FRONTLINE DEMONSTRATIONS: AN APPROACH FOR MANAGEMENT OF COTTON MEALYBUG, *PHENACOCCUS SOLENOPSIS* TINSLEY

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ABSTRACT

The present study was conducted to popularize the recommended practice for the management of cotton mealybug through frontline demonstrations in Panchmahals district of central Gujarat. Results indicated that application of insecticide in recommended practices, i.e., application of methyl parathion 2% dust on the soil @ 25 kg/ ha one month after germination followed by spray of profenophos 50 EC 0.1% (20 ml in 10 lit. water) at appearance of mealybug was found most effective in managing mealybugs (9.75/terminal shoot) as compared to farmers practices (23.17/ terminal shoot). The yield of cotton in recommended practice was 27.50 q/ha as compared to farmer's practices (23.90 q/ha). The percentage increased in the yield over farmer's practices was computed to be 15.06 q/ha. Results of study on economic analysis of the yield performance revealed that the recommended practices recorded appreciable higher gross returns (` 1,23,750/ha) and net return (` 77,225/ha) with higher benefit cost ratio (2.66) as compared to farmer's practices (2.08). The technology gap (7.50 q/ha), extension gap (3.60 q/ha) and the technology index values (21.42 %) were recorded. Frontline demonstrations brought out that the recommended practice was feasible and economically viable over farmers practice and was a better option to adopt for managing mealybug.

Keywords: *frontline demonstrations, insecticide, phenacoccus solenopsis tinsley, cotton*

INTRODUCTION

Mealybug, *Phenacoccus solenopsis* Tinsley is a serious pest of cotton limiting the production and quality of fibre and lint. It is a polyphagous pest and multiply on different hosts like field crops, horticultural, fruit, vegetable and ornamental plants. The insect has become a serious pest in cotton growing states in India. Jhala and Bharpoda (2008) has also reported 50% reduction in cotton yields in Gujarat during 2006 due to severe mealybug infestation. This coincided with the introduction of Bt cotton, its rapid adoption by the farmers, effective control of the bollworms and reduction in pesticide use. The pest became a threat to Bt cotton by 2006 and 2007 in Punjab, Haryana, Rajasthan, Gujarat and Maharashtra (Tanwar *et al*., 2007) and caused significant losses in cotton production. The farmers are suffering huge losses in yield and quality of cotton crop due to attack of various insect pests and diseases every year and this has further added to their damage. It is yellowish-green, oval in shape, somewhat rounded in lateral view, legs red, body covered by thin, white mealy wax with dark dorso-medial bare spots on inter segmental areas of thorax and abdomen forming one pair of dark longitudinal line on dorsum, ovisac ventrally with lateral wax filaments. It over winter as eggs on ratoon crop, stems, in soil, and inside crumpled leaves of fuel woods (Tanwar *et al.* 2008). Freshly laid eggs are orange but turn pink just prior to hatch. The crawlers disperse from the ovisac by way of walking, wind or ants. The nymphs feed and develop into adults in approximately 30 days. The insect has a life-cycle of 24–30 days. The female mealybug produces 10–15 generations/year in colonies of 500–600 eggs (Khaskheli 2007). Both nymphs and adults of mealybug feeds on the sap of leaves, tender shoots, bracts, bolls resulting in withering of leaves and shoots and affecting plant growth adversely (Bhosle *et al.* 2007) and ultimately reduce the seed cotton yield. Dhawan (1980) reported 58–73% reduction in seed cotton yields due to pink hibiscus mealybug.

As the pest was invading fast in newer areas, therefore, there was an urgent need to manage the menace of pest. Use of chemical insecticides is one of the most common and popular method of its control. Present study was undertaken to demonstrate the efficacy of methyl parathion followed by spray application of profenophos at appearance of mealybug infestation in the field under farm conditions. In view of the above factors, frontline demonstrations were

undertaken in a systematic manner on farmers' field to show the efficacy of recommended technology and convince the farmers to adopt the same.

METHODOLOGY

The field experiments were carried out during Kharif season of 2012-13 to demonstrate the efficacy of methyl parathion 2% dust on the soil @ 25 kg/ ha one month after germination followed by spray application of profenophos 50 EC 0.1% (20 ml in 10 lit. water) at appearance of mealybug infestation in the field and also added detergent powder @ 10 g in 10 litres of spray fluid in the control of the mealybug under FLD activity of Krishi Vigyan Kendra-Panchmahal (Gujarat) at farmer's field. Twelve innovative and receptive farmers from taluka Kalol were selected for conducting the demonstrations to ensure their active participation. Methyl parathion 2% dust and profenophos 50 EC used as a recommended pesticide to control the mealybug while the prevailing farmers practice i.e. spray of un recommended pesticides were treated as control for comparison.

FLDs were conducted by following all standard and recommended packages of practices such as tillage, spacing, irrigation and disease control for cultivation of the crop. Soil and foliar application of recommended insecticide was given as per schedule. The population of mealybug was recorded after spray from ten randomly selected plants per plot.

Production and economic data of recommended practices for front line demonstrations and farmers' practices were collected. In the present study, technology gap, extension gap and technology index were calculated using the formula given by Samui *et al*. (2000):

Technology gap = Potential yield - Demonstration yield;

Extension gap= Demonstration yield –Yield under existing practice;

Technology index = Potential yield – Demonstration yield/ Potential yield ×100.

Statistical analysis

The data collected were transformed into square root values as per the standard requisites. The experiments were subjected to statistical scrutiny following the method of Panse and Sukhatme (1989) and the means were compared with Least Significant Difference (L.S.D.).

RESULTS AND DISCUSSION

Performance of FLDs

A comparison of frontline demonstrations based on recommended technology and farmers practice were analyzed and presented in Table 1. Of the two practices, recommended practice application methyl parathion 2% dust on the soil @ 25 kg/ ha one month after germination followed by spray application of profenophos 50 EC 0.1% at appearance of mealybug infestation in the field was found to be more effective in managing mealybug over farmers practice. From the present investigation, it can be concluded that the infestation of mealybug starts occurring during last week of July in kharif and gradually increases up to second week of September before declining during October. Thereafter, again the incidence increases up to the end of the season. Recommended practice recorded significantly lower mean mealybug population. The highest mean mealybug population was recorded in farmers' practices. Mealybug population varied from 9.75 (recommended practices) to 23.13 (farmers practices) mealybug per terminal shoot. In the present study, recommended practice was found to be effective in bringing down the mealybug population. These findings were in close agreement with Bhosle *et al.* (2009) who reported that profenofos 50 EC proved significantly effective in management of mealybug. Insecticides belonging to different groups have been recommended against cotton mealybug (Saeed *et al*., 2007). The yield performance of recommended practice was 27.50 q/ha which is almost 15.06 % higher than farmers practice (23.90 q/ha). Yield enhancement in cotton crops in evaluation of insecticides has been documented by Bhosle *et al.* (2009) who obtained significantly highest yield from profenofos 50 EC (2.22 tonnes/ha).

From these results, it was evident that the recommended practice was better than the farmers practices under local conditions. Farmers were motivated by results of technologies applied in the front line demonstrations trials and it was expected that they would adopt this technology in the coming years. Yield of the front line demonstration trials and potential yield of the crop was compared to estimate the yield gaps which were further categorized into technology index.

The technology gap show gap in the demonstration yield over potential yield and it was 7.50 q/ha. The frontline demonstrations was laid down under the keen supervision of KVK specialist at the farmer's field. The observed technological gap might be attributed to dissimilarities in

soil fertility, salinity, erratic rainfall and vagaries of weather conditions in the region. Hence, to narrow down the gap between the yields of different varieties, location specific recommendation appeared to essential. These findings were similar to the findings of Sharma and Sharma (2004).

Technology index show the feasibility of recommended practices at the farmer's field. The lower the value of technology index more is the feasibility. Result of study depicted in Table 1 revealed that the technology index value was 21.42 %. The results of the present study were in consonance with the findings of Hiremath and Nagaraju (2009).

Table 1 Yield attributes, technology gap and technology index of demonstration

Variables	Mealybug / terminal shoot	Yield (q/ha)	Yield increase (%) (q/ha)	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
Farmer's practice	23.17 (4.91)	23.90	15.06	7.50	3.60	21.42
Recommended practice	9.75 (3.25)	27.50				
S.E±	(0.10)	1.25				
CV	(8.96)	17.68				
LSD(5%)	(0.33)*	3.94*				

Figures in parenthesis are transformed values of √x+1 * Significant at 5%

The economics of cotton production under front line demonstrations were estimated as presented in Table 2. Economic analysis of the yield performance revealed that front line demonstrations recommended practices recorded higher gross returns (` 1,23,750/ha) and net return (` 77,225/ ha) with higher benefit cost ratio (2.66) as compared to farmers practices. These results were in accordance with the findings of Byrappa *et al.* (2012). Further, additional cost of ` 2,275 /ha in demonstration acquired on additional net return of ` 29,475/ha with an incremental benefit cost ratio 13.95 suggesting its higher profitability and economic viability of the demonstration. Similar results were also reported by Hiremath and Nagaraju (2009).

Table 2. Economics of frontline demonstrations

Variables	Cost of cultivation (₹/h)	Gross return (₹/h)	Net return (₹/h)	Benefit cost ratio
Farmer's practice	44,250	92,000	47,750	2.08
Recommended practice	46,525	1,23,750	77,225	2.66
Additional in recommended practice	2,275	31,750	29,475	13.95*

*Incremental benefit cost ratio

CONCLUSION

Outcome of the frontline demonstrations clearly brought out that the adoption of recommended practice (application of methyl parathion 2% dust on the soil @ 25 kg/ ha one month after germination followed by spray application of profenophos 50 EC 0.1% at appearance of mealybug) was feasible, economically viable and effective technology for management of mealybug. The demonstration convinced most of the farmers to use recommended technology on account of its obvious advantages and effective management of mealybug . These innovative practices will help in solving the farmer's problem, decision-making and ability to modify their farming practices.

REFERENCES

Bhosle, B. B., Bambawale, O. M., Sharma, O. P., Tanwar, R. K., Patange, N. R and Bhede. B. V. (2007). Pithya Dekun Kapasivaril Navin Sankat. *Extension Folder No–32,* Published by MAU, Parbhani

Bhosle, B. B., Sharma, O. P., More, D. G., Bhede, B. V. and Bambawale, O. M. (2009). Management of mealybugs (*Phanacoccus solenopsis*) in rainfed cotton (*Gossypium hirsutum*). *The Indian Journal of Agricultural Sciences*. 79(3):199-202

Byrappa, A. M., Kumar, N. G. and Divya, M. (2012). Impact of biopesticides application on pod borer complex in organically grown field bean ecosystem. *J. Bio. pest.* 5(2): 148-160

Dhawan, A. K. (1980). *Maconellicoccus* sp. attacking *arboreum* cotton in Punjab. *Science and Culture* 46: 258

Hiremath, S. M. and Nagaraju, M. V. (2009). Evaluation of front line demonstration trials on onion in Haveri district of Karnataka. *Karnataka J Agric. Sci.,* 22(5): 1092-1093

Jhala, R. C. and Bharpoda, T. M. (2008). Occurrence in Gujarat and suggestions for action plan to combat the menace of mealybugs on cotton. *Paper presented in workshop organized by Department of Agriculture and Cooperation, Ministry of Agriculture, Krishi Bhavan, New Delhi,* held during 5 January 2008 at NCIPM, IARI Campus, New Delhi

Khaskheli, Mohammad Ali. (2007). Mealybug: An emerging threat to cotton crop. *http://www.pakissan.com/english/advisory/mealy.bug.an.emerging.threat.to.cotton.crop.shtml*

Panse, V.G. and Sukhatme, P.V. (1989). Statistical Methods for Agricultural Workers. Indian Council for Agricultural Research, New Delhi, Pages: 359

Samui, S. K., Maitra, S., Roy, D.K., Mondal, A.K. and Saha, D. (2000). Evaluation on front line demonstration on groundnut (*Arachis hypogea* L.). *J. Indian Soc. Coastal Agric. Res*., 18: 180-183

Saeed, S., M. Ahmad, M. Ahmad and Y.J. Kwon, (2007). Insecticidal control of the mealybug *Phenacoccus gossypiphilous* (Hemiptera: Pseudococcidae). *Entomol. Res*., 37: 76–80

Sharma, R.N. and Sharma, K.C. 2004. Evaluation of Front Line Demonstration trials on oilseeds in Baran district of Rajasthan. *Madhya Journal of Extension Education*. 7: 72-75

Tanwar, R.K., P. Jeyakumar and Monga, D. (2007). Mealybugs and their management. *Technical Bulletin*, 19, NCIPM, New Delhi

Tanwar, R. K, Jeyakumar, P., Monga, D, Kumar, R. and Singh, A. (2008). Mealybugs and their management in cotton. *Extension Folder.* NCIPM, New Delhi

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