

Stem application technique for sucking pest management in cotton at tribal area of Andhra Pradesh

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ABSTRACT

Cotton is one of the most important fibre and cash crop in tribal area at Visakhapatnam district of Andhra Pradesh and plays a major share in the agricultural economy of the country. Nearly 65 per cent of cotton area is under rainfed and mainly in the plain and High altitude tribal areas of the district. Sucking pests of leaf hopper, white fly, thrips, mealy bugs, mites, red cotton bugs and aphids are becoming more serious, inviting indiscriminate use of pesticides in Bt cotton growing areas. Sucking pest incidence was controlled by the stem application of systemic insecticides *viz.*, monocrotophos 1:4 ratio at 20 days after sowing and imidacloprid 200 SL with 1:20 ratio at 40 and 60 days after sowing. Within three days of application the population of sucking pests was reduced. This technique is being demonstrated and documented for two years at 20 locations in tribal farmers fields of Visakhapatnam district. Stem application in cotton showed better performance by reducing sucking pests damage of aphids (1.89%), leaf hoppers (3.57%), white fly (5.86%), thrips (4.31%), mealy bugs (5.09%), red cotton bug (6.82%) and mite (8.31%) along with more number of bolls and kapas yield in demo plots when compared to the farmers practice aphids (16.16%), leaf hoppers (27.32%), white fly (37.29%), thrips (18.42%), mealy bugs (36.87%), red cotton bug (7.90%) and mite (25.43%). On an average both years cotton kapas yield (2111 kg/ha) under Front Line Demonstrations (FLDs) were higher by 19.76 per cent as compared to farmer's practices. Results from the study showed that farmers realized additional net income of Rs.17,260 due to increased cotton kapas yield by 19.76 per cent with reduction of cost of cultivation by Rs.3300, it could be attributed in reduction of manual labour requirement for stem application and also increase in yield.

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INTRODUCTION

Cotton as a cash crop as well as commodity has a

unique place in economy of India as it plays an important role in agrarian and industrial activities of the nation, In

Andhra Pradesh, total area of cotton cultivation is 6.66 lakh hectares and production 18.17 lakh bales with the productivity of 464 kg ha⁻¹ during 2015-16 (Agriculture Statistics at a Glance, 2016-17). Vizianagaram is one of major cotton growing districts in Andhra Pradesh. Tribal farmers growing cotton in 1463 ha during *Kharif* with average productivity of 361 kg ha⁻¹. Majority of tribal farmers growing only Bt cotton, the incidence of sucking pest complex is increasing continuously. More over farmers are facing difficulties of water availability near by their fields at initial cotton growth stage to mix spray fluid without water storage tanks in rainfed areas of Visakhapatnam district. Besides that, cost of cultivation increasing day to day due to many reasons *i.e.*, social status, situational factors and input cost. At present, cost of cultivation per hectare is between Rs.30,000 to Rs. 35000 mainly due to escalation of labour wages, scarcity of labour in villages during agricultural operations, requirement of labour is very intense at the time of critical growth stages of cotton. To overcome these problems, DAATT Centre, Visakhapatnam is promoting the stem application of systemic insecticides of monocrotophos 1:4 ratio with water at 20 days after sowing and imidacloprid 200 SL in 1:20 ratio with water at 40 and 60 days after sowing found effective in controlling the sucking pest like aphids, leafhoppers etc., at initial stages of crop growth.

MATERIAL AND METHODS

Scientists in DAATT Centre, Visakhapatnam district of ANGRAU in collaboration with Department of Agriculture has introduced stem application technology (Anonymous, 2002) in cotton with comparing normal method of cultivation through organizing Front Line Demonstrations (FLDs) during *Kharif*, 2018-19 and 2019-20 at 20 locations. The stem application method is popularizing through trainings and method demonstrations in FLD fields as well as in other farmer fields for the control of sucking pests and simultaneously tested the modified tools (Stem application bottles) under FLD for the better adoption. During the first and second year we have faced difficulties in the adoption and spread of this technology even though it is an effective. We have collected feedback from the farmers in which most of the farmers expressed that, the application with brushes is laborious and women labour is refusing to work for this due to chemical smell and contamination. Here we

have taken a simple intervention of using Plastic pipes inserted with brush which can overcome drudgery reduction for the application of chemical. Stem applicators were distributed to the farmers under demonstrations by the DAATT Centre, Visakhapatnam district. Wide publicity was given through electronic and print media on this stem application technology and farmers were well educated about the stem application technology through method demonstrations. Objectives includes to popularize the stem application technology cotton in the Visakhapatnam district through Front Line Demonstrations (FLDs) for management of sucking pest in cotton, to analyze the parameters for contributing to yield and economics of stem application technology in cotton in Visakhapatnam district and to educate the farmers on stem application for management of sucking pests by organizing FLDs and follow-up of extension programmes

The Scientists interacted with farmers and imposed the treatments of stem application as per designed methodology. Data pertaining to the per cent incidence of *leaf hopper, white fly, thrips, mealy bugs, mites, red cotton bugs, aphids* and number of bolls per plant, yield of kapas were recorded. Yield per 5x5m² was collected and calculated per hectare area. Average of yield attributes, yield and cost of cultivation were calculated in demonstrations and farmers practice. The statistical tools like average yield, percentage increase; average cost of cultivation was used. Per cent yield increase over normal method was calculated and comparative analysis of cost benefit ratio per hectare was arrived and presented in the tables. Also indicate tribal farmers name, villages and address in table.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Sucking pests damage:

The front line demonstration was executed during *Kharif*, 2018-19 and 2019-20 in tribal farmer fields at Visakhapatnam district. Observations on sucking pests damages were recorded at 20, 40 and 60 days after sowing in tribal farmers cotton fields during *Kharif*, 2018-19 and 2019-20. As per the Table 1 revealed that less damage of aphids (1.89%), leaf hoppers (3.57%), white

fly (5.86%), thrips (4.31%), mealy bugs (5.09%), red cotton bug (6.82%) and mite (8.31%) were recorded in stem application of monocrotophos at 20 days after sowing (DAS) and imidaclopride 200 sl at 40,60 DAS compared to farmers practice by adopting foliar spraying of cypermethrin at 20 DAS, monocrotophos at 40 DAS and chlorpyrifos at 60 DAS recorded more damage of aphids (16.16%), leaf hoppers (27.32%), white fly (37.29%), thrips (18.42%), mealy bugs (36.87%), red cotton bug (7.90%) and mite (25.43%), respectively. Regarding natural enemies recorded more activities of predators (18.90) viz., coccinelids, green lacewing bug,

spiders, wasps and parasite braconids (16.07) in stem application of monocrotophos at 20 days after sowing (DAS) and imidaclopride 200 sl at 40,60 DAS compared to less activities of predators (3.08) and parasites (5.80) in farmers practice (Table 1).

No of bolls per plant:

The main yield attribute during both the years were recorded better in demonstration plots than farmers practice (Table 1). During the two seasons of two years of demonstrations and in all the locations recorded the number of boll per/plan 140 are more than normal practice

Table 1: Relative efficacy of insecticides through stem application against sucking pests in cotton executed in tribal farmers fields during Kharif, 2018-19 and 2019-20

Sr.No.	Treatments	Farmer practice (% damage)											
		Aphids	Leaf hopper	White fly	Thrips	Mealy bug	Red cotton bug	Mite					
1.	Cypermethrin at 20DAS	23.51	36.15	38.64	14.35	9.34	6.47	12.64					
2.	Monocrotophos at 40 DAS	15.64	20.64	30.64	19.47	48.34	13.84	27.18					
3.	Chlorpyrifos at 60DAS	9.34	25.18	42.61	21.46	52.94	3.41	36.47					
	Average	16.16	27.32	37.29	18.42	36.87	7.90	25.43					
Scientific demonstration (% damage)		Natural enemies (No.s)											
Aphids		Farmer practice			Scientific		Predators					Parasites	
	Leaf hopper	White fly	Thrips	Mealy bug	Aphids	Red cotton bug	Mite	Predators	Parasites	Predators	Parasites		
	Mono at 20 DAS	5.62	12.64	5.94	13.94	3.15	10.64	13.64	3.26	2.65	13.70	9.65	
	Imida at 40	3.26	3.48	4.16	1.34	1.02	5.67	7.46	2.84	9.87	23.87	18.41	
	Imida at 60	1.84	1.47	2.84	0.00	1.50	4.15	3.84	3.14	4.87	19.13	20.14	
	Average	3.57	5.86	4.31	5.09	1.89	6.82	8.31	3.08	5.80	18.90	16.07	

Table 2: Mean data on yield and yield attributes of front line demonstrations (FLDs) on stem application technology in cotton conducted during Kharif, 2018-19 and Kharif, 2019-20

Season	No.of locations	No.of bolls per plant		Cotton kapas yield kg/ha		Percentage increase over check
		Stem application method	Farmers practice	Stem application method	Farmers practice	
Kharif, 2018-19	3	140	110	2150	1780	20.79
Kharif, 2019-20	3	141	92	2073	1746	18.73
	Average	140	101	2111	1763	19.76

Table 3: Economics of the stem application technology in cotton vs normal cotton cultivation method recorded during Kharif, 2018-19 and Kharif, 2019-20

Sr.No.	Particulars	Stem application method	Farmers practice	Difference
1.	Kapas yield kg/ha	2112	1763	349
2.	Kapas value (Rs.40/kg)	84480	70520	13960
3.	Total cost of cultivation Rs./ha	34500	37800	-3300
4.	Net income Rs./ha	49980	32720	17260
5.	C:B ratio	2.45	1.87	0.58

101 (Table 1). In the farmers practice observed more number of aphids, leafhopper, thrips and whiteflies. The management of sucking pests of cotton by stem application with monocrotophos (1:4) dilution 20 and imidacloprid 200 SL (1:20) using small brush at 40 and 60 DAS keep the crop free from sucking pests upto 75 days without harming natural enemies (Gaur *et al.*, 1999). Similar results were found as effective treatment with imidacloprid as stem smearing against sucking pests of cotton (Barkhade and Nimbalkar, 2000). This could be attribute that, managing sucking pests, more photosynthetic area of leaves are active and helped in more squares formation and resulted in more bolls per plant.

Kapas yield:

On an average, cotton kapas yield (2111 kg/ha) in Front Line Demonstrations (FLDs) was higher by 19.77 per cent as compared to farmer's practices (1764 kg/ha). The results indicated that the demonstration has given good impact in terms of yield and it could be due to more number of bolls per plant contributed to more kapas yield (Table 1).

Economics:

The results indicated that the demonstration with stem application has given good impact in terms of yield and income with a gross return of Rs.84480, net return of Rs.49980 and cost benefit ratio 2.45 as compared to farmers practice (gross income of Rs.70520, net income of Rs.32720 and cost benefit ratio of 1.87). Impact of the technology revealed that the additional net income realized by Rs.13960 over the farmer's practice (Table 2). This could be attributed stem application in cotton showed better performance when compared to the

farmers practice in the kapas yield in demo plots and also 3 to 4 sprayings required for control of sucking pests were reduced along with purchase of systemic insecticide and spraying cost of Rs.3300 per ha.

Conclusion:

The Front Line Demonstration on stem application of systemic insecticides implemented by DAATT Centre, Visakhapatnam helped the tribal farming community in many folds. Stem application is an eco-friendly, cost effective technology, reduced the cost on number of sprays and labour usage in cotton growing areas at High Altitude Tribal Agency. The technology was handed over to the Department of Agriculture for further popularization and hand holding after conducting field days and through T and V meetings of regular interaction with officers of Department of Agriculture.

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