Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 01, Issue: 05 (NOV-DEC, 2021)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Methods and Techniques for Managing Pink Bollworm Resistance to Bt Crops

(*Ravinder Kumar[1], N. K. Sharma[1], Laxmi Jangir[2] and Sanjay Kumar[1])

[1]Department of Genetics & Plant Breeding, COA, SKRAU, Bikaner, (Rajasthan), India

[2]Department of Genetics and Plant Breeding, College of Agriculture, Agriculture University, Jodhpur- 342304, Rajasthan

* rkjalandhara19397@gmail.com

Since 1996, transgenic crops which deliver Bacillus thuringiensis (Bt) toxins to kill some insect pests have been commercialised, reducing dependence on synthetic insecticides in cotton, corn, peanut, soybean, and vegetable crops. By attaching to specific target sites, Bt toxins damage the midgut membranes, killing the insects. The Cry1A family of Bt toxins is the most widely employed, particularly Cry1Ac in transgenic Bt cotton and Cry1Ab in transgenic Bt corn. Millions of hectares have been planted with transgenic crops that deliver Bt toxins. Although Bt crops enhanced productivity and reduced the use of traditional insecticides, their effectiveness would be reduced when insect pests evolved resistance. There have been 13 cases of field-developed resistance to 5 Bt toxins in transgenic corn and cotton around the world, increasing the number of resistant species. The Cry1A family accounts for the majority of known resistance cases. By a number of techniques, insect pests have acquired resistance to Bt crops. As a result, knowing the molecular and genetic basis of Bt resistance could aid in the development of appropriate management strategies to postpone the development of resistance in insect pests.

Resistance Management Techniques

- Refuges strategy
- Pyramided plants
- Modified Bt toxin
- Release of sterile insect
- Natural enemies
- Seed mixtures

Refuges strategy: A fundamental technique for delaying insect resistance to Bt crops is provide refuges. This method allowed susceptible insects to mate with resistant insects, reducing the resistance allele in the pest population and delaying resistance development. The refugee method is most typically utilised in Bt crops to delay resistance.

Pyramided plants: For pest management and resistance management, pyramided plants producing two or more Bt toxins targeting one bug are more essential. Pyramided plants are now widely utilised to prevent the emergence of insect resistance. Different countries have

experimented with pyramided Bt crops. In the United States and Australia, for example, single-toxin Bt cotton has been completely phased out. Because they can improve both resistance management and pest control, pyramided Bt crops are projected to become even more popular in the future. After selecting Bt broccoli plants that produce two poisons, Cry1Ac and Cry1C, diamondback moth resistance was delayed.

Modified Bt toxin: Determine how target pests evolved resistance to specific poisons, then change these toxins such that resistance must occur in a different method. This would most likely prolong the time it takes for insect resistance to Bt crops to develop and extend the life expectancy of insect-resistant Bt crops. Cry1AbMod and Cry1AcMod, modified toxins, killed M. sexta and P. gossypiella with cadherin deletion mutations. These toxins may be useful in preventing or delaying insect resistance to Cry1A toxins. The genetically modified toxins Cry1AbMod and Cry1AcMod, which lack helix -1, were used to overcome the resistance of greenhouse-selected strains of T. ni to *B. thuringiensis* sub sp. kurstaki.

Release of sterile insect: The release of sterile insects approach has been utilised successfully in a range of insect problems for decades. Tabashnik were the first to use this strategy to decrease pests resistant to transgenic crops. They used a computer simulation research to show that releasing sterile moths suppressed pink bollworm resistance in Bt cotton. Released male-selecting (MS) transgenes were effective in preventing female offspring survival, and they could be used as a replacement for resistance management by introducing susceptibility alleles into target pest populations. MS insects were given an active and appropriate management alternative against *P. xylostella*, which could be used for other pests in the future.

Natural enemies: The preservation of natural enemies may help to delay the development of resistance in Bt crops. When the Corymbia maculata was employed with unsprayed non-Bt refuge plants, P. xylostella levels were reduced, according to a study. Natural enemies can delay Bt plant resistance and have a major impact on integrated pest management (IPM) in Bt crops, according to these findings.

Seed mixtures: Planting seed mixtures yielding random disseminations of non-Bt maize plants and pyramided Bt plants within fields to postpone resistance to Bt crops was successful only on pests with minimal innate susceptibility to Bt toxins. According to different studies, seed combination strategies were ineffective in delaying resistance in pests with mobile larvae and low vulnerability to Bt toxins.