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M Rajashekhar

Professor Jayashankar
Telangana State Agricultural
University, Telangana, India

B Rajashekhar

Professor Jayashankar
Telangana State Agricultural
University, Telangana, India

Dr. T Prabhakar Reddy

Professor Jayashankar
Telangana State Agricultural
University, Telangana, India

K Ramakrishna

Professor Jayashankar
Telangana State Agricultural
University, Telangana, India

Dr. Adi Shankar

Professor Jayashankar
Telangana State Agricultural
University, Telangana, India

Dr. Afifa Jahan

Professor Jayashankar
Telangana State Agricultural
University, Telangana, India

Dr. M Jagan Mohan Reddy

Professor Jayashankar
Telangana State Agricultural
University, Telangana, India

Corresponding Author:**M Rajashekhar**

Professor Jayashankar
Telangana State Agricultural
University, Telangana, India

IPM: An ecofriendly and low cost technology in arresting pest complex for higher net returns in cotton

M Rajashekhar, B Rajashekhar, Dr. T Prabhakar Reddy, K Ramakrishna, Dr. Adi Shankar, Dr. Afifa Jahan and Dr. M Jagan Mohan Reddy

Abstract

In Nagarkurnool district of Telangana state the Cotton crop is being cultivated in 1,19,059 ha mainly in shallow soils which are poor in fertility as well as water holding capacity. The farmers don't have the sufficient knowledge on IPM components to manage the pests and diseases in Cotton crop. To overcome these problems KVK, Palem has been organized Front line demonstration on promotion of IPM in *Bt* cotton in 10 locations every year from three years i.e. 2016-2018. Regular monitoring, Seed treatment with *Pseudomonas fluorescence* @ 30g/kg seed, stem application by using rolling stem applicators with monocrotophos 36% SL @ 1: 4 ratio at 30, 60 and 70 days intervals and installation of yellow sticky traps was reduced the incidence of sucking pest complex up to 25-30%, erecting of pheromone traps 8/acre at flowering to square formation stage, bird perches @ 20/acre, Spraying of Azadiractin 1500ppm @ 5ml/litre of water at boll formation stage and need based spraying of insecticides the incidence of Pink bollworm (PBW) is below the ETL up to first picking, but after the first picking due to prolonged dry spells, poor plant vigour the PBW flared up. The results revealed that in frontline demonstration on IPM in cotton an average three year yield recorded was 20.38 q/ha as compared to the farmer's practice which was 18.33q/ha with the average benefit cost ratios are 1:1.33 and 1:1.09 and with net returns of 24,691/- compare to farmer practice 7682/- respectively. However, with the IPM module five pesticidal sprays were reduced by saving an amount of 6000/-.

Keywords: Cotton, pink bollworm, sucking pests, front line demonstration, IPM

Introduction

In India cotton crop is being cultivated in an area of 119.78 lakh hectares with a production of 365 lakh bale of seed cotton which accounts to 35% of the world area ^[1]. India is one of the largest producers as well as consumers of cotton in the world. In India approximately 62% of the cotton area is under rainfed ecosystem and only 38% of area is under irrigation. Cotton is one of the most important commercial & cash crops which accounts for around 25% of the total global fibre production. In the world, India is the only country which cultivates all the four species of cotton. In India, there are nine major cotton growing states, which are grouped into three diverse agro-ecological zones, i.e., Northern zone comprising of Punjab, Haryana and Rajasthan, Central zone includes the States like Gujarat, Maharashtra and Madhya Pradesh and Southern zone comprising of States like Telangana, Andhra Pradesh and Karnataka ^[2] (Ref: Ministry of textiles). After the introduction of *Bt* Cotton (BG-1, cry1Ac) in 2002 and (BG-II, cry1Ac and cry2Ab) in 2006 the incidence of bollworm complexes on the crop has drastically reduced. Both the production and productivity of cotton in India have improved significantly during the past few decades. The incidence of Pink Bollworm (PBW) & other sucking pests are increasing since the recent past. In India the productivity levels are very low compared to USA & China.

In Nagarkurnool district of Telangana state the cotton crop is being cultivated in red soils occupying an area of 1,19,059 ha ^[3]. Regularly the crop is being encountered with the attack of sucking pests complex and Pink bollworm (PBW) which are causing huge losses to the crop. The farmers are investing on an average of Rs.10,000-12,000/acre on pesticides to control pests and diseases. This is causing huge damage to the natural resources as well as natural enemies which in turn bring down the net incomes levels of the farmers. One of the drawbacks in the successful cultivation of this crop is its susceptibility towards the attack of the pests. Amongst various reasons of low yield, losses caused due to insect pests are one of the

important factors in cotton. The crop is vulnerable to insect pests right from germination to harvesting [4]. Cotton in Nagarkurnool district is being cultivated mainly in red soils which are poor in fertility as well as water holding capacity which leads to manifestations of susceptibility to many pests and diseases. Hence awareness among the farmers need to be created on IPM components to manage the pests and diseases in cotton crop.

Materials and Methods

The frontline demonstrations (FLD) on Integrated Pest Management (IPM) in cotton was conducted in farmers fields to demonstrate the impact of IPM in cotton on the reduction in pest incidence & yield increase over three years during *kharif* 2016-17 to 2018-19. Each demonstration was laid out in area of 1 acre and adjacent 1 acre was considered as control for comparison studies. The IPM components comprised of *Pseudomonas fluorescens*, yellow sticky traps, pheromone traps with lures, Azadiractin (1500 ppm), Thiodicarb, Monocrotophos and Imidacloprid listed in (Table.1) distributed to the farmers. The above IPM components served

as a module for demonstrating in the farmer's field against the sucking pest complex and PBW. Apart from showcasing the viability of the above IPM components, the farmers were also sensitized on the relevance of these technologies by organizing Pre-Kharif awareness programmes, focused group discussions, conducting method demonstrations, training programmes and sending timely messages through AKPS, IFN and Whats app groups. They were also oriented on importance of stem application with Monocrotophos (1:4 ratio) and with Imidacloprid (1: 20 ratio) at 30, 60 and 70 days of the crop growth.

The FLD was conducted to study the potential yield reduction factors that are mainly due to the pests and yield difference between the farmers practice and demonstration⁵. A random crop cutting experiment was conducted and the yield data of farmer's practice and demonstration trial was recorded. The qualitative data was converted into quantitative form and expressed in terms of per cent increase in yield. Other data parameters like cost of cultivation, gross returns, net returns and benefit cost ratio were recorded.

Table 1: List of critical inputs provided as a IPM Module

S. No	Name of the input	Quantity supplied/acre
1.	<i>Pseudomonas fluorescens</i>	30g
2.	Yellow sticky traps	15
3.	Pheromone traps with lures	8
4.	Azadiractin (1500 ppm)	1 litre
5.	Thiodicarb	300g
6.	Monocrotophos and Imidacloprid	100 ml

Results & Discussions

The three years results of the frontline demonstrations are presented in the table-2. The results revealed that in frontline demonstration on IPM in cotton an average yield recorded was 20.38 q/ha as compared to the farmer's practice which was 18.33q/ha (Fig.1). The highest yield in FLD plot was 22.75q/ha in 2017-18 and in farmer's practice it was 21.35q/ha in the same year and the lowest yield was recorded in 2016-17 which was mainly due to the prolonged dry spells followed by severe incidence of sucking pests and PBW. The average percentage of yield increase was 10.26% and benefit cost ratio over the three years in demonstration was 1.33:1 when compared to farmer's practices which were 1.09:1 (Fig.2). This results clearly indicated that the higher average cotton yields in demonstration plots over the three years was mainly due to the adoption of IPM technologies comprised of seed treated with *Pseudomonas fluorescens* @ 30g/kg seed, and installation of yellow sticky traps @ 15/acre at 30 days after sowing, stem application with Monocrotophos and Imidacloprid at vegetative to boll formation stage *i.e.* 30,60,70 days was reduced the incidence of sucking pest complex up to 25-30% and installation of Pheromone traps with lures @ 8/acre at the time of flowering and spraying with Azadiractin (1500 ppm) @ 1litre/acre at the initial flowering stage and if the trap catches more than 8 adult moths sprayed with Thiodicarb @ 300g/acre were further reduced the incidence of PBW. The above IPM package of practices had drastically reduced the incidence of pests which ultimately lead to yield increase in cotton crop and the results were in accordance with the earlier reports [6].

Conclusion

Five pesticidal sprays were reduced by saving an amount of 6000/-. The population of natural enemies like Coccinellids, Syrphids, Spiders and parasitoids was significantly increased. The crop growth was luxurious and had not seen any phytotoxicity due to the absence of indiscriminate sprays. The fellow farmers of the village as well as from other mandals have approached KVK to procure and install various IPM components in their respective fields to arrest the sucking pests complex and PBW.

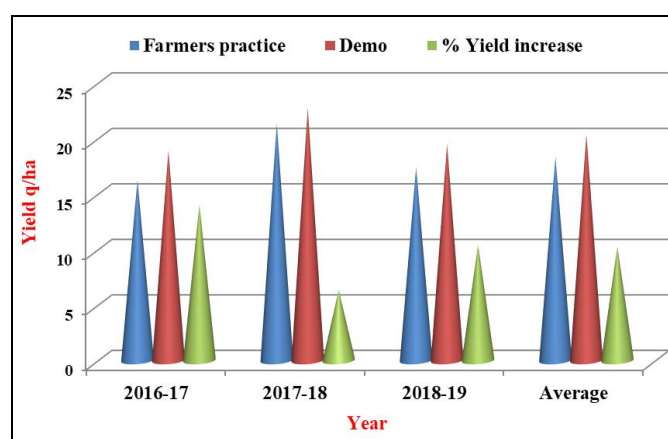


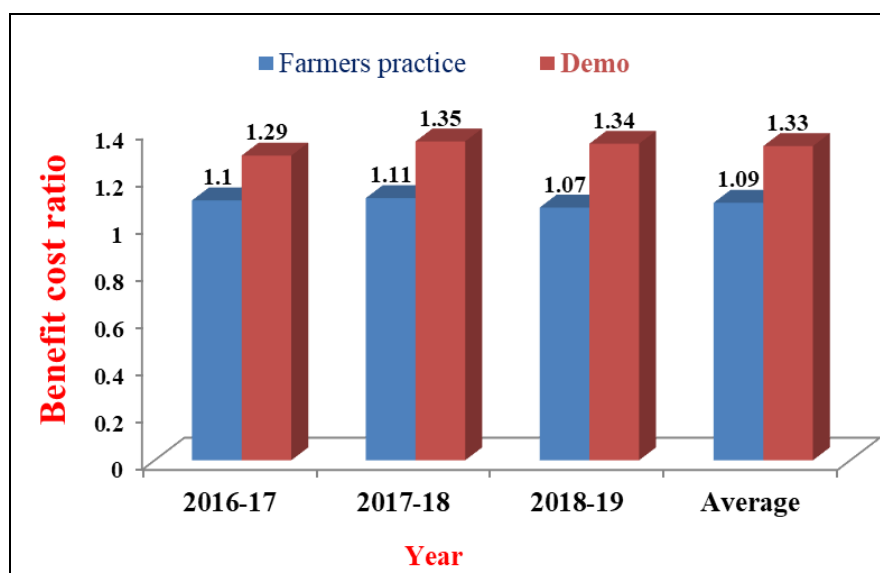
Fig 1: Average yield and percentage increase yield data in farmers practice and demo

Table 2: Average data pertaining to the IPM in Cotton

S. No	Year	Area (Acres)	Yield q/ha			Gross returns Rs./ha		Cost of cultivation Rs./ha		Net returns Rs./ha		B:C	
			Farmer practice	Demo	% Increase	Farmer practice	Demo	Farmer practice	Demo	Farmer practice	Demo	Farmer practice	Demo
1	2016-17	10	16.25	18.9	14.02	92780	96470	84560	74560	8220	21910	1.10	1.29
2	2017-18	10	21.35	22.75	6.33	96075	102375	86875	75912.5	9875	26462.5	1.11	1.35
3	2018-19	10	17.4	19.5	10.42	89610	100425	83984	74722.5	5626	25702.5	1.07	1.34
4	Average	30	18.33	20.38	10.26	92821.67	99756.67	85139.67	75065	7682	24691.67	1.09	1.33



Supporting quotes & images

**Fig 2:** Year wise benefit cost ratio in farmers practice and demo**References**

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