# Control of Emerging Weeds in Cotton and Wheat Minimum Tillage Systems in the Southern Rolling Plains

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## Introduction and Abstract

Reduced tillage and the adoption of glyphosate tolerant cotton (*Gossypium hirsutum*) varieties have resulted in a weed shift to certain perennial glyphosate tolerate weeds and are creating a potential for glyphosate resistant weeds in the US southern plains. New weed control strategies or the re-adoption of former weed control methods are needed to improve and prolong the benefits of reduced tillage and glyphosate tolerant crops. Emerging and re-emerging problem weeds in the US southern plains include: prickly pear (*Opuntia spp.)*, mesquite (*Prosopis spp.*), various native and introduced perennial grasses including (*Chloris spp., Tridens albescens, Nassella leucotricha, Bouteloua dactyloides, Schedonnardus paniculatus*), volunteer cotton (*Gossypium hirsutum*), field bindweed, hog potato, globe mallow (*Sphaeralcea ambigua),* and others, Figure 1. Applied research trials established in 2010 and 2011 in Central Texas evaluated multiple herbicides and rates for efficacy and development of control recommendations for many of these species. Trials to fallow fields were established in the fall of 2010 to evaluate different rates of glyphosate and glyphosate mixed with broadleaf herbicides for the control of native and introduced perennial grasses and other weeds. High rates of glyphosate, one exceeding twice the normal rate; provided acceptable control among the treatments but did not provide complete control. A trial established in May 2011; pre-plant to strip-till cotton in a wheat *(Triticum aestivum* )/cotton rotation, compare rates and combinations of glyphosate, clethodim, and saflufenacil. Higher rates of glyphosate and glyphosate mixtures provided reasonable control of some perennial grasses. No treatment provided complete control and some grasses showed no response to several treatments. It is expected that multiple treatments and/or tillage will be needed to control some of these species.

## Materials and Methods

- Herbicide efficacy trials evaluating 3 herbicide rate/combinations were established in a fallow field at San Angelo, Tx in November 2010. See Table 1 for treatments. Plots were established in a randomized complete block design (RCBD) with 4 Replications. Individual plot sizes were 50 ft (15.2 m) X 7ft (2.13 m).
- Herbicide efficacy trials evaluating 9 herbicide rate, formulation, and tank mix combinations; were established pre-plant in a strip-till cotton field near Tuxedo, TX in May 2011 (Figure 1). See Table 2 for treatments. Plots were established in a RCBD with 4 Replications. Individual plot sizes were 50 ft (15.2 m) X 11ft (3.35 m).
- Both trials were applied by a research plot sprayer using pressurized $CO_2$ at 40 psi., flat fan nozzles, and a total spray volume of 10 gallons/acre (93.5 L $ha^{-1}$).
- Plots were evaluated at intervals after treatment for percent control of multiple species located within the treatment area.

**Table 1. Percent control of Texas wintergrass (*Nassella leucotricha*) and windmill grass (*Chloris spp.)* with herbicide treatments in a fallow field Nov. 2010, San Angelo, TX**

| | % control of Texas winter grass | | % control of windmill grass | |
|---|---|---|---|---|
| Treatments† | 14 DAT | 153 DAT | 14 DAT | 153 DAT |
| Glyphosate @ 64 fl oz/ac (3.08 kg ae $ha^{-1}$ ) + AMS | 70 | 80 | 83 | 63 |
| Glyphosate @ 32 fl oz/ac (1.54 kg ae $ha^{-1}$) + AMS | 80 | 80 | 75 | 33 |
| Saflufenacil @ 1.5 oz/ac (37.5 g ae $ha^{-1}$) + Glyphosate @ 32 fl oz/ac (1.54 kg ae $ha^{-1}$) + COC + AMS | 70 | 77 | 67 | 11 |

†Glyphosate. Roundup PowerMAX®, Monsanto; containing 5.5 lbs/gal (660 g $L^{-1}$) active ingredient(ae). A 32 fl oz/ac (2.34 L $ha^{-1}$) applications is equivalent to 1.38 lbs/ac ae (1.54 kg ae $ha^{-1}$)
Saflufenacil. Sharpen®, BASF; containing 2.85 lbs/gal (342 g $L^{-1}$) ae. A 1.5 fl oz/ac (0.11 L $ha^{-1}$ ) application is equivalent to 0.03 lbs/ac ae (37.5 g ae $ha^{-1}$)
Ammonium sulfate (AMS) applied at 1.7 lbs/ac ae (1.9 kg $ha^{-1}$)
Crop oil concentrate (COC) applied at 1% v/v

## Results and Discussion

- High rates of glyphosate and high rates of glyphosate combined with clethodim or with saflufenacil provided acceptable control of Texas wintergrass, windmill grass, and tumblegrass. No treatment provided complete control and several grasses showed some recovery as evidenced by decreased percent control ratings at more than 100 days after treatment (DAT). See Tables 1 and 2 for treatments and ratings.
- Fall treatments appeared to have greater initial control of perennial weeds but some recovery was evidenced by lower control percentages at the last evaluation (Table 1.)

**Table 2. Percent control of tumblegrass [*Schedonnardus paniculatus* (Nutt.) Trel.], a perennial warm season grass with 9 herbicide treatments in strip-till cotton on May 2011; Tuxedo, TX.**

| Treatments† | % Control 13 DAT | % Control 27 DAT | % Control 63 DAT | % Control 130DAT |
|---|---|---|---|---|
| Glyphosate @ 64 fl oz/ac (3.08 kg ae $ha^{-1}$ ) + AMS | 28 | 46 | 73 | 74 |
| Glyphosate @ 32 fl oz/ac (1.54 kg ae $ha^{-1}$) + AMS | 23 | 28 | 75 | 76 |
| Clethodim # 3 @12 fl oz /ac (101 g ae $ha^{-1}$) + Glyphosate @ 32 fl oz/ac (1.54 kg ae $ha^{-1}$) + AMS + NIS | 23 | 18 | 73 | 94 |
| Clethodim #3 @ 24 fl oz /ac (202 g ae $ha^{-1}$) + AMS + NIS | 15 | 36 | 48 | 49 |
| Saflufenacil @ 1.5 oz/ac (37.5 g ae $ha^{-1}$) + Glyphosate @ 32 fl oz/ac (1.54 kg ae $ha^{-1}$) + COC + AMS | 20 | 20 | 28 | 46 |
| Clethodim #1@ 12 fl oz /ac (208 g ae $ha^{-1}$) + Glyphosate @ 32 fl oz/ac (1.54 kg ae $ha^{-1}$) + COC + AMS | 14 | 12 | 43 | 31 |
| Clethodim #1@ 12 fl oz /ac (208 g ae $ha^{-1}$) + COC + AMS | 10 | 8.8 | 13 | 50 |
| Clethodim #2 @12 fl oz /ac (101 g ae $ha^{-1}$) + AMS + COC | 10 | 7.5 | 15 | 46 |
| Clethodim #3 @ 12 fl oz /ac (101g ae $ha^{-1}$) + AMS + NIS | 10 | 7.5 | 25 | 14 |

†Glyphosate. Roundup PowerMAX®, Monsanto; containing 5.5 lbs/gal (660 g $L^{-1}$) active ingredient(ae). A 32 fl oz/ac (2.34 L $ha^{-1}$) applications is equivalent to 1.38 lbs/ac ae (1.54 kg ae $ha^{-1}$)
Clethodim #1. Select®, Valent; containing 2.0 lbs/gal (239 g $L^{-1}$) ae. A 12 fl oz/ac (0.87 L $ha^{-1}$) application is equivalent to 0.19 lbs/ac ae (208 g ae $ha^{-1}$)
Clethodim #2. SelectMAX®, Valent; containing 0.97 lbs/gal (116 g $L^{-1}$) ae. A 12 fl oz/ac (0.87 L $ha^{-1}$ ) application is equivalent to 0.09 lbs/ac ae (101 g ea $ha^{-1}$)
Clethodim #3. Tapout™, Helena; containing 0.97 lbs/gal (116 g $L^{-1}$) ae. A 12 fl oz/ac (0.87 L $ha^{-1}$ ) application is equivalent to 0.09 lbs/ac ae (101 g ae $ha^{-1}$)
Saflufenacil. Sharpen®, BASF; containing 2.85 lbs/gal (342 g $L^{-1}$) ae. A 1.5 fl oz/ac (0.11 L $ha^{-1}$ ) application is equivalent to 0.03 lbs/ac ae (37.5 g ae $ha^{-1}$)
Ammonium sulfate (AMS) applied at 1.7 lbs/ac ae (1.9 kg $ha^{-1}$)
Crop oil concentrate (COC) applied at 1% v/v
Non-ionic surfactant (NIS) applied at 0.25 % v/v

**Figure 1.** Perennial grasses and other weeds in a strip-till cotton field near Tuxedo,TX.

- Different formulations of clethodim showed varying control results at two rates and with glyphosate. The highest control of tumble grass at 130 DAT was achieved by a mix of glyphosate and clethodim. Other mixtures with clethodim or saflufenacil appeared to reduce control compared to glyphosate alone. Grasses appeared to have a slower control response to Clethodim than to glyphosate alone.
- The higher rate of glyphosate, 64 fl oz/ac (3.08 kg ae $ha^{-1}$ ) showed the greatest control at fewer DAT but overall was not significantly different from the 32 fl oz/ac (1.54 kg ae $ha^{-1}$) rate.
- Weather conditions for the spring trial were extremely hot and dry. AMS was added to all treatments based on label recommendations of clethodim and saflufenacil and to increase control of under the hot and dry conditions. Control may have been significantly affected by the extreme weather.
- Some treatments provided good control of annual and perennial broadleaf weeds in addition to the grasses. However, prickly pear, mesquite, white tridens, *Chloris spp*., and others received control ratings below 30% (data not shown). Other control measures need to be found for these weeds.

## Conclusions

- Glyphosate is still an important tool in the Southern Rolling Plains cotton/wheat production system.
- Multiple treatments, additional herbicides, different combinations, and/or tillage will be needed to control some of these species.

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