



Texas Precision Agriculture

The Texas A&M University System – Agriculture Program

Annual Reports – 2000

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Primary Research Locations: Texas Tech Research Farm near New Deal and the Western Peanut Growers Farm near Denver City. Satellite studies were conducted at Ropesville, at AG-CARES near Lamesa, and at the Texas Agricultural Research and Extension Center in Lubbock.

Project Title: Weed Mapping and the Economic Benefit of a Light-Activated Weed Sprayer in Texas Southern High Plains Peanut and Cotton Production

Reporting Period: January 1, 2000 to December 31, 2000

Objectives:

- 1) Compare conventional weed control systems to one using a light-activated hooded sprayer.
- 2) Determine the economic benefit of using a light-activated hooded sprayer.
- 3) Map the presence of weeds in a field and relate to yield and long-term weed control over time.

A. Summary of Progress:

A light-activated sprayer was purchased in spring, 2000. Because of the timing of delivery and because of the initial establishment of the Denver City peanut farm, the light-activated sprayer was not extensively tested in peanut. We did use the sprayer a few times in Lubbock and once at the Western Peanut Growers Farm. Weed control following each application was excellent, but peanut injury was observed as well. The outside sensors under the middle hoods detected the peanut reflectance and activated the sprayer. Because we were spraying glyphosate (Roundup) to control weeds and peanut is sensitive to this herbicide, injury was observed. The objective was to replace

early cultivation with the sprayer, but this application was made when the peanut was too large. Studies will be conducted in 2001 at the Western Peanut Growers Farm to further test this equipment in peanut.

In cotton, a series of experiments were established at the Texas Tech Research Farm to test the effectiveness and feasibility of using a light-activated sprayer. Our objectives were three-fold:

1. Compare conventional weed control systems to one using a light-activated hooded sprayer.

Below is a summary of the treatments at New Deal. PAYMASTER 2326 RR was planted on May 9 on 40-inch rows. Treatments include: 1) a dinitroaniline herbicide PPI, broadcast Roundup application at the 4-leaf stage, postemergence-directed Roundup applications using a hooded sprayer (a second postemergence-directed application was applied based on weed population), 2) a dinitroaniline herbicide PPI, broadcast Roundup application at the 4-leaf stage, use the light-activated sprayer to control weeds with Roundup postemergence-directed (2 applications were needed), 3) a dinitroaniline herbicide PPI, **banded Roundup application (14-inches) over the cotton row at the 4-leaf stage**, use the light-activated sprayer at the 4-leaf stage, use the light-activated sprayer to control weeds post-directed (2 applications were needed), and 4) a dinitroaniline herbicide PPI, Caparol PRE, plus cultivation.

In treatment 3, a band of Roundup Ultra was sequentially added to the light-activated sprayer treatment at the 4-leaf stage. We had intended to control the weeds in the cotton row by raising the light-activated sprayer. Unfortunately, the sensors did not detect the small weeds when the hoods were raised. Therefore, we needed to control the weeds in the cotton row with a band of roundup Ultra (14-inch band) and used the light-activated sprayer to control the weeds in the inter-row space.

Three post emergence Roundup treatments were applied (June 9, July 3, and July 18). Weed control has been rated throughout the growing season. Weed control results on August 14 are shown in the table below. The five letter Weed Science Society of America code for these weeds are CONAR is field bindweed, AMBGR is woollyleaf bursage (lakeweed), AMAPA is Palmer amaranth (carelessweed), XANST is common cocklebur, SOLEL is silverleaf nightshade (whiteweed), and PHYSO is groundcherry.

Trt	CONAR	AMBGR	AMAPA	XANST	SOLEL	PHYSO
1	93	92	91	91	96	15
2	93	87	91	88	89	13
3	90	80	88	86	86	11
4	63	55	69	49	69	18
cv	8	9	9	9	8	32
LSD	11	15	12	11	11	7

(0.05)

This data, although preliminary, may answer the first of our questions: Can we control weed effectively with the light-activated sprayer? If we compare treatment 1 to

treatments 2 and 3, I think the answer is yes! The second question we are after is: How much of a chemical savings do we get by using the light-activated sprayer? We saved 85% Roundup solution during the June 9 application, 63 to 67% during the July 3 application, and 56 to 71% during the July 18 application.

Cotton yield.

<u>Treatment</u>	<u>Lint yield (pounds per acre)</u>
1	433
2	440
3	422
4	379
cv	10
LSD _(0.05)	66

Weed control systems using a light-activated sprayer controlled weeds similar to conventional post emergence-topical and post emergence-directed applications. Plots treated with a light-activated sprayer yielded similar to plots treated with a conventional sprayer.

2. Determine the economic benefit of using a light-activated hooded sprayer. We did some preliminary analyses to see if this is affordable to our growers.

Given: Roundup UltraMax costs \$44.00 per gallon, each application requires 26 ounces per acre, a grower has 800 acres of cotton, he makes one post emergence-topical (PT) and one post emergence-directed (PD) application per season in the 28-inch inter-row space and broadcasts 12-inches over the row, an 8 row unit costs \$38,000, and he saves 80% solution at PT and 65% at PD.

Then: It will take between 5 to 6 years to pay for this equipment.

3. Map the presence of weeds in a field and relate to yield and long-term weed control over time.

Perennial weed patches were mapped at the New Deal location. Yield monitors were used to harvest this location and will be used to see if weedy patches match lower yielding areas. Unfortunately, these maps are not ready at the time this report is due.

B. Education/technology transfer:

Information regarding the equipment and observations collected were shared by numerous turn row meeting in 2000. On August 1, 2000, a Precision Agriculture meeting was held in Ropesville. A classroom discussion and field demonstration took place. Information will also be shared at the Beltwide Cotton Conferences in Anaheim, CA, and at the Southern Weed Science Society meeting in Biloxi, MS.

C. Milestones achieved:

A light-activated sprayer was purchased in spring, 2000 and tested in numerous location and times in the 2000 growing season. Initial data collected looks very promising, but the current technology is very expensive. Additional opportunities for equipment improvement and the testing of other light-activated sprayer equipment will be considered in the 2001 growing season.

D. Publications:

Peters, D.A., P.A. Dotray, J.W. Keeling, and J.A. Bond. Weed management in Roundup Ready Cotton using a light-activated sprayer. Proceedings of the Beltwide Cotton Conferences. (In Press).

Peters, D.A., P.A. Dotray, J.W. Keeling, and J.A. Bond. Comparison of glyphosate applied with standard and light-activated hooded sprayers. Proceedings of the Southern Weed Science Society. (In Press).

E. Precision agriculture proposals:

Dotray, P.A., J.W. Keeling, and A.D. Brashears. 2000. Economic analysis of a light-activated weed sprayer for cotton production on the Texas Southern High Plains. International Cotton Research Center. \$22,000/Funded.

Dotray, P.A. and J.W. Keeling. Economic benefit of a light-activated weed sprayer in Texas cotton production. State Support Committee. Cotton, Incorporated. \$15,000/funded.

F. Precision Agriculture meetings attended/papers (posters) presented:

Dotray, P.A. 2000. Cotton precision agricultural principles and equipment for weed control. District 2 Precision Agricultural Training. Ropesville, TX. August 1.

Peters, D.A. Weed management in Roundup Ready Cotton using a light-activated sprayer. Weed Science Conference of the Beltwide Cotton Conferences. To be presented on January 12, 2001, in Anaheim, California.

Peters, D.A. Comparison of glyphosate applied with standard and light-activated hooded sprayers. To be presented at the Southern Weed Science Society on January 24 in Biloxi, Mississippi.

G. Other developments:

Additional equipment was tested in preliminary greenhouse and field trials in 2000 and will continue in 2001. This new equipment has the potential to differentiate between plants.