

Scientific Tips for Management of Important Insect Pest and Diseases in Cotton

Dr. Nirakar Ransingh
Dr. Uttam Kumar Behera

Cotton (*Gossypium* sp.) is one of India's most important cash crop because of its agricultural and industrial importance which is well known as "White gold." India is the world's second largest supplier of cotton known for a number of major textile brands and merchants. In Odisha cotton crop is grown in Koraput, Balangir, Kalahandi and Nuapada districts under suitable soil and climate conditions. In 2019 cotton is grown in an area of 169.56 thousand hectare with production of 578.50 thousand bale having productivity 580.0 kg /ha but in 2018 it covers 157.88 thousand hectare with a production tune of 455.07 thousand bale with productivity 490.0 kg /ha in Odisha. (5 Decades of Odisha Agriculture Statistics, 2020. P-68). Important insect pest and diseases are reducing the seed as well as fiber quality in greater extend. To get higher yield with quality fiber integrated disease and pest management is one of the important umbrella for cotton crop. Since 2005-06, cotton growers in Odisha have planted *Bt* cotton varieties derived from the bacterium, *Bacillus thuringiensis* (*Bt*) genes gives a solution against major lepidopteran insect pests viz., the bollworms-American bollworm, (*Helicoverpa armigera*), Spotted bollworm (*Earias vittella*) and Pink bollworm (*Pectinophora gossypiella*); the defoliators- leaf

roller (*Sylepta derogata*), Semilooper (*Anomis flava*) etc. But due to grown of this *Bt* cotton varieties year after year sucking pests viz., Aphids (*Aphis gossypii*), Jassids (*Amrasca biguttula biguttula*), Thrips (*Thrips tabaci*) and whiteflies (*Bemisia tabaci*) as well as the Tobacco caterpillar (*Spodoptera litura*) are become a potential threat that damages the crop in greater extent. So sustainable Integrated Pest Management strategies are implemented in order to maximize the productivity. IPM has evolved as an economical, environmental and eco-friendly approach to manage biotic stresses to crop plants in terms of insects and diseases. This approach aims to reduce pest populations below the economic injury level and suppresses pest in a compatible manner towards sustainable crop production.

Different IPM practices that include cultural, physical, mechanical, biological and chemical practices are judiciously implemented to manage the insect pest. Following management practices are followed in cotton for getting higher yield with good fiber quality.

- Deep summer ploughing to expose soil inhabiting/resting stages of insects,

- Seed treatment with imidacloprid 70%WS@5-7g/kg or thiamethoxam 30% FS 10 g/kg of seeds for sucking pest management.
- Sowing should be done timely within 10 to 15 days in a village or block in the season.
- Avoid application of high nitrogenous fertilizers.
- The crop should be maintained weed free for at least 8-9 weeks after sowing by removal and destruction of weeds that serve as alternate hosts.
- Inter-cropping cotton with cowpea is recommended to conserve and help colonize the natural enemies such as lady bird beetles, *Chrysoperla* and syrphid flies.
- Use of trap/ border crops like castor, marigold to trap *Spodoptera* and *Helicoverpa* respectively.
- Biocontrol practices to be adopted for conservation of predators (lacewings, lady bird beetles, staphylinids, predatory wasps, geocoris, Anthocorid, Nabids, Reduviids and Spiders by growing two rows of maize/ sorghum and parasitoids.
- Allowing grazing of animals after last picking is recommended for checking the carry overpopulation of bollworms.
- Application of biorationals like Azadirachtin 0.15%, (Neem Seed Kernel Based EC) @ 2.5 l/ha against sucking pests' aphids, leaf hoppers, white flies during early vegetative stage of crop growth.
- *Verticillium lecanii* 1.15% WP is recommended @ 2.5 kg/ha in 500 l water against white flies.
- Release of *Chrysoperla carnea* @ 10,000 /ha against sucking pests at 45 and 60 days after sowing.
- Need based, judicious and safe application of chemical pesticides are necessary for chemical control measures under IPM.
- Avoid tank mixing of two or more insecticides.
- Repeated application of same insecticide in succession should be avoided.
- Avoid using insecticides such as pyrethroids which result in resurgence of sucking pests.
- Pyrethroids if used should be restricted to once or maximum of twice depending on the incidence of pink bollworms.
- For *Bt* cotton grow refuge crop - two border rows of non-*Bt* along with *Bt* in the main cotton crop as per recommendation is an essential parameter.
- For management of sucking insects use Acetamiprid 20% SP @ 50g/ha, Dinotefuran 20% SG @ 125-150g/ha, Diafenthiuron 50% WP @ 600g/ha, Fipronil 5% SC @ 1000ml/ha, Flonicamid 50% WG @ 100g/ha, Thiacloprid 21.7% SC @ 100-125/ ha, Thiamethoxam 25% WG @ 100g/ ha or Buprofezin 25% SC @ 1000 ml/ha in 500 l of water.
- For management of *Spodoptera* use pheromone traps @ 20 traps/ha. Sowing castor seeds at field borders serves as an indicator cum trap crop. Hand collection & destruction of egg masses & early instar gregarious larvae. Biopesticide *Beauveria bassiana* 1.15% WP is recommended @ 2kg/ha in 500 l water for *Spodoptera* control.

- To manage tobacco caterpillar (*Spodoptera litura*) chemicals as and when required may use Chlorantraniliprole 18.5% SC @150 ml/ha, Diflubenzuron 25% WP@300-350g/ha, Novaluron 8.8% SC@1000ml/ha, *Bacillus thuringiensis* var.kurstaki@750-1000 g/ha.

Besides different insect pest, diseases play an important role that reduces the seed quality upto 15-20% and yield upto 20-30 % irrespective of different diseases particularly for fungal and bacterial diseases. Among important

diseases vascular wilt caused by *Fusarium oxysporum* fsp. *Vasinfectum* and dry root rot caused by *Rhizoctonia bataticola*, leaf spot disease caused by *Alternaria alternata* and *Colletotrichum malvacearum*, grey mildew caused by *Ramularia areola*, black arm disease caused by *Xanthomonas campestris* pv. *Malvacearum* and cotton leaf curl disease caused by cotton leaf curl virus are important. The important diseases with their symptoms along with particular management are listed for knowledge of the farmer for quick outlook.

Disease	Causal Organism	Symptom	Management
Anthracoise	<i>Colletotrichum capsaci</i>	Small reddish circular spot on cotyledon and primary leaf, In mature plant stem splitting and shredding of bark, boll spotting.	Seed treatment with Carboxin+Thiram @2.0gm per kg of seed and spray Mancozeb @0.3%
Alternaria blight	<i>Alternaria macrospora</i> or <i>Alternaria alternata</i>	It is severe when plants are 45-60 days old. Small, pale to brown, round or irregular spot (0.5-1 mm dia.) surrounded with purple margin appear on the leaves. Often develop concentric rings. Severely infected plants show defoliation and similar symptoms found on bolls.	Seed treatment with Thiram75%WS @3.0gm per kg of seed and spray. Carbendazim+Mancozeb @2gm/lit. of water.
Vascular wilt	<i>Fusarium oxysporum</i> f.sp. <i>vasinfectum</i>	Cotyledon turns yellow and the brown, wilting and drying of seedling, yellowing of edges of leaf, browning and blackening of vascular tissue. Chlorosis of leaves - veins turn brown - interveinal area becoming chlorotic forming tiger stripe. Cupping of the lamina. Affected leaves droop & fall-off.	Treat acid delinted seeds with Carboxin+Thiram @2.0gm per kg of seed or <i>Trichoderma viride</i> formulations @ 10gm per kg of seed followed by soil application of @ 2.5kg <i>Trichoderma</i> enriched with 10.0q FYM. Spot drenching of Chlorothalonil 75%WP@ 1.0ml or Thiophanate methyl 70%WP @ 1.0 gm per lit. of water.
Grey mildew	<i>Ramularia areola</i> Sexual- <i>Mycosphaerella areola</i>	Irregular to angular, pale translucent lesions of lower surface, on upper lesion appear light green or yellow, entire leaf surface covered by white to grey powdery growth	Spray Carbendazim @0.15% or wettable sulphur @2kg/ha,
Black arm and boll rot	<i>Xanthomonas campestris</i> pv. <i>malvacearum</i>	Seedling blight, Angular leaf spot, vein blight/vein necrosis, Black arm, square rot/ boll rot.	Use recommended doses of fertilizer Delint cotton seed with conc. sulphuric acid. Seed treatment with plantomycin @ 1.0gm per kg of seed followed by

Cotton leaf curl	Cotton leaf curl Virus (<i>Bemisia tabaci</i> – Vector)	Plants remain stunted. Leaves show distinct upward or downward curling. Diseased leaves develop <u>enations</u> – often originating from the nectarines. Internodes become elongated and irregularly elongated	Seed treatment with <u>Imidachloprid</u> / <u>Thiamethoxam</u> 70WS@ 7g/kg of seed. Intercropping with Cowpea @ 10:2 rows as <u>ecofeast</u> crop. Encourages ladybird beetle, <u>sirphid</u> fly and <u>Crysoperla carnea</u> like natural enemies that feed the pupae and nymph of white fly. Under mechanical means use of yellow sticky traps 10 Nos. per Acre. Under Biological means Release of <u>Crysoperla carnea</u> 5000 No/ ha or <u>Beauveria bassiana</u> @ 2gm per lit. Use of Botanicals like <u>Neem</u> 3-5ml per lit or <u>NSKE</u> 5%. Spraying of <u>Flonicamid</u> 50WG @ 0.4gm per lit. of water. <u>Diafenthiuron</u> 5WP @1.2gm per lit. of water or <u>Buprofezin</u> 25EC@ 2.0ml per lit. or <u>Thiomethoxam</u> 25WG @ 0.2gm per lit.or <u>Fipronil</u> 5% SC @ 3.5ml per lit.or <u>Pymetrozin</u> 50WG @ 9gm per 15.0 lit. water.
------------------	--	--	--

Dr. Nirakar Ransingh, Assoc. Professor (Plant Pathology), College of Agriculture, OUAT, Bhawanipatna.

Dr. Uttam Kumar Behera, Assistant Professor (Entomology), College of Agriculture, OUAT, Bhawanipatna.