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COTTON STALK TERMINATION TO PREVENT REGROWTH

Robert G. Lemon, D. Joel Pigg, and Archie Abrameit
Texas Cooperative Extension
College Station, TX
W.C. Robertson
Arkansas Cooperative Extension
Little Rock, AR
J. Tom Cothren and Ty Witten
Texas Agricultural Experiment Station
College Station, TX

Abstract

Studies were conducted in central Texas and Arkansas in 2002 to evaluate 2,4-D (ester and salt formulations), Clarity (dicamba), and Harmony Extra for effectiveness in post-harvest cotton stalk destruction. Treatments included 2,4-D ester and amine formulations (1.0 and 1.5 lbs. a.i./acre – 32 and 48 oz. product), Clarity (0.5 lbs. a.i./acre – 16 oz. product), and Harmony Extra (0.028 lbs. a.i./acre – 0.6 oz. product) applied at shredding, and one, three, and five days post-shredding. The Texas location included an additional application timing of 21 days post-shredding. At both locations, herbicide application timing following shredding (0, 1, 3, and 5 days post-shredding) did not affect regrowth control. Similarly, at the Texas location root mortality also was not affected by herbicide application timing, except in the 21 days post-shredding treatment. Also, at both locations, the 2,4-D ester and amine formulations applied at 1.5 lbs. a.i./acre provided the best overall performance. Clarity and Harmony Extra showed the least regrowth control at both locations. Regardless of regrowth/root mortality ratings, all treatments rendered cotton non-hostable at both locations. Due to liability issues associated with ester formulations, 2,4-D amine (1.5 lbs. a.i../acre) appears to be the best choice for chemical stalk destruction. Due to significant environmental influences, additional research is necessary to develop standard recommendations.

Introduction

In its native habitat cotton is a perennial shrub that may survive for many years. The perennial habit of cotton allows it to regrow following harvest, providing the potential for development of hostable fruit (squares and bolls) for boll weevil feeding and reproduction. Early harvest and stalk destruction are among the most effective cultural practices for managing overwintering boll weevils when performed on an area-wide basis.

Stalk destruction is more important in the southern and eastern portions of Texas, where rainfall and warmer temperatures occur. In the western and northwestern regions, freezing temperatures generally kill the plant before hostable fruit is developed. In Arkansas in 2002, warm conditions during the harvest-season were conducive for large amounts of regrowth development. When field conditions and weather are favorable for tillage, stalks can be shredded and then disked to destroy the intact plant. Stubble stalk pullers can also be used to uproot the stalk. Although these mechanical methods are generally successful, many growers are implementing reduced tillage systems which do not allow for primary tillage operations, causing producers to evaluate new methods for stalk destruction.

Several herbicides have been registered for cotton stalk destruction. Herbicides available include 2,4-D (ester and salt formulations), several dicamba products (Weedmaster, Clarity, Banvel), and Harmony Extra (thifensulfuron-methyl + tribenuron-methyl). For these products to be legal for cotton stalk destruction, the label must contain a section addressing "crop stubble."

Literature is limited with regard to the best approach for using herbicides for cotton stalk destruction. Sparks et al. (2002) working in the Texas Rio Grande Valley reported that Harmony Extra reduced regrowth and delayed squaring, but only 2,4-D provided acceptable regrowth control. Herbicide applications made shortly after shredding showed the best results, potentially due to the wounding effect and the lack of callus formation. Once the tissue "heals", and the callus layer is formed efficacy is reduced. Effectiveness of 2,4-D in non-shredded stalks was generally much less than where stalks were shredded.

Materials and Methods

Studies were conducted in central Texas and Arkansas in 2002 to evaluate 2,4-D (ester and salt formulations), Clarity (dicamba), and Harmony Extra for effectiveness in post-harvest cotton stalk destruction. Treatments included 2,4-D ester and amine formulations (1.0 and 1.5 lbs. a.i./acre – 32 and 48 oz. product), Clarity (0.5 lbs. a.i./acre – 16 oz. product), and Harmony Extra (0.028 lbs. a.i./acre – 0.6 oz. product) applied at shredding, and one, three, and five days post-shredding. The Texas location included an additional application timing of 21 days post-shredding.

Texas Location

The study was conducted at the Stiles Farm Foundation, near Thrall. DP 422 B/RR was planted April 18 and stripper-harvested September 18. The harvest aid program consisted of Def (8 oz. product/acre) + Dropp (0.1 lbs. product/acre) followed by 24 oz. of Cyclone Max. Stalks were cut 6 to 8 inches in height with a flail-type shredder on September 24. The field was in a no-till production system. Herbicides were applied within one hour of the shredding operation using a hand-held, broadcast CO2 backpack sprayer set to deliver 11 gallons/acre (TT11002 nozzles, 19 inch spacing, 28 psi). Nonionic surfactant was used with each herbicide at 0.5% v/v. Plot dimensions were 4 rows wide x 40 ft. in length. Statistical design was a split plot, with timing serving at the main plot and herbicides the split effect. All data were subjected to analysis of variance. The timing x herbicide interaction was not significant; therefore, only the main effects are presented. Observations were taken at 21 and 49 days after the initial treatment application (DAIT). Regrowth and root mortality ratings were collected. Root ratings were made based upon the presence/absence of green, viable stalk tissue. Regrowth control ratings were based on a 0 to 100% scale relative to the untreated check.

Arkansas Location

A study was conducted near Aubrey in a field of PM1218 BG/RR that was planted April 17 and picker-harvested September 17. The harvest aid program consisted of a sequential application of Dropp (0.1 lbs. product/acre) + Aim (0.5 oz. product/acre) applied September 3, followed by an application of CottonQuik (48 oz. product/acre) + Aim (0.5 oz. product/acre). The study was initiated September 24, one week after harvest. The field was in a no-till production system. Stalks were cut with a flail-type shredder to a 6 to 8 inch height. Herbicide treatments were broadcast applied with a CO2 pressurized four-wheel ATV sprayer, delivering 10 gallons/acre (TT110015-VP nozzles, 19 inch spacings, 20 psi). Nonionic surfactant was used with each herbicide at 0.5% v/v. Plot dimensions were 4 rows wide x 40 ft. in length. Statistical design was a split plot, with timing serving at the main plot and herbicides the split effect. All data were subjected to analysis of variance. The timing x herbicide interaction was not significant; therefore, only the main effects are presented. Observations were taken at 13, 28 and 48 days after the initial treatment application (at shredding). Regrowth control ratings were based on a 0 to 100% scale relative to the untreated check.

Results and Discussion

Texas Location

Very little regrowth was present at study initiation. During the 49 day study duration, 404 DD60s were accumulated, averaging only 8.2 DD60s/day. No rainfall occurred from September 24-30, 6.5 inches were received in October, and 3.0 inches occurred from November 1-12.

The time of herbicide application following shredding did not affect root mortality or regrowth at 21 DAIT (Figure 1). At 21 DAIT, all timings demonstrated about 40% root mortality. However, at 49 DAIT a significant difference was detected among the application timings, with the 21 days after shredding treatment showing 54% root-kill, compared to over 70% for the other timings. No statistical difference in root mortality (P>F 0.1593) was observed among the herbicide treatments when evaluated at 21 DAIT (Figure 2).

At 49 DAIT all herbicide treatments demonstrated significantly better root-kill compared to the untreated check; however, only slight numerical differences were noted among the herbicide treatments. Regrowth evaluations taken at 21 and 49 DAIT showed similar results (only 21 DAIT presented, Figure 3). The 2,4-D ester (1.0 and 1.5 lbs. a.i/acre) and the 2,4-D amine (1.5 lbs. a.i./acre) treatments were significantly better than Clarity, Harmony Extra, and 2,4-D amine (1.0 lbs. a.i./acre). Regrowth control ratings taken at 21 DAIT indicated no differences among the application timings (data no shown). All treatments demonstrated about 80% control. Regardless of application timing or herbicide used, at 49 DAIT all treatments were considered non-hostable compared to the untreated check, which had pinhead to matchhead sized squares present.

Arkansas Location

At the time of shredding, about 50% of stalks had pinhead-size squares on the basal regrowth, and considerable leaf area was present. The time of herbicide application following shredding did not affect regrowth control at 13, 28, or 48 DAIT (Figure 4). There was a slight increase in regrowth control over time. The 1.5 lbs. a.i./acre rate of 2,4-D ester was significantly better than any other herbicide treatment (Figure 5). Clarity and Harmony Extra demonstrated the least regrowth control. However, regardless of regrowth ratings, all herbicide treatments resulted in complete square shedding when rated at 13, 28 and 48 DAIT. All treatments were considered non-hostable compared to the untreated check.

Conclusions

At both locations, herbicide application timing following shredding (0, 1, 3, and 5 days post-shredding) did not affect regrowth control. Similarly, at the Texas location root mortality also was not affected by herbicide application timing, except in the 21 days post-shredding treatment. Also, at both locations, the 2,4-D ester and amine formulations applied at 1.5 lbs. a.i./acre provided the best overall performance. Clarity and Harmony Extra showed the least regrowth control at both locations. Regardless

of regrowth/root mortality ratings, all treatments rendered cotton non-hostable at both locations. Due to liability issues associated with ester formulations, 2,4-D amine (1.5 lbs. a.i../acre) appears to be the best choice for chemical stalk destruction. Due to significant environmental influences, additional research is necessary to develop standard recommendations.

References

Sparks, A.N., J.W. Norman, Jr., C. Stichler, J. Bremer, and S. Greenburg. 2002. Cotton stalk destruction with selected herbicides and effect of application methodology. Proc. Beltwide Cotton Conferences. CD-ROM

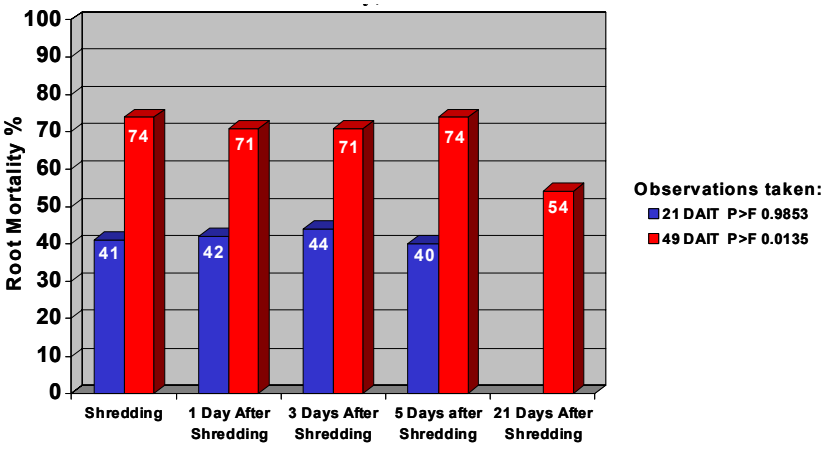

Figure 1. Effects of Herbicide Application Timing on Cotton Root Mortality, Central Texas.

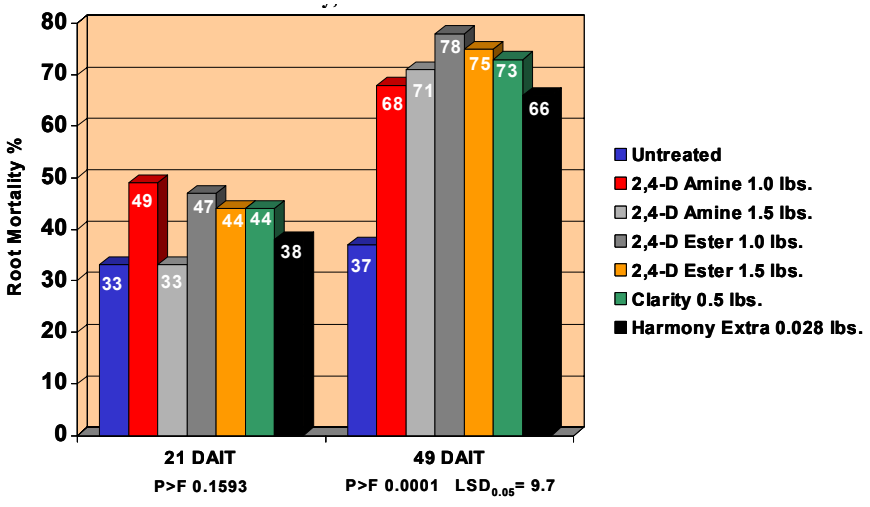

Figure 2. Effects of Different Herbicides on Cotton Root Mortality, Central Texas.

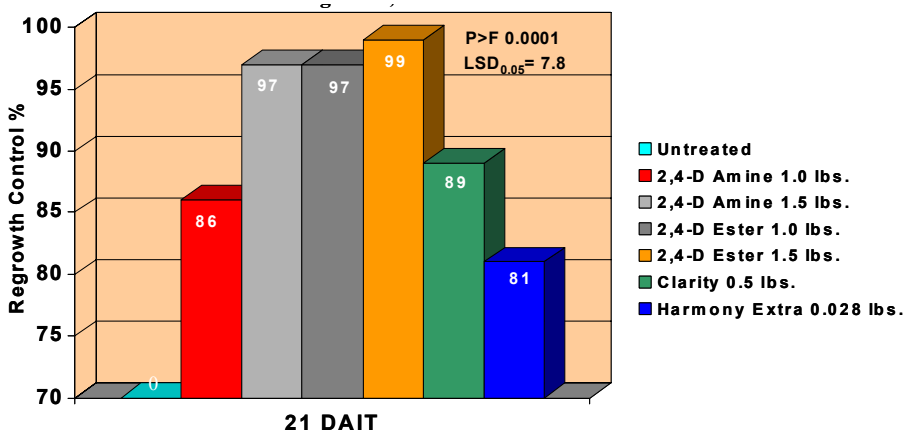

Figure 3. Effects of Different Herbicides on Cotton Regrowth, Central Texas.

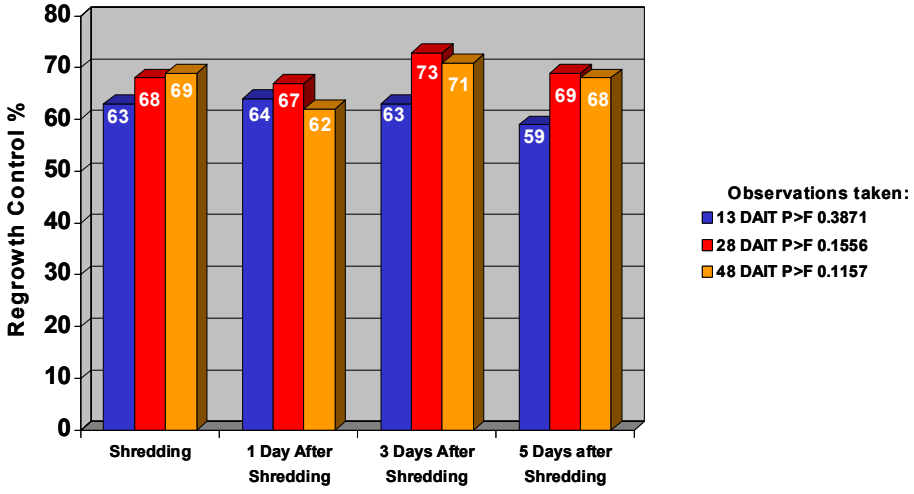

Figure 4. Effects of Herbicide Application Timing on Cotton Regrowth – Aubrey, Arkansas.

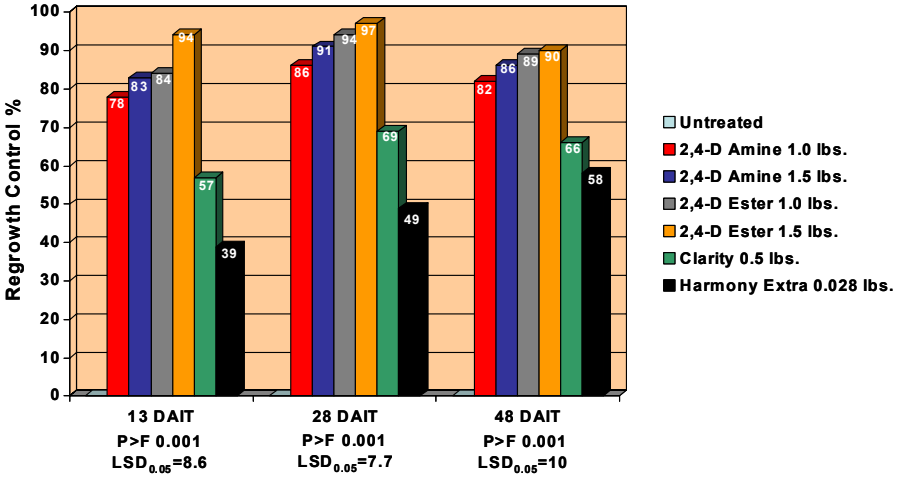

Figure 5. Effects of Different Herbicides on Cotton Regrowth – Aubrey, Arkansas.