

Whitefly Management in Cotton

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Whitefly has become a major pest in cotton. It is a sucking type pest from Aleyrodidae family. *Bemisia tabaci* is the most prominent species of whitefly found in cotton. Whitefly wasn't the alone danger for cotton farming in Punjab from a long time. In 90s era, Lepidoptera insect mainly American bollworm and mealy bug were the biggest threat to cotton. Heavy doses of insecticides were used to manage these pests. But, after the release of Bt cotton varieties, bollworms are no more dangerous pests to cotton cultivation.

In the starting of 21st century, whitefly took the position of bollworms, and became a high risk for cotton production. Whitefly damages cotton plants by sucking the sap from the leaves and ultimately decreasing the plant vigour. Whitefly multiplies at a great pace and can increase its population drastically. Nymph stage is the highest damaging stage of whitefly. It can cause the total crop failure if not controlled.

There are notably three stages in the lifecycle of whitefly as follows:

- 1. Egg:** Whitefly lays eggs under the tender leaves of cotton in groups. Eggs are oval shaped and can be spotted attached to the cotton leaves. Hatching period of eggs is around 5 to 9 days. It depends on several factors like temperature, humidity and species of the host.
- 2. Nymph:** The nymph stage can be divided into four instar stages. The first instar is the only nymph stage which can move. It travels from the egg site to its suitable feeding site under the leaf. In next instar stage, legs are not present i.e. are covered in a mould. It cannot move now. In this stage, it starts sucking the sap from the leaf remaining on that particular place in the entire nymph stage.

- 3. Adult:** In its adult stage, male is slightly shorter than female in length. Life span of a male adult is 9 to 17 days. Female adult has a longer lifespan which can extend up to 60 days. Adult is slightly yellowish white colour with waxy wings. A female can lay up to 300 eggs in her life span.

Why is whitefly a major threat to cotton?

Cotton is a vast plant which comes in the commercial crops. It is very similar to the plantation crops in autonomy. Cotton takes 6 to 8 months to mature depending on its variety. Whitefly easily feeds under the leaves of cotton and survives in the extreme summer temperatures of the northern India. The capacity of whitefly to reproduce, survive in harsh conditions and leading to total crop failure makes it a major pest in cotton.

Whitefly sucks the sap from the cotton leaves, and produces honeydew in large quantities. The honeydew is excreted under the leaf surface which afterwards gives the leaf silver color. The sap is the nutritional liquid flowing in the phloem of the plant, which provides nutrients to the leaf for its photosynthetic works. When whitefly starts consuming that sap, the lack of essential nutrients is observed, due to which photosynthetic compounds are not synthesized in required quantity.

The leaves of cotton turn yellow due to decrease of photosynthesis, mature and breakdown early from the plant. Branches can often die with the severe infestation. Death of small plants can be observed, but death of the plants by whitefly attack is rare. Whitefly makes the plant weaker and less productive.

Nymph stage is the most destructive to cotton. It is one of the reasons for the extreme damages done to cotton. Farmer detects whitefly in his field when it multiplies in adult form. But, the damage has been done by the nymphs before the emergence of the adult population.

Another threat by whitefly to cotton is that it is the vector for cotton leaf curl virus. This virus causes cotton leaf curl disease. It is a deadly disease in cotton which can decrease its production by two thirds. The leaves of cotton get cup-like shape inwards. Veins and midrib become broad and can be observed under the leaves. Plant growth gets stunted and square formation is limited.

How to manage whitefly population in cotton?

We cannot control whitefly with a single control technique effectively. Integrated pest management is very important for management of whitefly. We need to use all the techniques in combination at a right time to control whitefly effectively.

The main weapon for its control is monitoring. It is the first simple step to control whitefly. Monitor the population of adults and nymphs in the field regularly or weekly (as per infestation). Look down the top three fully developed leaves of cotton for adult whitefly. Its economic threshold level is 5 adults. Also, look at the bottom leaves of cotton for nymph population. These are the greenish white dots under the leaves (Horowitz *et al.*, 2018).

Here are some points to be kept in mind for whitefly control.

1. Monitoring of whitefly should be done regularly or twice in a week after 50 to 60 DAS old crop.
2. Don't forget to look out at the nymph population. They suck sap in enormous amounts that adults.
3. Use resistant cultivars of cotton. Desi cotton varieties can be used in high infestation areas.
4. Keep optimum plant to plant spacing of 60 to 75 cm and row to row spacing of 67.5cm. Don't overpopulate the crop.
5. Do not intercrop cotton with chilly and okra, as they are attacked by whitefly too.
6. Control and eliminate weeds from the field, and its border surroundings too. They can be attraction for whitefly.
7. Avoid heavy usage of nitrogenous fertilizers like Urea.
8. Don't ever use synthetic pyrethroid insecticides for controlling whitefly.
9. Avoid use of neonicotinoid insecticides like thiamethoxam and imidacloprid.
10. Avoid usage of insecticidal mixtures available in the market. Also, avoid tank mix of insecticides. Check whether their tank mix is possible or not.
11. Irrigation should be given at heavy infestations. Crop should not be under water stress before application of any insecticide.
12. In the first stage, use insecticides like pyriproxifen 10 EC @ 500ml/ acre to control the nymphs and eggs of whitefly. Two applications can be done per season.

13. Pyriproxifen don't control adults very effectively. It controls the population by controlling nymphs and eggs. Don't use it in severe attacks alone. Spray ethion @ 500ml/ acre for better control.
14. In heavy infestation, use insecticides like diafenthiuron 50 WP @ 200gm/ acre and ethion 500 – 800 ml/ acre for this control. Two applications can be done.
15. Always use the recommended dosage of the insecticide to control resistance of that insecticide in whitefly.
16. Maintain a difference of 7 to 25 days in the application of insecticides.
17. Time of application of insecticides is very important. Monitor for the infestation of whitefly, and use the recommended insecticides at that time without any delay.

Conclusion

So, these are the points to be kept in mind for the control and management of whitefly in cotton. Whitefly is a serious pest but can be controlled by following right steps. It can definitely decrease the overall production and profits of cotton. Take timely accurate decisions in the real-time to maintain the population of whitefly.