

Cotton Whitefly Upsurge: A Growing Concern for Farmers

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SUMMARY

Cotton Whitefly, *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae), is a cosmopolitan pest, but widely distributed in India and neighbouring countries and cause a significant destruction in many crops. *B. tabaci* nymphs and adults cause plant damage during feeding and can act as a viral vector, resulting in severe yield loss in tropical and subtropical crops. Chemical pesticides are frequently employed to manage *B. tabaci* because of their quick action, but this method has various downsides, including food safety concerns, insecticide resistance, pollution, and non-target organism effects. To effectively control *B. tabaci*, a multidisciplinary approach has been developed as an alternative to the traditional use of chemical pesticides in an integrated pest management (IPM) system. In this approach we use all the practices like cultural, biological, botanicals and chemicals to manage the population of whitefly below ETL. This article specially focuses on control of whitefly with special emphasis on use of bio control agents and other IPM practices.

INTRODUCTION

Cotton, often known as white gold is grown on an area of 12.9 million hectares in India with a production of 37.10 million bales (Anonymous 2020-21). Due to biotic and abiotic challenges encountered throughout the crop season cotton is unable to realise its full potential. From seed germination to harvest it is attacked by 16 kinds of insect pests in India showing that biotic constraints are quite important (Dhawan, 2004). The whitefly, *B. tabaci* (Gennadius) (Hemiptera: Aleyrodidae) is a noxious pest of many crops all over the world. Since 1990, it has been a severe cotton pest in north India. The incidence of bollworms dropped with the introduction of *Bt* cotton, while the incidence of sucking pests increased. Whitefly (*B. tabaci*) has recently become a severe pest of cotton in Punjab. An alarming outbreak of this pest affected the North Indian cotton-growing region in 2014-2015 resulting in significant crop losses. The genetic groupings Asia I and Asia II-1 of *B. tabaci* have been discovered in Punjab, India (Naveen et al., 2017). Whitefly nymphs and adults damage plants in two ways: first, by sucking cell sap and excreting helps sooty mould grow and second, by transmitting plant harmful viruses.

Identification of Pest

Eggs:

Females lay pyriform or ovoid eggs with a pedicel spike at the base in circular groups on the underside of leaves.

Nymphs:

The first instar is a crawler, flat, oval, and scale-like and other nymphs are sessile. The fourth nymphal stage is known as "red-eye nymphs" because the developing ~~all~~ unusually big eyes can be seen through the nymph integument (skin) at this stage.

Adult:

Adults are about 1 mm in length, with the male being somewhat smaller than the ~~female~~ female. A powdery, waxy substance, white to slightly yellowish color coats the body and both pairs of wings. Females have a life span of up to 60 days. Males have a generally smaller life span of up to 9 to 17 days.

Nature of Damage

Cotton whitefly, *Bemisia tabaci* Gennadius, (Aleyrodidae, Hemiptera), is a serious pest of cotton. *Bemisia tabaci* is a polyphagous pest that feeds on more than 500 different plant species from more than 60 different plant families. *B. tabaci* causes crop damage by sucking the sap and reducing crop production by roughly 50 percent. Whiteflies harm plants in two ways: In a direct way by sucking phloem sap, and by excreting honeydew, which promotes the growth of sooty mold. Indirectly by transmitting cotton leaf curl virus disease. Adults and nymphs

feed by inserting their sucking mouthparts in young plants and this sucking of phloem sap leads to a reduction in photosynthetic activity, turning the leaves yellow and causing them early to fall. Sooty molds inhabit honeydew which attracts ants and disrupt the actions of natural enemies that may otherwise control whiteflies and other pests. Whiteflies may carry and transmit viral infections that can severely harm sensitive plants, in addition to causing indirect damage. Plant pathogens such as Gemini and closterovirus are viral plant diseases. Geminiviruses spread by whiteflies, now known as Begomoviruses are the most common of these in agriculture, producing production losses of up to 100% in crops. Yellow mosaics, yellow veining, leaf bending, leaf curling, stunting, and vein thickening are few symptoms caused by Begomoviruses.

Factors Responsible For *B.tabaci* Upsurgence

The indiscriminate use of insecticides is blamed for the recurrence of insects in the agroecosystem. More than 50 phytophagous arthropod species have resurfaced as a result of widespread use of pesticides. High selection pressure and wide host range also induced the insect to emerge more ferociously.

Integrated Management Strategies for Cotton Whitefly

Cotton whiteflies remain active throughout the year but they are very active from June to September. Economic threshold level (ETL): 5-10 nymphs/leaf.

Cultural Control

- Grow only recommended *Bt* cotton cultivars.
- Plants should be spaced 67.5 x 75 cm apart, and a particular line of refusal cotton plant should be grown to maintain Bt resistance to the Boll Worm complex.
- During the vegetative and blooming phases of cotton, judicious and timely water application is critical. Excessive irrigation frequently encourages vegetative growth, which encourages the growth of whiteflies.
- Fertilizers (N, P) should be applied according to soil testing results.

Biological Control

- *Encarsia Formosa*, *Encarsia shafee*, and *Eretmocerus mundus* are natural parasitoids of cotton whitefly in cotton fields.
- *Chrysoperla sp.* Spiders, syrphid fly, *Geocoris sp.*, *Zelus sp.*, Ladybird beetle, Dragon and damsel flies, praying mantis, predatory ants, bugs, and wasps are natural predators of cotton whitefly. All these natural enemies (parasitoids and predators) are helpful to suppress the whitefly population.

Use of Botanicals

- Use of Azadirachtin 0.15% (Neem Seed Kernel Based EC) @ 2.5-5.0 L/ha, Azadirachtin 0.03% (300ppm) (Neem Oil Based WSP) @ 2.5-5.0 L/ha against whiteflies.
- Use of *Verticillium lecanii* 1.15% WP is recommended @ 2.5kg/ha in 500 L of water against whiteflies.

Chemical Control

- Use of synthetic pyrethroids viz. Cypermethrin, Deltamethrin, Fenvalerate, Acephate, and Acetamiprid should be avoided.
- Insecticides should be applied when the whitefly population has been crossed the ETL level i.e. 6 adults per leaf (upper canopy of the plant).
- Apply recommended insecticides as need-based applications
- -Pyriproxyfen 10 EC @ 500 ml/acre or Spiromesifen 22.9 SC @ 200-250 ml/acre
- -Dinotefuran 20SG @ 60-100 gm/acre or Buprofenzin 25SC @ 400ml/acre
- -Flonicamid 50WG @ 80-100 gm/acre or Diafenthiuron 50WP @ 200-250 gm/acre
- -These are most effective against nymphs of whitefly, wait for 5-7 days to see the effective results. Rotation of chemical groups helps in preventing the buildup of resistance against insecticides.

- -If there is severe infestation of whitefly adults in the field, spray Flonicamid 50 WG @ 80-100 gm/acre or Diafenthiuron 50WP@ 200-250 gm/acre with the dilution of 200-250 liter of water.

CONCLUSION

Bemisia tabaci is a polyphagous pest and causes damage to various crops viz. cotton, brinjal, ladyfinger, some other vegetables and ornamental plants. This article is a discussion about lifecycle, nature of the damage, economic importance and management of cotton whitefly. To manage the cotton whitefly not any single tactic is efficient so there should be an integration of several control tactics like cultural, biological, botanicals and chemical control. Correct implementation of all these control methods will lead to a reduction in the whitefly population. Most insecticides used to control the whitefly population cause environmental pollution and widespread resistance of *B. tabaci*. To counter all these problems we use those IPM tactics that are effective, environmentally safe, and socially acceptable.

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