 SL treated plot was significantly higher than that of Imitaf 20 SL and other treatments. But significant difference was also found between the treatments. So, the effectiveness of Actara 25 WG and Admire 200 SL proved sustained ability in overall production of cotton.

Benefit cost ratio: Considering the variable costs like insecticide and labour Admire 200 SL and Actara 25 WG provided the maximum return 7.80 and 7.38 (Table-2). Imitaf 20 SL gave adequate profit 7.0 due to its fewer price than Actara 25 WG and Admire 200 SL. Other insecticides e.g., Asataf 75SP, Dursban 20 EC, Chloropyriphos 20 EC and Murshal 20 EC, though applied at higher dosages yet they failed to express their effectively.

Table 2. Pooled benefit cost ratio of insecticides applied at threshold level

Treatments	Dose/ha	No. of spray	Variable cost			Gross return			Benefit cost ratio
			Insecticide Tk	Labour Tk	Total Tk	Yield Kg/ha	Return Tk	Net return Tk	
Asataf 75SP	600 gm	6	3060	3840	6900	1250	40000	33100	4.80
Admire 200SL	200 ml	3	3600	3120	6720	1700	54400	47680	7.80
Imitaf 20SL	200 ml	4	3200	3360	6560	1633.33	52266.56	45706.56	7.00
Dursban 20EC	1.4 litre	6	6300	3840	10140	1216.67	38933.44	28793.44	2.84
Chloropyriphos 20EC	1.4 litre	6	6300	3840	10140	1245	39840	29700	2.93
Actara 25WG	200 gm	3	3600	3120	6720	1760	56320	49600	7.38
Marsel 20EC	1.4 litre	6	6300	3840	10140	1175	37600	27460	2.71
Control(water)	200litre	6	00	3840	3840	308.33	9866.56	6026.56	1.57

Insecticide costs

Asataf 75SP	- 850.00 Tk/kg
Admire 200 SL	- 6000.00 Tk/litre
Imitaf 20 SL	- 4000.00 Tk/litre

Dursban 20EC	- 750.00 Tk/litre
Chloropyrifos 20 EC	- 750.00 Tk/litre
Actara 25WG	- 6000.00 Tk/kg
Marshal 20 EC	- 750.00 Tk/litre

Seed cotton 32.00 Tk/kg

Labour 2 labour/spray/ha
Hand picking 4labours/ha and 5 times
120 Tk/labour/day

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