



Missouri Soybean Merchandising Council
Research Pre-Proposal

2018

Project Title: Investigating Dicamba and 2,4-D Herbicide Off-Target Movement	
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Co-Investigator Name:
Co-Investigator Title, Employer:

New Project <input checked="" type="checkbox"/>	Ongoing Project <input type="checkbox"/>	MSMC Project No. _____
Proposed Funding Start Date: March 1, 2019		Proposed Funding End Date: February 28, 2021
Total Funding Requested: <u>Approved \$40,000</u>	Year 1 - \$ 46485 (2019/2020)	Year 2 - \$ 46485 (2020/2021)
Description of Project: <i>(Limit to 150 characters. Expanded scope may be included in pre-proposal content.)</i> The proposed research is to further study dicamba off-target movement and begin studying 2,4-D in the air.		
List of Project Partners, Institutions, Organizations, Businesses and Agencies: <i>(Use additional page if needed.)</i> Currently there are no other project partners.		
Principal Investigator: Kevin Bradley	Authorized Organizational Representative: <i>Michelle L. Leaton</i> 10/22/18	
Signature: <i>Kevin Bradley</i> Date: <i>16 Oct 2018</i>	Signature	Date

Michelle L. Leaton, Assistant Pre-Award Manager

For assistance, contact Ebbey Neuner with the Missouri Soybean Merchandising Council at eneuner@mosoy.org.

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Investigating Dicamba and 2,4-D Herbicide Off-Target Movement

Project Background, Need and Opportunity

Improvement of soybean management practices

Dicamba-tolerant (DT) soybean are commercially available and 2,4-D-tolerant soybean will be available once the seed is approved by the Chinese regulatory agencies. These technologies offer additional herbicide options for control of tough broadleaf weeds, such as waterhemp and Palmer in soybean.

Unfortunately, one of the same properties that makes these herbicides effective in controlling broadleaf weeds also makes the chemicals problematic with regards to drift and movement away from intended targets onto non-intended plants. Broadleaf plants are highly sensitive to these herbicides. Unlike glyphosate or glufosinate or other commonly-used herbicides in soybean production, 1/20,000th of a 1X rate of dicamba can cause visual dicamba injury to non-dicamba tolerant soybean¹. A 1/300th of a 1X rate of 2,4-D can result in visible wine grape injury². This is problematic in that unlike other chemicals it takes only a very small amount of off-target dicamba or 2,4-D movement to cause injury to unintended plants. Additionally, it highlights the need to ensure that dicamba and 2,4-D remain on target plants after application.

Historical work in the 1970's in the Yakima Valley in Washington state provided support that 2,4-D was capable of moving ~10 miles from the intended target following an application³. While the geography in Washington can be much different than Missouri and the formulations of 2,4-D have changed, those observations still highlight the reality of how these herbicides can move once suspended in the air.

The number of dicamba-related incidences filed with state departments of agriculture in the 2017 and 2018 growing seasons indicate that off-target dicamba movement is still problematic even with new formulations. Although 2,4-D-tolerant soybean have not been commercially approved yet, off-target incidences with 2,4-D tolerant cotton have been reported. The historical information on 2,4-D combined with what is known about broadleaf plants and 2,4-D sensitivity suggest that once 2,4-D-tolerant soybean are commercially available the problems with this herbicide may also increase.

This proposal aims to continue research on new formulations of dicamba and 2,4-D and their behavior following application. These herbicides can move off-target in multiple ways including physical drift due to wind, volatility, spray tank contamination, and herbicide applications during inversions. The specific focus of this proposal is aspects of off-target movement beyond the pesticide applicator's control. A better understanding of these factors will assist in minimizing off-target dicamba and 2,4-D movement.

The proposed project objectives of this research are 2-fold:

1. Continue studies on environmental factors that influence movement of newer dicamba formulations.
2. Initiate studies on 2,4-D and its movement into the air.

Outline of Proposed Project Objectives

Goal 1: *Further investigate the role that weather and environmental factors have on off-target dicamba movement.* Comparisons of weather and environment surrounding dicamba applications from 2017 and 2018 suggest that soil pH, nearby water sources, dew point temperatures, and wind play a role in whether a dicamba application remains on-target or moves. In 2018 we were able to begin testing the soil pH finding in the research setting with the use of “hoop houses”, flats of soil at different pH’s, and non-dicamba tolerant soybean. Preliminary results support what was found in the weather and environment analysis: a more acidic soil pH results in increased risk of dicamba volatility. Also, in 2018, we detected dicamba on soybean leaf surfaces for more than 48 hours following on-label dicamba applications. This is problematic in that if dicamba is not absorbed by the plant it is free to get moved into the air. For 2019 and 2020 we would like to expand the research conducted in 2018 by repeating the soil pH studies in the field, adding greenhouse studies to provide further support to the finding, and test other factors that were pulled out of the environment and weather comparisons between on- and off-target applications. Such studies will provide knowledge about what types of applications are most likely to be successful. Results will be presented at field days, extension events and at technical meetings.

Goal 2: *Initiate studies on 2,4-D and its movement into the air.* Most air sampling work reported thus far has been conducted in humidomes, which are typically less than 2 ft² in area and cannot represent all environment and weather conditions that pesticide applicators may face. The United Soybean Board has voiced interest and concern in the lack of 2,4-D air sampling data to date and expect to fund a core group of university weed scientists to address this issue in 2019, although any USB funding that may be available will not be known until the spring of 2019. We propose to start 2,4-D air sampling work with MSMC over the summer of 2019. If USB is able to provide additional funds for the summer of 2019, it will increase the number of experiments we can conduct over the course of the summer and help increase the amount of information that we will have available for Missouri farmers and applicators by the time 2,4-D-tolerant soybean are commercially available.

Impacts to Missouri Soybean Producers

Research results from this project will provide Missouri soybean producers and agriculture professionals with timely knowledge on dicamba and 2,4-D applications by providing additional information on what is likely to result in a successful application versus an application that is likely to move off target

OTHER COOPERATORS and FUNDING SOURCES

There are currently no other definitive funding sources for this project. United Soybean Board is considering support for work that will align with Goal 2. The Missouri Soybean Merchandising Council will be credited in research information achieved.

Investigating Dicamba and 2,4-D Herbicide Off-Target Movement
Revised Budget and Budget Justification
MSMC Project# 17-407-20
MU Project# 00065017

BUDGET JUSTIFICATION

The largest portion of this budget request (Table 1) is for salary support for both objectives and supplies. Salary support is requested for one staff to conduct the work and analyze the results. The necessary supplies needed for the air sampling will include gloves, bottles, filters, fiber papers, chemicals, and upkeep on the generators as well as the funds required for analysis of 2,4-D levels.

Table 1. Proposed budget

	2019	2020
Salary		
3.5 months specialist	\$21,875	\$21,875
Fringe Benefits		
3.5 months specialist @ 36.46%	\$7,975	\$7,974
Supplies		
Filters, tubes, gloves, bottles, etc. for air sampling	\$4,650	\$4,650
Supplies for generator maintenance	\$500	\$500
Analysis of air samples	\$5,000	\$5,000
TOTAL COST	\$40,000	\$40,000

REFERENCENCES

¹Solomon, C and KW Bradley (2014) Influence of Application Timings and Sublethal Rates of Synthetic Auxin Herbicides on Soybean. *Weed Tech.* 28:454-464.

²Mohseni-Moghadam M, Wolfe S, Dami I, and D Doohan (2016) Response of Wine Grape Cultivars to Simulated Drift Rates of 2,4-D, Dicamba, and Glyphosate, and 2,4-D or Dicamba Plus Glyphosate. *Weed Tech.* 30:807-814.

³Reisinger L, and E Robinson (1975) Long-Distance Transport of 2,4-D. *Jour. Of Appl. Meterology* 15:836-845.