Evaluation of biocontrol based IPM module on cotton Hybrid10

I.S. Patel, G.M. Patel, V.J. Patel and F.K. Chaudhary

ABSTRACT

A field trial on testing of biocontrol based integrated pest management (IPM) module on cotton crop was conducted during three *Kharif* seasons 1999-2001. Results revealed that both the IPM modules (T1 and T2) proved more effective and economical against cotton pests than the insecticides modules in North Gujarat. These modules have also promoted the activity of natural enemies in cotton ecosystem.

Key words : Cotton, IPM, bioagents, cotton pests .

INTRODUCTION

Cotton crop is an important cash crop and cultivated over an area of 91.58 lakh hectares. with a production of 315 lakh bales (CCI, 2008). It is damaged by 1326 species of insects. Among them 16 species are of major importance resulting in an annual loss of 50-60 per cent of total production (Anonymous, 1996). This crop is known to consume about 55 per cent of toxic insecticides used in India. It is now an established fact that injudicious use of pesticides leads to several hazards such as development of resistance to insecticides. Destruction of natural enemies, alarming quantities of toxic residues of pesticides in food, water, soil etc. result in the serious problems of biological magnificence of pesticides through food chain. Previously IPM modules (Balakrishnan *et al.,* 2010; Swamy *et al.,* 2010) was available leafhopper, *Amrasca devastans* (Distant) (Murugesan and Kavitha, 2008; Murugesan and Kavitha, 2009) stem weevil and root rot complex (Vimala *et al.,* 2009), *Phenococcus solenopsis* and *Paracoccus marginatus* (Gulsar Banu *et al.,* 2010) for in view of the above, the present investigation was undertaken in North Gujarat region to develop bio-control based IPM module for cotton Hybrid-10.

MATERIALS AND METHODS

A field trial was conducted at Agronomy Instructional Farm, C.P. College of Agriculture, Sardarkrishinagar, S.D. Agricultural University during three consecutive *Kharif* seasons, 1999-2000, 2000 and 2001. G. Cot Hybrid -10 variety of cotton was selected for the experiment. Treatments were laid out in completely randomized design with 10 repetitions. Each IPM Block was arranged in 0.2 hectare area. The following four treatments were tested for its efficacy: installation of five pheromone traps (Ervit lure and helilure), border planting of maize, eight releases of Tricho card @ 1.5 lakh/ha/week, mechanical collection of infested birds/ bolls and application of neem oil @ 0.5% (T1), As per T1 and need based application of chlorpyriphos 0.05 % and endosulfan 0.07 % after eight releases of *T. chilonis* (T2), need based application of methyl-o-demeton 0.05%, chlorpyriphos 0.05 %, imidacloprid 0.005%, endosulfan 0.07 % and fenvalrate 0.01% (T3) and control (T4).

For sucking pests counting the entire plot was divided into 10 divisions. From each division five plants were selected at random and tagged. The observations on population of aphids, jassids and thrips were recorded from three leaves of tagged plants from lower, middle and upper region at fortnight interval. Healthy and damaged buds/bolls were counted from each tagged plant and the extent of damage (%) was worked out at fortnight interval for bollworms. Weight of seed cotton was recorded from net plot at each picking and from these data yield in kg/ha and economics was computed considering the market price of various inputs and seed cotton.

RESULTS AND DISCUSSION

Perusal of results presented in Table 1 revealed significantly low aphid and jassid population in different modules as compared to control plot. It was further evident that aphid population was at a par in T1 and T2; significantly lower than insecticide module during all the years. In pooled results, the treatments did not differ significantly. however, the interactions were significant. The jassid population was the lowest in T1 during 1999-2000 but during the remaining two years and in pooled results it was the lowest in T2. The pooled results also indicated T1 and T2 modules were at a par and significantly better in controlling jassid population. Thrips population differed significantly among various modules during the year 1999-2000, 2001-2002 and in pooled results. Among three modules tested, T2 module showed the lowest thrips population and it was better than insecticide module, since IPM plots which received no insecticidal spray (T1) or less insecticidal spray (T2). The population of most of the bioagents *viz., Chrysoperla carnea* (Egg+Larva), *Menochilus sexmaculatus* and *Coccinella septumpunctata* (all stages), *Geocoris* sp. and *Staphylinids* was greater in IPM modules than on insecticide module. Thus these IPM modules have resulted in conservation of the important bio agents.

On the other hand, population of these natural enemies was greatly hampered in insecticide module. This indicated the presence and the occurrence of several bio agents in cotton growing areas of this agro climatic condition even under high pesticide regime. Further it was also observed that border planting of maize enhanced the activity of lady bird beetle and *Chrysoperla* in both the IPM modules. These might have

Table 1. Comparative population of sucking pests in different IPM modules

Treatment	Sucking pests / 3 leaves **		
	Aphid	Jassid	Thrips
T1	1.72* (2.46)	1.34 (1.29)	1.63 (2.15)
T2	1.75 (2.56)	1.15 (0.82)	1.13 (0.77)
T3	3.32 (10.52)	1.83 (2.84)	2.12 (3.99)
T4	4.33 (18.25)	2.87 (7.74)	2.72 (6.89)

* X ± 0.5 transformed value, while those in parenthesis are retransformed values; ** Mean of three years

played an important role in suppressing the population of sucking pests in IPM blocks. Results in Table 2 revealed that the damage due to *E. vitella* differed significantly among all treatments. T2 had significantly the lowest bud damage and was at a par with T1. However, T1 recorded the lowest significant boll damage but was at a par with T2. Such significant reduction of bud as well as boll damage in IPM block may be attributed to the integration of various bio intensive components resulting in reduced pesticides load in these blocks.

During 2001-2002, bud damage due to *Helicoverpa armigera* was significantly low in T2, while boll damage was found significantly low in T1 and T2. Both the modules gave better protection to buds and bolls over insecticides and untreated blocks. Though, pooled results were non significant for *H. armigera* damage. The hand picking of infested materials proved effective in removal of *E. vitella* from the crop. The materials reared out several natural enemies*viz., R. aligarensis* and *Cotesia* were further released in the same IPM module plot. Bharpoda *et al*. (2000) also observed that the IPM modules proved significantly effective by managing the population of bollworms and sucking pests on Cotton Hybrid-4.

The maximum net realization was obtained from the treatment of T2 followed by T1. The ICBR was however, the highest in T1 module followed by T2 module. Thus, both the IPM modules proved more effective and economical against cotton pests than the insecticide module in north Gujarat a giving higher ICBR and promoted activities of natural enemies of insect pests (Table 3).

Table 2. Extent of bud damage due to bollworm pests in different IPM modules

Treatments	% infestation**			
	E. Vitella		H. armigera	
	Bud damage	Boll damage	Bud damage	Boll damage
T1	20.54* (12.3)	16.78 (8.31)	8.06 (2.0)	7.79 (1.85)
T2	20.05 (11.7)	18.91 (10.5)	7.74 (1.8)	7.73 (1.85)
T3	35.87 (34.3)	35.87 (34.3)	17.41 (8.9)	15.34 (7.0)
T4	44.38 (48.9)	50.39 (59.3)	17.89 (9.4)	15.19 (6.81)

*" X ± 0.5 transformed value, while those in parenthesis are retransformed values; ** Mean of three years

Table 3. Economics and ICBR of the treatments (Pooled)

Treat - ment	Yield (kg/ha)	incr-ased yield (kg/ha)	net gain over control (Rs./ha)	cost of treat -ment (Rs./ha)	Net realiza - tion	ICBR
T1	1741	722	16606	3754	12852	1:3.42
T2	1869	850	19550	5234	14316	1:2.73
T3	1387	368	8464	4766	3698	1:0.77
T4	1019	-	-	-	-	-

Market price of seed cotton: Rs. 23 /Kg

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