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ALTERNATIVE HOST PLANT USE BY TOBACCO BUDWORM AND COTTON BOLLWORM, AND ITS IMPLICATIONS FOR BOLLGARD II IRM

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Abstract

Resistance evolution is an important consideration for the target pests of transgenic Bt cotton products like Bollgard® and Bollgard II® cotton because of the consistent exposure to insecticidal proteins that they provide. However, the heliothine target pests of Bt cotton in the US, tobacco budworm (*Heliothis virescens*) and cotton bollworm (*Helicoverpa zea*), have been observed to infest a wide variety of crop and non-crop hosts other than cotton. This high degree of polyphagy has implications for resistance management of these pests in Bt cotton. Some portion of the populations of these pests will develop on hosts other than cotton and therefore will not be exposed to the control methods used in cotton, meaning that these alternative hosts can act as a form of natural refuge for Bt cotton. This natural refuge will slow the rate of resistance evolution to Bollgard and Bollgard II cotton.

New large-scale studies of cotton bollworm and tobacco budworm host use in the U.S. cotton belt states from Texas to the east coast demonstrate that alternative crop and non-crop hosts are significant sources of natural refuge for both species throughout the central and southeastern portions of the U.S. Using the results of these studies, mathematical modeling shows that Bollgard II cotton, because of its two independent, highly effective modes of action, should have more than 30 years of durability for the control of cotton bollworm and tobacco budworm with natural refuge as the only source of refuge. This conclusion holds under a wide variety of product adoption and management scenarios. Therefore using a natural refuge for cotton bollworm and tobacco budworm resistance management in Bollgard II cotton is technically appropriate for the U.S.

Based on these findings, Monsanto is requesting of EPA that farmers growing Bollgard II cotton in the U.S. cotton belt states from Texas to the east coast be allowed to use the existing natural refuge for insect resistance management rather than being required to plant a structured refuge. That is, for all cotton-growing states from Texas to the east coast, no structured refuge would be required in association with planting Bollgard II cotton. In those same states, the refuge options for Bollgard cotton would remain unchanged. In the southwestern states (Arizona, California, and New Mexico) where pink bollworm (*Pectinophora gossypiella*) is the most important lepidopteran pest, its limited host range does not support a natural refuge option. In that region, the refuge options for Bollgard II cotton would remain unchanged. However, initiatives are underway to eradicate pink bollworm in New Mexico and Arizona and, if successful, the refuge options for Bt cotton in this region could be reconsidered.