



Short Season Compact Genotypes Planted at Higher Density Will Hold Fort Against PBW in India

Interview with Dr Y. G. Prasad



Dr Y. G. Prasad is currently working as Director, ICAR-CICR. He is an alumnus of Bapatla Agricultural College and earned his PhD in Entomology from the Indian Agricultural Research Institute. He worked extensively on development of microbial biopesticides, bio-ecology of invasive cotton mealybug, pest forecast research and development of decision support systems for pest management, climate resilience and agricultural extension.

How serious is the Problem of Pink bollworm in different Cotton growing States of India?

The first report of field-evolved resistance development by pink bollworm (PBW) to Bollgard (Cry1Ac) in India came in 2010 and subsequently to Bollgard II (Cry1Ac and Cry2Ab) in 2014. During the last 5 to 6 years early incidence of PBW was noticed on BG-II hybrids in the largest cotton growing tract in Central and South India. At present, PBW has become a key production constraint in the major cotton producing states like Maharashtra, Gujarat, Madhya Pradesh, Telangana, Andhra Pradesh and Karnataka together accounting for 85% of the cotton area in the country and the problem is expanding to newer areas as well.

How serious was the Pink bollworm in earlier times compared to what it is in recent years? What could the range of economic damage (%) per cent be in different States?

Pink bollworm infestation is showing an increasing trend late in the season during November to December and January months based on monitoring data of live larval recovery in random samples of green bolls collected from Bt-cotton fields across the country. During 2010 and 2011, pink bollworm incidence in green bolls was sporadic and was restricted mostly to non-Bt cotton in 11 out of 19 districts surveyed at that time. Surveys conducted every year after 2014 indicated higher

incidence of pink bollworm larvae in green bolls collected from Bt cotton fields as well with larval recovery on BG-II averaging between 37 to 55%. Since 2017, surveys conducted late in the season (November onwards) indicated larval recovery of over 70% in sampled green bolls. The estimated economic damage beyond 120 days after sowing is between 20 to 25% given that mostly one or sometimes two locules are found infested in bolls. In the recent years, crop extended beyond December-January suffered 100% PBW infestation in developing bolls.

What do you think are the factors that prompted its recent resurgence as serious pest?

Poor adoption of refuge strategy in Bt cotton triggered the initial development and later widespread expansion of resistant populations of PBW in the largest cotton growing belt of central and south India since the outbreak in 2015 that was reported from Gujarat, accentuated the problem. The problem of PBW exacerbated due to several factors including adoption of a large number of long duration hybrids with varying growth patterns providing continuous flowering and fruiting periods for early appearance of the pest and development of overlapping generations late in the season. A cotton crop-free period of over 5 to 6 months after January until the next sowing in June is known to reduce infestation. In rainfed areas, farmers extend the crop duration to realize additional yield because it involves no extra cost. In certain years, this habit of extending the crop is reinforced as yield from later pickings compensates

the loss incurred during first-second pickings. Poor retention of early formed bolls during the season due to weather vagaries in August-September and damage due to excess rainfall events in October is partly responsible for holding on to this practice. However, this exigency has become a perfect recipe for exacerbation of this late season pest.

Have there been any recent Innovations for PBW Management from research Institutes, All India Coordinated Cotton Improvement project and Universities in India?

Crop window-based pest management has been formulated by ICAR-CICR and advocated by the national agricultural research system. This comprises of several steps of crop regulation and management right from the time of sowing to harvest combined with monitoring of pest arrival and threshold-based treatment options at different crop growth stages. Pheromone technology for monitoring in the early to mid-crop growth stages and mass trapping and mating disruption options late in the season have been evaluated by several researchers. The latter option is likely to have better impact when practiced on area-wide basis. ICAR-CICR, Nagpur has developed and commercialised an innovative slow-release pheromone formulation with extended field performance. Eco-friendly treatment options such neem application for oviposition deterrence and population reduction through egg parasitisation by *Trichogramma bactrae* have been included in the management package for PBW. The practice of cultivating short duration and early maturing genotypes amenable for single picking sown under high density planting system has the potential of tackling the PBW menace which is most damaging late in the crop season. Any mismatch between susceptible crop stage and arrival of the pest is key for bringing down resistant populations over a period of time. Both public and private sector research is gearing up to put this approach to test. The All India Coordinated Cotton Improvement Project (AICCIIP) has sponsored multilocation testing of early maturing varieties or hybrids paving the way for their testing and commercial release. ICAR-CICR undertakes regular resistance

monitoring studies in field populations of bollworms to Bt Cry toxins (Cry1Ac and Cry2Ab). Weekly advisories and pest alerts (text/ voice messages) are issued in local languages to farmers and State Departments.

Is there any concerted mission programme or a Campaign to Control or Eradicate PBW in India?

Area-wide management of the pest warrants community action in a campaign mode. Awareness creation on management actions at different crop growth stages during the season starting from sowing to harvest followed by crop termination, crop residue management and trapping of adult moths at ginneries are crucial factors in the fight against PBW. ICAR-CICR was the first to advocate a stepwise pest management package that was first implemented in Gujarat state and later in Maharashtra state in campaign mode. The insecticide (Bt) resistant management (IRM) project is being implemented in all the 11 cotton growing states in 21 key districts to create awareness and disseminate IPM measures for PBW management since 2018. Eradication of the pest is challenging due to widespread nature and prevalence of mostly resistant populations. The success achieved through sterile male release technique in USA may not be relevant now to Indian conditions for this reason.

What in your Opinion are the most important management Strategies?

A host of interventions are needed to keep in PBW in check. Adoption of short duration compact genotypes planted at higher density and amenable for single picking is a key strategy for PBW management in India. Monitoring, mass trapping and mating disruption using pheromone technology are likely to help reduce population levels and economic loss. Use of neem and biological control agents at flowering along with need based use of insecticides at boll development stage may help minimise cost of cultivation to a certain extent and maximise economic returns.



Photograph: Keshav kranthi