

Integrated Morningglory Control Strategies: Transgenic Cotton and Precision Cultivation

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Abstract

A field demonstration was conducted in Mohave Valley to compare cotton morningglory control programs that combined the use of over the top herbicides Roundup Ultra on Roundup Ready cotton (Deltapine 436 RR) or Staple on non-transgenic cotton (SureGrow 125) with and without precision cultivation.

Introduction

Tri-lobed morningglory (*Ipomea xleucantha*) is an annual with twining, trailing stems up to 20 feet long. It reproduces from seed germinating from April into June, and the plant produces mature seeds from June through November. It is widespread in western AZ and its vigorous growth can smother and severely retard the growth of annual crops. It is most troublesome to cotton at harvest when the large plants smother defoliated cotton plants and clog cotton pickers. Cotton losses from morningglory vines in cotton plants include higher labor costs associated with hand removal of morningglory from the picker head, lower lint quality and color discounts attributed to lint staining, and lower lint yields associated with lower plant vigor and inefficient picker harvest.

Staple herbicide applied over the top of most upland cotton varieties or Roundup Ultra applied over the top of transgenic Roundup Ready (RR) cotton varieties controls or suppresses a broad spectrum of weed species including morningglory and nutsedge. These contact herbicides should be applied before morningglory plants reach the two true leaf growth stage. Staple is safe to apply over the top of cotton up to cut-out, however best control and coverage of targeted weed species is obtained early in the growing season with band applications. Roundup Ultra can be applied over the top of transgenic Roundup Ready cotton varieties through the 4th true leaf growth stage.

Mechanical in row weeding with articulated quick hitch guidance systems can be combined with herbicide applications to provide effective season long control of annual morningglory. A generalized integrated approach would include pre-plant application of a yellow herbicide, over the top application of Staple or Roundup on very small pre-5 leaf cotton, mechanical in-row weeding until layby, and a layby herbicide application or spot treatment if necessary as the cotton canopy closes in the row. The objective of this field demonstration was to determine the effectiveness of an integrated approach to morningglory control in cotton.

Materials and Methods

A field demonstration was conducted during 1998 in Mohave Valley (located in southwestern Mohave County) to determine the effectiveness of an integrated approach utilizing over the top herbicides and mechanical in-row weeding for morningglory control in cotton. Trifluralin (Treflan) was applied pre-plant to the entire field to stunt or suppress

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early emerging morningglory and control annual grasses and small seeded broadleaf weeds. Alternating six row strips of Deltapine 436 RR and SureGrow 125 upland cotton varieties were planted wet to 40 inch rows on April 14. Small morningglory plants were tilled into the soil during the planting process. Morningglory plants did not begin to re-emerge until April 27. Staple over the top at 1.2 oz/acre and 1 qt/acre Roundup Ultra post directed herbicide applications in 16 inch band widths were made to 2 leaf morningglory growing in 8 to 10 leaf cotton on June 9. Staple was applied over the top of SureGrow 125 plots and Roundup Ultra was applied post directed to Deltapine 436 RR cotton plots with a six row sprayer. Nine Deltapine 436 RR and nine SureGrow 125 six row cotton plots were cultivated with a mechanical in-row cultivator with an articulated guidance system (Pegasus) on June 25. Nine SureGrow 125 six row plots (54 rows) were not cultivated on this date as a control.

The field demonstration consisted of three treatments: 1) SureGrow 125 treated with Treflan preplant, Staple herbicide over the top on June 9, and no in-row precision cultivation; 2) SureGrow 125 treated with Treflan preplant, Staple herbicide over the top on June 9, and in-row precision cultivation on June 25; and 3) Deltapine 436 RR treated with Treflan preplant, Roundup Ultra herbicide post directed on June 9, and in-row precision cultivation on June 25. Individual plots were 6 rows (20 feet) wide by the length of the irrigation run (800 feet long) and each treatment was replicated 9 times.

Growth characteristics (height to node ratios and percent fruit retention) were determined at periodic intervals for the two cotton varieties. Visual weed control rating were done on July 23 at 60 to 80% cotton canopy row closure. Hoeing labor hours were determined with and without the precision in-row cultivation. Each of the two cotton varieties were harvested on November 18 and bulked by rep into two separate trailers to be weighed for lint yield and HVI quality determinations at the Mohave Valley cotton gin. Statistical analyses were performed on the data using ANOVA and the least significant difference Duncan's Multiple Range Test at the 0.05 level of probability when appropriate.

Results and Discussion

The Deltapine 436 RR and SureGrow 125 upland cotton varieties had similar crop vigor and fruiting characteristics during the 1998 growing season (Table 1). Roundup post directed at 1 qt/acre to Deltapine 436 and Staple applied over the top at 1.2 oz/acre to SureGrow 125 provided adequate and similar control of tri-lobed morningglory and common purslane (Table 2). Precision cultivation resulted in superior purslane control, compared to conventional cultivation. Precision cultivation also realized in a cost savings of \$13.50 per acre in late season hoe crew labor, compared to conventional tillage.

Lint yield of SureGrow 125 was 272 lbs/acre more than Deltapine 436 RR. Both varieties had similar lint quality characteristics (Table 3). In this study, precision cultivation had a greater impact on broadleaf weed control than herbicide applications. Therefore, the most profitable alternative for effective morningglory and purslane control was to grow the SureGrow 125 cotton variety without mid-season herbicide application, but with precision in-row cultivation.

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Table 1. Plant growth characteristics of SureGrow 125 and Deltapine 436 RR upland cotton varieties as a function of heat units accumulated after planting (HUAP).

Variety	HUAP	Height to Node Ratio (inch)		Fruit Retention (%)	
		Actual	Baseline	Actual	Baseline
SureGrow 125	1649	1.52	1.36	93.4	65.2
Deltapine 436RR	1649	1.52	1.36	93.3	65.2
SureGrow 125	2296	1.67	1.57	90.0	57.8
Deltapine 436RR	2296	1.67	1.57	89.7	57.8
SureGrow 125	3108	1.50	1.68	79.5	48.6
Deltapine 436RR	3108	1.49	1.68	79.9	48.6
SureGrow 125	4152	1.41	1.56	83.6	36.7
Deltapine 436RR	4152	1.40	1.56	80.3	36.7

Table 2. Tri-lobed morningglory and common purslane control following over the top or post directed herbicide and precision cultivation treatments and final lint yield data for the SureGrow 125 and Deltapine 436 RR.

Treatment	Purslane Control (%)	Morningglory Control (%)	Hoe Crew Labor (\$/acre)	Lint Yield (bale/acre)
1. SureGrow 125 - Staple Applied Conventional Cultivation	60.0 b	84.4 a	18.00	---
2. SureGrow 125 - Staple Applied Precision Cultivated	79.4 a	85.3 a	4.50	2.7
3. Deltapine 436 RR Roundup Applied Precision Cultivated	86.7 a	90.3 a	4.50	2.1

Table 3. Lint turnout and HVI quality analysis for the SureGrow 125 and Deltapine 436 RR upland cotton varieties.

Variety	Turnout (%)	Grade	Micronaire	Strength	Staple
SureGrow 125	35.3	31-2	5.1	25.6	35
Deltapine 436 RR	27.0	31-2	5.2	26.3	35