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Cotton Exchange Building, 2nd Floor, Cotton Green, Mumbai - 400 033
Phone: 30063400 Fax: 2370 0337 Email: cai@caionline.in
www.caionline.in

Let Not The Whitefly See Red

(Dr. K.R. Kranthi, Director of Central Institute for Cotton Research (CICR), Nagpur has completed his Ph.D in Entomology from IARI, New Delhi. He has more than 20 years of experience in the field of cotton research.)

EXPERT's Column

Dr. K.R. Kranthi

The first part of the whitefly problem was dealt in my article 'Whitefly –The Black Story' published in the 8th September 2015 issue of the 'Cotton Statistics and News'. In this article, I would like to focus more on the ground realities of the 'CLCuD and whitefly malaise' in north India with proposed solutions that can mitigate the problem in the 2016 cropping season.

As the 2015 cotton season draws to a close, a small insect called the 'whitefly' declared rebellion and won the battle. Though miniscule in size, it brought cotton farming in Punjab on to its knees. The small insect became 'Bahubali' in 2015 and threatens to return as 'Bahubali-II' in 2016.

On 8th October, the Times of India Headlines screamed 'Whitefly destroys 2/3rd of Punjab's cotton crop, 15 farmers commit suicide" The article stated that the cotton crop losses due to whitefly in Punjab were Rs 4200 crores despite the use of pesticides worth Rs 150 crores. The article also mentioned that the state Government announced a compensation of Rs 640 crores, which was dismissed by angry farmers as peanuts.

While insecticides rained on the crop, the whitefly roared its way silently to victory. The whitefly refused to die even with cocktails of insecticides. A farmer in Bhatinda exclaimed in despair 'Kya karen.. shayad zehar me bhi milavat hai" "what to do.. even the poison may be adulterated"). Did spurious pesticides cause the problem? But spurious pesticides have been in existence over the past several decades in Punjab.

What then could have triggered the whitefly? Clearly four factors fanned the fire. 1. Late sowing, after 15th May. 2. Cultivation of hybrids susceptible to whitefly and cotton leaf curl disease (CLCuD). 3. Excessive nitrogen application, especially during vegetative stage of the crop. 4. Indiscriminate use of chemical insecticides or mixtures that disrupt ecology and cause whitefly resurgence. Another factor 'hot-humid weather' favours the whitefly more when all the above four factors operate together in a combined manner.

Leave the whitefly white, let it not turn red
Oh what have we done in our greed?
What kind of farming at beak neck speed
On plants and soils we spray poisons to harm
Manmade disasters forced on the farm
Are chemical pesticides advanced technologies?
When they kill microbes, animals, birds and bees
To protect our crops, are these poisons a must?
See how the tiny little insects turn them to dust
The more we spray -in droves do they return
God's own little creatures make us to learn
To care for the earth's life forms in symphony
To respect nature and to live in harmony
For our daily bread, we till and toil
Pray, not at the cost of nature's turmoil
Leave the little whitefly white, let it not turn red
Lest in anger it may destroy our bread instead
Remember, insects own the earth with god's own spirit
We only live on rent, come what may, never to inherit
So that we live in peace to make our daily bread
Leave the little whitefly white, never let it see red

-Kranthi

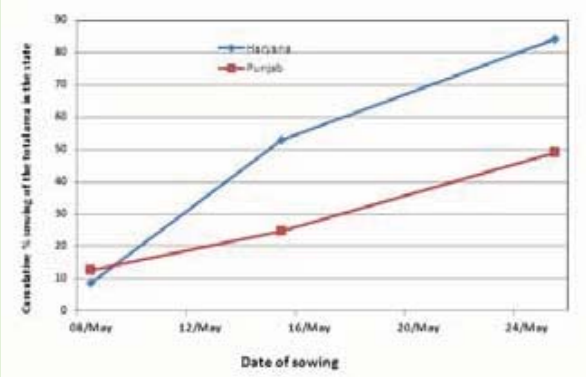
Why cotton in Haryana suffered less than Punjab: It is also important to analyze the reasons as to why the whiteflies ravaged Punjab and not Haryana, which has similar cropping systems, climate and ecology. The main differences were that Haryana farmers cultivated hybrids that were tolerant to the leaf curl virus, while Punjab farmers didn't. Further, more than 75% of Punjab's cotton was sown later than 15th May. In comparison, only about 47% of Haryana's cotton area was sown after 15th May (Figure 1).

Whereas more than 85% sowing in Haryana was completed by the third week of May, Punjab could not exceed 49.0% sowing even by the third week of May. Late sowing in the four main cotton growing districts of Punjab was the main factor that triggered the whitefly and CLCuD crisis in the state. May 15th is a scientifically decided cut off date for cotton sowing in north India. In Bhatinda 64% of 149,000 hectares of the crop were sown after 15th May. The entire 99,000 hectares of cotton in Fazilka were sown after 15th May. Similarly, 59% of the 90,000 hectares in Mansa and 94.4% area of 72,000 hectares in Muktsar were sown late after 15th May 2015. Farmers informed that late harvest of wheat and late release of canal water were responsible for late sown cotton. But late sown cotton leads to late sowing of wheat and the problem can continue in a cyclic manner year after year.

Thus the two factors of susceptible hybrids and late sowing firmly laid the foundation for an impending whitefly attack and intense CLCuD infestation. I would like to emphasize here that some factors associated with late sowing actually contribute to enhanced insect pest attacks. Early or timely sown crop picks up good growth and has healthy leaves that are not vulnerable to either the whitefly or the leaf curl virus. Late sowing leads to poor plant growth prompting farmers to use more urea to enhance seedling growth. The crop picks up growth rapidly but the fresh succulent tender foliage coincides with the whitefly peaks and supports proliferation. Whiteflies occur under hot and humid conditions that are associated with delayed monsoon and intermittent drought.

To make matters worse -is the common belief that 'insecticides if sprayed properly on the under-surface of the leaves can actually solve the problem'. The fact is that whitefly problem only gets worse with indiscriminate insecticide use. This is what happened precisely in Punjab. Farmers who sprayed more and more lost the battle. The best way to keep the whiteflies at bay is to select varieties that tolerate CLCuD, sow in time, use

Figure 1. Cotton sowing in Haryana and Punjab 2015



urea judiciously and then by chance if the insects turn up in good numbers due to bad weather, rely on integrated pest management approaches of botanicals, biopesticides, yellow sticky traps, vacuum traps, reflective sheets etc., all through the initial phase. This approach works well. Just in case for some reason, unlikely though, if the whiteflies increase, turn towards insecticides such as buprofezin or pyriproxifen or diafenthiuron or soil application of the highly systemic neonicotinoids near the root zone.

Impact of voice mail weekly advisories on mobile phone: CICR implemented a voice-mail mobile weekly advisory programme called 'E-Kapas' during 2014 and 2015. A total number of 72,114 farmers were registered from the three north Indian states. Results on the ground showed that E-Kapas played a key role in Haryana being able to combat the whitefly menace effectively, whereas Punjab could not harness the benefits. The number of 'E-Kapas' registered farmers was highest at 46,805 in Haryana, 19,823 registered farmers of Rajasthan had only 5,486 in Punjab. A total of 44 weekly messages were sent to 66,628 farmers of Haryana and Rajasthan totalling at 898,559 voice calls. The number of successful calls was only 121,000 for Punjab. The initial messages on the need for timely sowing sent to Haryana farmers resulted in timely sowing in Haryana in 53.10% of the area before 15th May and 84.0% of the area by 25th May. On the contrary, the less number of registered farmers in Punjab resulted in cotton sown at 24.0% by 15th May and only 49.10% by 25th May 2015.

Preliminary surveys showed that the use of urea and indiscriminate misuse of chemicals was less in Haryana and Rajasthan compared to Punjab. Thus whitefly and the virus were more effectively managed in Haryana and Rajasthan as compared to Punjab.

Photo by Dr. K.R. Kranthi

Chrysoperla eggs

Photo by Dr. Shailesh Gawande

CL CuD

Weekly advisories on the ICAR-CICR web-site: weekly advisories were published on ICAR-CICR web-site in 9 languages. The advisories were released every Wednesday on the institute web page at http://www.cicr.org.in/weekly_advisory.htm and also sent by mail regularly to KVKs, SAUs & State Departments.

Research on whitefly and CLCuD at ICAR-CICR: At several points in time over the past three years, scientific evidence was accumulating to point out that the CLCuD could become a major issue in north India. Whitefly was on the radar, but wasn't expected to declare war at this scale this soon. We initiated several experiments that could lead to management strategies. Under the aegis of the AICCIP (All India coordinated cotton Improvement project) ICAR-CICR coordinated multilocation field trials with 143 Bt-hybrids to evaluate their susceptibility to CLCuD and whiteflies at 5 locations (Hisar, Sirsa, Sriganganagar, Bhatinda and Faridkot) in the three north India states of Haryana, Rajasthan and Punjab. A unified list of recommended hybrids for north India was prepared by the AICCIP and sent to the ICAR Delhi head quarters for further needful. Additionally, the three State Agricultural Universities, PAU Punjab, CCS-HAU Haryana and RAU Rajasthan processed the data separately to finalize a list of recommended Bt-hybrids for their respective states. At ICAR-CICR we made an assessment of the geographical and temporal diversity of whitefly races across India; Seasonal dynamics of whiteflies at 16 locations across India; ecology of whitefly eco-systems; insecticide induced whitefly resurgence; insecticide resistance in whiteflies; epidemiological and loss estimation studies on whiteflies & CLCuD; variability in the CLCuV races in north India; RNAi constructs for CLCuD management and evaluation of biopesticides, unconventional biological sprays, cultural methods and insecticides for whitefly and CLCuD management. A new grafting method was developed to screen for resistance to CLCuD. A New technology of inexpensive ICAR-CICR sticky traps was designed.

The studies clearly diagnosed the causes for outbreaks of whitefly and CLCuD. The diagnosis was used to formulate the following Management strategies.

1. Promote Desi cotton varieties: Desi cotton species Gossypium arboreum is resistant to the whiteflies and immune to the CLCuV. Desi cotton may be preferred in regions which are highly prone to CLCuD disease.
2. Do not permit susceptible Bt-hybrids: Bt-hybrids that are susceptible to the CLCuD

Photo by Dr. Prabhu Linga-1

Whitefly

Photo by VS Nagare

Whitefly

and whiteflies must not be permitted to be cultivated. Such list for 2016 is prepared by the respective state agricultural universities in north India.

3. Cultivate short duration Bt-hybrids for north India: Choose early maturing short duration varieties. These escape whiteflies especially when sown in time. Additionally they facilitate timely sowing of wheat and cotton in the cotton-wheat rotation system.
4. Timely sowing (before 15th May): Timely sown crop tolerates whitefly and CLCuV
5. Avoid excessive urea during vegetative phase of the crop. Excessive urea makes the crop vulnerable to sap-sucking insects especially whiteflies and leaf hoppers. Balanced nutrients of N with adequate P and K assist plants to combat whiteflies and the CLCuD.
6. Weeding: Keep fields and the vicinity free of weeds especially during July.
7. Barrier crop: Grow two rows of sorghum or pearl-millet or maize as border around cotton fields.
8. Conserve naturally occurring natural enemy fauna: A 2014 report by Santosh Kedar, CCS-HAU Haryana showed that at least three whitefly predators, Serangium parcesetosum (Sicard), Cheilomenes sexmaculata (Fabricius) and Brumoides suturalis (Fabricius) were most commonly in cotton ecosystems in north India. Two other predators Coccinella septempunctata L., Chrysoperla zastrowi sillemi (Esben-Petersen) (see Chrysoperla eggs: photograph by K. R. Kranthi) were found to occur albeit at lesser population densities. The parasiotid Encarsia lutea (Masi) was also reported. Reports also indicate that Eretmocerus spp. Is an important parasitoid of whiteflies in north India. Naturally iccuring biological control in the field is reported to have been effective to the extent of 65.0%. Therefore care must be exercised to ensure that the natural ecosystems are not disrupted with indiscriminate choice and indiscriminate use of insecticides.
9. Yellow sticky traps and vacuum suction traps: The use of yellow sticky traps and vacuum suction traps must be encouraged during the early phase of infestation.
10. Botanicals: Sprays based on Neem oil, castor oil, cotton seed oil, fish oil rosin soap etc., must be preferred in the initial stages of whitefly infestation.
11. Insecticides: For effective management of whitefly, insect growth regulating (IGR) chemicals should be preferred, because they are less toxic to natural enemies of whiteflies.
12. Avoid indiscriminate use of synthetic pyrethroids and all kinds of insecticide mixtures during the initial phase of whitefly infestation. These insecticides are known to aggravate resurgence of whiteflies when used indiscriminately.

CONCLUSION

The mute point is, were any lessons learnt from the 2015 episode? If not, then, it is quite likely that there would be a repeat performance of the whitefly in north. I am listing out some suggestions based on the diagnosis of the malady. 1. The state agricultural universities (SAU) must prepare a list of Bt-hybrids and varieties that are susceptible to CLCuD and whiteflies based on the coordinated trial data of the AICCIP. This list must be considered by the State Government to ban such Bt-hybrids and varieties from being cultivated in the state. 2. The State Government must ensure the release of canal water in time so that sowing is completed before 15th May. 3. IPM recommendations must be finalized by the State agricultural universities based on insecticide resistance data, resurgence data and eco-toxicological data. 4. The SAUs especially PAU must enrol large number of farmers in the E-Kapas programme and ensure that voice mail messages on the above three aspects are efficiently delivered.

Recent insecticide bioassays conducted by ICAR-CICR scientists showed that whiteflies developed resistance to a wide range of insecticides. Also, some insecticides were found to cause resurgence of whiteflies, thrips and mealybugs. These data are important and must be considered seriously while insecticide recommendations are finalized. Any small mistake in insecticide choice can lead to serious ecological problems and resurgence of whiteflies. Similarly it would be very important to ensure that the hybrids susceptible to CLCuD, however high yielding these may be, must be banned so that the dreaded disease inoculum load is minimized in the ecosystems. Some business houses and the corporate sector may oppose the choice of hybrids and insecticides to foster their business interests, many a times disregarding the pain it may cause to the farming community. But it is the responsibility of good Governments to ensure that science and scientific recommendations must prevail in the interest of the farmer. I earnestly hope that it happens this year in 2016 and the whitefly will not get a chance to go berserk once again.

(The views expressed in this column are of the author and not that of Cotton Association of India)
