



Cotton lint stains caused by pests is a significant threat to Cotton in Pakistan

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When one cropping system shifts to a better or different cropping system or to a new crop in that area; the expected benefits are always associated with various challenges and problems. The cultivation of Desi (indigenous) cotton which was substituted by American type (Pima) cotton resulted in susceptibility to attacks from various sucking and chewing types of pests, Cotton Leaf Curl Disease, which were not as severe a problem with Desi Cotton. Similarly, converting Barani (rain fed) agriculture system to irrigated agriculture brought up weed problem (The seeds of these weeds shift from one place to other through canal water) along with second problem associated water borne diseases. Introduction of pesticides resulted in lowering the population of predators/parasitoids (the beneficial insects) and insecticide resistance issues. The agriculture scientists and environmentalists are always ready to deal with such outbreaks and scenarios by observing the entire agro ecology holistically. Introduction of Bt cotton is again a new production system and expected to bring some challenges or associated issues along with its benefits.

Bacillus thuringiensis (abbreviated as Bt) is a soil inhabitant bacterium, which infect larval stage of Lepidopterous insects (immature stage of butter flies and moths) and kill them by a toxin produced by that bacteria in the gut of larva, when ingested. The bacteria are safe for "other" groups of insects and organisms including human and livestock. This toxin is only effective against lepidopterist insects or caterpillars or locally known as Sundies. After the discovery of insecticidal activity of these bacteria, the scientists used to kill insects by spraying its solution in early days in green houses. This bio-control agent was the key choice in organic production system for the management of pests, but since bacteria is living organism, its use was restricted to green houses and in mild environments and cannot be used in high temperatures areas where cotton and corn harvested.

Later on, with the further developments in genetic engineering, the toxin producing gene in the bacteria was identified and using biotechnology tools, that specific gene was isolated and incorporated to cotton, corn, soybean and other crops or vegetables to enable them to produce bacterial-toxin by plants. This is an inbuilt mechanism, to fight against worms or Sundies in these crops plants.

Cotton in Pakistan is mainly damaged by number of Sundies like spotted bollworms, American bollworms, pink bollworms and Army worms, to name a few. Mostly cotton growers have limited expertise to manage these worms due to number of reasons. The farmers are not able to recognize the entire life cycle of insects, with no existence of pest scouting, limited knowledge of pesticides and beneficial insects. These sundies feed on cotton bolls or flowers, and therefore cause direct and great yield losses. The pest management is considered as the weakest link of the cotton grower in Pakistan. With the introduction of Bt cotton, the bollworms are no longer an issue and thus these farmers save their crop from Sundies and that is reflected



Red Cotton Bug.

into higher yield and farm income. It is important to note that the elimination of pink bollworm enabled these growers to keep cotton crop longer in fields. On the other hand, insecticides used for the control of bollworms in cotton production are substantially reduced. These insecticides caused the so called "imbalance" of cotton ecosystem and thus the imbalanced ecology converted some minor pests to the status of major pests. Cotton mealybug which was attacking cotton and other crops at very lower incidence, became a major pest in 2008-09, is a good example of imbalance in cotton ecology.

The farmers also made complaints regarding yellow spots on cotton lint, with significant increase in number of rotten or un-opened bolls. The scientists revealed that two sucking pests are responsible for lint coloration and thus based on preliminary studies at Central Cotton Research Institute, Multan it was noted that Red cotton Bug and Dusky Cotton Bug, and with cell sap feeding habits (insect with needle like mouth) sucks sap from cotton seed. The insects are mostly feed on seed of a partially or unopened bolls. While inserting its needle like mouth into cotton seed for feeding and crawling on bolls, the body secretes colored liquid resulting in lint staining with yellow spots. The discolored lint not appreciated by spinners as its fiber is weakened, which end up a low quality yarn or subsequent textile products. The saliva also carries bacteria which rots the boll. The bolls are aspirated by bugs, and even if they manage to open, they have lighter seeds and therefore, making

higher seed-lint ratio. The seed produced from such bolls suffer from viability and germination issues, and such crop cannot be used for seed production. Furthermore, the hole made due to the feeding of insect on the bolls, gets fungal infection, and seed cake made from such seed had higher aflotoxine contents. Animals refuse to take such feed and at times this aflotoxine is extracted in milk, if fed to milking animals. Due to this reason, the milk processing sector has refused to accept milk from those dairies which are using cotton seed cake as concentrate diet for their animals. It is worth mentioning here that aflotoxine is carcinogenic in nature and can cause cancer. These insects are not new to our environment; rather they were surviving in the past in small numbers, and could not make an impact in the past due to management practices adopted for bollworms or other insects.

Red Cotton Bug, scientifically known as *Dysdercus cingulatus*, is small insect of about 12-14 mm in length, with deep red legs and antennae. The wings are of two parts, outer part is membranous and is black in color, whereas inner portion is hard and grayish with black spots. Females lay eggs in crevices of moist soil with bright yellow color. Adults feed on leaves, green bolls and partially opened bolls.

Oxycrenus hyalipennis is the Latin name of Dusky Cotton bug. It is a very small insect of about 4-5 mm in length.



Dusky Cotton Bug.

The body is dusky brown in color, legs are deep brown and wings are faded transparent with black spots. Young ones suck the sap from the immature seed, which do not ripen and remain light in weight. The adults are picked up with picking of seed cotton and are crushed during ginning, which results in stained lint and additionally also produce bad smell.

It is quite important to understand that Bt cotton has nothing to do with these insects, it is the ecosystem where pesticides for Sundies are withdrawn which facilitated the development and rapid multiplication of these bugs. In non-Bt cotton cultivation pesticides applied for Sundies unnoticeably killed these insects as well, so they never appeared as serious pests. This phenomenon is not new to Pakistan; other countries that adopted Bt cotton also had similar experiences with varying degree.

Cotton scientists have devised a management strategy for these pests with a systematic research to address various aspects of current and potential pests. They also evaluate the pest biology, natural enemies and study the host range. It is also advised that farmers should report to their nearest agriculture officer or research institute/station if they notice any abnormal behavior in the crop, insect or disease symptoms. Strong vigilance may prompt the farmers to solve these problems and address these issues before it could cause an economic loss to the cotton farmer. ♦

