EXPERIENCES WITH THE ROUNDUP READY XTEND CROP SYSTEM IN OKLAHOMA

Shane Osborne
Randy Boman
Oklahoma State University
Altus, OK
John Everitt
Monsanto
Lubbock, TX

Abstract

The Roundup Ready Xtend Cropping System will provide a platform for cotton producers to address current herbicide resistant weed challenges in Oklahoma (pending regulatory approval). However, without proven performance from these new transgenic varieties, adoption may be slow to occur. This could lead to the continued spread of herbicide (glyphosate) resistant weeds in Oklahoma. The ability to effectively control weeds with a system that offers yield potential comparable to current standards would be very desirable for cotton producers. The Roundup Ready Xtend cropping system will offer cotton varieties with tolerance to three herbicides representing separate modes of action. This could facilitate or increase the adoption of recommended resistance management practices necessary to stop the progression of glyphosate resistant weeds in Oklahoma. The objectives of this project were to determine the effectiveness of this system on current weed problems and to evaluate the performance of several new variety offerings expected upon deregulation. Several replicated trials were established to determine the effectiveness of this weed control system and to evaluate the performance of several new varieties. New dicamba formulations effectively controlled horseweed, pigweed and morningglory. Seven new Bollgard II Xtendflex cotton lines were compared to four current standards. Four of the seven new lines evaluated performed as well or better than the four standards.

Introduction

Glyphosate resistant (GR) weed populations (pigweed and/or horseweed) are prevalent in most of Oklahoma's cotton production areas. A recent producer survey identifies these weeds as the "most difficult to control" in Oklahoma cotton. In addition, GR weeds have caused many producers to re-assess production practices (no-till vs. conventional) and question their ability to meet important conservation goals. Despite the fact that many producers rotate their cotton ground to winter wheat, GR weed problems continue to escalate. This is most likely due to the exclusive use of glyphosate (only) weed control programs in both cropping systems. This heavy in-season dependence upon glyphosate in Roundup Ready Flex cotton and off-season use for no-till wheat can lead to a series of GR weed escapes over consecutive years, accelerating the spread of resistance. It is critical that growers adopt programs that limit the spread of GR weeds. Utilizing herbicides with multiple modes of action will help limit the spread of GR weeds while also restoring the weed control benefits normally experienced through crop rotation. The Roundup Ready Xtend Crop System should provide an effective platform to control GR weeds in cotton. Bollgard II XtendFlex cotton varieties will confer differential tolerance to three herbicides representing three different modes of action: glyphosate (Roundup Powermax-group 9), glufosinate (Liberty-group 10) and dicamba (Mon 119096 / Engenia-group 4). The current windows of application for Roundup Powermax and Liberty will be continued with an additional season-long window (same as current glyphosate window) for dicamba application. Currently the only stand-alone dicamba formulations expected to be approved for use in the Mon 76832 System are Mon 119096 (Monsanto) and/or Engenia (BASF). In addition, Monsanto will offer a prepackaged combination of glyphosate plus a new dicamba formulation currently referred to as Mon 76832. These new dicamba formulations exhibit ultra-low volatility compared to currently registered products. This increase in product safety coupled with specific application requirements will significantly lower the risk of off-target movement associated with applications.

Combining the Roundup Ready Xtend system with the known effectiveness of current residual herbicides will provide growers with preemergence and postemergence herbicide options necessary to effectively control glyphosate resistant weeds in cotton. Several projects were established in 2013 and 2014 to determine the effectiveness of these new dicamba products and to evaluate the performance of potential new Bollgard II XtendFlex (B2XF) cotton varieties.

Materials and Methods

Two new dicamba formulations were evaluated for horseweed, pigweed and morningglory control and included Mon 119096 and Engenia . Two projects were conducted in a non-crop setting. One study evaluated preplant control of horseweed and the other focused solely on postemergence (POST) control of large (12-24 inch) pigweed. The third study was conducted in Bollgard II XtendFlex cotton and targeted pitted morningglory. All applications were made with TurboTeejet Induction nozzles at 40 PSI in 10 gallons of water. All treatments were replicated four times in randomized complete block designs. Results from each project are presented in figures 1-5.

In addition, a germplasm trial was established in order to assess the performance of seven Bollgard II XtendFlex lines. The trial was planted June 2nd in two-row plots, 30 feet in length and replicated four times. The trial received approximately 11 inches of in-season rainfall combined with 11 inches of sprinkler irrigation. Weeds, insects and plant growth were managed for optimum yields. The sole purpose of this trial was to compare germplasm performance. It was managed in a Roundup Ready Flex herbicide system in order to make direct comparisons to current commercial standards. No dicamba products were used. Results are presented in figure 5.

Results and Discussion

Horseweed control presented in figure 1 indicates that 0.25 lb ai/A Engenia + 0.75 lb ai/A Roundup applied to horseweed in the rosette stage provided 81% control 14 days after treatment (DAT). This was similar to control observed from an application of 0.25 lb ai/A Clarity + 0.75 lb ai/A Roundup Powermax (79%). The same Engenia rate when combined with 1 oz/A Sharpen + 2.5 oz/A Zidua controlled horseweed 100% 14 DAT. All three treatments effectively controlled horseweed (99-100%) 45 DAT.

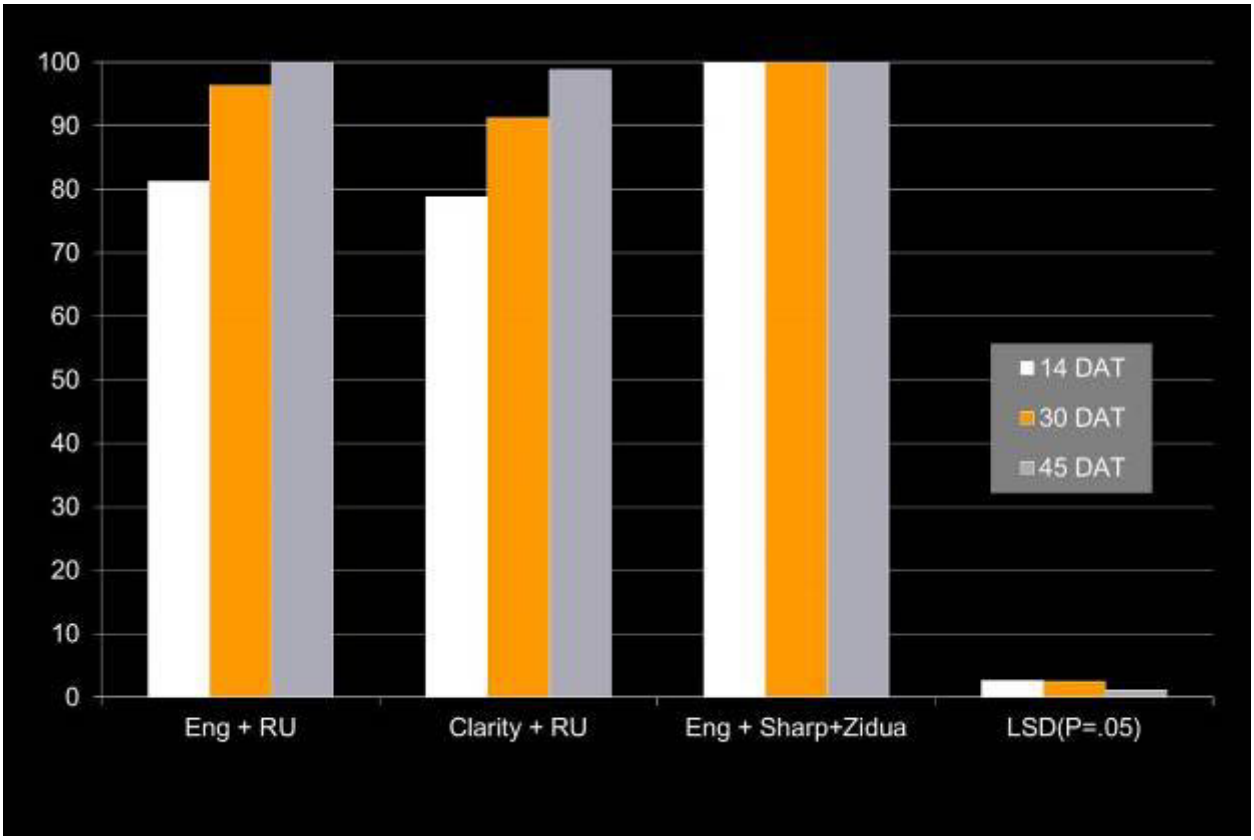

Figure 1. Preplant Control of Horseweed with Engenia.

The second study assessed POST control of over-sized (12-24 inch) pigweed. While prior work has proven the effectiveness of dicamba on small (2-6") pigweeds (data not shown), fewer studies have emphasized salvage situations. Growers often experience weather issues delaying weed control applications beyond recommended timings. This trial focused on large pigweed control in that setting. Results are presented in figures 2 and 3. Mon 76832 applied at 1.5 lb ae/A controlled 12-24 inch pigweed 48% 7 DAT. This was significantly greater than 0.5 lb ae/A Mon 119096 alone (29%) or with 29 oz/A Liberty (39%). However, by 14 DAT control of large pigweed from Mon 76832 increased to 98%. This was significantly greater than control observed from Mon 119096 alone (48%) or with Liberty (72%). At the final observation (36DAT) control from Mon 76832 remained effective (97%) while Mon 119096 and Mon 119096 + Liberty controlled pigweed 75% and 63%, respectively.

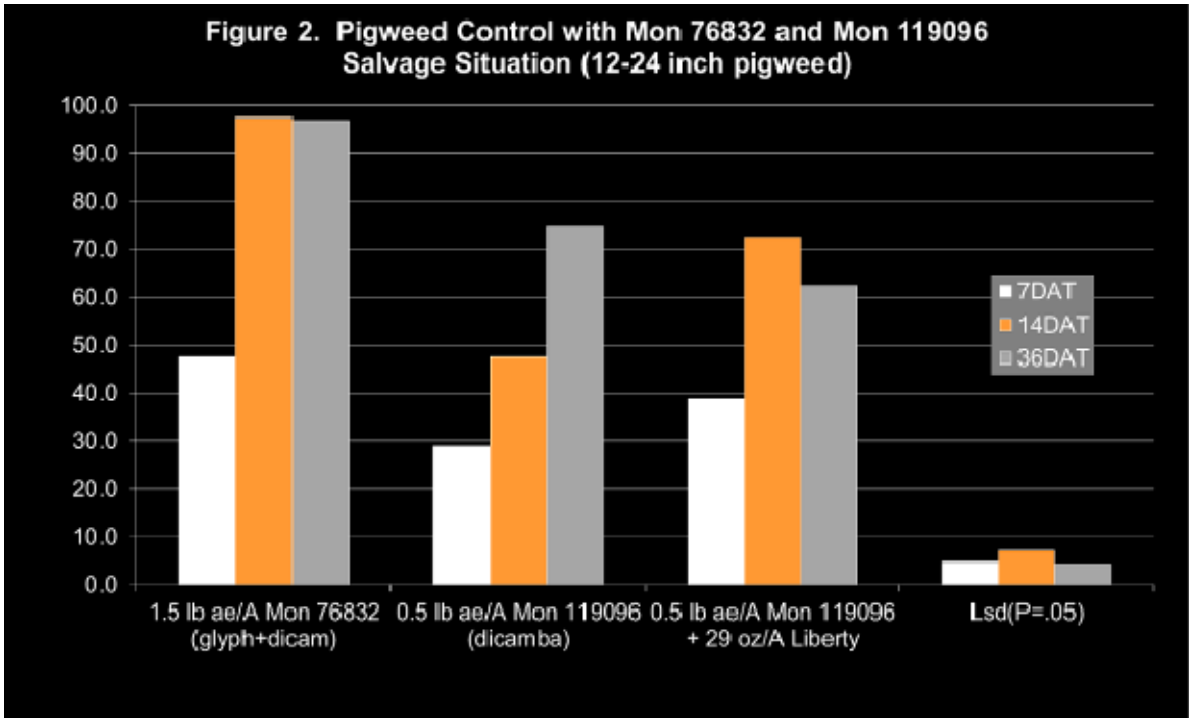

Figure 2. Pigweed control with Mon 76832 and Mon 119096 in a salvage situation.

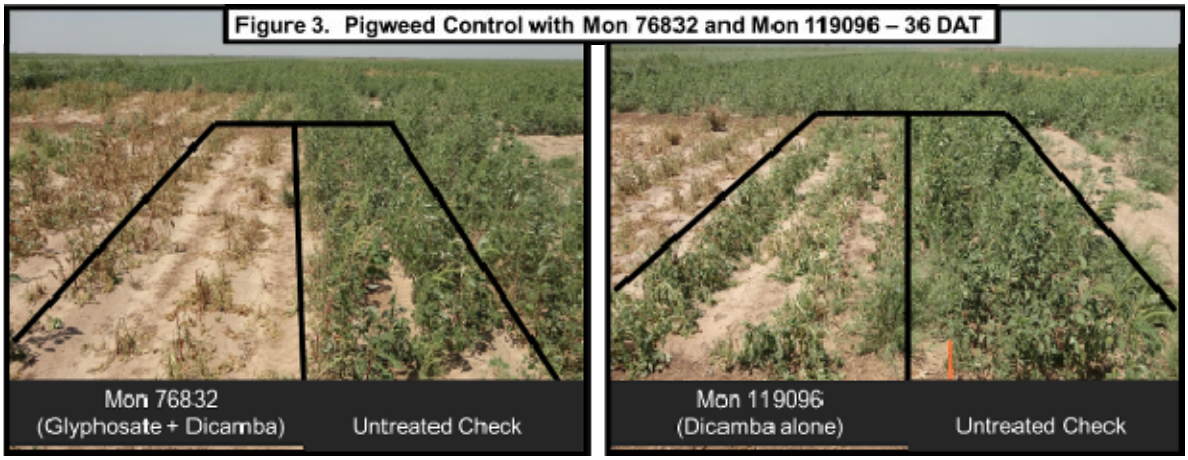

Figure 3. Pigweed control with Mon 76832 and Mon 119096 – 36 DAT.

The third weed control project targeted pitted morningglory and was conducted in-crop (B2XF cotton). While severe drought reduced late-season weed pressure potential, early-season observations were made and are presented in figures 4-5. An activating rain was received within 24 hrs of preemergence applications. Preemergence (PRE) applications of 0.5 lb ae/A Mon 119096 combined with either Prowl (1.0 lb ai/A), Warrant (48 oz/A) or Direx (0.5 lb ai/A) controlled pitted morningglory approximately 68-76% 30 DAT. Increasing the Mon 119096 rate to 1.0 lb ae/A (when combined with Warrant) improved control to 90%. All PRE treatments were followed with POST applications of either Mon 76832 or Mon 119096 + Liberty to 2-6 inch pitted morningglory. These postemergence treatments controlled pitted morningglory 90-100% 21 DAT.

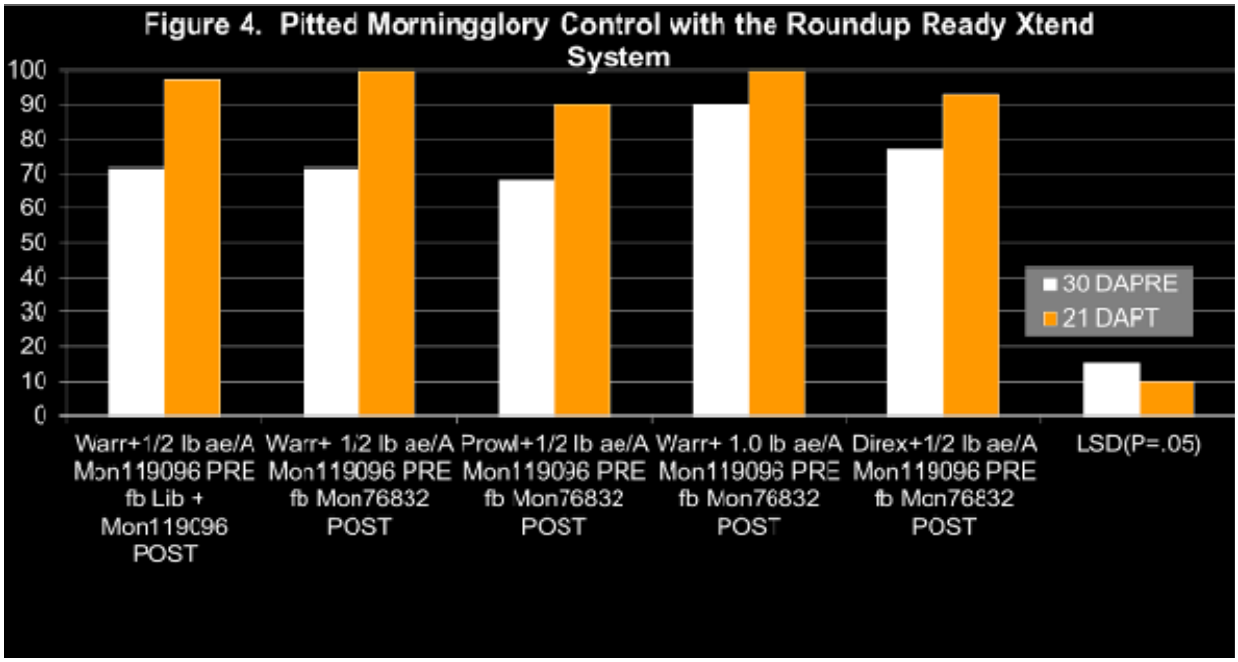

Figure 4. Pitted morningglory control with the Roundup Ready Xtend System.

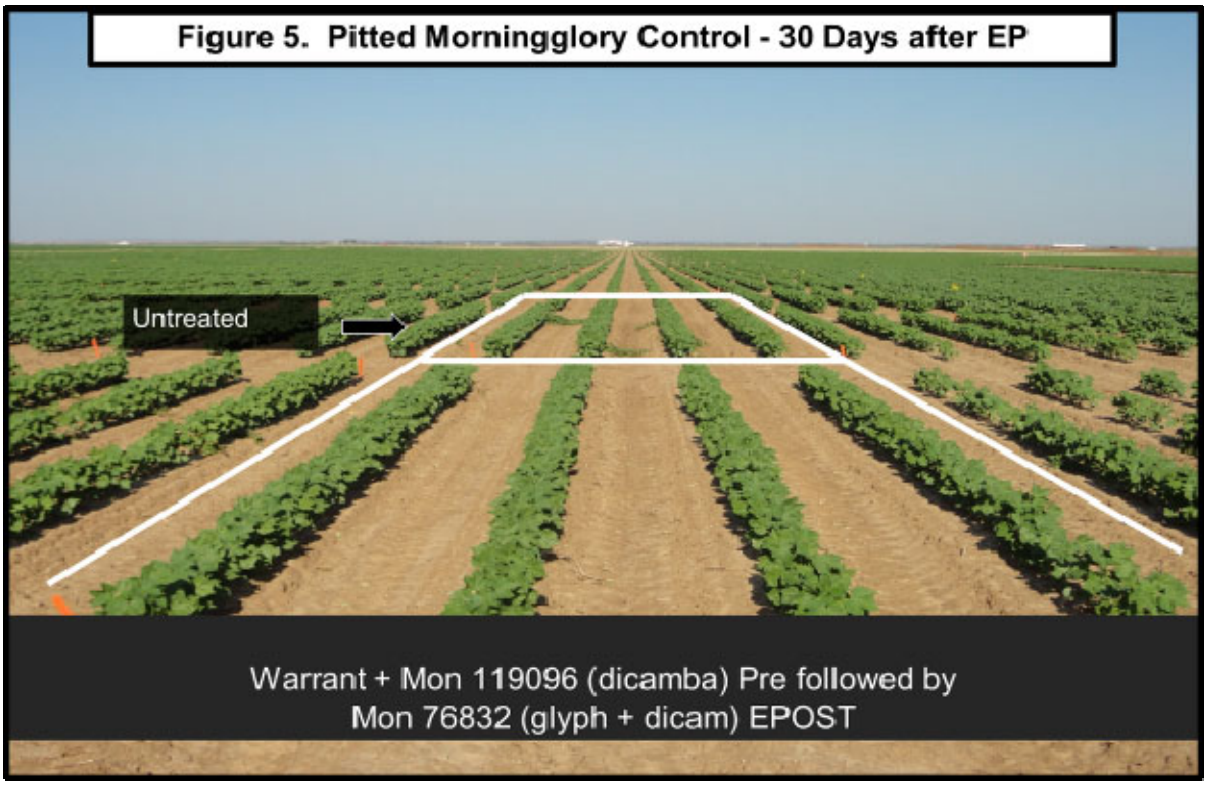

Figure 5. Pitted morningglory control – 30 DAEP.

The fourth project assessed germplasm performance. Seven Bollgard II XtendFlex lines were compared to 4 standard varieties in a center pivot irrigated setting. Resutls are presented below in figure 6. Deltapine 1518 B2XF produced 2041 lbs lint/A. This was statistically similar to lint yields (1884-1980 lbs/A) from six other entries (DP 1522 B2XF, DP 0912 B2RF, ST 4946 GLB2, DP 14R935 B2XF, DP 1549 B2XF and DP 1553 B2XF. Deltapine 1044 produced 1840 lbs lint/A which was similar to yields produced by DP 14R960 B2XF and DP 14R934 B2XF. Fibermax 1944 GLB2 produced 1649 lbs lint/A.

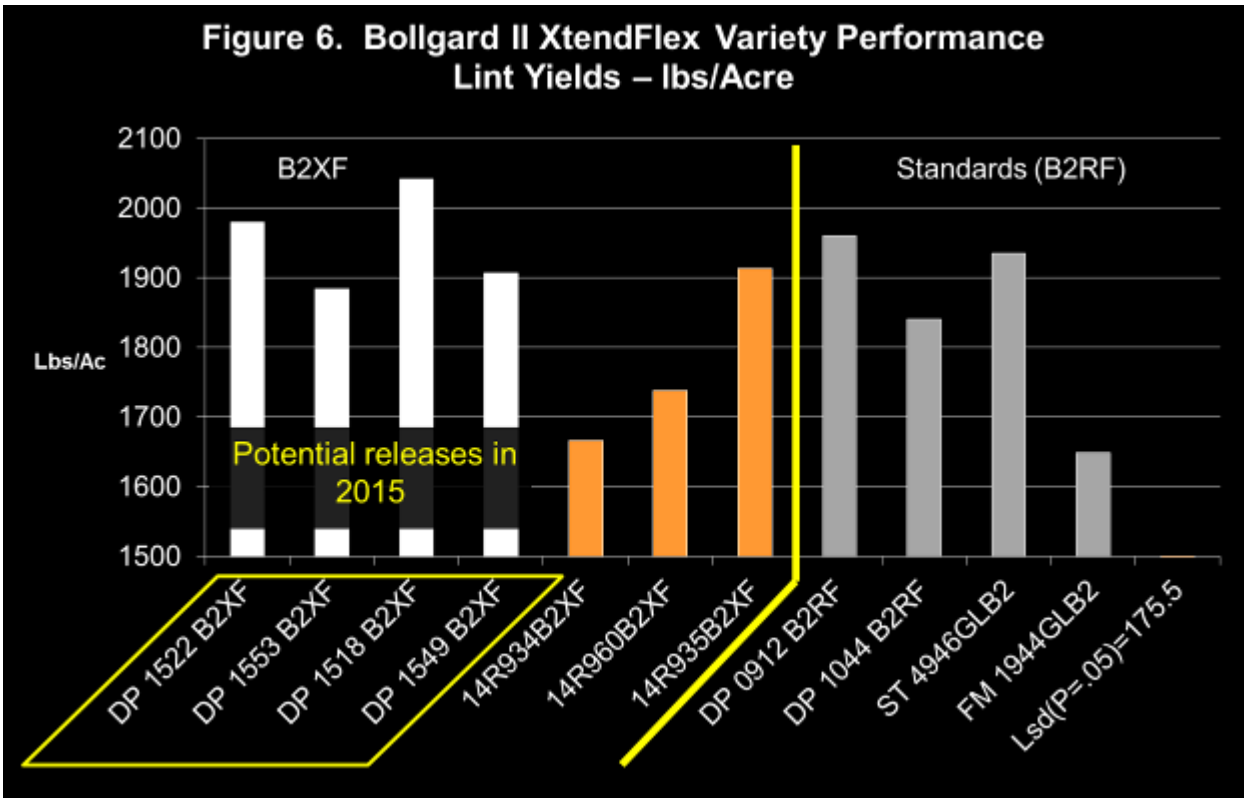

Figure 6. Bollgard II XtendFlex variety performance lint yields – lbs/Acre.

Summary

Results indicate that Engenia provided similar horseweed control compared to Clarity. It should be noted that the horseweed population was not believed to be GR. If GR horseweed is present higher rates of dicamba may be more appropriate. In addition, while Mon 76832 effectively controlled large (12-24 inch) pigweed, multiple considerations must be addressed. First, growing conditions at application time were excellent, with excellent moisture and mild temperatures. This may have contributed to results. Also, it should be noted that the pigweed population within this trial was not GR. In the presence of GR pigweed, control from Mon 76832 would essentially be equivalent to that observed from Mon 119096 alone (75%). This level of GR pigweed control is not acceptable. Also, prior research (data not shown) indicates that effective control can be achieved from either treatment when applications are made to appropriate size (2-4 inches) pigweed. Therefore, growers should continue to target small weeds.

Although drought conditions affected overall weed pressure, early season results suggest improved PRE control of pitted morningglory when the Mon 119096 rate was increased from 0.5 lb ae/A to 1 lb ae/A. It should also be noted that dry conditions following the activation of PRE treatments may have extended morningglory control beyond typical expectations. Following any PRE treatment with any POST combination including Mon 119096 resulted in excellent morningglory control.

Germplasm evaluation results indicate that the seven Bollgard II XendFlex cotton varieties performed as well or better when compared to current commercial standards. Although not presented, fiber properties were also competitive with current standard entries. It is anticipated that four of these "B2XF" varieties will potentially be released after deregulation of the technology.

Based on results from various projects, the Roundup Ready Xtend Crop System should provide an effective platform to control Oklahoma's three most troublesome weeds while also offering varieties that produce yield and fiber quality comparable to current standards.

Disclaimers

This information is for educational purposes only and is not an offer to sell Mon 76832™, Mon 119096™, Bollgard II® XtendFlex™ or Roundup Ready 2 Xtend™ or Engenia. These products are not yet registered or approved for sale or use anywhere in the United States.

Commercialization is dependent on multiple factors, including successful conclusion of the regulatory process. The information presented herein is provided for educational purposes only, and is not and shall not be construed as an offer to sell, or a recommendation to use, any unregistered pesticide for any purpose whatsoever. It is a violation of federal law to promote or offer to sell an unregistered pesticide. *B.t.* products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state. Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. Always read and follow IRM, where applicable, grain marketing and all other stewardship practices and pesticide label directions. Bollgard II®, Genuity®, Respect the Refuge and Cotton Design®, Roundup Ready 2 Xtend™, Roundup Ready®, Mon 76832™, XtendFlex™ and Mon 119096™ are trademarks of Monsanto Technology LLC. LibertyLink and the Water Droplet Design® is a registered trademark of Bayer. All other trademarks are the property of their respective owners.