Compliance with Bt Cotton Refuge Requirements in AZ

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Bt cotton is now beginning its ninth season of use in Arizona without any indication of resistance problems in the field. It continues to provide exceptional control of pink bollworm. Moreover, in concert with the continued excellent field performance of insect growth regulators for controlling whiteflies, insecticide use in Arizona cotton has reached historic low levels. Thus, Bt cotton has contributed to substantial reductions in exposure of workers and the environment to neurotoxic insecticides. For growers in areas of severe pest pressure, Bt cotton is unquestionably the most effective insecticidal technology ever available for management of pink bollworm. Keeping pink bollworm from developing resistance to Bt cotton is essential for maintaining these advantages for cotton growers, workers, and the environment.

The Problem

Analysis of refuges of non-Bt cotton in Arizona in 2003 indicated a misunderstanding on the part of some cotton growers who planted single-row or multiple-row in-field refuges. The in-field refuge approach to Bt cotton was developed in Arizona and cannot be used in states other than California, Arizona, or New Mexico. It consists of systematically planting at least 5% (preferably 10 to 20%) of Bt fields with non-Bt seed by having one or two hoppers on planters dispense non-Bt seed. This practice has been evaluated by producers throughout the State for many years with very favorable results in terms of yields and production costs. However, the terms of the Bollgard® Insecticide Resistance Management Guide specifically prohibit producers from counting non-Bt plants of in-field refuge fields as refuge for other Bt cotton fields, irrespective of the amount of non-Bt planted. For non-Bt cotton to be legitimately counted as refuge for a block of Bt cotton, it must average

It is critical for Arizona producers to understand that non-Bt cotton planted within Bt fields cannot be counted as refuge for other Bt fields unless the non-Bt cotton is planted in blocks that are at least 150 feet wide.

Definitions

**Embedded Refuge**

Blocks of non-Bt cotton of at least 150 feet in width that are planted within fields of Bt cotton.

**In-Field Refuge**

Single rows of non-Bt cotton, or multiple rows of less than 150 feet in width, that are planted within field of Bt cotton.

**External Refuge**

Solid blocks or fields of non-Bt cotton that are at least 150 feet in width.
levels late in the season. In-field refuges intersperse non-Bt plants throughout the Bt plants, thereby insuring that susceptible moths will be distributed throughout the Bt cotton. This reduces uncertainty regarding movement of susceptible moths from external refuges to mate with resistant moths that survive in Bt fields. However, it is because they produce fewer pink bollworm that non-Bt plants used as in-field refuges cannot be counted toward the refuge for other Bt fields.

Be Sure to Monitor Bt Cotton for Pink bollworm

At least once each season, you should monitor for pink bollworm in Bt cotton fields, preferably in areas adjacent to non-Bt cotton fields. This is best done once you begin to reach threshold levels of pink bollworm in your non-Bt cotton. Sample 50 bolls of Bt cotton, crack them and look for large pink larvae and exit holes. Remember that 1" and 2" instar larvae normally survive and mine in Bt bolls. However, 3rd and 4th instar larvae, the larger pink stages, should not survive in bolls of Bt cotton. If you find more than 2 out of 50 bolls with large pink bollworm larvae in Bt cotton fields, this is an unusual event and should be reported to the Rapid Response Team.

Arizona’s Bt Cotton Rapid Response Team

To report a problem call the ARPC at 602-438-0059. You will be asked to identify the precise location of the field where you found unusual pink bollworm survivorship. It would be helpful if problem locations were clearly marked or flagged so that follow-up collections can be made at precisely the same locations. If ACRPC field personnel confirm the unusual event, they will collect infested bolls and forward them to EARML, in Tucson, where the pink bollworm will be tested for susceptibility to Bt toxin. Additionally, bolls in which pink bollworm survive will be tested for presence of toxin to confirm that they were collected from Bt cotton.

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\text{SUMMARY}
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- Single or multiple row in-field refuge plantings do not meet the contractual requirements as refuge for other Bt cotton fields. To qualify as refuge for Bt cotton, non-Bt plantings must be at least 150 feet in width.

- Report instances of unusual survivorship of pink bollworm in Bt cotton to the ACRPC at 602-438-0059. Unusual survival is 2 or more large pink bollworm larvae in 50 bolls of Bt cotton.

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Figure 1. In-field refuges of non-Bt cotton in Marana and Safford averaged only 50-70% of the pink bollworm produced by external refuges. A value of 100% on the y-axis means that the in-field refuge produced the same number of pink bollworm as the embedded refuge.