OPTIONS FOR PIGWEED CONTROL IN OKLAHOMA COTTON

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<u>Abstract</u>

Currently the use of residual herbicides within a Liberty Link system is the best way to chemically control glyphosate resistant (GR) pigweeds in cotton. In addition, Grower's anticipate the approval of new auxin based technologies (Xtendflex and Enlist) and eagerly await the opportunity to utilize these systems for the control of GR pigweed. Therefore three projects were established, one to evaluate the effectiveness of currently available residual herbicides, one to evaluate the utilization of the Liberty Link system and one to evaluate the effectiveness of residuals in a Bollgard II Xtendflex system. Valor, Prowl H20, Warrant, Dual Magnum, Caparol and Direx were applied preemergence (PRE) to evaluate glyphosate resistant pigweed control. Valor, Prowl H20, Warrant and Dual Magnum controlled GR pigweed greater than 90% 30 days after treatment. Caparol and Direx provided slightly less control. In the second project Caparol plus Liberty applied PRE followed by Liberty applied early postemergence (POST) followed by postemergence directed (PD) applications of either Aim plus Direx or Liberty plus Anthem Flex provided excellent control (100%) 10 days after the second POST (10DAP2) application. The third project was established to evaluate the effectiveness of a system comprised of residual herbicides and postemergence combinations including a new formulation of dicamba. Results indicated that effective season-long pigweed control (96-100%) is achieved when two residual herbicides are utilized within a system utilizing postemergence applications of dicamba. Significantly less control was observed (85%) when one of these residual components was removed from the system.

Introduction

Glyphosate resistant pigweed (Amaranthus spp.) is prevalent in most of Oklahoma's cotton production areas. Its prolific nature and unrivaled ability to spread over broad geographies guarantee its continued status as "enemy number one" in the cotton patch. Regardless of whether conventional or minimum tillage is used, producers are struggling to effectively control this weed. In addition, Oklahoma's largest commodity crop is winter wheat. Challenging economics and rainfall patterns have facilitated adoption of no-till production practices in that crop. Unfortunately, heavy dependence upon glyphosate-only treatments for summer weed control in no-till wheat systems has increased the frequency and the distribution of pigweed control failures across the state. Given the ability of various pigweed species to hybridize within its genus it is recommended that producers assume all pigweed is glyphosate resistant and plan accordingly. As recommendations evolved to battle this problem, researchers and producers quickly arrived at three conclusions. First, residual herbicides are a foundational requirement. Second, success is currently dependent on the effectiveness of Liberty (glufosinate) herbicide. Thirdly, new technologies cannot arrive soon enough. Unfortunately, all of these come with their respective challenges.

A grower must realize that cotton production with a "residual free" weed control system is not possible. While most of the residual herbicide options available to growers have been around for quite some time, they should be reminded of their effectiveness. In addition, many growers battling resistance in the Southwest lack personal experience with the Liberty Link herbicide system and its value as it relates to GR pigweed. Lastly, when new technologies (e.g. dicamba or 2,4-D tolerance) become available, producers need to understand that a return to the past (dependence on a single POST herbicide) is only a prescription for repeating history. Utilizing new POST options and maximizing the value and benefits of these systems will continue to depend on the use of foundational residual herbicide programs. Evaluating new systems that integrate residual herbicides will be critical for success in the future.

Three projects were established in 2015. One was designed to educate producers concerning current residual herbicide options and their relative value. Another project was implemented to evaluate the effectiveness of the Liberty Link system with respect to glyphosate resistant pigweed management. The final study was to assess benefits of residual herbicide integration into a Bollgard II® Xtendflex[™] Cotton System. The three objectives of this presentation were to re-establish the effectiveness of residual herbicides, to highlight currently available POST control options (Liberty Link System) and to establish the effectiveness of emerging POST technology.

Materials and Methods

In 2015 the Residual Herbicide Trial was established prior to planting in a cotton field previously observed to have a glyphosate resistant population of (primarily) Palmer amaranth. The density of this population was high enough to result in complete crop failure and total abandonment in 2014. Six residual herbicides were applied May 1 to a notill field (cotton after cotton system) near Altus. No pigweeds were emerged at the time of application due to prior treatment with paraquat. These six herbicides were Valor, Prowl H2O, Warrant, Dual Magnum, Caparol and Direx. Applications were made with a standard high clearance research sprayer delivering 10 gallons per acre (GPA) of spray volume at a speed of 3 miles per hour (MPH). Teejet 110015 "Turbotee" nozzles were used to make the application. Treatment performance was evaluated at both 14 and 30 days after treatment (DAT). Results are presented in Figure 1.

The Pigweed Control with Liberty and Anthem® Flex Project was established near Altus to evaluate the effectiveness of a Liberty Link System with the integration of residual herbicides. The effectiveness of two Liberty Link treatment programs was evaluated in FiberMax 1944GLB2 planted June 5. The first system consisted of Caparol + Liberty applied preemergence (PRE) followed by Liberty alone at the early POST (POST) timing followed by Aim + Direx postemergence-directed (PD). The second consisted of the same Caparol + Liberty PRE application also followed by Liberty alone early POST followed by Anthem® Flex + Liberty PD. All PRE and POST applications were made with a high clearance research sprayer delivering 15 GPA with a medium spray droplet provided by Teejet "Turbotee" nozzles. PD applications were made with a Redball 420 Layby Hood also delivering 15 gallons per acre spray volume with a medium spray droplet. Specific herbicide rate information and weed control observations made 30 days after PRE (30DAPRE), 27 days after post 1 (27DAP1) and 10 days after post 2 (10DAP2) are presented in Figure 2.

The third project was Pigweed Control in a Bollgard II® Xtendflex[™] System. A dicamba-tolerant variety was planted June 5 near Altus. Five treatment programs were evaluated for the control of palmer amaranth. Two numbered compounds were evaluated within these programs, Mon 119096 (a new ultra-low volatility formulation of dicamba) and Mon 76832 (a combination of the same dicamba with glyphosate). Caparol was applied PRE alone or with Mon 119096 (M119) followed by two POST applications, either Mon 76832 (M768) with or without Warrant, or Liberty alone. This was compared to PRE applications of M119 + Warrant followed by two POST applications of M768, the first of which was also tank-mixed with Warrant. All applications were made with Teejet "Turbotee induction" nozzles delivering 10 GPA in an ultra-coarse spray droplet. Specific herbicide rate information and treatment performance are presented in Figure 3.

Results and Discussion

The Residual Herbicide Trial site received approximately 1 inch of activating rainfall 5 days after application. An additional 10 inches of rainfall were received during the following three weeks. As indicated in Figure 1, excellent pigweed control (100%) was observed 14 DAT from plots receiving Valor applied at 2 oz/ac. Similar control (97-100%) was observed from plots receiving Prowl H2O applied at 1 qt/ac, Warrant applied at 3 pt/ac, and Dual Magnum applied at 1.3 pt/ac. Slightly less control (89-90%) was observed in treatments that received Caparol applied at 1 qt/ac or Direx applied at 1 qt/ac. Observations at 30 DAT indicated that Valor controlled pigweed 95%, Warrant 93%, Dual Magnum 91%, and Prowl H2O 85%. Applications of Caparol and Direx controlled pigweed 59% and 65%, respectively, 30 DAT.

PRE treatments in the Pigweed Control in a Bollgard II® Xtendflex[™] System were activated within ten days of application. Mild temperatures and adequate soil moisture resulted in excellent early POST activity. Although late-season rainfall was limited, irrigation provided sufficient soil moisture to produce good herbicidal activity from all

treatments. Excellent, season-long weed control (100% 14DAP2) was observed in plots that received PRE applications of Caparol at 1 qt/ac plus M119 at 22 oz/ac followed by early POST applications of M768 at 64 oz/ac plus Warrant at 3 pt/ac followed by late POST applications of M768 at 64 oz/ac. Similar control (96-98%) was observed in plots that received PRE applications of Caparol at 1 qt/ac followed by POST applications of M768 at 64 oz/ac device of M768 at 64 oz/ac. PRE applications of M119 at 22 oz/ac plus Warrant at 3 pt/ac followed by early POST treatments of M768 at 64 oz/ac plus Warrant at 3 pt/ac followed by early POST treatments of M768 at 64 oz/ac plus Warrant at 3 pt/ac followed by early POST applications of M768 at 64 oz/ac plus Warrant at 3 pt/ac followed by early POST applications of M768 at 64 oz/ac plus Warrant at 3 pt/ac followed by early POST applications of M768 at 64 oz/ac plus Warrant at 3 pt/ac followed by early POST applications of M768 at 64 oz/ac followed by late POST applications of Liberty at 29 oz/ac provided significantly less pigweed control (85%) 14 DAP2.



Figure 1. Pigweed Control with Residual Herbicides



Figure 2. Pigweed Control with Liberty and Anthem Flex



Figure 3. Pigweed Control in a Bollgard II Xtendflex System



Figure 4. Comparison of abandoned cotton to same field utilizing residuals in Liberty Link system.



Figure 5. Effective season-long control of pigweed utilizing residuals in a Bollgard II Xtendflex system.

Summary

Though most residual herbicides used in this project may not be new to the marketplace, this data suggests that they will provide effective control of GR pigweed. Even though 2015 had above average rainfall, treatments still performed very well. While growers in the Southwest tend to overlook residual products due to the required, timely, activating rainfall, there are no better alternatives. While excellent GR pigweed control was observed from many of these treatments beyond thirty days, it is important to point out that good control does not mean that pigweeds are not present. In fact, many times there are relatively few compared to the untreated. Therefore, under normal circumstances one should expect additional POST applications to be required to maintain 100% control to 30 days Many producers are beginning to turn to the only technology left that can provide adequate pigweed and beyond. control across multiple species since the Staple LX label only lists suppression of Palmer amaranth. However, there are additional points to consider. Liberty herbicide performance is very sensitive to weed size, spray volume, droplet size, speed at application and environmental conditions. Traditionally in the Southwest, these factors need to be in our favor to obtain satisfactory results. Although we have no control over the weather, success is highly dependent on other factors clearly listed on the product label that we can control. Lastly, due to the extensive proliferation of GR pigweed, growers are poised to adopt any new, effective POST technology coming in the near future. There are two important components of the take-home-message. First, dicamba technology works very well when used properly and it is expected to come with important label requirements. When guidelines are followed very good pigweed control can be achieved. While this work indicates that there are several combinations of residual and POST herbicides that produce effective season-long control, the omission of residual herbicides resulted in significantly decreased control. Residual herbicides must be the foundation of any program - now or in the future, with expectations of season long control.

Disclaimers

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