PERFORMANCE OF SHARPEN IN OKLAHOMA

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Introduction

Although weed resistance continues to take center stage across the cotton belt, Oklahoma producers remain committed to limited tillage production techniques. Horseweed is one of the most difficult and widespread challenges encountered in these systems. Effective control is critical for successful production. Sharpen (saflufenacil) is a protoporphyrinogen oxidase (PPO) inhibitor recently introduced by BASF which offers effective burn-down (post-emergence) activity on many tough broadleaf weeds, including horseweed. Prior research has indicated that Sharpen may have the potential to become a standard recommendation for horseweed; however, additional work is needed. In addition, Sharpen likely has a fit in Oklahoma as a harvest aid and its potential role should be investigated. Also, the PPO inhibitors' safety in regards to small grains gives them a clear advantage over paraquat when harvest aids are applied next to a seedling wheat or rye crop. Seedling wheat's tolerance to Sharpen is not yet well defined. Sharpen's development as an effective harvest aid in Oklahoma (or alternative to paraquat) could depend heavily on this aspect. Three studies were conducted in the spring and fall of 2011 in order to evaluate the effectiveness of Sharpen for horseweed control, as a cotton harvest aid, and to observe its effects on seedling wheat.

Objectives

Compare the effectiveness of Sharpen tank-mixes to standard recommendations for preplant horseweed control in cotton.

Evaluate the effectiveness of Sharpen as a cotton harvest aid and its effects on the growth and development of seedling wheat.

Materials and Methods

All three studies were randomized complete block designs with three or four replications. Horseweed and wheat tolerance trials were conducted on clay loam soils while the harvest aid project was conducted on a sandy loam soil. Broadcast over-the-top applications were made with a compressed air, high-clearance sprayer applying 10 gallons per acre (GPA) at the horseweed site and 12 GPA at the harvest aid and wheat tolerance locations. Horseweed treatments were applied on April 9. Horseweed was past the rosette stage and ranged from 2 to 4 inches in height. Treatments were applied at 28 psi with flat fan nozzles. Harvest aid project treatments for defoliation comparisons were applied at approximately 60% open bolls on October 4. Seedling wheat project treatments were made at the 3-4 leaf stage on November 4. Applications in both trials were made at 60 psi using flat fan nozzles. Treatments from each site are listed below in tables 1 and 2, while their respective performance data are presented in Figures 1-5.

Results and Discussion

Horseweed Project

Horseweed treatments were evaluated at 7, 14 and 30 days after treatment. However, only data from the 30 day observation are presented Figure 1. 2011 was a very unique and challenging year. Conditions through the winter remained very dry and spring weed emergence was limited. No significant rainfall was encountered before or after treatments were applied. Therefore, these treatments were subjected to very stressful conditions. When Sharpen was applied alone, approximately 50% control was observed 30 days after treatment (DAT). Similar control was observed when Sharpen was tank-mixed with Ignite 280. However, when Sharpen was tank-mixed with either

dicamba or 24 oz/A of 2,4-D, greater control (72-75%) was obtained. Sharpen, Aim or ET tank-mixed with glyphosate provided 82-88% control. Dicamba applied alone or 2,4-D applied alone at 32 oz/A provided 87-92% control. Only tank-mixes of 2,4-D (at 32 oz/A) or dicamba with glyphosate provided greater than 92% control of horseweed 30 DAT. Although the standard treatments (8 oz/A dicamba or 32 oz/A 2,4-D + 32 oz/A glyphosate) performed well in 2011, some Sharpen treatments seemed to be less effective than indications from prior work. Sharpen applied alone or tank-mixed with dicamba or the lower rate of 2,4-D did not control horseweed as effectively in 2011 as we have seen in prior years. This may be attributable to the extreme dry conditions in 2011. These treatments should be evaluated further. In addition, glyphosate clearly had a positive impact on treatment performance which suggests that horseweed at this site is not a resistant population. Since resistant populations of horseweed have already been found in Oklahoma we should continue to explore effective glyphosate alternatives such as Sharpen.

Table 1. Treatments evaluated for horseweed control project:

1. Untreated Check
2. 1 oz/A Sharpen + 1% MSO + 17 lb/100 gal AMS
3. 1 oz/A Sharpen + 1% MSO + 17 lb/100 gal AMS + 24 oz/A 2,4-D (4lb)
4. 1 oz/A Sharpen + 1% MSO + 17 lb/100 gal AMS + 29 oz/A Ignite 280
5. 1 oz/A Sharpen + 1% MSO + 17 lb/100 gal AMS + 8 oz/A Dicamba
6. 1 oz/A Aim + 1% MSO + 17 lb/100 gal AMS + 32 oz/A Glyphosate (4lb)
7. 2 oz/A ET + 1% MSO + 17 lb/100 gal AMS + 32 oz/A Glyphosate (4lb)
8. 1 oz/A Sharpen + 1% MSO + 17 lb/100 gal AMS + 32 oz/A Glyphosate (4lb)
9. 8 oz/A Dicamba + 32 oz/A Glyphosate (4lb) + 17 lb/100 gal AMS + ¼% NIS
10. 32 oz/A 2,4-D (4lb) + 32 oz/A Glyphosate (4lb) + 17 lb/100 gal AMS + ¼% NIS
11. 32 oz/A 2,4-D (4lb) + ¼% NIS
12. 8 oz/A Dicamba + ¼% NIS

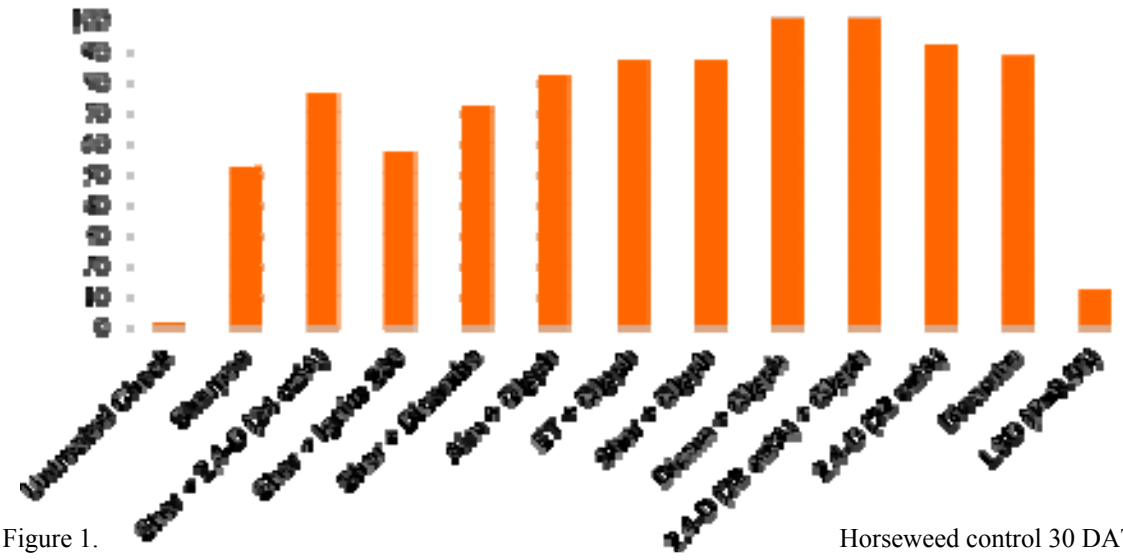

Figure 1. Horseweed control 30 DAT.

Harvest Aid Project

Harvest aid results are presented in Figure 2. This trial received a total of 3 inches of rainfall beginning 24 hours after the first application, and over the next 3 days. Sandy soil conditions allowed the sequential applications to remain on schedule 7 DAT. Treatments were evaluated for defoliation and boll opening at 7 and 14 DAT, but only data from the 14 day visual evaluation are presented. Sharpen applied at 1 oz/A with methylated seed oil (MSO) or when combined with ethephon and ammonium sulfate (AMS) resulted in 80-82% defoliation. When Sharpen was tank-mixed with ethephon and MSO, defoliation was significantly decreased to 52%. Defoliation ranged from 50-

63% for treatments including tank-mixes of ethephon with other PPO products (Aim, ET and Blizzard with crop oil concentrate (COC)) or with 8 oz/A Def. Sharpen tank-mixed with ethephon and COC resulted in 38% defoliation, which was the least amount observed 14 DAT. Ethephon tank-mixed with 8 oz/A of Def + COC followed by a sequential application of 1 oz/A of Sharpen + MSO + AMS provided the greatest amount of defoliation observed 14 DAT (93%). These data suggest that Sharpen has potential as a harvest aid; however, it was noted that the addition of ethephon reduced cotton defoliation unless AMS was present. In addition, Sharpen + MSO + AMS performed well as a sequential (desiccant type) application 7 days after the initial treatment of ethephon plus Def.

Table 2. Treatments evaluated for defoliation project:

1. Untreated
2. 1 oz/A Sharpen + 1% MSO
3. 1 oz/A Sharpen + 1% MSO + 21 oz/A Ethephon
4. 1 oz/A Sharpen + 1% MSO + 21 oz/A Ethephon+ 17 lb/100 gal AMS
5. 1 oz/A Aim + 21 oz/A Ethephon + 1% COC
6. 2 oz/A ET + 21 oz/A Ethephon + 1% COC
7. 0.6 oz/A Blizzard + 21 oz/A Ethephon + 1% COC
8. 1 oz/A Sharpen + 21 oz/A Ethephon+ 1% COC
9. 21 oz/A Ethephon + 8 oz/A Def + 1% COC
10. 21 oz/A Ethephon + 8 oz/A Def + 1% COC fb 1 oz/A Sharpen + 1% MSO + 17 lb/100 gal AMS

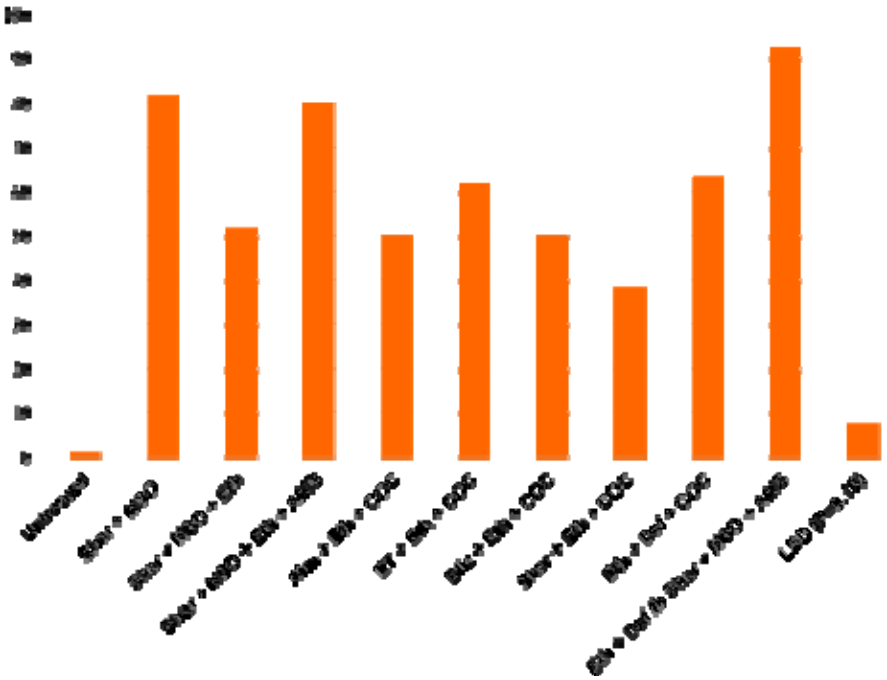

Figure 2. Defoliation 14 DAT

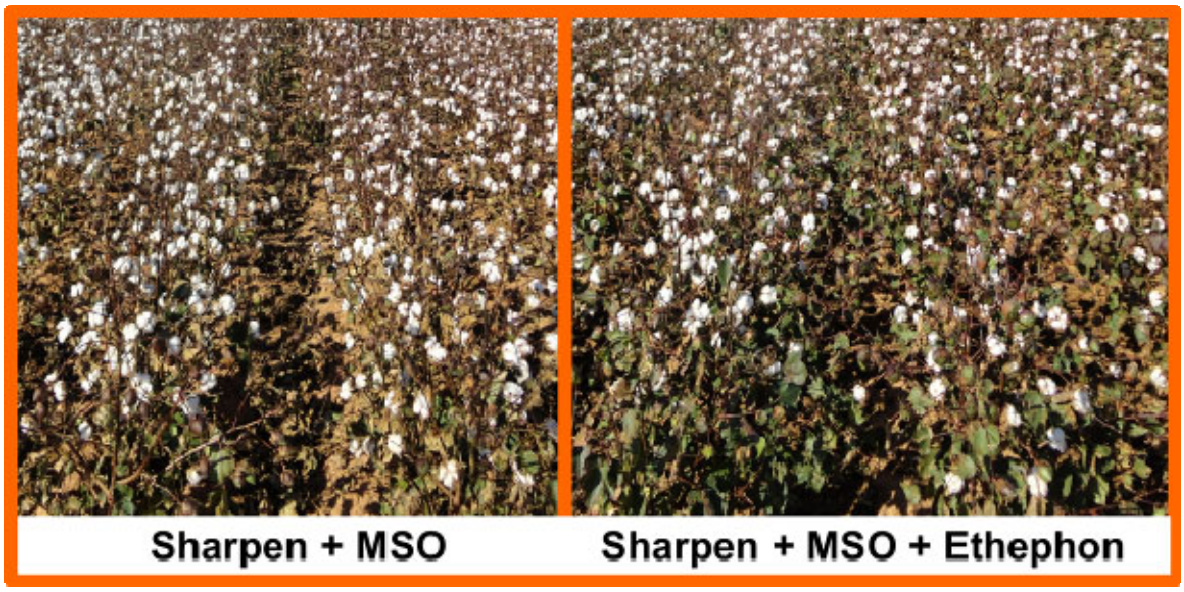

Figure 3. Effects of ethephon on defoliation with Sharpen.

Wheat tolerance project

Data obtained 10 DAT for cotton harvest aid treatments made directly to 3-4 leaf seedling wheat are presented in Figure 4. When Sharpen was tank-mixed with COC, ethephon + COC or ethephon + MSO, less than 10% chlorosis was observed. Similar results were observed when Aim, ET or Blizzard were applied with COC. Tank-mixing Sharpen with MSO alone (no ethephon) increased chlorosis significantly to 42%. Firestorm (3 lb/gallon paraquat) applied at 5.5 oz/A produced 96% chlorosis 10 DAT. Sharpen + MSO also produced 25% necrosis and 21% stunting which was significantly greater than that observed from all other treatments except Firestorm. Subsequent observations (data not presented) indicate that all treatments except Firestorm were beginning to recover from early injury.

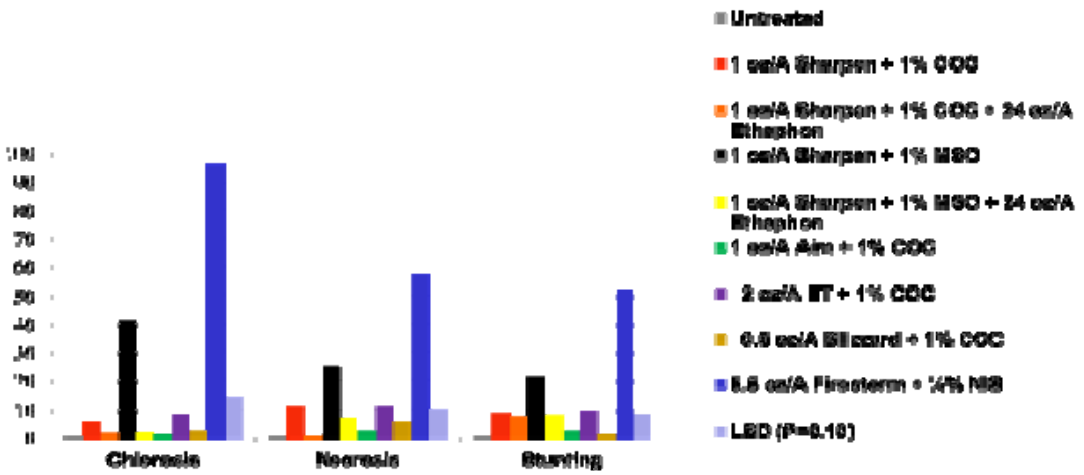

Figure 4. Seedling wheat project treatments and results 10 DAT.

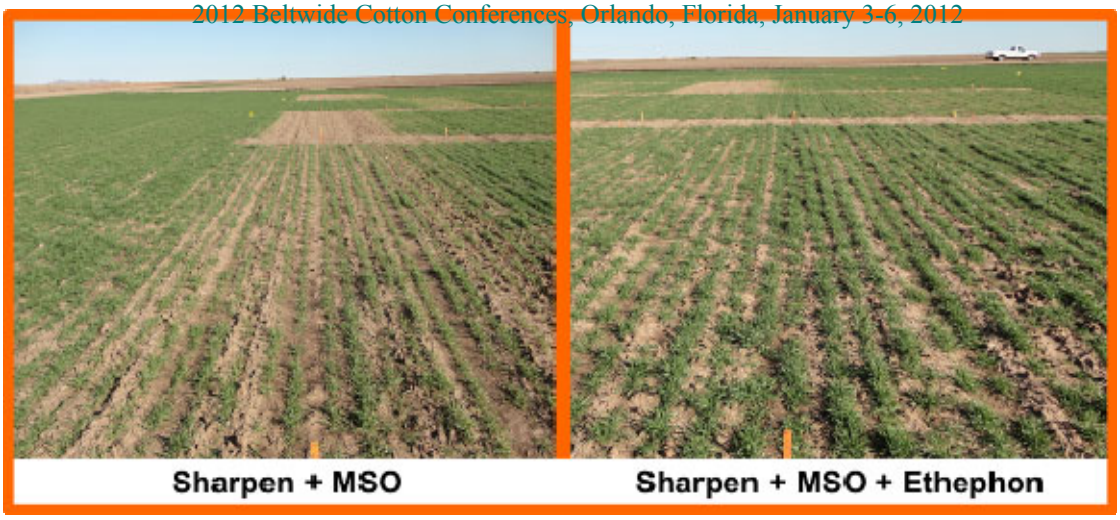

Figure 5. Effects of ethephon on wheat's tolerance of Sharpen.

Summary

Although Sharpen applied alone did not effectively control horseweed in 2011, good (72-88%) control was obtained when tank-mixed with dicamba, 2,4-D or glyphosate (similar to Aim or ET with glyphosate). Results from the defoliation and wheat injury trials indicate that tank-mixing Sharpen with ethephon can significantly alter its performance. However, in the defoliation trial, the addition of AMS to the tank-mix resulted in similar performance to Sharpen treatments without ethephon. Unfortunately, AMS was not utilized in the wheat injury trial. Further studies should be conducted to determine if AMS could also safen the application of Sharpen + MSO with respect to seedling wheat. In addition, these treatments will be evaluated again in the spring in an attempt to identify any potential long-term effects on wheat growth and development.