

# FIELD AND LABORATORY TOLERANCE OF ROUNDUP READY COTTON TO GLYPHOSATE

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## Abstract

Research has shown that topical applications of glyphosate (Roundup Ultra) on Roundup Ready cotton (*Gossypium hirsutum* L.) after the 4-leaf stage may affect reproductive development. Applications made after the 4-leaf stage are required, by current label restrictions, to be post-directed. Equipment type, adjustment, and speed cause variation in herbicide deposition. Field experiments were conducted in 1997 and 1998 at the Black Belt Branch Experiment Station near Brooksville, MS, the Delta Branch Research Station near Stoneville, MS, and at the Plant Science Research Center near Starkville, MS, to evaluate Roundup Ready cotton tolerance to topical and post-directed applications of glyphosate. In the topical study, treatments consisted of topical applications of 16, 24, and 32 fl oz/A of glyphosate at the 6, 9, and 12 node growth stage following a topical application of 32 fl oz/A of glyphosate at the 3 node stage.

Under these conditions, machine harvested seed cotton yield was unaffected by off-label topical applications; however, fruiting patterns were affected. Seed cotton weight, from the sympodial branches at nodes 4-9, was decreased by all treatment combinations at Stoneville in 1997. Favorable late season weather in 1997 and 1998 may have allowed plants to compensate for early fruiting losses.

Post-directed treatments consisted of a topical application of 32 fl oz/A of glyphosate at the 3<sup>rd</sup> node followed by 32 fl oz/A post-directed at the base of the plants at the 6, 10, and 14 node growth stage. At the 6 and 10 leaf growth stages, post-directed applications were made at the base of the plant and 25% of the total plant height. No significant differences among glyphosate post-directed treatments were seen in the in-season parameters such as height or plant mapping data. No differences in yield were detected in either year or at any location. The box mapping data are still being quantified to ascertain if fruiting patterns were altered although yield was unaffected.

Laboratory studies were conducted to evaluate the absorption, translocation, and partitioning of <sup>14</sup>C-glyphosate in Roundup Ready cotton as affected by environmental conditions, plant growth stage, and application type. Plants were grown at

65/75 and 75/85 F night/day temperatures with a 12-hour photoperiod, which represented optimal and sub-optimal temperatures, respectively. Four levels of herbicide treatment consisted of topical applications at the 3, 6, and 12 leaf cotton growth stages, and a post-directed application to cotton in the 6 leaf growth stage.

The environmental conditions evaluated had little effect on the parameters evaluated. However the growth stage at time of application had a significant effect on all parameters evaluated. Percent absorption of <sup>14</sup>C-glyphosate applied at the 6 lf growth stage was greater when applied to the stem (39%) than when applied to the leaf (27%). Upward translocation from topical applications ranged from 1 to 11% and was significantly less than the 14 to 18% observed with the post-directed application. Downward translocation of 4.5 to 10% was observed with the post-directed application and was significantly greater than the 0.1 to 1.5% observed with the topical applications. More <sup>14</sup>C-glyphosate was partitioned into Zone 2 (nodes 5-8) and Zone 3 (nodes 9-14) and less in Zone 1 (nodes 1-4) when applied to the stem than from any topical application.