Mississippi Corn Promotion Board
2018 Progress Report

Project Title: Towards improved Italian ryegrass (*Lolium multiflorum*) control in Mississippi Corn

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Project Summary (Issue/Response)

Italian ryegrass (*Lolium perenne* ssp. *multiflorum*) is a major weed problem for Mississippi corn growers, reducing yields by 1 bushel each day it survives in the field prior to corn planting (Hydrick et al. 2015). This weed is especially tough to manage as there are no herbicides on the market that effectively control it season due to herbicide resistance. Bond et al. identified that fall (November) plus early spring application (February) or late-winter (January) plus early-spring applications were effective in controlling Italian ryegrass prior to planting. By controlling Italian ryegrass in Mississippi corn, we can capture the crop's full yield potential in each field, thereby maximizing economic productivity. An economic analysis will be conducted to better understand the return on investment of certain herbicide programs which will be a key component of this project.

This project has begun to evaluate seven different preemergence herbicides with active ingredients that have been identified by Bond et al. (2014) as effective in a fall control program (*s*-metolachlor and pyroxysulfone). This project has also conducted research to better understand the work by Bond et al. (unpublished) to determine the effect that Italian ryegrass populations have on corn growth, development, and yield throughout the season to determine an optimal timing of removal for Italian ryegrass in Mississippi corn. The timing of removal study has also utilized NDVI sensing technologies to monitor crop growth and development throughout the season to quantify losses prior to harvest. Yield data was collected in year one, and will be collected in each of these studies to assist the economic analysis as well as classify effectiveness of each treatment.

Finding an economically effective control program for Italian ryegrass in Mississippi corn production will be a crucial aspect of helping corn growers combat this tough to control weed problem. Based on the results in the first year of the project and by continuing to trial new preemergence herbicides, the best performing programs will be widely publicized in time for fall applications to be made in late 2019. Furthermore, understanding the impact that Italian ryegrass has on corn growth, development, and yield will be a necessary message to communicate the need to control this weed in the fall. This project is well on track to finding a lasting solution for corn growers across Mississippi.

Project Results/Outcomes

Active Ingredient (AI) Study

This project trialed seven different PREs applied in the Fall followed by a January application of Select Max and a February application of paraquat, or the PREs followed by only a February application of paraquat. PREs were selected based on research from Bond et al. which showed that *S*-metolachlor and pyroxasulfone were effective in controlling Italian ryegrass. PREs selected were Dual II Magnum, Bicep II Magnum, Lexar EZ, Acuron, Zidua SC, Anthem Maxx and Anthem ATZ. Each of these PREs were followed by either Select Max in January or Gramoxone in February or by Gramoxone only in February. Plots were rated for weed control up to 56 days after application of the PREs and for each of the respective January and/or February herbicide applications. Yields in this study averaged around 160 bushels per acre, with the Bicep II Magnum followed by Gramoxone yielding 200 bushels per acre, resulting in a grower ROI of $697.48 per acre. The next best treatments were Anthem Maxx (pyroxasulfone + fluthiacet) followed by Select Max and Gramoxone, yielding 190 bu/A and an ROI of $653.58 per acre and Dual II magnum followed by Gramoxone which resulted in a 182 bu/A yield – which was lower than the Anthem Maxx treatment, but provided a higher ROI than that treatment of $663.47 per acre. A POST treatment of Acuron was applied at 12" corn which was able to keep ryegrass slowed until corn canopy.

Timing of Removal Study

This project assessed 12 different removal timings of Italian ryegrass starting at 90 days before planting up to 34 days after planting. At each timing (90, 76, 60, 48, 35, 28, 21, 14, and 7 days before planting; at planting, and 34 days after planting) an application of Acuron + Gramoxone was made to kill ryegrass. At the 34 days after planting, only Acuron was applied. This project found that for each week that ryegrass stayed in the field prior to corn planting, yields were reduced by 2.6 bushels per week. This was determined by assessing corn yield at each of the timings, and dividing by the weeks up to corn planting. This was a greater result than what was observed by Bond et al. who found that in the Delta, corn yields were reduced by 1 bushel per week that ryegrass remained in the field. This project had some drastic timing lengths before planting for the control programs, but this was due to a later planting from a cool and we start to March.

Droplet Size Effect on Herbicide Efficacy

This project examined the effect of three droplet size sprays from nozzles that produce Medium (TT 110015), Coarse (AIXR 110015) and Extremely Coarse (TTI 110015) droplets to apply herbicides for Italian ryegrass control. The result of this project showed that droplet size did not affect ryegrass control – and no differences between control programs. The data from 2018 showed conclusively that droplet size does not affect PRE herbicide efficacy. This project, while interesting, did not give results that research team felt needed an additional year of data.

For 2019, if the project is funded another year, the Active Ingredient Study will be nearly doubled in size from 18 total treatments to 32. This will include an additional seven PRE treatments as well as the addition of a study to examine the effect of additional AIs on the control of ryegrass. New PRE additions will include Boundary, Goal, Axiom, and Parallel Plus. It was observed that Lexar, while containing two additional AIs to Dual II Magnum, does not contain the same *S*-metolachlor rates nor the same atrazine rates as Bicep II Magnum. Treatments will be designed to match the same AI rates to truly examine the effect of additional AIs for ryegrass control and grower ROI.

Project Impacts/Benefits

Finding an economically effective control program for Italian ryegrass in Mississippi corn production will be a crucial aspect of helping corn growers combat this tough to control weed problem. The AI study yields in this study averaged around 160 bushels per acre, with the Bicep II Magnum followed by Gramoxone yielding 200 bushels per acre, resulting in a grower ROI of $697.48 per acre. The next best treatments were Anthem Maxx (pyroxasulfone + fluthiacet) followed by Select Max and Gramoxone, yielding 190 bu/A and an ROI of $653.58 per acre and Dual II magnum followed by Gramoxone which resulted in a 182 bu/A yield – which was lower than the Anthem Maxx treatment, but provided a higher ROI than that treatment of $663.47 per acre.

The Timing of Removal Study found that for each week that ryegrass stayed in the field prior to corn planting, yields were reduced by 2.6 bushels per week. This was determined by assessing corn yield at each of the timings, and dividing by the weeks up to corn planting. This was a greater result than what was observed by Bond et al. who found that in the Delta, corn yields were reduced by 1 bushel per week that ryegrass remained in the field.

The Droplet Size Effect Study found droplet size did not affect ryegrass control. The data from 2018 showed conclusively that droplet size does not affect PRE herbicide efficacy. This project, while interesting, did not give results that research team felt needed an additional year of data.

Based on the results in the first year of the project and by continuing to trial new preemergence herbicides, the best performing programs will be widely publicized in time for fall applications to be made in late 2019. Furthermore, understanding the impact that Italian ryegrass has on corn growth, development, and yield will be a necessary message to communicate the need to control this weed in the fall. This project is well on track to finding a lasting solution for corn growers across Mississippi.

Project Deliverables

Presentations made from this project during 2018:

- Southern Weed Science Society Annual Meeting – Atlanta, GA January 29-31, 2018 (Paper)

  Droplet size effects on preemergence herbicide efficacy for Italian ryegrass (*Lolium perenne* ssp. *Multiflorum* Lam. Husnot) control in corn

  Michael T. Wesley*, Dan B. Reynolds, Jason A. Bond, Erick J. Larson, and J. Connor Ferguson

- Plant and Soil Sciences Department Scholarship and Awards Banquet – MS State, MS April 19, 2018 (Poster)

  Active ingredient effects on preemergence herbicide control of Italian ryegrass (Lolium multiflorum)

  Michael T. Wesley*, Dan B. Reynolds, Jason A. Bond, Erick J. Larson, and J. Connor Ferguson

- Mid-South Association of Wheat and Feed Grain Scientists Annual Meeting – Madison, AL August 13-14, 2018 (Both papers)

  Active ingredient efficacy on Italian ryegrass control in Mississippi Corn

  Michael T. Wesley, Dan B. Reynolds, Jason A. Bond, Erick J. Larson, and J. Connor Ferguson*

  Italian ryegrass timing of removal effects on corn in Mississippi – Won 1st place in Graduate Student Paper Competition

  Michael T. Wesley*, Dan B. Reynolds, Jason A. Bond, Erick J. Larson, and J. Connor Ferguson

Figure 1: Untreated control from the Active Ingredient study showing the immense ryegrass pressure absent any control measures.

Figure 2: Anthem ATZ treatment from the Active Ingredient study showing the effect of Italian ryegrass control when an effective Fall preemergence herbicide is applied.