NEW CHEMISTRY FOR CHEMICAL COTTON STALK DESTRUCTION

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Abstract

Stalk destruction following cotton harvest in South and Central Texas is critical to continuing the success of the Boll Weevil Eradication Program in these areas. Chemical stalk destruction allows for a quick and efficient method of managing regrowth following cotton harvest. As 2,4-D and dicamba resistant cotton varieties are in the pipeline, new alternatives to these two herbicides need to be identified and tested at various application timings. The objectives were to evaluate the efficacy various herbicides for post-harvest chemical stalk destruction and prevention of boll weevil hostable plants. A 20 treatment research trial was initiated in Wharton, Nueces, and Williamson counties on producers' fields with the RoundupFlex cotton varieties. The standing stalk trial received the treatments 11-15 days after harvest. The Wharton and Williamson county locations were mowed with a flail mower and rotor mower, respectively. Treatments were applied within 3 hours after mowing. Weather conditions were favorable (warm and wet) for regrowth at the Nueces and the Wharton county locations. Minimal regrowth occurred following harvest in Williamson county due to minimal fall precipitation. Across all locations, the 2,4-D was the most effective and consistent treatment for killing cotton and preventing hostable plants. Milestone at 1 oz/a was comparable to 2,4-D for minimizing hostable plants in Wharton and Nueces. In Williamson County, several products performed well; however, the poor growing conditions minimized regrowth on all treatments. The 2,4-DP was comparable to 2,4-D for killing cotton stalks and preventing hostable plants at the Williamson county location. However, 2,4-DP did not provide good control at the other two locations. This may be explained by the fact that the 2,4-DP did not remain dissolved in the spray solution well, unless constantly agitated. Constant agitation only occurred at the Williamson county site. Several experimental compounds appear to have some potential for chemical stalk destruction and reducing hostable cotton plants.

Introduction

In its native habitat cotton is a perennial shrub that may survive for many years. The perennial habit of cotton allows it to re-grow 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 over-wintering 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 when compared to other labeled products.

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 and/or are looking toward chemical stalk destruction to save time and fuel. Several herbicides have been registered for cotton stalk destruction since the inception of the boll weevil eradication program. Herbicides available include 2,4-D (ester and salt formulations), several dicamba products (Weedmaster, Clarity, Banvel), Harmony Extra (thifensulfuron-methyl + tribenuron-methyl) and possibly others. For these products to be legal for cotton stalk destruction, the label must contain a section addressing "crop stubble."

Literature supports the fact that 2,4-D has been the best product to use for cotton stalk destruction as well as prior experience, when compared to other labeled products. Sparks et al. (2002) working in the Texas Rio Grande Valley reported that Harmony Extra reduced re-growth and delayed squaring, but only 2,4-D provided acceptable re-growth 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. However, Lemon et al. (2003) and Morgan et al. (2010) reported that herbicides, either 2-4D amine or ester, application timing following shredding did not diminish the re-growth control from these products.

Now with various cotton seed companies developing transgenic cotton that will be tolerant to multiple herbicides, including 2,4-D and Dicamba, there is a lot of interest from producers and the Boll Weevil Eradication Program to look for alternative chemistries to aid with cotton stalk destruction. These chemical stalk destruction treatments must be as or more effective at preventing cotton from re-growing and developing boll weevil hostable fruit following harvest. Additionally, these products also need to be cost effective compared to the current standard of 2,4-D.

Objective

The objectives of these trials were to identify potential alternative candidate herbicides besides 2,4-D for cotton stalk destruction and to determine if application to shredding or standing stalks provides better over control with such products.

Materials and Methods

Two studies were conducted in the Coastal Bend (Nueces and Wharton counties) and one in the Southern Blacklands region of Texas (Williamson County). Treatments included Weedar 64, Harmony Extra SG, Clarity, Milestone, Python 80 WG, 2,4-DP, Sharpen and several other experimental compounds applied to standing stalks or stalks that had been shredded immediately prior to application. A crop oil concentrate (COC) was used with each treatment at 1.0 % v/v. The plots were arranged in a randomized complete block design and all data were subjected to analysis of variance with ARM 8 using LSD at 5%.

Nueces County Location: The study was conducted at the Texas AgriLife Research and Extension Center near Corpus Christi, TX. See Table 1 for background information for this location. The cotton stalks at this location had not been shredded (standing stalks) prior to application of treatments. Data was collected at 15, 30 and 44 DAT. Data included in these counts included the following, percent control, percent volunteer seedling control, percent of plants with terminal re-growth, percent of plants with square development and percent live plants. Note, not all measurements were taking at each rating date.

Wharton County Location: This study was conducted at Rancho Grande Farms near Wharton, TX. See Table 1 for background information for this location. The cotton stalks at this location were shredded immediately prior to application of treatments. Data was collected at 21 and 42 DAT. Data included were the percent control, percent volunteer seedling control, percent of plants with terminal re-growth, percent of plants with square development and percent live plants. Note, not all measurements were taking at each rating date.

Williamson County Location: The study was conducted at the Texas AgriLife - Stiles Farm Foundation at Thrall, TX. See Table 1 for background information for this location. The cotton stalks in trial had not been shredded (standing stalks) prior to application of treatments. Data collected included percent control at 13, 27 and 40 DAT, and number of living and dead plants/16' and percent hostable plants per 10 plants at 40 DAT.

Results and Discussion

Nueces County Location: The single treatments with the best percent control at 42 DAT included Weedar 64 @ 33.7 oz (91.8%), Milestone @ 1 oz, Exp 4 @ 2.8 oz, and Exp 3 + Python were statistically equal to Weedar 64 (Figure 1). Clarity @ 16 oz was less efficacious than Weedar 64 at 33.7 oz. Treatments with the highest percent control yielded the lowest % hostable plants at 42 DAT (Figure 2). Additionally, the low rate of Milestone (0.5 oz) was also effective at minimizing reproductive development.

Table 1. Location and background information for cotton stalk destruction sites, 2010.

	Location		
County of Study	Nueces	Wharton	Williamson
Stalk Status	Standing	Shredded	Standing
Variety	PHY 375 WRF	PHY 375 WRF	FM 840 B2F
Harvest Date	Aug 21	Aug 23	Sept 5
Application Date	Sept 1	Sept 2	Sept 21
Rows/plot	4	4	4
Row Spacing (in)	38	40	38
Plot Length (ft)	40	40	40
Sprayer Type	Lee Spider	Lee Spider	Lee Spider
Nozzles	8003XR	8002XR	8002XR
GPA	12	12	11

Wharton Co Location: The treatments with the best percent control at 44 DAT included Weedar 64 @ 33.7 oz (99%), Milestone @ 1 oz, and Clarity @ 16 oz, respectively (Figure 3). In the untreated check, 73% of the plants had reproductive structures that would be hostable for boll weevils (Figure 4). Multiple products at this site had no hostable plants at 44 DAT, Weedar 64 and Milestone @ 1 oz, while Clarity @ 16 oz had 3% hostable plants.

Williamson Co Location: The site remained dry following cotton harvest, and re-growth was unusually low due to limited soil moisture. In fact, no re-growth occurred in the shredded stalk portion of this trial and data were recorded for standing stalks only. The treatments with the best percent control at 40 DAT included Weedar 64, 2,4-DP (all rates), Exp 4, Sharpen @ 3 oz and Phython 80 + 2,4-DP (@ 0.5 +11oz) (Figure 5). Two treatments had no hostable plants at 56 DAT, Weedar 64, Harmony Extra SG, while Exp 3 and 4, Sharpen @ 1 oz and Phython 80 + 2,4-DP (@ 0.5 +11oz) only had 3% hostable plants at 56 DAT (Figure 6).

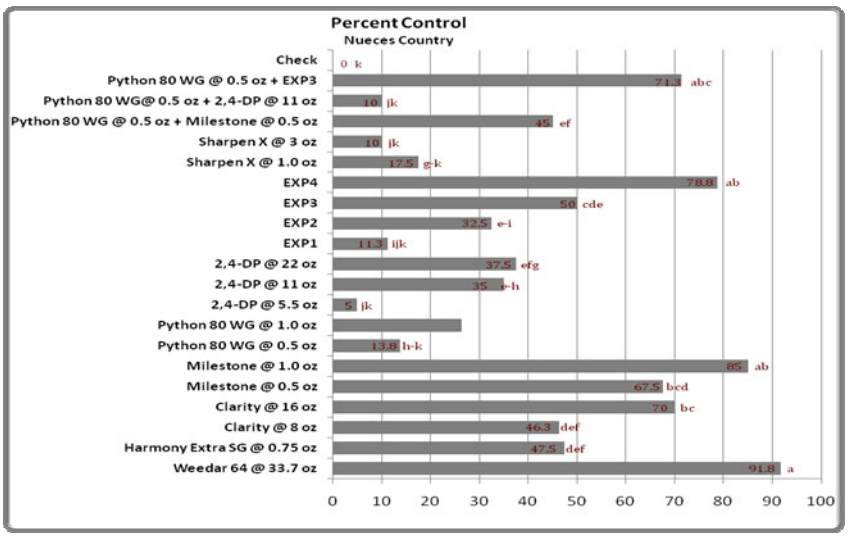

Figure 1. Percent Control for herbicides evaluated for stalk destruction in Nueces County in 2007 (LSD, P=0.05).

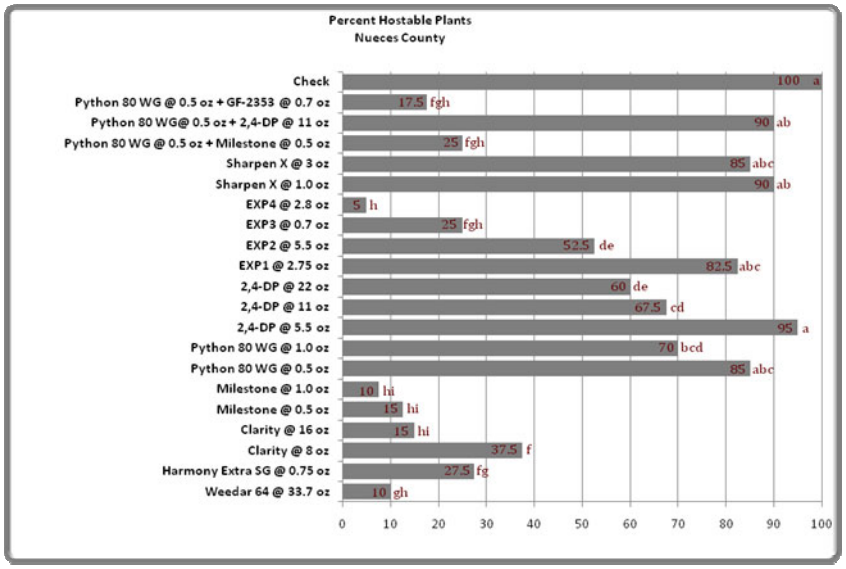

Figure 2. Percent Hostable Plants for herbicides evaluated for stalk destruction in Nueces County in 2007 (LSD, P=0.05).

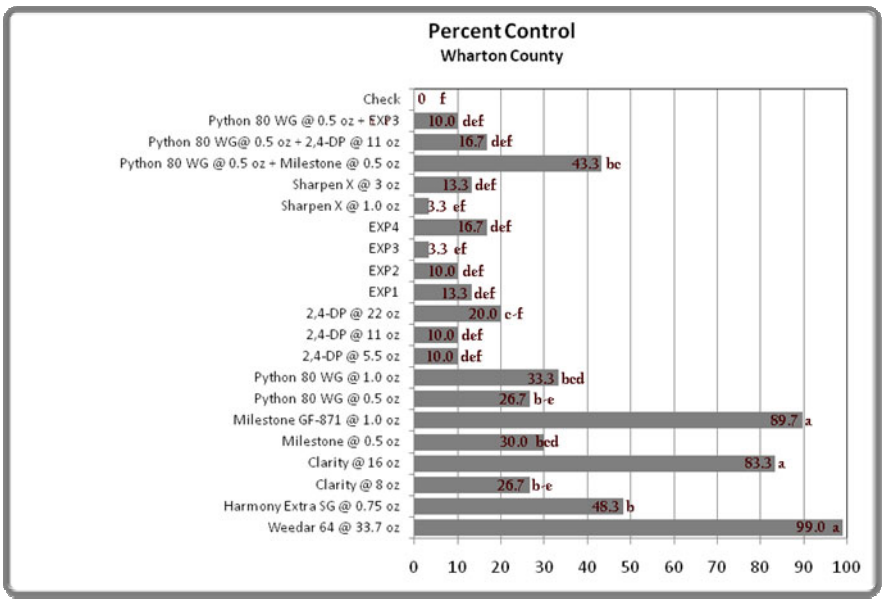

Figure 3. Percent Control for herbicides evaluated for stalk destruction in Wharton County in 2007 (LSD, P=0.05).

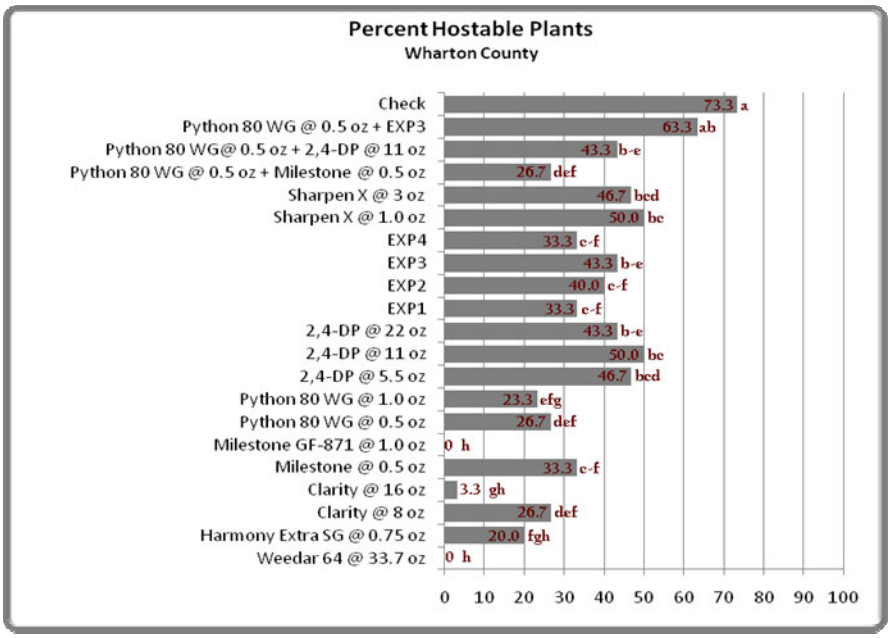

Figure 4. Percent Hostable Plants for herbicides evaluated for stalk destruction in Nueces County in 2007 (LSD, P=0.05).

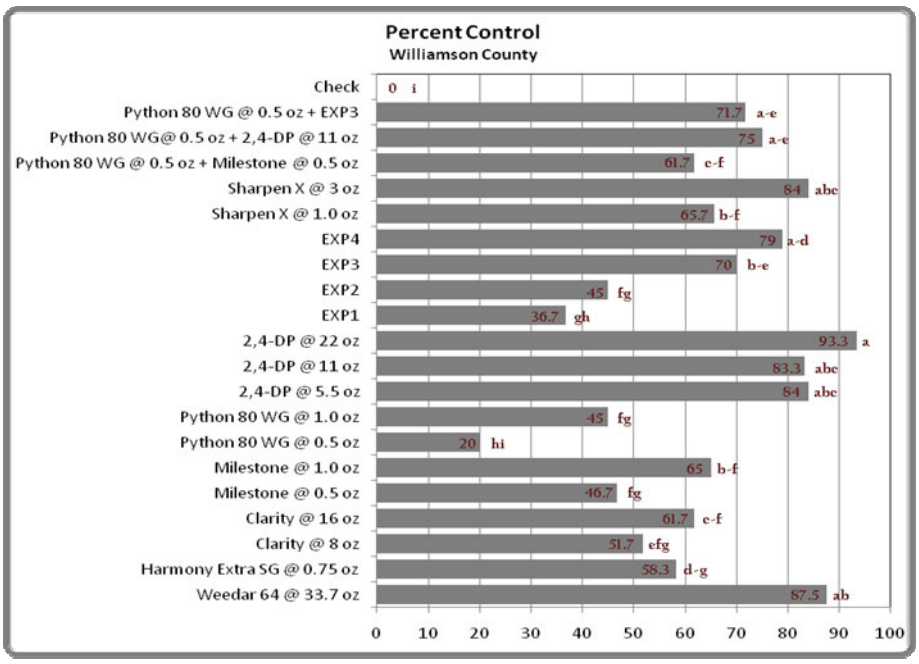

Figure 5. Percent Control for herbicides evaluated for stalk destruction in Williamson County in 2007 (LSD, P=0.05).

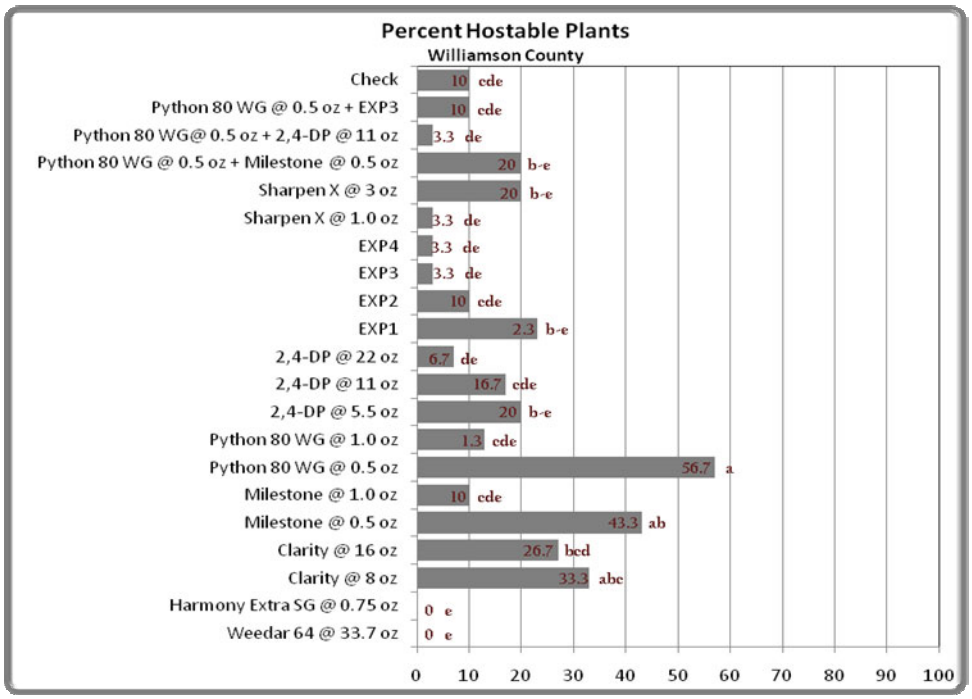

Figure 6. Percent Hostable Plants for herbicides evaluated for stalk destruction in Williamson County in 2007 (LSD, P=0.05).

Conclusions

The current grower standard, Weedar (2,4-D) at 33.7 oz/a was the most consistent treatment across all the locations and for both standing and mowed stalks. Numerous other herbicides (Milestone, Exp 4)and tank-mixtures were numerically lower but significantly comparable to Weedar 64 in percent control and reducing hostable plants at the 40+ day ratings. The liquid formulation of 2,4-DP evaluated in this trial did not remain in solution without constant agitation. In Nueces and Wharton Counties, constant agitation was not possible, while in Williamson County the 2,4-DP was agitated during application. This may explain the 2,4-DP variability in between the locations. Sharpen did not provide sufficient suppression of re-growth or hostability, at locations with optimum condition for cotton stalk re-growth. Additional research with these products and others needs to occur to identify the consistency across locations and will occur in 2011.

Acknowledgements

Funding provided by Dow AgroSciences and Cotton Incorporated through the Texas State Support Committee.