Exhibit 25

Report Title

Determination of the Relative Volatility of Dicamba Herbicide Formulations

Test Guideline

Not Applicable

Author

Walter K. Gavlick, Ph.D.

Report Date

November 17, 2015

Performing Laboratory

Monsanto Company
800 N. Lindbergh Blvd.
Saint Louis, MO 63167

Report Identification

Monsanto Report Number: MSL0026648

MRID 49770303

Page Count

Page 1 of 16

NO CLAIM OF CONFIDENTIALITY

No claim of confidentiality, on any basis whatsoever, is made for any information contained in this document. I acknowledge that information not designated as within the scope of FIFRA sec. 10(d)(1)(A), (B), or (C) and which pertains to a registered or previously registered pesticide is not entitled to confidential treatment and may be released to the public, subject to the provisions regarding disclosure to multinational entities under FIFRA 10(g).

Submitter: Jerry W Cubbage Date: 11/19/2015

Typed Name of Signer: Jerry W. Cubbage

Typed Name of Company: Monsanto Company

SUBMISSION AND USE OF MATERIALS UNDER FIFRA

The inclusion of this page is for quality assurance purposes and does not necessarily indicate that this study or document has been submitted to the EPA.

The text above applies only to use of the data or document by the United States Environmental Protection Agency (U.S. EPA) in accordance with the provisions of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and not to any other use or use by any other agency or government.

We submit this material to the U.S. EPA specifically under the requirements set forth in FIFRA as amended, and consent to the use and disclosure of this material by EPA strictly in accordance with FIFRA. By submitting this material to EPA in accordance with the method and format requirements contained in PR Notice 2011-3, we reserve and do not waive any rights involving this material, including but not limited to copyright and data compensation, that are or can be claimed by the Company not withstanding this submission to the U.S. EPA.

GOOD LABORATORY PRACTICE STATEMENT

This project does not meet the U.S. EPA Good Laboratory Practice requirements as specified in 40 CFR Part 160. Measures taken to ensure project quality have been included in the Data Quality Measures section of the report.

REPORT AUTHOR:

Walter K. Gavlick, Ph.D. — Date: 11-17-15
Product Development Analytics Platform Lead

APPLICANT / SUBMITTER:

Jerry W. Cubbage, Ph.D. — Date: 11/17/2015
Dicamba Regulatory Affairs Manager

CERTIFICATION PAGE

This report is an accurate and complete representation of the project activities. It does not meet the GLP definition of a study, and 40CFR160 does not apply.

REPORT AUTHOR:

Walter K. Gavlick

11-17-15

Walter K. Gavlick, Ph.D.
Product Development Analytics Platform Lead

Date

COPYRIGHT INFORMATION PAGE

REPORT INFORMATION PAGE

Report Title: Determination of the Relative Volatility of Dicamba Herbicide Formulations

Report Number: MSL0026648

MRID: [insert MRID, if applicable]

Report Date: November 17, 2015

Report author:

Walter K. Gavlick, Ph.D.

Contributors:

Julie K. Webb
Viktar I. Yermolenka, Ph.D.

ABBREVIATIONS AND ACRONYMS

PUF	Polyurethane foam plug
DGA	Diglycolamine
MEA	Monoethanolamine
DMA	Dimethylamine
LOD	Loss on drying
GPA	Gallons per acre
RH	Relative humidity
SLPM	Standard liters per minute
LC	Liquid chromatography
MS	Mass spectrometry
ng	Nanogram
mg	Milligram
mL	Milliliter

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. Abstract

The relative volatility of dicamba containing herbicide formulations was determined in a growth chamber under controlled environmental conditions through the use of a sprayed soil sample application and PUF (polyurethane foam) based dicamba collection in a disposable closed dome system. A track sprayer in a fume hood was used to dose the soil with the dicamba containing formulation, the dosed soil was covered with a dome, placed into a growth chamber and then air was drawn out of the closed dome and through the PUF for twenty-four hours. Any dicamba that was present in the air was trapped on the PUF. The dicamba was then extracted from the PUF with methanol, and the resultant extract solution was analyzed for dicamba acid by liquid chromatography – mass spectrometry.

2. Introduction

In this study, the relative volatilities of the following formulations were determined: XtendiMax with VaporGrip™ (dicamba diglycolamine (DGA) salt containing formulation), Clarity® (dicamba DGA salt containing formulation), and Banvel® (dicamba dimethylamine (DMA) salt containing formulation).

3. Materials and Methods

3.1 Closed Dome System Preparation

Closed Dome Lid Preparation - To a disposable clear, plastic dome lid[1], a 7/8" diameter air outlet hole was cut with an arch punch on one end, two inches from top of the dome, to allow for insertion of a glass air sampling PUF tube (Figure 1). On the opposite end of the lid, two inches from the top, another 7/8" air inlet hole was cut.

Closed Dome Tubing Preparation - A section of ¼" ID flexible air line tubing[2] with a quick disconnect fitting[3] on one end was secured onto the 3/16" tapered end of a glass air sampling tube[4] containing a PUF[5]. A Viton O ring[6] was placed over the larger open end of the glass tube, and the tube was inserted into the air outlet port in the dome lid, extending approximately one inch inside the dome. The glass tube was secured in place by inserting a second Viton O ring over the tube from inside the dome and pushing it against the dome wall toward the outer O ring (Figure 1). The air inlet hole was plugged temporarily with a #3 rubber stopper.

Closed Dome Tray Bottom Preparation - A disposable flat plastic tray bottom[7] was filled with 1 liter of a 50% Redi-Earth and 50% U.S.-10 field soil mixture which was sifted with a ¼" opening sieve screen. The non-compacted soil was leveled out to an approximately 1 cm depth in the tray. A sample of the soil was tested for moisture content using a loss on drying (LOD) instrument.

Soil Dosing - To avoid contamination of the outer sides of the tray during spraying, the tray of soil was placed inside of an empty tray bottom. The tray bottom containing the soil was sprayed at a rate of 10

[1] Hummert part 14-3850-2; clear plastic; 6"H x 21"L x 11" W
[2] Vincon part ABH02017
[3] CPC part PLC1700412
[4] SKC Inc. part 226-124G, 4 ½" long with openings of 3/4" ID and 3/16" ID on opposite ends
[5] SKC Inc. part P22692, polyurethane foam 76 mm long x 22mm OD which is cut to 30mm L; approximately 1 inch from end of larger opening
[6] Danco part 14, 15/16"OD x ¾" ID
[7] Hummert part 11-3050-1, F1020-no holes, 3"H x 20"L x 10"W

gallons per acre (GPA) using a track sprayer inside a fume hood with a 9501E nozzle tip 16 inches above the soil with a test formulation which had been appropriately diluted (1.2% dicamba acid). After the spraying was complete, the tray was removed from the empty bottom. A humidity dome lid, containing a PUF sampling tube and an air line apparatus in the outlet hole and a #3 rubber stopper in the inlet hole, was then immediately placed over the tray of sprayed soil and secured along the edges and ends with metal binder clips. The tray was handled carefully to avoid shifting the sprayed soil (Figure 2). All soil dosing and closed dome assemblies were completed before the domes were moved to the growth chamber.

Closed Dome Placement in Growth Chamber - The assembled closed dome was placed on a shelf inside the growth chamber (set at 35°C, 40% RH, 14 hour day light cycle) and connected to a vacuum line (Figure 3). The #3 stopper that was placed in the air inlet hole was then removed to allow air to flow through the dome and the PUF. The vacuum system consisted of a 12-port vacuum manifold with mass flow controllers and displays which allowed for twelve closed domes to be used simultaneously. A vacuum pump was connected to the manifold and exhausted outside the growth chamber. The closed dome remained undisturbed in the growth chamber for 24 hours with air drawn through it at a flow rate of 2 standard liters per minute (SLPM).

3.2 Test Completion

After 24 hours, the vacuum pump was turned off, and the closed dome was removed from the growth chamber with rubber stoppers placed in the air inlet holes to prevent the release of dicamba vapors into the growth chamber. The glass PUF containing sampling tube was removed and wrapped in aluminum foil.

3.3 Sample Analysis

The PUF was removed from the glass tube and placed into a 20 mL vial. Twenty milliliters of methanol were added to the vial, and the dicamba was extracted from the PUF by repeatedly squeezing the PUF with a disposable pipet tip in an up and down motion. The resultant extract was analyzed by LC-MS[8] for extracts in the range of 0.002 to 2 ppm and LC-MS/MS[9] for extracts in the range of 0.0005 to 0.2 ppm (0.5 to 200 ppb). The LC-MS method used a Waters Acquity UPLC HSS T3 (2.1 x 150 mm, 1.8 micron) column with a mobile phase gradient consisting of 0.1% formic acid in water and 0.1% formic acid in acetonitrile. The dicamba was quantitated at a m/z of 177. The LC-MS/MS method used a Zorbax XDG-C8 (4.6 x 50 mm, 3.5 micron) column with a mobile phase gradient consisting of 0.1% formic acid in water and 0.1% formic acid in acetonitrile. The dicamba was quantitated using Q1 at 218.811 and Q2 at 175.000 daltons.

4. Data Quality Measures

The study in this report was not conducted according to good laboratory practice (GLP) standards. However, quality control measures were taken to ensure the integrity and validity of the study. The study was conducted under the direction of Monsanto personnel and was conducted in a near-GLP manner. The study report will be retained in the Monsanto Regulatory Archive and the raw data will be retained in the Monsanto electronic notebook system

[8] Waters Acquity UPLC with SQ detector
[9] Agilent 1200 series HPLC with Applied Biosystems API 3200 MS/MS

The following quality measures were implemented:

- A calibrated track sprayer was used to insure correct dosing of the soil.
- Calibrated flow meters were used to insure correct air flow through the domes.
- Growth chambers were calibrated with respect to temperature and humidity.
- Glass sample holders were cleaned with mild detergent and dried at 120 C prior to insertion of the PUF to prevent the glass from being a source of contamination.
- The PUFs were stored in a lab that is isolated from dicamba acid to prevent contamination.
- Solvent blanks were analyzed between samples to ensure there was no carryover or cross contamination between samples.

5. Results and Discussion

5.1 Sample Description

The following formulations were used in the study: XtendiMax with VaporGrip™ (dicamba diglycolamine (DGA) salt containing formulation), Clarity® (dicamba DGA salt containing formulation), and Banvel® (dicamba dimethylamine (DMA) salt containing formulation). Each sample was diluted with water to achieve a dicamba acid concentration of 1.2% (w/w) or 1 lb/acre application rate. The 20 inch by 10 inch tray of soil was sprayed at a rate of 10 gallons per acre, which resulted in a theoretical application of 0.01448 g or 14.48 mg of dicamba acid applied to the soil. Table 1 contains the pH values of the dilute formulations.

Table 1. Dilute formulation pH values.

	pH
XtendiMax with VaporGrip™	5.22
Clarity®	7.05
Banvel®	5.62

5.2 Relative Volatility Results

The amount of dicamba that was trapped on each PUF over the 24 hour collection period was determined by analyzing the PUF extract using either LC-MS or LC-MS/MS. These results are found in Table 2.

Table 2. Nanograms of dicamba acid on the PUF.

			ng of Dicamba Acid on PUF	
	Number of Domes	Analytical Method	Mean	Standard Deviation
XtendiMax with VaporGrip™	4	LC-MS/MS	8.58	4
Clarity®	3	LC-MS/MS	117	9
Banvel®	4	LC-MS	6499	654

Theoretically, 14.48 mg (or 1.448×10^7 ng) of dicamba acid were applied to the soil substrate. The highest amount of dicamba acid that was trapped on a PUF was 6499 ng for Banvel® which means 0.045% of the applied dicamba acid was trapped on the PUF. The lowest amount of dicamba acid that was trapped on a PUF was 8.58 ng for XtendiMax with VaporGrip™ which means that 0.000059% of the applied dicamba acid was trapped on the PUF.

Equation 1 was used to calculate the dicamba acid concentration per liter of air.

Equation 1.

$$C = (S \times A) / (F \times M \times T)$$

where:

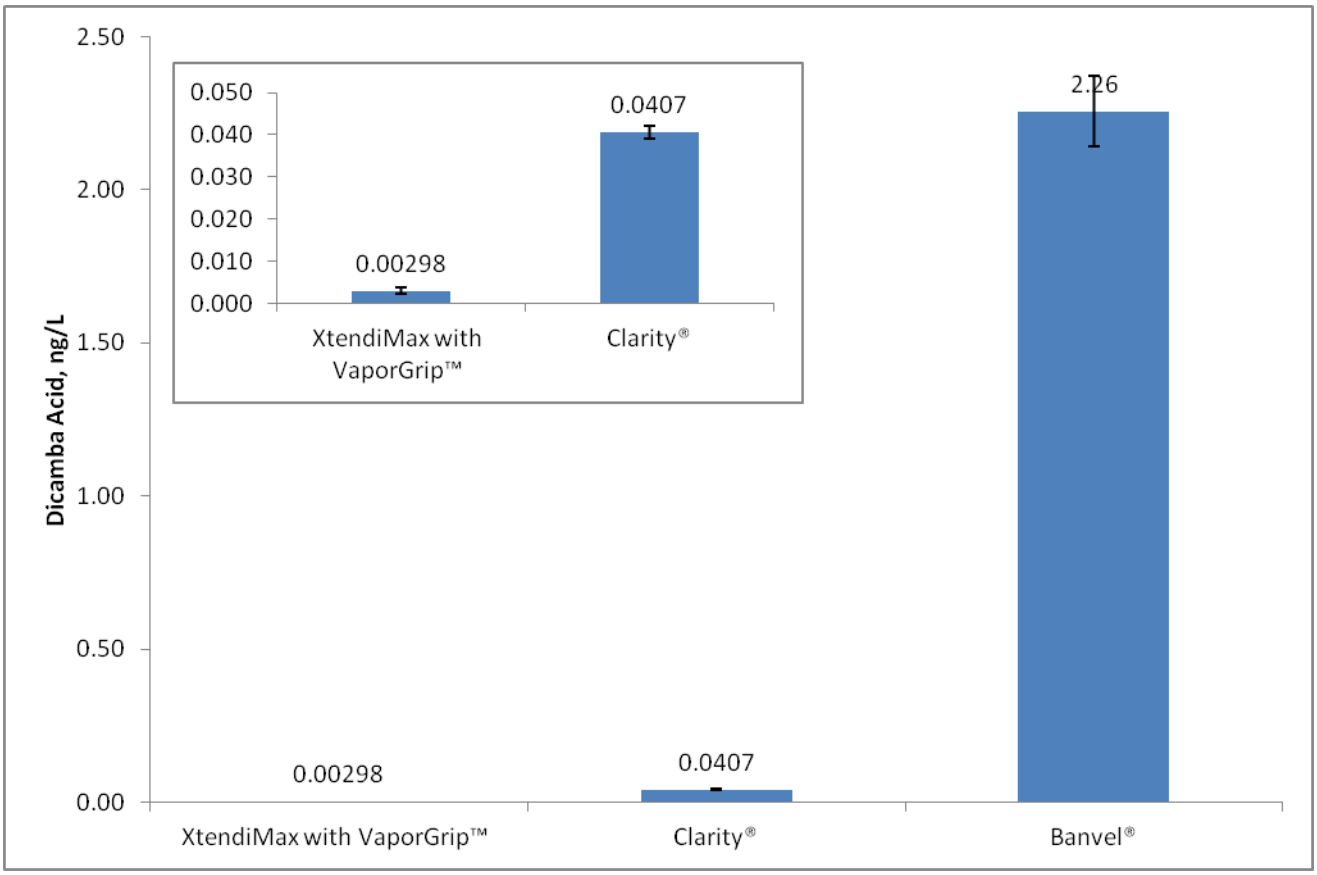
C = ng/L of dicamba acid
S = mL of extraction solvent (20 mL methanol)
A = ng/mL of dicamba acid in extract solution (as determined by LC-MS)
F = air flow rate in SLPM (2 SLPM)
M = 60 minutes per hour
T = Hours of air flow (24 hours)

Table 3 contains the data generated from Equation 1 for the various formulations, and Figure 4 is a plot of those results.

Table 3. Dicamba acid trapped with respect to air flow.

	Dicamba acid, ng/L		
	Mean	Standard Deviation	Standard Error
XtendiMax with VaporGrip™	0.00298	0.001	0.001
Clarity®	0.0407	0.003	0.002
Banvel®	2.26	0.227	0.114

Figure 4. Relative volatility data.



6 Conclusions

The relative volatility of three dicamba containing formulations was determined. XtendiMax with VaporGrip™ was approximately three orders of magnitude less volatile than Banvel® and over one order of magnitude less volatile than Clarity®.

7. References

Gavlick, W., Wright, D., MacInnes, A., Hemminghaus, J., Webb, J., Yermolenka, V., Su, W., "A Method to Determine the Relative Volatility of Auxin Herbicide Formulations" submitted for publication in ASTM International, January 2015.

Closed dome study number DCV-984.

8. Figures

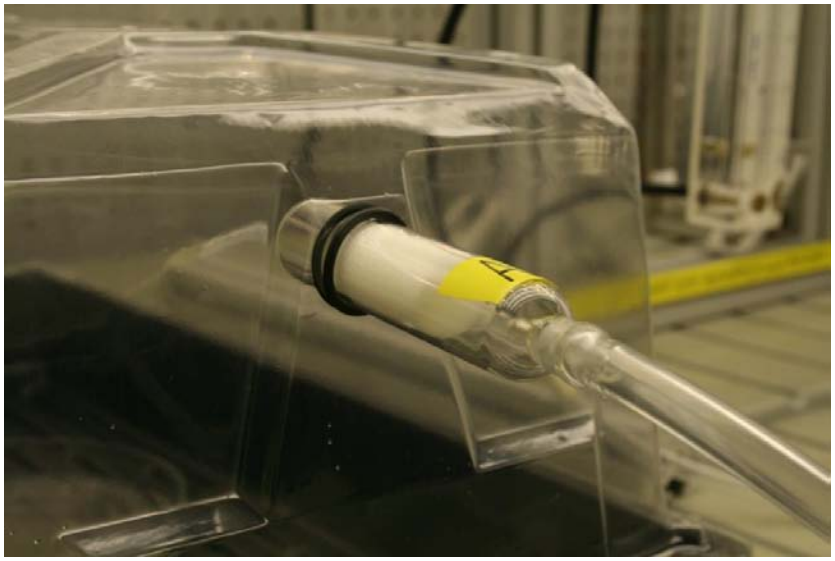


Figure 1. Close-up view of PUF in glass tube.

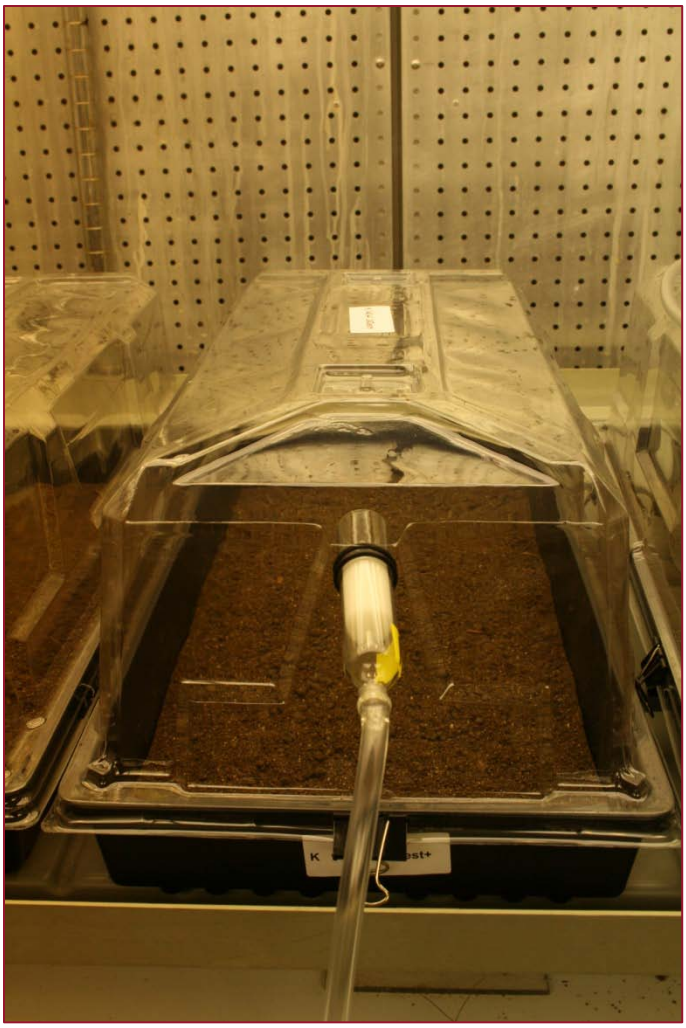


Figure 2. Assembled closed dome system.

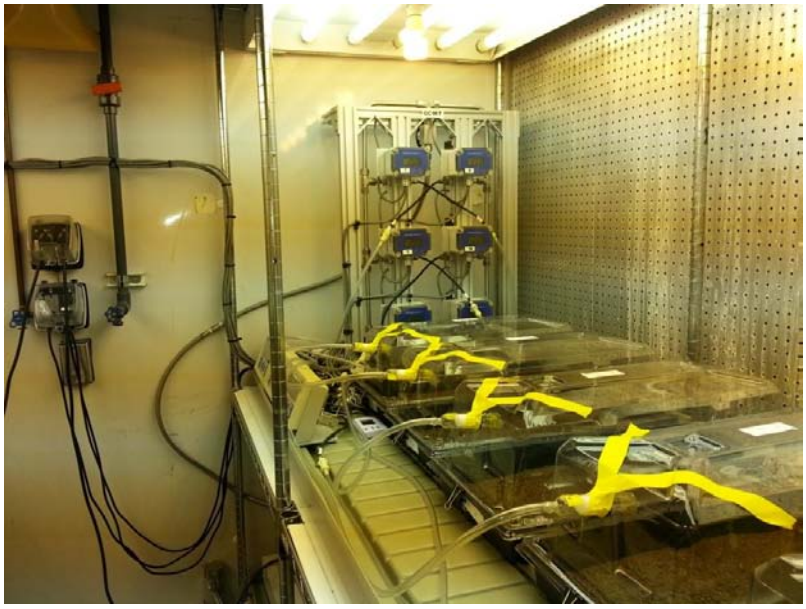


Figure 3. Series of closed dome systems in a growth chamber.