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B Sudhakar
Assistant Professor, Dept. of
Agrl. Extension, Faculty of
Agriculture, Annamalai
University, Tamil Nadu, India

KA Ponnusamy
Retired Professor, Tamil Nadu
Agriculture University (TNAU),
Coimbatore. Tamil Nadu, India

Adoption of integrated pest management oriented cotton cultivators in an rainfed condition – A critical analysis

B Sudhakar and KA Ponnusamy

Abstract

In recent years due to pest and disease attack in cotton crop was severe and crop losses occurred. For this problem rectify through adoption of IPM (Integrated Pest Management) practices. The present part of the study deals with adoption of IPM (Integrated Pest Management) practices in rainfed condition. Among cultural practices, majority of the respondents had sowing quality and certified seeds and growing high yielding and pest resistant varieties. Regarding mechanical practices majority of the respondents had adopting IPM practices viz., collecting and destroying egg, larvae and pupae of pests. With regard to biological practices, majority of the respondents had tying *Trichogramma* eggcards, spraying neem oil and spraying thuricide: Bt. Among chemical practices, majority of the respondents avoided repeated use of the same insecticides and applying safe insecticides

Keywords: Biological practices, Chemical practices. Cultural practices, IPM, Mechanical practices, Rainfed condition

Introduction

In India productivity of cotton lint yield in rainfed area is 170 kg/ha and the national average is 320 kg/ha. The area under cotton had come down in Tamil Nadu State over the years. It stood at 2.33 lakh hectates in 1998-99. The year 2001 showed a further drop to 1.94 lakh hectates ^[1]. According to recent estimates, insects and pathogens have the potential to causes 84 per cent loss in cotton, 83 per cent loss in rice, 59 per cent in maize, 58 per cent in soyabean and 52 per cent in wheat ^[2]. To meet these challenges, it is of utmost importance that in future the insect problems would have to be tackled through Integrated Pest Management (IPM). IPM has been defined as the integrated use of some or all the pest control strategies in a way that not only reduce pest population to economically acceptable levels but it is sustainable and non-polluting ^[3]. The IPM programme aims at educating the farmers and extension agencies through Farmers Field Schools (FFS). Under FFS programme, farmers are made experts in identifying natural enemies of pests, monitoring regular pests and taking suitable management measures ^[4].

Review of Literature

The cotton growers adopted the IPM practices viz., raising pest and disease cotton varieties, using acid delinted seeds at correct seed rate, destruction of crop residues, and removal of cotton stalks in the field ^[5].

The IPM adoption of rice fallow cotton farmers have applied more organic manure and balanced dose of inorganic manure of NPK. The non-IPM farmers have applied less organic manure and more of inorganic manure in an imbalanced way ^[6].

Specific Objective of the Study

The specific objective of this study was adoption of Integrated Pest Management (IPM) practices by cotton growers under rainfed agro-ecosystem in Coimbatore district of Tamil Nadu, India.

Research Methodology

Coimbatore district stands first in total number of IPM-FFS training programmes conducted for cotton throuout the Tamil Nadu State over the years and hence, it was selected for the study. Selection of Block where Avinashi block under rainfed condition were selected. In Avinashi block, four villages were selected. A sample of 100 farmers was selected for study. The adoption is defined as make use of innovation in to practice in field conditions ^[7]. The list

Correspondence
B Sudhakar
Assistant Professor, Dept. of
Agrl. Extension, Faculty of
Agriculture, Annamalai
University, Tamil Nadu, India

of items that would help to measure the adoption on recommended IPM technologies were prepared in consultation with entomologists, extension scientists and by referring to the IPM-FFS guide. The items were categorized into cultural, mechanical, biological and chemical practices. The response category followed was 'adopted' and 'not adopted' and a score of 2 and 1 was assigned respectively.

Findings and Discussion

Practice-wise Adoption of IPM Practices under Rainfed Condition

A. Cultural Practices

It is seen from the Table -1, under rainfed condition all the respondents had avoiding cotton ratoon cropping practices. This was followed by huge majority of respondents who had adopted the practices viz., sowing quality and certified seeds (98 %), growing high yielding and pest resistant varieties (97 %), summer ploughing (91 %), growing intercropping like greengram and blackgram (71 %), growing same variety throughout the village (68 %), applying FYM/Compost (65 %), growing bund crops like maize, cumbu and castor (65 %) and treating seed with *azospirillum* (52 %). The respondents opined that during IPM-FFS training program, knowledge gained on cultural practices and intern adopted the majority of technologies. Lesser proportion of respondents had sown cotton seeds by ridges and furrow method. The respondents felt that this method of sowing did not conserve rainwater and they preferred the raised beds for sowing.

B. Mechanical Practices

Table 1 also reveals that under rainfed condition, majority of the respondents adopted the mechanical practices viz., collecting and destroying egg, larvae and pupae of pests (80 %), removing and destroying pest and disease infected cotton squares, flowers and other shed materials (71%). This was followed by fixing pheromone traps (68 %) fixing yellow sticky trap (55 %) and clipping terminal portion of main stem (51 %). None of the farmers adopted the practice of covering dark blue cloths in the field. The respondents said that the reason for fixing pheromone traps was due to the bestowal of pheromone trap septas by the State Department of Agriculture not only during training period, but even after training period at subsidized rate.

C. Biological Practices

The Table 1 indicates that with respect to biological practices under rainfed condition, nearly two-third of the respondents

had adopted the practices viz., tying *Trichogramma* eggcards (64 %) and spraying neem oil (60 %). This was followed by 43 per cent spraying thuricide: Bt and 35 per cent of them spraying NPV. None of the respondents adopted the practices viz., spraying pungam oil, releasing the predator *Chrysopa* and releasing the egg, larval parasitoid: *Chelonus Blackburni*. Higher proportion of respondents adopted by tying *Trichogramma* eggcards and spraying neem oil, the respondents opined that State Department of Agriculture supplied eggcards and neem oil not only during training period, but even after training period at subsidized rate.

D. Chemical Practices

From the Table 1 indicates that with regard to rainfed conditions as for as chemical practices were concerned, 95 per cent of the respondents avoided repeated use of the same insecticides. This was followed by Applying granular insecticides like carbofuran (51 %) and identifying ETL for cotton pests (51%). Higher proportion of respondents avoided repeated use of the same insecticides, the rainfed cotton farmers reported that gained knowledge of ill effects of use of same insecticides during IPM-FFS training. The reason for half of the respondents following ETL (Economic Threshold Level) for applying chemical insecticides, the respondents were convinced about the significance of ETL for all pests during the training period.

Conclusion

Cotton is a very important commercial crop and is of vitally important both in the agricultural as well as industrial economy in a country. India accounts for 25 to 30 per cent of the world export of cotton. The area under cotton in India is the largest and constitutes nearly one-fourth of the world cotton area [8]. From this study, it is concluded that under rainfed condition, among cultural practices more than one-third of respondents had adopted most of the IPM practices. Regarding mechanical practices more than sixty per cent of respondents had adopted three among eight IPM practices. With regard to biological practices, only three practices adopted by half of the respondents and three practices none of respondents adopted. Among chemical practices, more than thirty per cent of respondents had adopted six among eight IPM practices. It may be concluded that the adoption of cultural and mechanical practices was higher than the adoption of biological and chemical practices by IPM trained cotton farmers under rainfed conditions.

Table 1: Practice-wise Adoption of IPM Practices under Rainfed Condition

| S. No | Practices | Adopted | Not Adopted |
|----------|--|---------|-------------|
| A | Cultural | | |
| 1 | Avoiding cotton ratoon cropping practices | 100.00 | ---- |
| 2 | Sowing quality and certified seeds | 98.00 | 2.00 |
| 3 | Growing high yielding and pest resistant variety | 97.00 | 3.00 |
| 4 | Summer ploughing | 91.00 | 9.00 |
| 5 | Growing intercrops like blackgram and greengram | 71.00 | 29.00 |
| 6 | Growing same variety throughout the village | 68.00 | 32.00 |
| 7 | Applying FYM/Compost @ 5 tones/ac | 65.00 | 35.00 |
| 8 | Growing bund crops like maize, cumbu and castor | 65.00 | 35.00 |
| 9 | Treating seed with <i>azospirillum</i> @ 2 pockets/ac | 62.00 | 38.00 |
| 10 | Treating seed with fungal bioagent : <i>Trichoderma</i> @ 3 gm/kg of seed | 52.00 | 48.00 |
| 11 | Applying neem cake @ 100 kg/ac | 47.00 | 53.00 |
| 12 | Growing trap crops like sunflower and marigold | 44.00 | 56.00 |
| 13 | Sowing cotton seed by ridges and furrow method | 11.00 | 89.00 |
| 14 | Treating seed with mixture of <i>Trichoderma</i> and <i>Pseudomonas</i> fungal bioagents | 5.00 | 95.00 |

| | | | |
|----------|--|-------|--------|
| 15 | Seed hardening with pungam leaf extract @ 3%/ac | 5.00 | 95.00 |
| 16 | Acid delinting of cotton seeds | --- | 100.00 |
| B | Mechanical | | |
| 1 | Collecting and destroying egg, larvae and pupae of pests | 80.00 | 20.00 |
| 2 | Removing and destroying pest and disease infected cotton squares, flowers and other shed materials | 71.00 | 29.00 |
| 3 | Fixing sex pheromone traps @ 5 numbers/ac | 68.00 | 32.00 |
| 4 | Fixing yellow sticky traps@ 5 numbers/ac | 55.00 | 45.00 |
| 5 | Clipping the terminal portion of main stem | 51.00 | 49.00 |
| 6 | Fixing 'T' shaped poles @ 5 numbers/ac | 47.00 | 53.00 |
| 7 | Fixing light traps @ 5 numbers/ac | 37.00 | 63.00 |
| 8 | Covering dark blue cloths in cotton field with 2 sqft size in 10 places /ac | --- | 100.00 |
| C | Biological | | |
| 1 | Tying <i>Trichogramma</i> egg cards 4cc (40 pieces) / ac | 64.00 | 36.00 |
| 2 | Spraying neem oil | 60.00 | 40.00 |
| 3 | Spraying thuricide: Bt (<i>Bacillus thuringensis</i>) @ 300 gm / ac | 43.00 | 57.00 |
| 4 | Spraying 200 ml NPV(Nuclear PolyHedrosis Virus) / ac to control bollworms | 35.00 | 65.00 |
| 5 | Releasing the predator <i>Chrysopa</i> @ 5000 / ac | 20.00 | 80.00 |
| 6 | Spraying pungam oil 3 % / ac | --- | 100.00 |
| 7 | Releasing the predatory Reduvid bug @ 2000 / ac | --- | 100.00 |
| 8 | Releasing the egg, larval parasitoid : <i>Chelonus Blackburni</i> @ 5000/ac | --- | 100.00 |
| D | Chemical | | |
| 1 | Avoiding repeated use of the same insecticides | 92.00 | 8.00 |
| 2 | Applying granular insecticides like carbofuran 3 G 12 kg / ac | 51.00 | 49.00 |
| 3 | Identifying ETL (Economic Threshold Level) for cotton pests | 51.00 | 49.00 |
| 4 | Applying correct quantity of pesticides | 45.00 | 55.00 |
| 5 | Spraying chemicals in evening hours | 40.00 | 60.00 |
| 6 | Applying safe insecticides such as endosulfan @ 250 ml / ac and phosalone @ 100 ml / ac | 27.00 | 73.00 |
| 7 | Spraying neem based insecticide: such as <i>Azadirachtin</i> 200 ml / ac | 21.00 | 79.00 |
| 8 | Spraying herbicide such as fluchloralin @ 900 ml/ac and pendimethalin @ 1.3 lit / ac | 20.00 | 80.00 |

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