

Pink bollworm can best be described as a mysterious pest. It sounds paradoxical, but the fact is that it is difficult to control but not difficult to manage. Difficult to control, because it is a cryptic pest that completes its larval cycle feeding inside a boll and is thus hidden away from insecticides and predatory insects. It is rather easy to manage, however, because the pest is specific to cotton and a cotton-free period of six months starves most of the pest populations.

Pink bollworm is also a mysterious pest because it is present in all the cotton growing countries of the world except Uzbekistan; it is a menacing problem in India and Pakistan but has been eradicated in the United States. The very fact that it was possible to eradicate the pest in such a huge continent as the United States strengthens the argument that it is not a difficult pest to manage, if not eradicate completely.

However, the PBW eradication story is a saga of collaboration, dedication, determination, persistence and scientific excellence. Government agencies in Mexico and the USA worked in close collaboration for 50 years, beginning in 1968, to eradicate the pink bollworm by 2018. The key components of the eradication programme were pest surveys using delta traps, sterile insect technique, pheromone-based mating confusion, short-season cotton and transgenic Bt cotton. Of all these, implementation of the 'sterile insect technique' strategy is the most amazing story. Three insect-rearing facilities were established in 1968, 1969 and 1995 in Texas and Arizona. The insect-rearing facility, measuring 6,131m² in Phoenix, Arizona, was able to produce an unbelievable 20 million to 28 million moths per day. The PBW eradication programme thus speaks volumes for the technical excellence, commitment and dedication of the USDA and US scientists, which will remain the 'gold standard' in the history of pest management — an achievement that is worth remembering and worth emulating.

Will India and Pakistan be able to manage the pink bollworm? Why are the two countries struggling to do it? The answer could be 'because the emphasis in both countries so far has been more on its control and less on its management'. Researchers in both countries have been looking at control measures using insecticides mostly, to be applied at economic threshold levels (ETLs) defined by pheromone trap catches. PBW management basically mandates the maintenance of a cotton crop-free window for at least six months. Maintaining a cotton-free closed-season for six months requires strict enforcement of a policy to ensure area-wide compliance of a fixed 10-days sowing window and a fixed termination date that does not allow any six-months old cotton crop to remain in the field, and also that all unharvested immature bolls are destroyed. Scientific reports confirm that most of the immature bolls harbour diapausing PBW larvae. Unfortunately, cotton in central and south India and in some regions of Pakistan is sown and harvested at staggered intervals to enable an area-wide window of cotton crop that stretches over eight to nine months every year thus providing a continuous source of food for the pink bollworm over a long period. Moreover, millions of diapausing pink bollworm larvae are safely harboured inside unharvested bolls mostly present in crop residues stacked or scattered near fields and in gin waste and trash near ginneries. Since a long season and diapausing larvae together cause the recurrent menace, it is logical that the two strategies, namely 'closed-season' and destruction of 'diapausing larvae', can have the greatest impact on PBW management.

Can these two strategies be implemented in India and Pakistan? The Indian hybrid Bt-cotton scenario provides ideal long-season conditions for the pink bollworm to eat well, survive, proliferate, develop resistance to Bt toxins and thus reclaim its lost status as the crown prince of cotton disasters. With the kind of crop conditions in India, PBW resistance to Bt cotton was inevitable; India grows hybrid Bt-hemizygous Bt-cotton on a near saturated scale to impose intensive selection pressure and non-Bt refuge is a mirage. Bt-hybrid seeds are expensive and are planted at a low density which forces farmers to maintain the crop through a long season to harvest a greater number of bolls from the fewer number of plants to get a decent harvest. As of now, timely termination of the crop to ensure a cotton-free window for six months on an area-wide scale appears to be nearly impossible in India but probably possible in Pakistan, because open pollinated varieties are grown there; seeds are inexpensive and high yields are possible within six months from a high-density crop. On the issue of destroying diapausing larvae, Pakistan scientists are seriously exploring harvesting technologies to destroy residual unharvested bolls (see Dr. Khalid Abdullah's interview in this issue), while Indian scientists are developing cotton gin trash treatment systems to destroy and prevent carryover of pink bollworm from ginning mills (see the article by Dr. Arude in this issue). Both technologies look promising.

The inspiration for this special issue on pink bollworm came from an online meeting of ICAC with cotton scientists of Pakistan on 8 February 2021. Pink bollworm occupied a major space in the discussions. It was clear that the scientific team was hungry for information on the pink bollworm and it is commendable that the cotton scientists in Multan appeared to be moving closer to robust management solutions. They are exploring several options including technologies for host plant resistance, mating confusion and removal of residual unharvested bolls.

PBW is believed to have its origins in the Indo-Pak region from where it spread through seed-cotton to all cotton growing countries except in Uzbekistan. PBW is a serious problem in India and Pakistan, a seasonal problem in Egypt and Greece but not a problem in the USA and China. I invited short articles and interviewed scientists from all the countries mentioned above. Prof. Gutierrez and Prof. Tabashnik are legends in their own right and have expressed their views on the status of PBW in the United States and other countries. In their interview-responses, eminent cotton scientists, Dr Khalid Abdullah (Pakistan), Dr Mohamed Negm (Egypt), Dr YG Prasad (India), Dr GMV Prasada Rao (India), Dr Dong (China), Dr Yang (China) and Dr Stefanos (Greece), provide insightful inputs on the status and way forward for PBW management in their respective countries. There are 10 scientific articles on various aspects of PBW, authored by scientists from India, Egypt and Benin.

Indeed, with its lovely translucent pink shade, the pink bollworm is probably the most beautiful of all caterpillars in our agricultural ecosystems. I sincerely hope that this special issue will provide food for thought and ammunition to fight this beauty with our brains.

-Keshav R Kranthi



Photograph: Keshav Kranthi