

Original Research Article

Alternation of Insecticide Sprays for the Management of Bollworms and Effect of Natural Enemies of *Bt* Cotton

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ABSTRACT

An experiment was conducted during *kharif* 2014 at RVSKVV Gwalior, College of Agriculture, Indore (M.P.) All India Coordinated Cotton Improvement Project Indore (MP). In randomized block design. The least open boll damage was recorded in T3- Imidacloprid (17.8%SL) @ 25 *gai/ha* & Acephate (75%SP) @ 250 *gai/ha*. (2.66%). further locule damage per cent was noticed minimum in T4- thiamethaxam WG @ 37.5 *gai/ha* and Imidacloprid 30.5 SC @ 26.25 *gai/ha* (3.56%). The highest seed cotton yield was observed in T7- Acetamiprid (20%SP) @ 30 *gai/ha* & Difenthiuran (50%WP) @ 300 *gai/ha*. received maximum net return (Rs.121313) with maximum cost benefit ratio (1:2:81) at par with T6- Fipronil (5%SC) @ 100 *gai/ha* & Lambdacyhalothrin (4.9%EC) @ 15 *gai/ha*. In which (3105 kg/ha) yield was recorded and second highest net return (112092 kg/ha) and cost benefit ratio (1:2.60) was noticed.

Keywords

Insecticides,
Natural enemies,
Bollworms, Crop,
Bt cotton

Introduction

Cotton (*Gossypium* sp.) is an important *Kharif* cash and fibre crop of India. Cotton is known as the “white gold”. Belongs to family Malvaceae. The new world cotton *viz.*, *G. hirsutum* (L.) cultivated in about 60 countries in the world. With the production of cotton is 29.59 million bales. In India, cotton is grown in almost all parts of the country but it is produced mostly in the black soil areas and also to a considerable extent in the upper part of the Indo-Gangetic alluvium. In Madhya Pradesh cotton is mainly grown in Nimar and Malwa Plateau, besides being the main source of raw material for textile industry in

the country, it also provides cotton seeds of high industrial value.

Important insect pests of cotton crop are bollworm complex and sucking pests. Among the sucking pests, aphid (*Aphis gossypii* Glover), leafhopper (*Amrasca biguttula biguttula* Ishida), thrips (*Scirtothrips dorsalis* Hood) and whitefly (*Bemisia tabaci* Gennadius) attack at the early stage of the crop, while bollworms *viz.*, spotted bollworm (*Earias vittella* Fabricius and *Earias insulana* Boisduval), American bollworm (*Helicoverpa armigera* Hubner) and pink bollworm (*Pectinophora gossypiella* Saunders) are the most serious pests during the fruiting stage of the crop.

The continuous cultivation of *Bt* cotton reduces the infestation of boll worms and increases the activities of sucking pests. It is also in tradition that a numbers of sprays of various insecticides are required to control pests. the continuous and repeated application of various insecticides has created many fold resistance against insecticides (Singh & Jaglan, 2005 and Sayyed *et al.*, 2011) To avoid the resistance against pesticides, repeated spray of same insecticide is not recommended and insecticides should always be used alternatively viewing the above facts the present study is planned to use two insecticides alternatively in one treatment.

Materials and Methods

The experiment was carried out in Randomized Block Design (RBD) with eight treatments and 3 replications, which is depicted through figure 1 and 2. In this experiment seven insecticidal treatments (two insecticides in each treatment) were evaluated along with one untreated check. Thus eight treatments were evaluated and the details of experiment are given below (Table 1).

Results and Discussions

Efficacy of insecticides against bollworm complex

The least open boll damage per cent was recorded in T3- Imidacloprid 17.8 SL @ 25 gai/ha and Acephate 75 SP (2.66%) and exhibited non significant difference within T6- Fipronil 5 SC and Lambdacyhalothrin 4.9 EC (2.85), T1- Imidacloprid 70 WG & Oxydemeton Methyl 25 EC (2.93), T2- Thiachlorprid 21.7 SC and Dimethoate 30 EC (3.26%), T4- thiamethaxam 25 WG and Imidacloprid 30.5 SC (3.32%). further locule damage per cent was noticed minimum in T4-

thiamethaxam WG and Imidacloprid 30.5 SC (3.56%) and found at par with T6- Fipronil 5 SC and Lambdacyhalothrin 4.9 EC (3.74%) and T3- Imidacloprid 17.8 SL and Acephate 75 SP (3.99%), T2- Thichlorprid 21.7 SC and Dimethoate 30 EC (4.22) and T5 Spiromesifen 22.9 SC and Deltamethrin 2.8 EC (4.36). The present finding supported by Prasad and Rao (2008), Kumar *et al.*, and (2012) Naik *et al.*, (2013) (Fig. 1 and Table 2).

Adverse effect of insecticides against natural enemies

The total number of natural enemies *viz* chrysoids, coccinellids and spiders were observed collectivity on five randomly selected plants from each plot before 1st spray and 10 days after each spray. The population of natural enemies was found in the range of 16.95 to 21.18 per five plants and exhibited non significant difference in all the treatments including untreated check. Similarly it also differed non significantly in the last observation of each spray although slight population fluctuation was noted in each treatment. During the significant in the present investigations of insecticidal in of treatments was observed against natural enemies. Sharma *et al.*, (2008), Fonseca *et al.*, (2008), Patel *et al.*, (2010) and Sohrabi *et al.*, (2012).

Treatment

T1- Imidacloprid and Oxydemeton methyl
T2-Thiachlorprid and Dimethoate
T3- Imidacloprid and Acephate
T4- Imidacloprid and Thiamethoxam
T5- Spiromesifen and Deltamethrin
T6- Fipronil and Lambdacyhalothrin
T7- Acetamiprid and Diafenthiuron
T8- Untreated check (Fig. 2 and Table 3).

Table.1 Experimental detail

Crop	Cotton <i>Bt.</i>
Hybrid	NCS 927
Design	RBD (Randomized Block Design)
Replications	3
Treatments	8
Plots	24
Gross plot size	2.4 x 2.4 = 5.76 m ²
Net plot size	1.8 x 1.8 = 3.24 m ²
Spacing	0.6 x 0.6 m ²
Spacing replication	1.0 m
Spacing plots	1.0 m

Table.2 Damage by bollworm complex and seed cotton yield

Treatments	Dosage	Damage by bollworm complex		Seed cotton yield (Kg/ha)
	g.a.i./ha	Open boll damage %	Locule damage %	
T1	24.5 and 250	2.93 (9.86)	4.66 (12.47)	2441
T2	30.0 and 250	3.26 (10.40)	4.22 (11.85)	2060
T3	25.0 and 250	3.78 (11.21)	3.99 (11.52)	1779
T4	26.25 and 37.5	3.32 (10.50)	4.36 (12.05)	2884
T5	144 and 15.0	2.66 (9.39)	3.56 (10.88)	2416
T6	100 and 15.0	2.85 (9.72)	3.74 (11.15)	3105
T7	30.0 and 300	3.95 (11.46)	4.45 (12.18)	3264
T8	—	4.63 (12.43)	5.48 (13.54)	1325
S Em±		0.36	0.47	10.81
CD at 5 %		1.03	1.33	32.49
CV %		6.03	6.97	146.64

The values in parentheses are square root transformed values.

DAS = Days after spray.

Table.3 Effect of treatments on natural enemies

Treatments	Dosage	Pre-treatment	Natural Enemies (Coccinellid, chrysopids and spiders)/five plants					
	g.a.i./ha		1 st spray	2 nd spray	3 rd spray	4 th spray	5 th spray	6 th spray
			10 DAS	10 DAS	10 DAS	10 DAS	10 DAS	10 DAS
T1	24.5 and 250	17.52 (4.2)	17.64 (4.3)	18.34 (4.3)	21.22 (4.7)	19.21 (4.4)	18.34 (4.3)	14.39 (3.9)
T2	30.0 and 250	16.95 (4.2)	18.44 (4.4)	14.67 (3.9)	17.11 (4.2)	15.72 (4.0)	14.67 (3.9)	13.44 (3.7)
T3	25.0 and 250	18.12 (4.3)	16.29 (4.1)	19.27 (4.4)	13.21 (3.7)	21.06 (4.6)	19.27 (4.4)	17.34 (4.2)
T4	26.25 and 37.5	18.37 (4.3)	18.1 (4.3)	15.19 (4.0)	17.82 (4.3)	16.13 (4.1)	15.19 (4.0)	18.64 (4.4)
T5	144 and 15.0	17.62 (4.3)	19.64 (4.5)	14.39 (3.9)	20.74 (4.6)	16.54 (4.1)	14.39 (3.9)	21.13 (4.7)
T6	100 and 15.0	19.12 (4.4)	19.21 (4.4)	17.31 (4.2)	17.35 (4.2)	15.78 (4.0)	17.64 (4.3)	21.91 (4.7)
T7	30.0 and 300	21.18 (4.7)	20.68 (4.6)	18.81 (4.4)	16.89 (4.2)	19.31 (4.5)	18.44 (4.4)	19.74 (4.5)
T8	---	18.14 (4.3)	17.55 (4.2)	15.96 (4.1)	18.37 (4.3)	19.27 (4.4)	16.89 (4.2)	20.62 (4.6)
S Em±		NS	NS	NS	NS	NS	NS	NS
CD at 5 %		NS	NS	NS	NS	NS	NS	NS
CV %		NS	NS	NS	NS	NS	NS	NS

The values in parentheses are square root transformed values.

DAS = Days after spray

Fig.1 Damage by bollworm complex and seed cotton yield

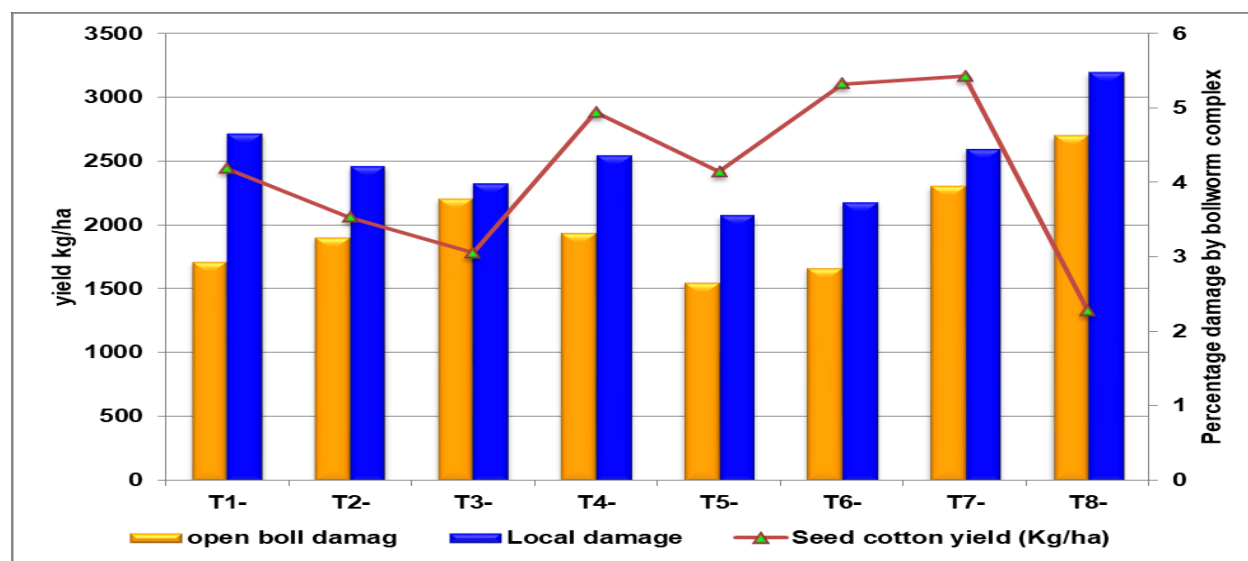
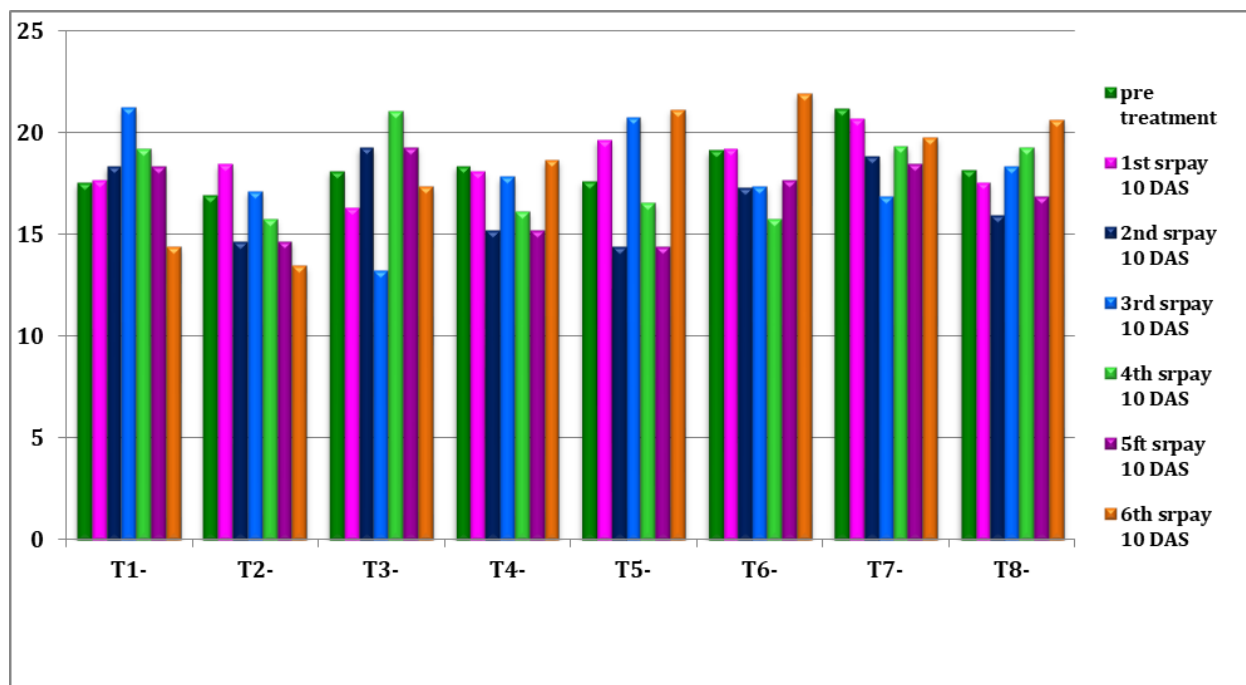


Fig.2 Effect of treatments on natural enemies



In conclusion, the highest seed cotton yield was observed in T7 (3264) and it was at par with T6 (3105) and followed with T4 (2884), T1 (2441), T5 (2416), T2 (2060) and T3 (1779). The minimum seed cotton yield was recorded in untreated check T8 (1325). Patil *et al.*, (2009) significantly highest seed cotton yield was harvested with higher dosage of fipronil 5% SC @ 800 g/ha which was on par with acetamiprid 20 SP@ 100 g/ha.

Based on over all expenditure and gain of treatments maximum cost benefit ratio was noted in T7 (1:2.81) followed by T6 (1:2.60), T4 (1:2.55), T1 (1:2.08), T5 (1:1.89), T2 1:1.66), T3 (1:1.40).

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