

COTTON INJURY AS INFLUENCED BY HERBICIDES, IRRIGATION, SEEDLING VIGOR, SEEDING DEPTH, AND ENVIRONMENTAL STRESSES

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Abstract

Cotton production in Georgia requires the use of residual herbicides to be applied throughout the season for control of glyphosate-resistant Palmer amaranth. Preemergence herbicides are a required component of these systems but they do pose a significant risk of cotton injury. Production practices may influence the level of herbicide injury observed with preemergence herbicides.

An experiment studied the relationship of irrigation, seedling vigor, seed placement depth, and preemergence herbicides on cotton planted into soil containing 90% sand. A maximum soil temperature range of 105-115 F was observed during the first 5 days after planting. Two irrigation options included 1) an intense irrigation schedule where seeds were placed into very dry soil followed with irrigation the day of planting as well as irrigation/rainfall 6 of the following 8 days and 2) a pre-irrigated system where seeds were placed into a moist soil followed by irrigation 3.5 days after planting and rainfall on day 7 and 8 after planting. Individual irrigation/rainfall amounts ranged from 0.4 to 0.6 inch. High vigor seed, "PHY 499 WRF", and a known low vigor seed were placed either 0.5 or 1.0 inch below the soil surface. Herbicide options included Reflex (16 oz/A), Staple LX (2 oz/A), Prowl H₂O (2.1 pt/A), Direx (1.5 pt/A), Prowl + Staple LX + Reflex, and a non-treated control. Visual injury, shoot growth, and root growth were measured from before emergence through 24 days after planting; only visual injury at 24 day is reported.

Reflex: Cotton injury ranged from 4 to 41% and injury was greatly influenced by production practices. The greatest level of injury (necrosis, leaf burn, leaf drop) was observed when planting shallow and using intense irrigation (33% injury for high vigor seeds and 41% injury for low vigor seeds); planting depth did not influence injury with the pre-irrigated program. Regardless of irrigation program or planting depth, injury to low vigor seedlings was 8 to 13% greater than with high vigor seedlings.

Staple: Cotton injury ranged from 10 to 41% and again injury was greatly influenced by production practices. Greatest level of injury (26 to 41%) was noted with the intense irrigation program; injury of 26 to 28% and 37 to 41% was observed with cotton planted at 1 or 0.5 inch, respectively. Seedling depth did not impact injury when using the pre-irrigated system. Seedling vigor did not influence injury with the intense irrigation system; however, 11 to 12% more injury was noted with low vigor seedlings as compared to high vigor seedlings when using the pre-irrigated system.

Prowl: Prowl injury was observed with low vigor seed only. In the intense irrigation system, injury ranged from 10 to 13% as reduced shoot growth. Greater injury (31 to 46%) was noted with the pre-irrigated system with low vigor seedlings (0.5 or 1 inch depth); injury was a result of plant absorption of Prowl during emergence (stem, leaf, etc). The first herbicide activating irrigation with this system occurred 3.5 days after planting while cotton was emerging in these two systems.

Prow + Staple + Reflex: Injury ranged from 13 to 64% with injury being visibly identical to Staple alone with all high vigor systems as well as with low vigor seeds under intense irrigation. The two pre-irrigated systems with low vigor seedlings emerging during the first herbicide activating showed foliar Prowl injury plus stunting from Staple. No system appeared similar to injury observed by Reflex applied alone.

Direx: Injury from Direx was less than 3% with all systems except where low vigor seed were planted into the pre-irrigated system. With the first herbicide activating irrigation occurring during cotton emergence with these two programs, foliar injury (11-15%) was visible.

Results from this experiment suggest production practices will greatly minimize or maximize cotton injury from preemergence herbicides. Efforts, such as this, can assist growers' in effectively managing glyphosate-resistant Palmer amaranth while reducing herbicide injury potential.