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COTTON STATISTICS & NEWS

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The Story of American Bollworm

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He has received number of internationally reputed awards for his contribution to the research field.

Every 2nd week of the month, Dr. K.R. Kranthi would share his expert views on recent updates on cotton research).



American bollworm does not exist in America

It is ironical that the 'American bollworm' never existed in America. The scientific name of the 'American bollworm' is *Helicoverpa armigera*. It is generally believed that the worm that voraciously feed on green bolls of cotton may have arrived from America and therefore the name 'American bollworm'. But this is not true because there was never a trace of this species in America. The species occurs in central and southern Europe, China, India, Pakistan, Nepal, Bangladesh, Africa, Australia, Newzealand and many other countries in Austral-Asia. It is interesting that the insect species acquired the false title of 'American' obviously without a passport, because it was observed as a pest, first on American cotton species in India during the early 1970s. The scientific name of American cotton species is *Gossypium hirsutum*. It was introduced into India

by the East India Company in 1790. The British tried hard to cultivate the American cotton species in various parts of the country because it provided ideal raw material for the mills in Manchester and Lancashire. They did not actually succeed. When the British left India, only 2-3% of the area was under American cotton. The rest was under the native Desi species *Gossypium arboreum* and *Gossypium herbaceum*. The American cotton species now occupies 95% of the area in India.

The American bollworm was not a major pest of Cotton in India before 1980

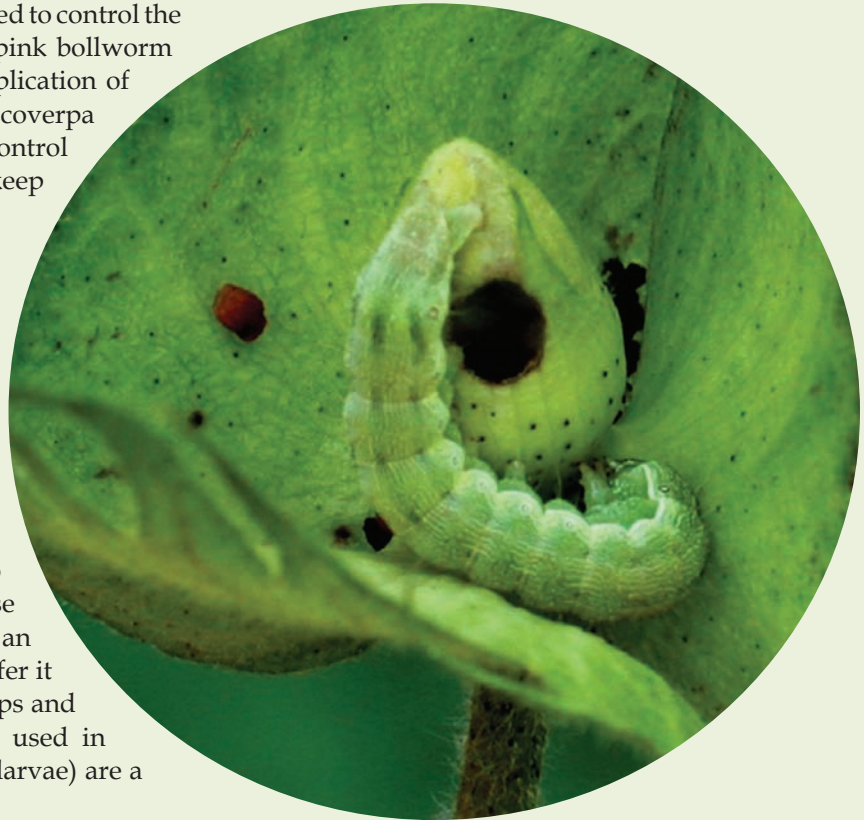
It is interesting that cotton was not listed as a host crop of *Helicoverpa armigera* in India by eminent entomologists Prof Lefroy and Prof Fletcher in the list of host crops prepared by them in 1906 and 1914 respectively. There were only two isolated references of Kaushik et al., 1969 and Manjunath, 1974 who reported occurrence of *Helicoverpa armigera* on Hybrid-4 cotton. Prof MRGK Nair listed *Helicoverpa armigera* as a minor pest of cotton in a text book published in 1975. The spectacular development of American cotton hybrid 'H-4' in 1970 by Indian scientists using signaled the arrival of *Gossypium hirsutum* hybrid cotton technology in India. The area under American cotton species was about 50% from 1970 to 1990. It was during this time that the cotton bollworm *Helicoverpa armigera* gained the status of a major pest. The occurrence was mainly on American cotton. By 1985 the American bollworm became a monster on cotton in India. The main probable reasons were the increase in the area under American cotton hybrids coupled with introduction of synthetic pyrethroids into India in 1980. Synthetic

pyrethroid insecticides were introduced to control the cotton leafworm *Spodoptera litura*, pink bollworm and spotted bollworm. Repeated application of pyrethroids caused outbreaks of *Helicoverpa armigera* by disturbing the natural control ecosystem which would otherwise keep American bollworms under check.

Why is it difficult to control the American bollworm?

The American bollworm feeds on 181 plant species which includes weeds and crops. The insect can adapt in a vast range of temperatures from temperate to tropical climate. They are strong fliers and can fly for hundreds of kilometers. They undergo diapauses to overcome adverse conditions. *Helicoverpa armigera* has an enormous range of enzymes that confer it the capability to adapt to various crops and also to several insecticides that are used in pest management. Thus the worms (larvae) are a challenge for pest control specialists.

The pest finds food all round the year all across the country. The main crops subjected to severe damage are cotton, pigeonpea, chickpea and tomato. Other crops such as, cowpea, sorghum, maize, bajra, groundnut, bhendi, chillies, coriander and vegetable crops are also damaged. On cotton, each moth lays about 500 to 3000 eggs singly on leaves, buds, flowers and green bolls. After hatching the larvae scrape on leaves and 1-2 days later cause



severe damage to fruiting parts. The larva feeds on green bolls by keeping half its body outside. In the history of insect resistance to insecticides, *Helicoverpa armigera* tops the list with more than 650 reported cases of resistance, accounting for 6.0% of all reports on insecticide resistance. Thus the propensity to develop resistance is the highest in all the known insect species. In India the American bollworm was found to have developed resistance to all the recommended insecticides, except the recently released insecticides such as Spinosad, Indoxacarb, Rynaxypyr, Flubendiamide and Emamectin benzoate. The pest has strong potential to develop resistance in the shortest possible time to many pesticides. Over the past 3 decades, cyclic peaks of infestation were observed once every 5-6 years., mostly exacerbated because of insecticide interventions.

Bt Cotton and American bollworm

Over the past 10 years, Bt cotton has been effectively controlling the bollworm. Bollgard-II with two genes was introduced 7 years ago and confers excellent control efficacy apart from being an effective tool of resistance management. However, it is important to ensure that Insect Resistance Management (IRM) strategies are followed to delay the resistance development in the bollworms. The basic question is -Will the bollworm return back? The answer will be -Beware, this is one insect species whose potential to 'return back with vengeance' should never be underestimated.

