Impact of frontline demonstrations on management of sucking pests in cotton using IPM technology

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 Received: 05.07.2021/Accepted: 20.07.2021

ABSTRACT

Krishi Vigyan Kendra, Banavasi, Andhra Pradesh conducted frontline demonstrations (FLDs) on management of sucking pests in cotton using IPM technology in 30 farmers' fields in western part of Kurnool district, Andhra Pradesh for three years. The technology included stem application of monocrotophos (1:4) at 30 and 45 days after sowing (DAS) with imidacloprid (1:20) at 60 DAS and erection of sticky traps @ 10/acre. Average yield recorded in demonstration plots was 1,942 kg/ha compared to 1,767 kg/ha in check plots. The increment in yield over check was 9.9 per cent. The cost of cultivation in demonstration plots (Rs 45,950) was reduced by 8.6 per cent compared to Rs 50,250 in check plots. In demonstration plots higher net return of Rs 42,133/ha with B-C ratio of 1.94:1 was observed as against check plots having net return of Rs 30,683/ha with B-C ratio of 1.62:1.

Keywords: Cotton; frontline demonstrations; stem application; sucking pests

INTRODUCTION

In India, the cotton crop is being cultivated in an area of 125.84 lakh ha with a productivity of 486 kg/ha. The yield of cotton is being greatly reduced due to the incidence of boll worm. After the introduction of Boll Guard technology using *Bt* gene technology, sucking pests like jassids, thrips, whiteflies, aphids and mealy bugs became major problem. If these pests are not managed at early stages, they may affect the crop growth, flowering and boll formation and ultimately the production and productivity. In *Bt* cotton the estimated yield losses due to sucking pests under unprotected field conditions was 26.21 per cent (Makwana et al 2018).

Frontline demonstration (FLD) is a significant tool to demonstrate recommended technology to provide solution to a problem in farmers' fields. KVK scientists play an important role in laying out FLDs. The main objective of the present study was to demonstrate recommended plant protection measures against sucking pests in cotton. The technology interventions of these demonstrations included stem application of monocrotophos (1:4) at 30 and 45 days after sowing (DAS) and imidacloprid (1:20) at 60 DAS and erection of sticky traps @ 10/acre.

There are many advantages of stem application of pesticides. It requires low cost equipment only and doesn't need any skill to operate. It is easy to apply as stem applicator (Plate 1) is light in weight, small amount of pesticide is used, doesn't cause harm to natural enemies, the technique is eco-friendly, risk of exposure to environment and human beings is less because the pesticide is not drifted and is well suited to rainfed areas as small quantity of pesticidal solution is used.

KVK, Banavasi, Andhra Pradesh demonstrated this technology in farmers' fields in the adopted villages of KVK. Technology gap, extension gap, technology index and differences in economic parameters between demonstration and farmers' practice were studied.

MATERIAL and METHODS

Frontline demonstrations were conducted at KVK adopted villages for three consecutive years from 2015-16 to 2017-18 at 30 locations of western part of Kurnool district, Andhra Pradesh during kharif season. The size of each FLD plot was 0.4 ha. The farming situation for the FLD was rainfed black soil.

Data were collected on yield potential of cotton crop in a given situation and demonstration yield was obtained using data from FLDs implemented in the farmers' fields. Farmers' yield was obtained with their own plant protection practices. For this study technology gap, extension gap and technology index were calculated as suggested by Samui et al (2000):

Technology gap: Potential yield – Demonstration yield

Extension gap: Demonstration yield – Farmers' yield

Technology index: Technology gap/Potential yield) ×100

RESULTS and DISCUSSION

Population of sucking pests: The population of sucking pests (jassids/thrips/whiteflies) was recorded on 3 leaves after stem application at three intervals for 60 days and data are given in Table 1. It was noticed that the population of sucking pests was less in demonstration plots as compared to farmers' practice. This might be due to stem application and use of yellow and blue sticky traps at early stages of crop. The average population of thrips was observed higher as compared to jassid and whitefly population in both the practices.

Plant protection: The data given in Table 2 show that the cost incurred on plant protection in demonstration plots (Rs 1,080) was less as compared to farmers' practice (Rs 1,925) per ha and was thus reduced by 43.8 per cent. The quantity of pesticide required for stem application (monocrotophos 500 ml) was less as compared to spraying which required nearly 800-1,000 ml per ha. These findings

Table 1. Sucking pests population in demonstration plots and farmers' practice

DAYS	Demonstration plots			Farmers' practice plots		
	Jassids/ 3 leaves	Thrips/ 3 leaves	Whiteflies/ 3 leaves	Jassids/ 3 leaves	Thrips/ 3 leaves	Whiteflies/ 3 leaves
30	3.55	5.85	2.8	5.5	9.15	4.7
45	4.8	7.95	5.65	8.1	11.9	7.75
60	8.1	13.8	8.35	11.25	17.6	12.1
Average	5.48	9.2	5.6	8.28	12.88	8.18

Table 2. Comparison of plant protection measures between demonstration plots and farmers' practice

Crop stage (DAS)	Demonstration plots			Farmers' practice		
	Application	Quantity of pesticide (ml)	Cost of plant protection (Rs/ha)	Application	Quantity of pesticide	Cost of plant protection (Rs/ha)
15-20	Erection of sticky traps (10 number)	-	100	Application of monocrotophos + acephate	800 ml + 750 g	910
30	Application of monocrotophos (1:4)	500	220	-	-	-
45	Application of monocrotophos (1:4)	500	220	Acetamiprid	100 ml	175
60	Application of imidacloprid (1:20)	100	540	Imidacloprid	150 ml	840
Total	-	-	1,080	-	-	1,925

Plate 1. Cotton stem applicator

are in line with those of Kumar et al (2019). As per scientific recommendation, neonicotinoid pesticides like imidacloprid and acetamiprid should not be used before 60 DAS but most of the farmers were using these chemicals before 60 DAS. Due to frontline demonstrations, farmers realized the importance of stem application technique as it required less quantity of the chemical which reduced the cost of cultivation.

Yield: The average Kapas yield of cotton under frontline demonstrations (1,942 kg/ha) was higher by 9.9 per cent as compared to farmers' practice (1,767 kg/ha) (Table 3). Similar yield improvement in different crops was documented through FLDs by Patel et al (2013) and Meena et al (2017).

Technology gap: There was a technology gap of 158 kg/ha (Table 3). The FLDs were conducted under close supervision of KVK scientists and this technology gap could be due to different weather conditions and soil fertility status which were not included in the present study. Hence location specific recommendations were necessary to bridge the gap.

Extension gap: The extension gap found was to the extent of 175 kg/ha (Table 3). It highlights the need to educate the farmers by various means viz trainings and method demonstrations for the adoption of recommended protection technologies.

Technology index: It shows feasibility of the technology demonstration at the farmers' fields. The technology index was 7.52 (Table 3). The lower value of the technology index indicates the more chances of feasibility. These findings are similar to the observations of Meena et al (2017).

Economic analysis of FLDs: The data in Table 4 reveal that the cost of cultivation in demonstration plots (Rs 45,950) was lower compared to the check plots (Rs 50,250). Similarly in demonstration plots higher net

Table 3. Yield, technology gap, extension gap and technology index of the frontline demonstrations vs farmers' practice

Component	Yield (kg/ha)	Increase over farmers' practice (%)	Technology gap (kg/ha)	Extension gap (kg/ha)	Technology index (%)
Demonstrations	1,942	9.9	158	175	7.52
Farmers' practice	1,767	-	-	-	-

Table 4. Economic analysis of frontline demonstrations vs farmers' practice

Details	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B-C ratio
Demonstrations	45,950	89,550	42,133	1.94:1
Farmers' practice	50,250	81,433	30,683	1.62:1
Decrease/increase over farmers' practice	-4,300	+8,117	+11,450	

return of Rs 42,133/ha with benefit-cost ratio of 1.94 was recorded as compared to the net return of Rs 30,683/ha with benefit-cost ratio of 1.62 in check plots.

In view of the advantages of using stem applicator in cotton cultivation, KVK, Banavasi, Andhra Pradesh developed an entrepreneur from Alurmandal of Kurnool district for supply of the stem applicators to farmers as well as departments, institutes and NGOs who were interested in using and testing its efficiency.

CONCLUSION

Cotton is major kharif crop of Kurnool district, Andhra Pradesh. Most of the farmers here had been using indiscriminate spraying of chemical pesticides for the control of sucking pests which increased their cost of cultivation. IPM technology in cotton reduces the risk of pesticide exposure to natural enemies and human beings besides controlling sucking pests. Hence the use of stem applicator and sticky traps (yellow/ blue) would serve as effective tools in the IPM approach. Frontline demonstrations on stem application technology proved effective in making the farmers to adopt this technology.

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