Mississippi Corn Promotion Board 2012 Progress Report

Project Title: Evaluation and Integration of New Corn Weed Control Technologies in Mississippi Crop Production Systems

PI: Daniel Reynolds / Jason Bond

Department: Plant & Soil Sciences / Delta Research & Extension Center

Project Summary (Issue/Response)

Fourteen weed species have developed resistance to glyphosate in the U.S., with eight of these species (giant ragweed, goosegrass, horseweed, Italian ryegrass, johnsongrass, Palmer amaranth, spiny amaranth, and waterhemp) found in Mississippi. Among the glyphosate-resistant weeds in Mississippi, Palmer amaranth poses the greatest threat to current crop production practices.

Corn growers have multiple options for controlling glyphosate-resistant Palmer amaranth. The HPPD (bleacher) chemistry represents a herbicide mode of action that, currently, is unique to corn. Rotating herbicides with different modes of action is one tool to combat problems with herbicide-resistant weeds. Callisto (mesotrione) is an HPPD herbicide that has been available for use in midsouthern U.S. corn for several years. Callisto is a component of both Halex GT and Lexar herbicide premixes. When Halex GT is applied in mixture with atrazine or when Lexar is applied with glyphosate or Liberty 280 (glufosinate), these herbicides represent the current industry standard for Palmer amaranth control in Mississippi. Laudis is another HPPD herbicide that was introduced in recent years. Laudis has performed well for control of Palmer amaranth when mixed with glyphosate or Liberty 280 and atrazine. Impact (topramezone) is a third HPPD herbicide that was recently marketed for use in Mississippi corn production.

Project Results/Outcomes

At 14 days after application, control of Palmer amaranth, barnyardgrass, and velvetleaf was similar following Callisto, Laudis, and Impact applied alone. Control of these three species was improved when atrazine was included with all three HPPD herbicides. Combinations of all HPPD herbicides with atrazine controlled Palmer amaranth, barnyardgrass, and velvetleaf better than atrazine alone 14 days after treatment. Palmer amaranth control with HPPD herbicides applied alone or in combination with atrazine followed similar trends at 28 days after treatment as were observed 14 days after treatment. All herbicide treatments controlled velvetleaf at least 85% at 28 days after treatment with no differences among HPPD herbicides. At 14 and 28 days after treatment, Laudis and Impact controlled more browntop millet than Callisto when HPPD herbicides were applied alone or in mixtures with atrazine. Laudis and Impact applied alone or with atrazine also controlled barnyardgrass better than Callisto at 28 days after treatment. There were no

Project Results

differences in corn yield following any herbicide treatment.

At the time of corn harvest, only Zidua plus atrazine (1 oz/A + 1.5 qt/A) and Guardsman Max (4 pt/A) controlled Palmer amaranth less than 85% following applications made to 12-inch corn. However, 21 days after corn harvest, only Halex GT plus atrazine (3.6 pt/A + 1.5 qt/A), Lexar (3 qt/A), and Bicep II Magnum (2.1 qt/A) controlled Palmer amaranth greater than 85%. Of note, Halex GT, Lexar, and Bicep II Magnum were the only herbicides that contained S-metolachlor. This indicates that in-season applications of S-metolachlor are important for full-season residual control of Palmer amaranth.


Nontreated


Callisto at 3 oz/A + atrazine at 1 qt/A


Laudis at 3 oz/A + atrazine at 1 qt/A


Impact at 0.75 oz/A + atrazine at 1 qt/A

Project Impacts/Benefits

To date, glyphosate-resistant weeds have had a tremendous impact on Mississippi agriculture, and this trend will continue. The Roundup Ready technology allowed producers to farm more acres with less equipment and less labor. Glyphosate-resistant weeds evolved as a consequence of overuse of glyphosate in Roundup Ready production systems. Many growers now have insufficient equipment, labor, and resources to adequately manage increasing problems with glyphosate-resistant weeds.

Row crop producers in Mississippi are a small minority in terms of population; however, they contributed over $2.3 billion in state revenues in 2011. Corn production in Mississippi was valued at approximately $595 million in 2011. Mississippi acreage planted to corn has increased 14% over the last five years. Given the potential for yield reductions from glyphosate-resistant plants and the rapid spread of these weeds, there is a need for continued research and extension outreach on their management.

Project Deliverables

Eubank, T. W. and J. A. Bond. 2012. Post-harvest weed control options. [Online] Available at http://www.mississippi-crops.com/2012/08/08/post-harvest-weed-control-options/. (08/08/2012)

Bond, J. A. 2012. Midsouth agriculture must move from weed control to weed management. Delta Farm Press. 69(21):12.

Bond, J. A. 2012. Pigweeds, pigweeds, pigweeds. Delta Farm Press. 69(12):8.

Stephenson, D. O., IV, D. K. Miller, J. A. Bond, R. L. Landry, M. S. Matthews. 2012. Utility of pyroxasulfone in mid-south corn and soybean. Proc. South Weed Sci. Soc. 65:111.

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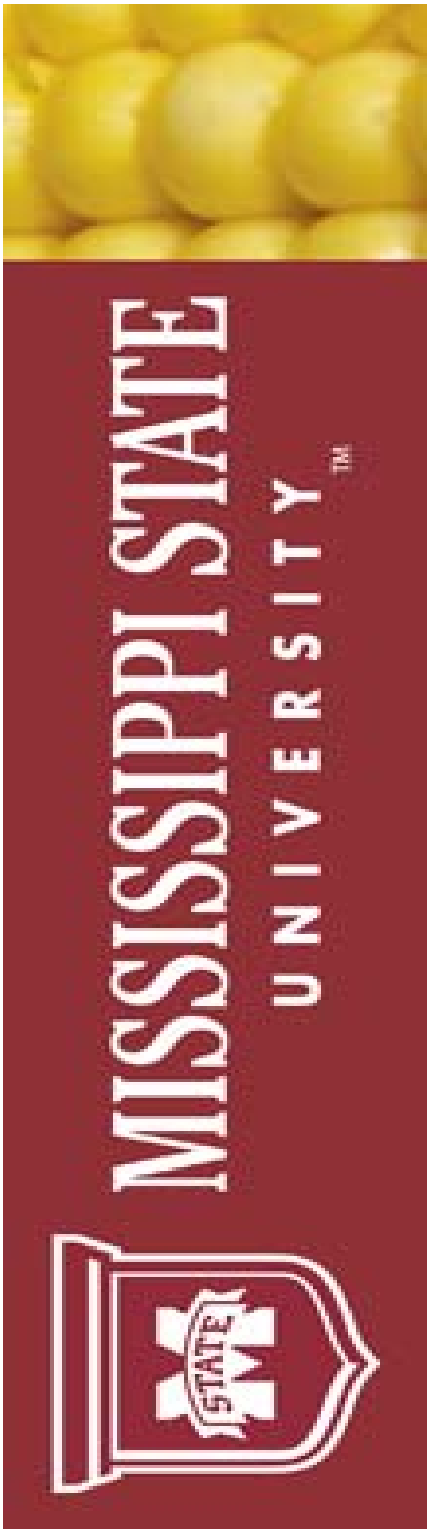

Project Summary (Issue/Response)

Genetically modified row crop acres have continued to increase as conventional row crop acres have decreased. As the acres increased so has the use of glyphosate (Roundup). One negative aspect of the herbicide tolerant technology is that undesirable glyphosate-tolerant plants in the form of volunteers or failed stands require additional herbicides for their control when tillage is not an option. The reason for needing to control these failed corn stands is partial stands can limit yield in the replanted corn . In many instances, the addition of the Herculex trait to the hybrid results in its tolerance to glufosinate (Liberty/Ignite) as well as to glyphosate. Now that glyphosate and/or glufosinate is not an option to most producers due to double stacked traits in corn, new methods of controlling failed corn stands are need.

Project Results/Outcomes

Experiments were conducted to evaluate different herbicides tank mixed with an insecticide, herbicide tank mixture combinations, herbicides tank mixed with different adjuvants, and graminicides to see the best options for controlling failed stands of corn.

Results indicated that paraquat (Gramoxone) provided significantly greater control than glufosinate at all rating timings ranging from 88-97%. Glufosinate control provided 68-90% across rating timings. Residual herbicides were averaged across burndown herbicides. Results indicated that simazine (Princep) and rimsulfuron (Resolve) provided the lowest control of failed corn stands with 75 and 76% control at 7 days and 86 and 88% control at 14 days. Atrazine, diuron (Direx), metribuzin (Sencor / Lexone), and linuron (Linex) all provided 80-81% control at 7 days and 91-96% control 14 days after treatment. At the 28 day rating, atrazine, simazine, and rimsulfuron all provided significantly lower control ranging from 89-90%. Diuron, metribuzin, and linuron provided significantly better control ranging from 96-98%.

Project Results

IGNITE + RESOLVE + DYNEAMIC +UAN

GRAMOXONE + LINEX + DYNEAMIC + UAN

Project Impacts/Benefits

These data show that a base application of paraquat (Gramoxone) is more effective than a base of glufosinate (Liberty) for the control of Roundup Ready corn. The literature clearly shows that paraquat activity can be maximized when tank-mixed with certain photosynthetic inhibiting herbicides (PS II Inhibitors). These data show that several PS II herbicides result in increased efficacy. They also show that linuron (Lorox /Linex) and metribuzin (Sencor/Lexone) are the most effective in increasing the activity of paraquat. Depending on what crop the farmer is going to replant, these herbicides may be used to not only increase the control of the failed stand but may also provide some in crop residual activity depending upon the rate applied.

Project Deliverables

Storey, Reed. 2013. Masters Thesis. Mississippi State University

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