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EVALUATION OF IPM STRATEGY FOR MANAGEMENT OF PINK BOLLWORM COTTON

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ABSTRACT

Over ambitious plant protection measures adopted by farmers for this commercial crop resulted in tragic crop failure in spite of heavy expenditure, which was followed by many suicidal instances of the cotton growers. The state has been beset with problems of cultivating cotton hybrids from private seed industry due to poor pest suppression under high crop management levels. The pest pressure, particularly of bollworms, due to which crop loss in cotton becomes very high, drives the growers to all tactics may not be really suited to the given situation and would ensure failure of such efforts. Though the value of IPM in sustainable agriculture has been well recognized, much intense action is desired at field level. The slow progress in adopting IPM by cotton growers and raising demand for chemical pesticides is the issue of great concern. Hence a suitable technology for the cotton farmers in various agroclimatic regions has to be adapted to all states. A study on assessment of integrated pest management module for the management of pink bollworm in cotton was conducted in 2 ha in farmers' fields in cotton growing tract of Prakasam district during 2018- 19. Lowest per cent rosette flowers (5.6%), green boll damage (8%), open boll damage (17%) was recorded in IPM module over farmers practice of per cent rosette flowers (14%), green boll damage (15%), open boll damage (35%), respectively. IPM module recorded 12 q/ha (C:B ratio of 1: 0.8) which is 20 % higher than that obtained in farmers practice (10 q/ha with C:B ratio of 1:0.6).

KEYWORDS: IPM strategies, pink bollworm, Pectinophora gossypiella, cotton

INTRODUCTION

Cotton (Gossypium sp) popularly called white gold is one of the important commercial crop of India particularly in Andhra Pradesh. Crop is attacked by 1326 insect pests among them 12 are important and Pink bollworm is most destructive pest [3] . Cultivation of Bt cotton in India has increased exponentially since its introduction [7] . Large scale cultivation of Bt cotton can impose a continuous and intense selection pressure on bollworms leading to the development of resistance to toxins [6] . Recently, in India, the development of resistance in Pink bollworm to Cry 1 Ac and Cry 2 Ab toxins has been reported [5] . Prakasam district of Andhra Pradesh is one of the traditional cotton belt with intensive cultivation. Crop occupied nearly 38467 ha during 2018-19 season. Management of Pink bollworm is very difficult with insecticides alone since it is an internal feeder. So, potential solution is adoption of integrated pest management strategies plays a key role. Cotton pest management includes different strategies to be combined to manage the complex of pest starting from sucking pest to bollworms of which pink bollworm in the recent past. Choice of insecticides and other management tactics will depend upon the occurrence of the pest. In this context, integrated pest management is an essential, suitable and sustainable for cotton production system which includes series of control measures (cultural, physical, mechanical, biological, chemical methods) keeping the pest below economic threshold level [1] . The feedback since the commercialization of Bt cotton indicated that, the technology is not a panacea for all pest problems and integrated approach would be necessary to draw maximum benefit and to sustain the technology [4] . Adoption of Integrated pest management measures in the region of Annur and Avinashi blocks of Coimbatore district helped to manage the major pests of cotton especially bollworms and sucking pests with reduced number of sprays and plant protection cost Rs. 5960 to Rs. 2080/ha over farmer practice. Besides, there was an yield increase of 15.85 per cent and a net profit of Rs. 9475/ha over farmer practice [13] . In this context following integrated pest management module has been validated in the field conditions at Prakasam district during 2018-19 to reduce the incidence of pink bollworm.

Pink bollworm Pectinophora gossypiella Saund

Rosette flowers and larval feeding on staminal column, pollen and anthers of the flowers. Infested buds and young bolls may drop off. Interlocular burrowing and improper opening of bolls. Lint is discoloured, fibre quality, ginning percentage and oil content are affected.

Spotted Bollworm Earias vittella Fab

During early vegetative stage, infested shoots wither, drop and show drying. Flaring up and shedding of infested squares and young bolls. Infested bolls open prematurely and the quality of lint spoiled due to rotting.

Major components of IPM for bollworm management in Cotton

1. Diversified cropping system:

Monocultures and overlapping crop seasons are more prone to severe outbreaks of pests and diseases. Diversity of natural enemy complexes attacking various stages of the pests prevalent in polycrop and intercropping systems also tend to prevent severe pest outbreaks. Hence in available area instead of growing cotton alone other possible crop, less preferred by cotton pest have to be cultivated.

2. Cotton free period:

Cotton should be grown only once in a year. Cotton double cropping, ratooning or extending the crop by applying additional fertilizers and water beyond certain period should be avoided as they provide continuous food supply for pest multiplication and carry over population to the next crop.

3. Crop rotation:

Cotton should be rotated with crops, which are not favourable or less preferred by cotton pests. It is observed that cotton maize/sorghum- cotton has given considerable high cotton yield than cotton alone.

4. Time of sowing:

Sowing cotton cultivar within 10-15 days in a village at a proper time and avoidance of staggered sowing have been found helpful in reducing insect build up. Delayed sowing gets high attack of pink bollworm.

5. Spacing and fertilizer:

Adoption of higher dose of fertilizers particularly nitrogen results in bushy crop growth, which provide favourable microclimate for the pest to multiply and thus the crop becomes vulnerable to pest attack. Further high crop density interferes with pesticide application. Hence, the insecticide will not reach the target leading to improper coverage. Application of neem cake 250 kg /ha reduces infestation of stem weevil, ash weevil, pathogenic nematode and soil borne pathogen. Early earthing up 15-20 days after sowing minimizes the stem weevil incidence.

6. Irrigation water management:

Alternate row or skip row irrigation, drip irrigation, avoiding excessive irrigation etc will minimize the development of microclimate for the development and build-up of pests.

7. Cropping Systems Approach:

The principle behind this system is to create a polycrop ecosystem, which will minimize the pest load on any one host crop and maximize the natural enemy load.

a. Trap crops:

To serve as trap crops for major pests and for in situ conservation and enhancing predator and parasite population and NPV/fungus infection of the key pests.

Maize: Planting maize or sorghum in the cotton field at fixed rows encourages aphid predators (coccincllids and chrysophids), which migrate to cotton crop to feed on the cotton pest.

Castor: One plant for 6 meters as a border crop attracts female moths of Spodoptera litura Fab. for egg laying and the eggs can be collected and destroyed.

Okra: As a trap crop receives more number of bollworm eggs (Earias and H. armigera) on its fruits than on cotton. The larvae can be collected and destroyed.

b. Intercropping:

Cowpea, sunflower, bhendi and marigold intercropped with cotton favours colonization of more aphid predators and bollworm (Earias spp.) parasitoids.

8. Monitoring:

The occurrence, activity and abundance of bollworm moths can be monitored by erecting pheromones traps.

9. Bird perches:

Certain carnivorous birds like Myna and Drango prey on caterpillars. Erection of bird perches 20—25 /ha observed helpful for the birds to sit and prey on the caterpillars.

10. Host plant resistance (Resistant cultivar):

Insect resistant cotton varieties provide an inherent control, which involves no expenses or environmental pollution problem and helps in suppressing the pest population with least disturbance to ecosystem. Selection of pest -resistant cultivar greatly reduces insect population and dependency on insecticides. Insect resistant cultivars form foundation for IPM in which pest suppression strategies are superimposed. Varieties with characters like less trichomes and yellowish green canopy received less oviposition by insect pests and further those with higher content of total sugars, gossypol and dihydroxy phenols are also reported to be resistant to pests and diseases. Some early maturing varieties viz., Abadhita and LRK 516 escape from bollworm damage. Cotton varieties with high foliage and dense canopy are conducive for proliferation of pests.

11. ETL adopted for major pests:

The foremost factor to be determined for use of insecticide or any other appropriate technology is the arrival of economic threshold level. The field scouting for the pest has to be assessed by counting the insects and

natural enemies or affected parts present in 50 randomly selected plants per ha. Based on the economic threshold level appropriate insect suppression techniques are to be adopted.

Spotted bollworm more than	10 % of attacked fruiting bodies
American bollworm	10 % infested fruiting bodies or one egg or larva per plant
Pink bollworm	More than 10 % attacked bolls or flowers

12. Biological control:

The cotton ecosystem is endowed with rich fauna of natural enemies. Cotton bollworm pest complex alone is attacked by more than 65 natural enemies. Inundative release of parasitoids has been reported to play an important role in suppressing the bollworm particularly the pesticide resistant American bollworm, H. armigera. A true IPM system should conserve beneficial insect and utilize them as a basic component in the management of key pests.

a. Parasitoids: Trials conducted at several locations revealed that release of the egg parasitoids Trichogramma chilonis I.5 lakh/ ha thrice after observing adult moth catch in pheromone traps or fresh eggs of H. armigera has reduced the incidence.

b. Microbial Pesticide: Application of Nuclear Polyhedrosis Virus HaNPV 450 LE / ha 2-3 times after immediately observing early instars larvae reduced the bollworm damage. Laboratory bioassay studies revealed that NPV infection in late stage larvae of H. armigera increases its susceptibility to insecticides.

c. Botanical pesticide: Among the botanical pesticide neem product such as neem seed kernel extract 3-5 % and neem oil 0.5 % were found effective in suppressing bollworm and whitefly without affecting natural balance of cotton ecosystem.

13. Mechanical control:

Collection of egg masses, larvae, flared up squares, affected and fallen reproductive parts of cotton plant minimise the pest cycle to greater extent. Even after application of insecticide, surviving larvae are to be collected and destroyed as they may be resistant population to insecticide which will form as inoculums of resistant population in the ecosystem. Remove cotton crop and dispose of crop residues as soon as harvest is over.

14. Need based Chemical control:

Selection of right insecticide and applying them at recommended dose is most essential to conserve susceptibility. This is achieved by strategies aimed at preventing the development of resistance to existing new pesticide. Application of synthetic pyrethroid or its combination has to be avoided. The use of ineffective

insecticides, insecticides that induce vegetative growth (Acephate, monocrotophos) are to be avoided. Chemicals like phosalone and Endosulfan which are less harmful to beneficial insects are preferred.

15. Transgenic cotton

Transgenic cotton has emerged as a potential biotechnological tool for management of cotton pests, particularly Helicoverpa armigera. However being resistant to specific group of insects which do not totally eliminate the need to use pesticides and are also to be accepted with caution against their breakdown under given set of conditions.

CONCLUSION

Studies were made on the assessment of integrated pest management module for the management of pink bollworm in cotton during 2018-2019. Lowest per cent rosette flowers (5.6%), green boll damage (8%), open boll damage (17%) was recorded in IPM module over farmers practice of per cent rosette flowers (14%), green boll damage (15%), open boll damage (35%), respectively. During 36th standard week recorded more adult moth/trap catches. Correlation analysis between adult moth trap catches with weather parameters indicated that minimum temperature (0.51) showed positive significance and negative significance with evening relative humidity (-0.50).The full model regression equations developed were Y = -16.340 + (-0.3.08) RF + (-0.467) Min Temp + (1.168) Max Temp + (0.368) Morning RH + (-0.276) evening RH +2.340. Regression analysis of the pink bollworm incidence during August, 2018-November, 2018 indicated that all the weather parameters i.e., maximum temperature, minimum temperature, morning relative humidity, evening relative humidity and rainfall together influenced pink bollworm incidence to the extent of 44.8 per cent (R2=0.448).The economic analysis results revealed that the cotton crop recorded higher returns from IPM module were 60000 Rs ha-1 as compared to 50000 Rs ha1 in farmers practice. The C:B ratio in IPM module was 1:0.8 while in farmer practice plot was 1:0.6. IPM module proved beneficial in respect of yield and economics of cotton. The IPM based practices were found effective in comparison to farmer practice. So, the above said management practices must be followed by the cotton farmers.

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