

**EXAMINATION OF GLYPHOSATE AS A NOVEL MARKER FOR PHOTOASSIMILATE
DISTRIBUTION IN MATURE GLYPHOSATE-RESISTANT COTTON**

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Abstract

Roundup Ready® Flex is the next generation of glyphosate-resistant cotton currently under development. The enhanced level of resistance in Roundup Ready Flex allows glyphosate applications over-the-top beyond the 4-node stage. We examined distribution of ¹⁴C-glyphosate in mature plants (14 nodes) from manual application to a single leaf. We compared glyphosate distribution from application to individual leaves within an immature (9th node) vs a mature (5th node) sympodium.

In the immature Node 9, 30-37% of applied glyphosate was mobilized away from the treated leaf. When applied to the stem leaf, the majority (22%) of mobilized glyphosate was exported to the plant. In comparison, applications to leaves 1 or 2 produced similar distribution between the sympodium (14-18%) and the plant (17-19%). Within the sympodium, glyphosate was distributed mainly to the fruiting structures. Boll 1 contained the highest level (6-12%) of glyphosate relative to boll 2, flower 3 and square 4 when application was made to the stem leaf, leaf 1 or 2.

In the mature Node 5, 20-27% of applied glyphosate was mobilized away from the treated leaf. Glyphosate applied to the stem leaf or leaf 3 was mainly (15%) exported to the plant. In contrast, application to leaves 1 or 2 resulted in distribution mainly to the sympodium (12-18%). Contrary to common belief, the subtending boll to the treated leaf did not receive the highest glyphosate. Distribution was highest to the boll at the next higher sympodial position relative to the treated leaf. Glyphosate distribution to bolls in a mature sympodium is very complex and is expected to vary according to which leaves actually intercept and retain the spray. Within the boll, distribution was mainly to seeds and fiber.

Our studies demonstrate that the stem leaf exported mainly to the plant while the other leaves exported more to the sympodial bolls. Glyphosate distribution to bolls was affected by sympodial age, position of treated leaf, and position and sink strength of the bolls.