

SCSB Final Report

General Information

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Proposal Information

Title: Broadleaf Weed Management Programs in Soybean

Anticipated Start Date: February 1, 2020

Completion Date: January 31, 2021

Funding Budget: \$6,256

Other Cooperators/Funding Sources: None

Project Summary: This project will help South Carolina soybean growers choose the most effective herbicide program for troublesome broadleaf weeds in their operations. Although many herbicide options are available, crop prices and input costs can influence budget such that the number of applications of herbicides is reduced or eliminated. A high percentage of soybean grown in South Carolina have the dicamba tolerance trait and growers are tempted to rely solely on this mode-of-action for the season. The concern for reducing the diversity of our herbicide programs in soybean will lead to resistance to our new modes-of-action (i.e., dicamba) like the glyphosate dominated programs in the late 1990's to the early part of the 2000's

Project Introduction: Herbicide tolerant soybean are the predominant varieties grown in South Carolina. The most recent technology, Roundup Ready Xtend, provided tolerance to postemergence applications of dicamba. In 2020, 2,4-D tolerant soybean will be available in limited variety selections for South Carolina (only in early group 5's). This will provide an additional herbicide option for growers (although 2,4-D and dicamba belong to the same mode-of-action). Commodity price constraints in soybeans have squeezed crop input budgets and may have forced growers to reduce the diversity and number of herbicide applications in 2019. Resistance is a concern where we rely on limited modes-of-action for weed control. In addition, dicamba applications are not permitted 45 days after planting; therefore, other herbicide options will be needed because some broadleaf weeds can emerge throughout the season. Palmer amaranth and sicklepod can still be issues where herbicide applications are made after the optimum height of the weed is reached (i.e., less than 4 inches for dicamba). Therefore, this proposal will support on-going research in the weed science program to test herbicide programs that are effective on these problem weeds, such as Palmer amaranth, morningglory, and sicklepod. We cannot rely limited herbicide program (i.e., dicamba alone or w/glyphosate) to control these weeds because of ongoing resistance concerns that have been documented in other states.

Project Objectives:

1. To quantify the efficacy of selected herbicide programs on control of Palmer amaranth, morningglory, and sicklepod in soybean.
2. To disseminate these research results to South Carolina soybean growers through field days and grower meetings.

Project Procedures: Field studies were conducted in 2020 at the Edisto Research and Education Center. The experimental design was a randomized complete block design with a plot size of 4 rows by 40 ft. The herbicide programs are listed in Tables 1. An untreated control will be included as a visual check for weed density in the experimental area. Roundup Ready 2 Xtend soybean variety Asgrow '74X6' and Enlist E3 Pioneer 'P53T90E' were planted on June 19, 2020. The two varieties (dicamba and 2,4-D) were segregated in separate field spaces to avoid drift. Trivence at 8 oz/A was applied at planting (minus the untreated check). The following postemergence (PT1) treatments were applied on June 30, 2020 at the V3-V4 growth stage (Table 1). At the PT1, a preemergence weed efficacy rating for Trivence was collected. The PT2 application was applied at the V6-V7 growth stage (July 15, 2020). All POST treatments included the recommended adjuvant according to the manufacturer. Soybean fertility, insect, and other production practices will be followed according to South Carolina Extension recommendations. Weed control and soybean visual injury was evaluated at PT1 (PRE evaluation), PT2 (PT1 evaluation), and 2WPT2 (2 weeks after PT2 application). At crop maturity, yield was collected using a small plot combine harvester.

Table 1. Soybean Herbicide Programs (all treatments will receive Trivence PRE at planting at 8 oz/A):

Trt	POST1	Rate/A	POST2	Rate/A
1	Glyphosate + Dual Magnum	32 oz + 16 oz	Glyphosate + Cobra	32 oz + 12.5 oz
2	Glyphosate + Xtendimax	22 oz + 32 oz	Glyphosate + Xtendimax	22 oz + 32 oz
3	Glyphosate + Flexstar	32 oz + 24 oz	Glyphosate + Xtendimax	22 oz + 32 oz
4	Glyphosate	32 oz	Glyphosate	32 oz
5	Glyphosate + Xtendimax + Dual Magnum	22 oz + 32 oz + 16 oz	Glyphosate + Xtendimax + Classic	32 oz + 22 oz + 0.5 oz
6	Glyphosate + Xtendimax + FirstRate	22 oz + 32 oz + 0.3 oz	Glyphosate + Xtendimax + FirstRate	32 oz + 0.3 oz
7	Glyphosate + Cobra	32 oz + 12.5 oz	Glyphosate + Xtendimax + Dual Magnum	22 oz + 32 oz + 16 oz
8	Glyphosate + 2,4-D choline + Dual Magnum	32 oz + 32 oz + 16 oz	Glyphosate + 2,4-D choline	32 oz + 32 oz
9	Liberty + 2,4-D choline + Dual Magnum	32 oz + 32 oz + 16 oz	Liberty + Glyphosate	32 oz + 32 oz
10	Untreated Check			

Project Results: At the PT1 timing, Trivence at 8 oz/A preemergence provided excellent control of Palmer amaranth and pitted morningglory populations (~90-95% control). At PT2, Palmer amaranth control ranged from 95-100% control except the glyphosate fb glyphosate treatment (TRT 4) (resistance level check). As expected, Palmer amaranth control decreased as the Trivence PRE herbicide degraded in the soil. In addition, pitted morningglory was controlled 98-100% across the treatments with the exception of the postemergence glyphosate only treatment. As a side observation, grass control was slightly lower in the Liberty treatment (TRT 9) indicating that some antagonism occurred (data not shown). At 2WPT2 treatment, Palmer amaranth control was excellent (98-100%). Likewise, pitted morningglory and crabgrass control were equivalent to Palmer amaranth. Subsequent weed control evaluations after Mid-August and up until soybean canopy closure were similar to 2WAPT2 timing. Sicklepod weed density was not sufficient for data collection in this study. Soybean injury was noted with Flexstar and Dual Magnum treatments at PT2 and 2WPT2. Visual injury was less than 10% and the soybeans quickly recovered from the damage. Soybean yields were significantly lower in the check and the glyphosate fb glyphosate treatment (due to weed competition). The other treatments ranged from 45.7 to 49.3 bu/A.

Table 2. Broadleaf Weed Response (% control) to Selected Herbicides in Soybean (see Table 1 for treatment descriptions)

TRT	% Palmer Amaranth			% Pitted Morningglory			Soybean Yield BU/A
	PT1	PT2	2WPT2	PT1	PT2	2WPT2	
1	90	95	99	90	100	98	49.3
2	92	100	100	95	100	100	47.7
3	95	98	100	95	100	100	48.3
4	95	65	50	94	90	83	10.4
5	95	98	100	95	100	100	45.8
6	94	100	99	94	100	100	48.8
7	95	96	100	95	100	98	48.5
8	93	100	98	95	100	100	45.7
9	93	100	100	95	100	100	48.1
10	0	0	0	0	0	0	4.1
LSD (0.05)	NS	5	6	NS	6	5	11.6

Project Summary: The key to effective broadleaf weed management in both 2,4-D and dicamba tolerant soybean is to rotate herbicide modes-of-action and utilize residual herbicides in every application across the field (overlapping residuals starting with a preemergence residual at planting). With the occurrence of resistance in Palmer amaranth in other regions to most of these herbicides, it is critical to follow these recommendations.

Timeline:

First quarter (Feb 1 to Apr 30): Trial planning and preparation of experimental field site (fertilizer, tillage, and other pre-planting activities).

Second quarter (May 1 to Jul 31): Plant soybean, apply herbicide treatments, collect plant and weed visual ratings,

Third quarter (Aug 1 to Oct 31): Scout soybeans for mid- to late-season insects and disease pressure, collect soybean yield data.

Fourth quarter (Nov 1 to Jan 31): Present results to SC soybean growers throughout the state at Clemson Extension county and regional meetings.

Expected Outputs/Deliverables:

- 1) *4 Quarterly reports to the SC soybean board*
- 2) *1 final report to the SC soybean board*
- 3) *Present soybean injury results to soybean growers at virtual soybean meetings in the 1st quarter of 2021.*

Key Performance Indicators:

This study will provide research-based information on herbicide programs that will increase grower's knowledge to effectively manage problem broadleaf weeds in soybean production and prevent the development of herbicide resistance in current trait technologies.