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LIGHT ACTIVATED SPRAYER: IS IT WORTH THE COST?

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Abstract

Field experiments were conducted from 2000-2002 near New Deal, TX to compare weed control in a Roundup Ready cotton production system using mechanical cultivation, a conventional hooded sprayer, and a light-activated hooded sprayer. Treatments included Treflan at 1.5 pt/A applied preplant incorporated (PPI) followed by Caparol at 1.2 qt/A applied preemergence and mechanical cultivation as needed; Treflan PPI followed by a postemergence over-the-top (POT) broadcast application of Roundup Ultra at 1 qt/A at the four leaf growth stage, and Roundup Ultra applied at 1 qt/A with a conventional hooded sprayer (CS) as needed; Treflan PPI followed by Roundup Ultra POT broadcast and Roundup Ultra applied at 1 qt/A with a light-activated hooded sprayer (LAS I) as needed; and Treflan PPI followed by a POT application of Roundup Ultra at 1 qt/A on a fourteen inch band over the row at the four leaf stage and Roundup Ultra applied at 1 qt/A with LAS as needed (LASII).

'Paymaster 2326 RR' cotton was planted at a seeding rate of 15 lb/A on 40 inch rows on May 9, 2000, and May 10 of 2001 and 2002 and harvested November 20, 2000, December 10, 2001, and December 13, 2002. Experimental design was a randomized complete block consisting of four replications. Plots were 8 rows by 600 feet. Preplant incorporated treatments were applied February 29, 2000, March 2, 2001, and March 18, 2002 and incorporated with a springtooth harrow. Preemergence applications were made on May 10 all three years. Postemergence treatments were applied on June 9, July 3, and July 18 in 2000; June 9 and July 5 in 2001; and June 14 and July 10 in 2002. Weeds were 1 to 6 inches in height at the time of application. Control of field bindweed, Palmer amaranth, common cocklebur, and silverleaf nightshade was visually rated 14 and 28 days after the last application (DAT) was made to each treatment. The amount of spray solution used by the LAS was determined by subtracting the volume remaining after spraying a single plot from the initial volume in the tank. Percent herbicide savings was calculated based on the amount of solution required to apply a broadcast treatment. Economic analysis includes total specified expenses consisting of: herbicide, insecticide, growth regulator, defoliant, fertilizer, ginning, operation, and fixed expenses (irrigation maintenance and hooded sprayer cost), and returns above total specified expenses, derived from sale of cotton lint and seed.

In 2000, field bindweed control 14 and 28 DAT was similar for CS, LAS I, and LAS II treatments and ranged from 88 to 95%. Control achieved with mechanical cultivation was lower at both observation dates (71% 14 DAT and 63% 28 DAT). In 2001 and 2002, there were no differences in field bindweed control with cultivation, CS, and LAS I (55 to 61%). Field bindweed control was 49% with LAS II and was lower than that obtained with the other three treatments.

The CS, LAS I, and LAS II treatments provided similar control of Palmer amaranth (89 to 91%) at 14 DAT when averaged over 2000 and 2002. Cultivation resulted in lower Palmer amaranth control 14 DAT (71%). The hooded sprayer treatments controlled Palmer amaranth 86 to 91% at 28 DAT, but cultivation did not effectively control Palmer amaranth (64%) at this observation time. At 14 DAT in 2001, Palmer amaranth control ranged from 64 to 75% and was similar for all hooded sprayer treatments. Palmer amaranth control was less effective with cultivation (36%). By 28 DAT, hooded sprayer treatments controlled Palmer amaranth 59 to 76% and cultivation controlled Palmer amaranth 40%.

Control of common cocklebur 14 DAT was similar for CS, LAS I, and LAS II treatments and control ranged from 73 to 77%. Cultivation controlled common cocklebur 52% 14 DAT. At 28 DAT, common cocklebur control improved for CS, LAS I, and LAS II and ranged from 83 to 85%. Conversely, common cocklebur control following the cultivation treatment declined to 47%.

Silverleaf nightshade was controlled less than 75% with all treatments 14 DAT. There were no differences in control between the hooded sprayer treatments, while control with cultivation was lower than with the CS and LAS II. In 2000, control 28 DAT was greater than 85% with all hooded sprayer treatments, while the cultivation treatment resulted in less than 70% control. The LAS II treatment controlled silverleaf nightshade similar to CS and greater than LAS I. In 2001 and 2002, silverleaf nightshade was controlled 68 to 72% 28 DAT and was similar for all hooded sprayer treatments. Cultivation con-

trolled silverleaf nightshade 62%, which was similar to control achieved with LAS II, but lower than control achieved with CS and LAS I.

Herbicide savings for LAS II at the first application was 55% in 2000 and 51% in 2001 and 2002 when compared to the conventional treatment. LAS I resulted in herbicide savings of 70%, while LAS II used 62% less herbicide compared to the conventional sprayer. The reduction in total herbicide used over the entire growing season for LAS I was 39% and the reduction for LAS II was 35%.

Lint yields for all hooded sprayer treatments were similar and ranged from 690 to 730 lb/A. Plots that were cultivated produced 510 lb lint/A, and this yield was less than all hooded sprayer treatments.

The three hooded sprayer treatments provided similar net returns that ranged from $3.48 to $7.15 /A. These net returns were greater than the net returns observed from the preemergence plus cultivation treatment (-$43.70 /A).

In summary, the LAS treatments consistently controlled all weeds similar to the CS treatment. Lint yields and net returns were similar for all hooded sprayer treatments and were greater than the yield and net return observed in the preemergence plus cultivation treatment. These results indicate that the additional cost of LAS was offset by reductions in herbicide use when compared to CS. However, net returns were not increased when compared to a conventional sprayer, offering no financial incentive to use LAS. An environmental incentive may exist when considering the difference in the amount of herbicide applied with LAS compared to CS. However, glyphosate is an environmentally benign herbicide so little incentive would be observed unless another herbicide program was employed.