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Recent Trends of Pest Management in Bt Cotton

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Cotton (*Gossypium* spp), the king of fibres, usually commercial referred as white gold. It's contributes 7% of GDP our country. It is providing employment to 60 million people in India. 45% world's fibre need is met from cotton. 10% of world's edible oil is met from cotton. Raw cotton is also used for medical and surgical purpose. Linters also used for high grade paper, rayon, films, explosives. Seed crushed for edible oil. Seed cakes contain 40% protein and serves as a important concentrated feed for livestock. Not only that, cake is the good organic matter contains 5% N, 3% P₂O₅ and 2% K₂O.

Insect Pest of Bt Cotton

Cotton ecosystems throughout the world harbor a wide variety of insects. One hundred and sixty two species of phytophagous insects have been recorded on the crop in India, of which 24 species have attained pest status and nine are key pests in one or more cotton growing zones of the country. The life history and damage symptoms for important insect pests are briefly described here.

Sap Sucking Pests

Whitefly, *Bemisia tabaci* (Hemiptera: Aleyrodidae) & **Thrips, *Thrips tabaci*** (Thysanoptera: Thripidae) & **Cotton aphid, *Aphis gossypii*** (Hemiptera: Aphididae) (ETL2-3 nymphs per random leaves)

Management

1. Cultural Practices

- Early sowing (15 April-15 May) reduce its population. Adopting crop rotation with non-preferred hosts such as sorghum, ragi, maize etc.
- Removal and destruction of alternate weed hosts like *Abutilon indicum*, *Chrozophora rotulari*, *Solanum nigrum*
- Cultivate alternate host crop such as tomato and castor at bunds to trap and destroy them.
- Set up yellow pan traps and sticky traps @ 12/ ha

2. Biological control

- *Verticillium lecanii* 1.15% WP 2500 g/ha
 - Natural predators include ladybird beetles and bigeyed bugs.
- using biopesticides based on microbials such as *Beauveria bassiana* (effective on larvae and adults) or *Isaria fumosorosea*.
- For managing different kinds of sucking pests spray 5 % NSKE solution (5 kg neem seed or 5 kg neem leaves in 100 lts. water). Immediately after germination of crop arrange 10-15 Yellow and White sticky traps per acre at 1 feet height.
 - The aphid fungus (*Neozygites fresenii*) is very effective in reducing aphid populations
- The parasitic wasp, *Lysiphlebus testaceipes*, also helps control aphid populations incotton.
- **Bollworm complex**
 - **Spotted bollworm :- *Earias insulana* and *E. vitella*** (Lepidoptera: Noctuidae)
 - ETL= (1 larvae/ plant)

- **Biological control-** Erect 5-7 pheromone traps/ha. to capture male moth. Release *Chrysoperla* predator eggs @ 50000 eggs/ha.Repeat it after flowering. Release *Trichogramma* predator @ 1,50,000 eggs/ha.in the evening period. Apply thrice at weeks interval.

American bollworm: *Helicoverpa armigera* (Lepidoptera : Noctuidae)

- ETL= 5% flower damage

Biological control- Erect 5-7 pheromone traps/ha. to capture male moth. Release *Chrysoperla* predator eggs @ 50000 eggs/ha.Repeat it after flowering. Release *Trichogramma* predator @ 1, 50,000 eggs/ha.in the evening period. Apply thrice at weeks interval. Spray NPV450 LE/ha. Spray 10% neem oil.

Virus: Nuclear polyhedrosis virus (NPV) Bacteria: *Bacillus thuringiensis*

Fungus: *Beauveria bassiana*, *Nomureae rileyi*

Pink bollworms: *Pectinophora gossypiella* (Lepidoptera: Gelechidae)

Biological control- Erect 5-7 pheromone traps/ha. to capture male moth

Natural enemies- *Trichogramma achaeae*, *Trichogramma chilonis*, *Apanteles angaleti*, *Goniosus sp.*, *Chelonus sp.*, *Bracon greeni*

Release egg parasitoids *Trichogramma* sp. @ 1.5 lakh/ha at 40-45 DAS followed by second release after a week to parasitize the eggs of bollworms and larval parasitoids like *Chelonus blackburni* or *Bracon kirkpatricki* @ 3000 adults/ha.

Spray HaNPV @ 250 LE/ha to manage the larval population of American bollworms and Spodoptera below the ETL level

IPM practices for Pest management

Deep ploughing in summer , Removal of weeds and alternate hosts, Growing of Trap crops, Border crop, Delinting, Seed and soil treatment, Growing of Trap crops, White and Yellow sticky traps, Bird perches, Pheromone traps etc.

Other IPM practices in Bt cotton crop

Judicious use of irrigation and fertilizers ·Sowing of maize interlaced with cowpea along the borders of cotton fields to conserve and promote activities of natural enemies. Growing one row of *Setaria* between the 9th and 10th row of cotton as an attractant of insect predatory birds. Effective boll formation period was determined for different varieties and calendar based sprays were recommended during this period for management of bollworms. Sheep and goats were allowed to feed on unpicked bolls and burs left in the cotton fields after the last picking. Cotton sticks were removed from the cotton fields after the crop season. Cotton sticks are used as fuel wood by the farmers and unpicked bolls on these sticks are the main source for carryover of the pink bollworm.