Technology Transfer that Mitigated the Challenge of Pink bollworm of Cotton in Maharashtra

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ABSTRACT

Pink bollworm of cotton is a serious pest first appeared in the form of an epizootic in 2017-18 season in all most all cotton growing areas of Maharashtra after 16 years of successful cultivation of Bt cotton. This has shattered the hopes of rainfed farmers as cotton is the only cash crop for them and they had adopted the Bt technology whole heartedly because of successful control of bollworms. When it was scientifically proved that the outbreak of the pest and probable breakdown of resistance of Bt cotton was in fact due to some common advocated agronomic practices that the farmers missed while growing the GM cotton. For example, farmers did not use the refugia around the Bt cotton which ultimately assisted the PWB built up and outbreak. A massive technology transfer campaign was organized for continuously two years, 2018-19 and 2019-20. The campaign technical tips were so designed that they were easily absorbed by the farmers for managing the pest.The TOT used wide range of communication techniques like posters, hoardings, cartoon bulletins, radio jingles, farmers rallies and leaf lets to reach nearly 80,000 cotton growers in more than 32,000 villages. The success of campaign was assessed in the crop season and by farmers reaction. It revealed extreme satisfaction of farmers as they developed confidence in management of such pests and not only that the actual incidence in the campaign years was less than 5 per cent.

INTRODUCTION

The unusual outbreak of the pink bollworm pest has hit hard the cotton farmers in Maharashtra in the crop season 2017-18. After a successful last season 2016-17, farmers have shifted a large area under cotton touching an estimated 4.3 million hectare in the state with the hope that they will again raise their farm income. They have reposed their faith on Bt cotton which have given them financial stability over the last few years and therefore the Bt cotton occupied nearly 96 per cent of the total cotton area in the state (Mayee and Chaoudhary, 2013). Their calculations went wrong as the Pink Bollworm caused by *Pectinophoragossypiella* (PWB), a dreaded pest, shattered their hopes of another good returns from cotton. Why there has been sudden outbreak of PBW in the Kharif-2017-18 has been scientifically explained (CICR, 2018). However, the question was, can the stakeholders in cotton value chain restore the confidence of producers back in cotton cultivation as they find hardly any good substitute to replace cotton as a cash crop particularly in the rain fed areas of Maharashtra.

When a critical scientific analysis of the sudden outbreak was done it was felt that yes this is possible. What is needed is educating the farmers to undo the mistakes in cultivation practices in the past which led to erosion or may be loss of resistance of Bt cotton crop to this dreaded pest. Scientific information available for management of the PBW appears to have not reached the farmers .Hence it was decided to take the information to cotton farmers of the State and participate in the massive campaign being carried out by public and private sector stakeholders of cotton. Thus the first campaign of technology transfer called "WAR ON PINK BOLLWORM" was conducted in 2018-19 and subsequently continued in Vidarbha region of Maharashtra in 2019-20 as "SCIENTIFIC OUTREACH and FARMERS" AWARENESS CAMPAIGN on Pink Bollwormin intensive cotton growing villages to educate the growers and empower them to counter the attack of PBW pest. Both the reports describing all the details have been published (Anonymous, 2019[a,b]). Thecampaign were so planned to target maximum villages through various modes of communications to alert them on the precautions and after care that needs to be taken before cotton crop sowing and after the crop sowing during the season to defeat the PBW pest attack. The campaign was planned meticulously to see that the cotton is free from the damage of the pest and

farmers restore back their faith in cotton cultivation.

Reasons for the Outbreak of PBW:

Resistance is natural and is an evolutionary adaptation of the insects and pests to widely and continuously applied stress factors.

Factors that may have contributed to the increased occurrence and survival of Pink Bollworm in Bt-cotton have been scientifically studied and confirmed by many organizations. They were;

1. Absence of crop rotation.
2. Use of unapproved, unauthorized Bt-cotton seeds for cultivation.
3. Zero to low adoption of non-Bt refuge planting. In the absence of non-Bt cotton refuge, PBW population was continuously exposed to Bt-protein, accelerating the build up of tolerance and further resistance development.
4. Gradual build up of PBW in the previous seasons and high carryover between seasons due to low adoption of PBW specific field and gin sanitation practices.
5. Low adoption of Integrated Pest Management (IPM) practices such as deep sowing, sanitation, stubble removal and monitoring based ETL decisions for spraying pesticides in time. Late termination after 180 days of planting, led to ratoon crop, which facilitated PBW live stages to thrive without break in life cycle.

Storage of seed cotton in Gins without proper sanitation practices, which provided opportunity for growth, multiplication and development of PBW.

METHODOLOGY

Campaign Technology Transfer Tips

Based on the scientific information and the known causes of outbreak of the pest, following simple tips were prepared for farmers use.

1. Uproot and destroy the cotton stalks and stubbles in the field before end of February.
2. Carry out deep ploughing in the month of March-April and allow full exposure to solar heat of May; a natural soil solarisation method. The farmers should avoid pre-monsoon sowing of cotton.
3. Ginneries and market yards to be provided with pheromone and light traps to maximise the moth catches immediately.
4. Farmers are advised to choose only those hybrids/varieties of 140-160 days duration and follow timely sowing being crucial on the onset of monsoon. If the refuge is not available as mixed in Bt seed (RIB), sow refuge at least two rows around the main Bt cotton plots.
5. Plant some Bhendi (okra) seeds adjoining the cotton plots
6. By August end install PBW pheromone traps at 4-5 traps per ha in at least one field per village in minimum 100 villages spread across in each cotton growing districts. The lures of the traps need to be changed every fortnight. The ETL is 24 moths trapped for consecutive three days or 8 moths per day for consecutive three nights in at least 2 traps per field. Alternatively, monitoring can be done by opening green bolls for the presence of PBW larvae. The ETL in this case is 10 per cent damaged green bolls out of 25 examined from 25 plants randomly selected for green boll examination When the moth catches or green boll damage exceeds the ETL ,undertake the spray as suggested by Universities or CICR or State Department of Agriculture.
7. Try to use only neem- based chemicals in the first 60 days of crop growth specially on sucking pest susceptible cultivars.
8. Avoid strictly the use of chemical tank mixtures including PGPR, botanicals, hormones, pesticides, nutrients etc.

Campaign Structure

Posters carrying the tips in bold letters of 36x24 inches were prepared and 100,000 such posters were prepared to be pasted in equal number of villages. These posters were distributed in nearly 32,000 villages with the help of Agricultural schools, colleges, Krishi VigyanKendras in all cotton growing districts in February –March well before

planting season. Simultaneously from that day a float carrying the posters was launched that would travel in most of the affected villages in Vidarbha. The float voiced an attractive teaser jingle when it reaches an affected village to spread message of effective strategies to be adopted to avoid the pink bollworm.

A PBW jingle was framed and continuously aired twice a day through All India Radio-Akashwani for one month in July-August.

Huge hoardings (27 number) with information on Do's and Dont's of management of PBW was displayed on all major bus stops of districts and talukas during cotton growth period.

Series of villages meets and ginnery groups were organized to make the farmers aware of the importance of pre – and post-planting cotton operations to avoid the damage by PBW.

RESULTS AND DISCUSSION

HOARDINGS at all major bus stands, visible corners in all the selected districts depicting the key points of PBW management were so placed that when farmers move around the places get a clear view (Plate 1).

The same content was printed **on EXHIBITION POSTERS to be exhibited in several** villages in the districts (Plate 2).

These 1,00,000 such posters were pasted in Panchayat and village school in nearly 32,000 villages. Simultaneously **THE CARTOON -BOOKLETS** in Marathi with simple tips on Dos and Dont's were distributed to 20,000 farmers in villages when the float moved along the village road (Plate 3).

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Foundation prepared a campaign **FLOAT** for moving around the prescribed route through villages of intensively cotton growing areas (Plate 4).

JINGLES on RADIO as a mass communication technique was also used in the current campaign.

Finally with the help of Krishi VigyanKendras (KVK) and Colleges, three huge **FARMERS RALLIES** organized so that the local papers give wide publicity to the campaign (Plate 7&8).


The cotton farmers are being told to not use unapproved seeds and not buy from the 'fly by night' operators.

To give wide publicity for the campaignswere inaugurated by Minister of Transport and Highway, Government of India in February, 2018 and in next year by Minister of Agriculture Government of Maharashtra in March 2019 (Plate 5&6).

The campaign commenced from February to attract farmers for activities to be performed in summer before main season planting and continued as farmers contact throughout the season.

This campaign happened to use all the possible techniques of communication to farming community and considered as the most exhaustive technology transfer method to stop an epizootic of a pest. It was estimated through a survey of cotton farmers that PBW campaign information reached around 75,000 to 80,000 cotton farmers in vidarbha and 12,000 farmers outside Vidarbha region.

The campaign's success during 2018-19 and 2019-20 cotton crop seasons was judged based on an independent survey of the farmers in Vidarbha region. (Anonymous, 2019[C]). The main education and empowerment is as below:

A. Farmers are now confident of management of the PBW pest in the field as they learnt not only the tricks of management but also the life cycle of the pest and thus know now how to break it.

B. The incidence of the pest in the campaign year was less that 5 per cent at most of the places except in some parts of Akot Tehsil of Akola District during 2019 season due to two factors; premonsoon crop availability and the Ginners not following the instructions of trapping the moths in their gins.

C. The farmers have given the feed back that organization of the campaign continuously for two years had strengthened their will power to combat the menace as recurrence of the pest is totally eliminated.

D. The general productivity of Bt cotton during campaign year enhanced to nearly 400 kg lint per ha as against a maximum of 365 kg lint per ha in Maharashtra as the damage due to PBW has been low. Farmers reported a better price because of clean cotton which otherwise has been the case in earlier year of PBW outbreak.

E. The campaign has also given a lesson that any such crop calamity can be averted if all the stakeholders come together for the benefit of farming community. Farmers also realized that pest control is not a job to be performed by individual farmers but community approach is highly useful for management.

CONCLUSION

Pink bollworm of cotton threatened the cultivation of cotton in Maharashtra in 2017-18 crop season. A massive technology transfer project with an aim to educate and empower the farmers on management of the pest was carried during 2018-19 and 2019-20.The programme used all the possible methods of extension communication such as; posters, hoardings, radio jingles, floats, farmers rallies, cartoon booklets and leaflets to attract the farmers for making aware of the methods of the pest management and empower them to use the same at village level as a community approach. The campaign was highly successful as the pest was well contained for the last two years and not only that farmers developed confidence in management of such epizootic pest of crops.

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REFERENCES

1. Anonymous, (2019[a]), Final Report of the project "*War on pink bollworm*" Published by *SABC, New Delhi and Agrovision Foundation, Nagpur, p 16*
2. Anonymous, (2019[b]), Final Report of the project " *Scientific outreached and Farmers Awareness Campaign on pink bollworm*" published by *SABC, New Delhi and Agrovision Foundation, Nagpur, p 16*
3. Anonymous, (2019[c]), Final Report of the project "*On Farm Technological Assessment and Foresight of Cotton in Vidarbha*". published by *SABC, New Delhi and Agrovision Foundation, Nagpur p2*
4. CICR, Feb, 2018, *Intigrated Management of pink bollworm, Bulletin.*
5. Mayee, C.D. & Choudhary, B., 2013. Adoption and Uptake Pathways of Bt Cotton in India, *ISCI, Mumbai India,p120*