IMPACT OF SEED VIGOR, PLANTING DEPTH, AND SOIL CONDITIONS ON COTTON INJURY FROM SOIL-APPLIED HERBICIDES
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Abstract

With the evolution of glyphosate-resistant weeds throughout the Mid-South, especially Palmer amaranth, many cotton growers are reverting to using soil-applied herbicides as part of an integrated weed management approach to controlling these weeds. Pre-emergence (PRE) herbicides, although often effective, can cause considerable injury to cotton; hence some growers are reluctant to use these products. Agronomic and environmental factors that could potentially affect the tolerance of cotton to PRE-applied herbicides were evaluated to better understand the causes of injury and steps growers could take to minimize the risk of injury from soil-applied herbicides. Field and growth chamber experiments were conducted in 2012 and 2013 to evaluate the influence of planting depth, seed vigor, and soil conditions on cotton tolerance to various rates of PRE-applied herbicides.

The field experiment was conducted in Fayetteville and Rohwer, AR in 2012 and 2013. The experiment was set up as a split-split plot design with the main plot being planting depth (1.27 and 2.54 cm), the subplot being herbicide product (diuron, fomesafen, and fluometuron) at two application rates (1X and 2X), and seedling vigor (low and high) as the sub-sub plot factor, replicated four times. In 2013, a factorial growth chamber experiment was conducted in twice in Fayetteville, AR. Factors included soil conditions (stressed vs non-stressed), seedling vigor (low and high), and herbicide treatments (non-treated check, diuron, and fomesafen). All experiments were assessed for injury, plants per 2 m\(^2\) of row or pot (for growth chamber studies), and biomass. Results suggest that differences in herbicide chemistry accounts for various levels of injury in cotton planted at 0.25 and 1.0 in depths. Generally, low-vigor seed exhibited greater injury than high-vigor seed in both stressed and normal soil conditions.

In Fayetteville in 2012, increased application rates and planting depths of 1 inch significantly increased risk of injury to cotton from soil applied herbicides; whereas in 2013, cotton injury increased with shallow planting depth, and decreased seed vigor. Cotton applied with cotoran exhibited the least amount of injury, followed by direx and reflex. In Rohwer in 2012, cotton injury was significantly increased when reflex was applied to deeper planted cotton. Cotoran applications caused greater injury when applied at 2X rates. In 2013, low vigor cotton planted 1 inch deep had significantly greater injury at 2X rates compared to lower rates, shallower planting depths, and greater vigor. In addition, low vigor cotton applied with 2X rate of direx exhibited more injury then low vigor cotton, regardless of planting depth. Results from the growth chamber experiment suggest that stressed, low-vigor cotton exhibited greater injury then high vigor cotton.