WEED MANAGEMENT SYSTEMS UTILIZING HERBICIDE RESISTANT COTTON

W. K. Vencill
University of Georgia
Athens, GA

Abstract

Field research was conducted in 1995 to evaluate the utility of glyphosate-resistant cotton (Gossypium hirsutum L.) for weed management systems in Georgia. Small plots were established at the Plant Sciences Farm near Athens, GA. Glyphosate was applied at 2-leaf, 5-leaf, and 2-leaf followed by 5-leaf at 0.84 kg/ha cotton with and without soil-applied residual herbicides. Glyphosate-resistant cotton showed no differences in germination, vigor, emergence, or cut-out when compared to non-transgenic cotton. Glyphosate did not injury cotton at any application timing and differences in yield were due to weed management. Glyphosate applied at 2-leaf followed by 5-leaf stage with and without residual herbicides provided weed control equivalent to the standard. Glyphosate applied at 2-leaf stage of cotton without residual herbicide did not provide adequate weed control. Seed cotton yield from all treatments containing glyphosate except for application at 2-leaf cotton without residual herbicides were equivalent to the standard.

Introduction

Weeds cost Georgia growers approximately $120 million dollars each year in cotton yield and quality losses. Current weed management systems often fail to adequately control the most troublesome and common weeds in Georgia cotton production such as Texas panicum (*Panicum texanum* Buckl.), sicklepod (*Senna obtusifolia* L.), and common cocklebur (*Xanthium strumarium* L.). Currently, growers must utilize inefficient weed management strategies such as post-directed and shielded herbicide applications. The introduction of glyphosate -resistant cotton has the potential to improve weed management systems and the profitability of Georgia cotton production.

Materials and Methods

Research was conducted in 1995 at Plant Sciences Farm near Athens, GA on a Cecil sandy loam (clayey, kaolinitic, thermic, Typic Hapludults) with 76% sand, 16% silt, 8% clay, 0.9% organic matter, and pH was 5.9. 'Coker 315' cotton were planted.

The experimental design was a randomized complete block with three replications. Individual plots consisted of two rows, spaced 91-cm apart, 6.1 m long. Cotton was planted May 18. Common cocklebur, sicklepod, and johnsongrass [*Sorghum halepense* (L.) Pers.] was present in the plots at each location at an approximate density of 50 plants/m^2.

All herbicide treatments were applied with a tractor-mounted or backpack CO_2-pressurized sprayer, calibrated to deliver 170 L/ha at 220 kPa. PRE herbicides were applied the same day as planting. Treatments examined were glyphosate applied POST at 0.84 kg/ha at either the 2-leaf, 5-leaf, and 2-leaf followed by 5-leaf stage of cotton with and without soil applied pendimethalin plus fluometuron applied at 0.84 and 1.6 kg/ha, respectively. A standard consisting of pendimethalin applied at 0.84 kg/ha plus fluometuron applied at 1.6 kg/ha PRE followed by pyrithiobac applied at 70 g/ha POST broadcast followed by MSMA applied at 1.6 kg/ha plus cyanazine at 0.84 kg/ha POST-directed was included.

Weed control was visually estimated on a 0 to 100% scale where 0 = no control and 100 = complete control. Cotton injury was visually estimated on a 0 to 100% scale where 0 = no injury and 100 = complete kill. Visual estimates of weed control and cotton injury was taken 21, 42, and 84 DAP and 10 wk after planting. The cotton crop was mechanically harvested on November 14.

All weed control data were subjected to arcsine transformations before analysis. Significance of differences in treatment means for weed control ratings, cotton yield were determined with Fisher's Protected Least Significance Difference Test at the 5% level of probability. Visual estimates of weed control are expressed as untransformed data for reader clarity.

Results and Discussion

Glyphosate-resistant cotton showed no differences in germination, vigor, emergence, or cut-out when compared to non-transgenic cotton. Glyphosate did not injury cotton at any application timing and differences in yield were due to weed management. Glyphosate applied at 2-leaf followed by 5-leaf stage with and without residual herbicides provided weed control equivalent to the standard. Glyphosate applied at 2-leaf stage of cotton without residual herbicide did not provide adequate weed control. Seed cotton yield from all treatments containing glyphosate except for application at 2-leaf cotton without residual herbicides were equivalent to the standard. Treatments containing a split application tended to perform better than those containing one glyphosate application.

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Table 1. Mean seed cotton yield for weed management systems utilizing glyphosate-resistant cotton, Athens, GA, 1995.

Treatment	Cotton Stage	Rate (kg/ha)	Seed Cotton Yield (kg/ha)
Untreated			0 d
Glyphosate	2-leaf	0.84	523 c
Glyphosate	5-leaf	0.84	980 b
Glyphosate fb Glyphosate	2-leaf fb 5-leaf	0.84 fb 0.84	1285 ab
Pendimethalin + Fluometuron fb Glyphosate	PRE + PRE fb 2-leaf	0.84 + 1.6 fb 0.84	1241 ab
Pendimethalin + Fluometuron fb Glyphosate	PRE + PRE fb 5-leaf	0.84 + 1.6 fb 0.84	969 b
Pendimethalin + Fluometuron fb Glyphosate fb Glyphosate	PRE + PRE fb 2-leaf fb 5-leaf	0.84 + 1.6 fb 0.84 fb 0.84	1450 a
Pendimethalin + Fluometuron fb Pyrithiobac fb MSMA + Cyanazine	PRE + PRE fb POST fb POST-directed (25 cm)	0.84 + 1.6 fb 0.07 fb 1.6 +0.84	1252 ab