

INFLUENCE OF CULTURAL PRACTICES ON ROUNDUP READY® COTTON IN NORTH CAROLINA

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Abstract

Over 85 percent of the cotton (*Gossypium hirsutum* L.) varieties selected for production in North Carolina are Roundup Ready®. Many growers have complained that these varieties do not consistently yield as well as conventional varieties. Research has shown that the Roundup Ready® trait is not expressed well in cotton reproductive tissue, and that glyphosate causes pollination problems and fruit abortion in Roundup Ready® cotton. Cotton is able to compensate by new fruit initiation, however the fate of newly set fruit depends on the length of favorable environmental conditions during the remainder of the growing season. North Carolina has a high probability of experiencing early fall frosts, heavy precipitation, and hurricane damage, forcing growers to push for an early crop. The Monsanto label allows over-the-top (OT) applications of glyphosate to Roundup Ready® cotton prior to the 5th true leaf stage. Precision post-direct or hooded applications are recommended since glyphosate contact to green tissue may result in yield damage. Most glyphosate applications are post-directed after the 5th true leaf stage. Obtaining good coverage to weed targets and avoiding contact with cotton tissue are contrasting goals, which results in a 'sloppy post-directed application'.

Field studies were conducted at the Upper Coastal Plain Research Station near Rocky Mount, North Carolina in 2001, 2002, and 2003. The primary objective was to determine if late planted cotton is more susceptible to glyphosate damage over a range of application timings and methods. The secondary objective was to apply current MC recommendations and evaluate their affect on fruiting compensation. Treatments were arranged in a factorial design with an optimum (first week of May) and late (first week of June) planting date, and 5 glyphosate application methods including an untreated check (UTC). All glyphosate treatments were sprayed OT at the four-leaf stage, and three received an additional application at the 8-leaf stage consisting of an OT (8OT), sloppy post-direct (8 Slop.), and hooded (8 Hood) at 0.75 lb ae A⁻¹ glyphosate. These ten combinations were factored across programs using MC and no MC as needed according to current North Carolina extension recommendations equaling a total of twenty treatments. Cotton variety 'DP 451 B/RR' was planted on 36" beds, plots were 4 rows wide by forty feet, and data were obtained from the middle two plot rows. Six plants per plot were plant mapped prior to harvest and lint samples were subject to HVI analysis. Data were analyzed in SAS under the general linear model and means were separated by Fisher's Protected LSD at $\alpha=0.05$, unless otherwise noted.

Glyphosate applied at 8OT reduced lint yield by 121-173 lb A⁻¹ regardless of planting date or MC use. Cotton planted at optimal dates out-yielded late planted cotton by 468 pounds of lint A⁻¹. Glyphosate and MC treatments separated by planting date, exhibited significant year by treatment interactions in the optimum planting date, of which only two situations revealed differences. The 2001 crop lost 230-290 lb lint A⁻¹ with the 8OT glyphosate application and the 2003 crop was improved by 80 lb A⁻¹ when MC was used in optimal planted cotton. In late-planted cotton, MC use improved lint yield by 99 pounds ($P = 0.0976$) over all glyphosate applications. The 8 Slop. and 8OT treatments reduced lint yield of late-planted cotton 105 and 468 pounds respectively compared to UTC, 4OT, and 8 Hood over all years and MC programs. Bolls retained on vegetative branches were increased by 8OT glyphosate over all other treatments. Fruiting positions two and three retained more bolls for 8 Slop. and 8OT glyphosate than the UTC, which was a factor of compensation due to early fruit loss. Glyphosate did not affect first position or total boll counts. MC programs retained 0.35 fewer bolls than cotton not treated with MC over all years and treatment combinations. Both staple length and fiber strength were improved with MC. MC did not affect micronaire in the optimum-planted cotton. MC positively affected late-planted cotton, increasing micronaire in 2001, which was a low micronaire year and reducing micronaire in 2002, which was a high micronaire year. Glyphosate did not affect fiber quality.