No. 19-70115

**UNITED STATES COURT OF APPEALS**
**FOR THE NINTH CIRCUIT**

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NATIONAL FAMILY FARM COALITION, *et al.*,

*Petitioners*,

v.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, *et al.*,

*Respondents*,

and

MONSANTO COMPANY,

*Intervenor-Respondent.*

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ON PETITION FOR REVIEW FROM THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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# PETITIONERS' EXCERPTS OF RECORD VOLUME IV of IX

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[1] Unless otherwise specified, the document identifier numbers refer to their document numbers as listed in the Certified Indices, ECF Nos. 26-3 (Sections A through P), 34-3 (Section Q).

[2] Respondent United States Environmental Protection Agency (EPA) did not produce, but only provided hyperlinks to, publicly available documents. *See* ECF No. 26-3. For the Court's convenience, Petitioners have produced those hyperlinked documents in their entirety in the Excerpts of Record.

| | | | |
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| 10/31/2018 | P.1131 | Attachment to 00025600 - revised terms and conditions | ER 0504 |
| 10/31/2018 | M.10 | Public comments from Center for Food Safety | ER 0509 |
| 10/31/2018 | M.10 | Public comments from Center for Biological Diversity | ER 0510 |
| 10/31/2018 | M.10 | Public comments from R. Coy | ER 0515 |
| 10/30/2018 | P.220 | E-mail from R. Baris to T. Marvin re: terms of registration | ER 0516 |
| 10/18/2018 | P.694 | E-mail from M. Thomas to R. Baris re: EPA label edits | ER 0521 |
| 10/11/2018 | P.880 | E-mail from David Scott to Reuben Baris re: Dicamba registration | ER 0522 |
| 10/5/2018 | P.5 | Attachment to 0000956 E-mail - Update on dicamba evaluation | ER 0523 |
| 10/5/2018 | P.4 | E-mail from Mark Corbin to J. Norsworthy re: phone call | ER 0526 |
| 10/1/2018 | P.194 | E-mail from Nancy Beck to S. Smith re: Thank You | ER 0527 |
| 10/2018 | O.95 | EPA/BEAD Summary of 2017 & 2018 Incidents by State | ER 0529 |
| 9/28/2018 | P.1230 | Attachment to 00037613 Letter from Oklahoma on behalf of several states to Wheeler | ER 0532 |

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| 9/26/2018 | O.38 | Office of the Indiana State Chemist. 2018. Dicamba Discussion 2017-2019. Indiana State Pesticide Review Board Meeting. September 26, 2018. | ER 0540 |
| 9/13/2018 | O.271 | Presentation by Ruben Baris, EPA/RD, to Pesticide Inspector Regulatory Training: "EPA's Considerations for Over-the-Top Dicamba Registrations (EPA Auxin Updates ) 2018 Basic Inspector and Use Concerns" | ER 0575 |
| 9/6/2018 | P.925 | E-mail from M. Sunseri to R. Baris re: Minnesota comments | ER 0596 |
| 9/2018 | P.1293 | E-mail from Pesticide Action Network to Rick Keigwin re: EPA: Pull Monsanto's crop-killing dicamba now | ER 0597 |
| 8/29/2018 | P.213 | Attachment letter to 00076811 | ER 0612 |
| 8/29/2018 | P.173 | August 2018 AACPO Letter to then-Acting Administrator Wheeler re: dicamba decision | ER 0615 |
| 8/29/2018 | P.14[3] | E-mail from R. Baris to R. Keigwin re: articles of interest | ER 0618 |
| 8/22/2018 | P.253 | E-mail from T. Gere to R. Baris re: update | ER 0627 |
| 8/21/2018 | P.1232 | E-mail from C. Wozniak to EPA recipients re: Drifting Weedkiller Puts Prized Trees at Risk | ER 0628 |

[3] This e-mail contains a hyperlink to an online article that Petitioners have produced in its entirety. For the Court's convenience, Petitioners have produced relevant hyperlinked articles in their entirely in the Excerpts of Record. Throughout the index these documents containing hyperlinks are noted with a double asterisk (*e.g.* __.__**).

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| 8/21/2017 | K.92 | E-mail from Nicholas Sorokin to EPA recipients of Office of Public Affairs media clips re: Reuters: Exclusive: U.S. farmers confused by Monsanto's weed killer's complex instructions | ER 0637 |
| 8/15/2018 | P.1060** | E-mail from R. Robinson to R. Baris re: Dicamba 2018 – The Iowa Experience (Attachment) | ER 0639 |
| 8/15/2018 | P.1060 | E-mail from R. Robinson to R. Baris re: Dicamba 2018 – The Iowa Experience | ER 0642 |
| 8/16/2018 | Q.67 | Polansek, Exclusive: U.S. seed sellers push for limits on Monsanto, BASF weed killer | ER 0643 |
| 8/16/2018 | P.251 | E-mail from S. Jewell to R. Baris re: Call: Brian Major and OPP | ER 0650 |
| 8/16/2018 | P.1034 | Attachment to 00022969: Illinois Fertilizer & Chemical Association comment letter | ER 0625 |
| 8/14/2018 | P.1212 | Attachment to 00030074August 2018 Letter from Association of American Pesticide Safety Educators re: efficacy of dicamba training | ER 0656 |
| 8/10/2018 | P.1365 | Center for Biological Diversity, et al. comments re: dicamba decision sent to then-Acting Administrator Wheeler | ER 0657 |
| 8/10/2018 | P.1277** | E-mail from T. Bennett to Multiple EPA recipients re: Ag Retailers Discuss Dicamba | ER 0662 |
| 8/10/2018 | Q.65 | Steckel, Dicamba drift problems not an aberration | ER 0667 |
| 8/8/2018 | P.1003 | Illinois Fertilizer & Chemical Association 2018 survey results | ER 0670 |
| 8/2/2018 | P.75 | E-mail from D. Scott to S. Smith re: reflections on the dicamba situation | ER 0709 |
| 7/27/2018 | O.293 | Letter from L.S.Beck, Becks Superior Hybrids, to Rick Keigwin EPA/OPP | ER 0711 |
| 7/26/2018 | P.299 | E-mail from D. Scott to J. Ikley re: June Spray Hours | ER 0713 |

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| 7/26/2018 | P.293 | E-mail from J. Ikley to S. Purdue re: June Spray Hours | ER 0175 |
| 7/25/2018 | P.1286 | E-mail from H. Subramanian to T. Bennett re: DTN dicamba report | ER 0717 |
| 7/23/2018 | P.351 | E-mail from A. Thostenson to R. Baris re: Contemplating 2019 Without Dicamba – Yes, by all means | ER 0724 |
| 7/20/2018 | Q.35 | Unglesbee, When Drift Hits Home | ER 0727 |
| 7/19/2018 | O.24 | Bradley, K. 2018. July 15 dicamba injury update. Different year, same questions. University of Missouri Integrated Pest Management | ER 0732 |
| 7/2/2018 | P.371 | E-mail from S. O'Neill to D. Simon re: AAPCO and EPA Recurring Call | ER 0734 |
| 6/27/2018 | P.503** | Google Alerts for R. Baris, with attachment | ER 0737 |
| 2018 | O.159 | Presentation: Bish, M., and Bradley, K., Analysis of Weather and Environmental Conditions Associated with Off-Target Dicamba Movement | ER 0745 |
| 6/25/2018 | P.362 | E-mail from A. Thostenson to R. Baris re: Dicamba issues | ER 0747 |
| 6/25/2018 | O.15 | Baldwin, F. Undated. Open Letter to the WSSA Board of Directors and Other Interested Parties | ER 0748 |
| 6/22/2018 | P.181 | E-mail from R. Keigwin to L. Van Wychen re: Effects of the herbicide dicamba on non-target plants | ER 0750 |
| 6/14/2018 | P.481 | E-mail from C. Hawkins to Multiple EPA recipients re: Dicamba Injury Mostly Confined to Specialty Crops | ER 0751 |
| 5/4/2018 | P.554** | Google Alerts for R. Baris, with attachment | ER 0753 |
| 4/10/2018 | P.437 | E-mail from D. McKnight to R. Keigwin & Stanley re: ARA Dicamba Webinars | ER 0758 |
| 2/22/2018 | P.675** | Google Alerts for R. Baris with attachment | ER 0762 |

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| 10/10/2017 | K.36 | E-mail from J. Green to R. Baris re: FW: New Dicamba non-crop complaints | ER 0952 |
| 10/9/2017 | K.52 | E-mail from P. Perry to M. Knorr re: Implementation Terms and Conditions | ER 0953 |
| 10/5/2017 | K.16 | E-mail from R. Baris to T. Marvin re: dicamba proposed registration conditions | ER 0955 |
| 9/27/2017 | K.41** | E-mail from J. Green to R. Baris re: article on Dicamba from Delta Farm Press | ER 0958 |
| 9/27/2017 | K.11 | E-mail from J. Green to A. Overstreet re: correspondence received from seed company owner regarding Dicamba Control | ER 0964 |
| 9/21/2017 | K.80** | E-mail from C. Hawkins to J. Becker and others at EPA forwarding Reuters article on dicamba | ER 0969 |
| 9/21/2017 | K.19 | E-mail from Pesticide Action Network to R. Keigwin re: EPA: Pull Monsanto's crop-killing dicamba now | ER 0974 |
| 9/18/2017 | O.14 | State FIFRA Issues Research & Evaluation Group (SFIREG) Joint Meeting Minutes of the Pesticide Operations and Management (POM) & Environmental Quality Issues (EQI) Committees | ER 0976 |
| 9/13/2017 | K.39** | E-mail from J. Green to D. Kenny re: FW: Record number of pesticide misuse claims by Iowa farmers due to dicamba drift problems | ER 0992 |
| 9/11/2017 | K.63 | E-mail from K. Bradley to R. Baris re: slides from several university weed scientists on volatility testing on new dicamba formulations | ER 0998 |

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| 9/5/2017 | K.91 | E-mail from N. Sorokin to EPA recipients of Office of Public Affairs media clips re: Reuters: Exclusive: EPA eyes limits for agricultural chemical linked to crop damage. | ER 1057 |
| 8/31/2017 | K.79 | E-mail from TJ Wyatt to J. Becker and to other EPA staff forwarding Washington Post article on Dicamba | ER 1060 |
| 8/29/2017 | Q.45 | Horstmeier, Dicamba's PTFE Problem | ER 1066 |
| 8/29/2017 | K.51 | Ten articles on Dicamba sent as a Google Alert to R. Baris | ER 1068 |
| 8/28/2017 | P.1186 | Illinois Fertilizer & Chemical Association 2017 survey results | ER 1073 |
| 8/23/2017 | K.101 | Notes from EPA meeting with various state officials mentioned in Doc. 91 of the Supplemental Material | ER 1093 |
| 8/22/2017 | K.38 | Email from J. Green to D. Kenny re: FW: Off-target Movement of Dicamba in MO. Where Do We Go From Here? | ER 1096 |
| 8/22/2017 | K.31 | Email from J. Green to D. Kenny (EPA) re: FW: Letter to Topeka paper | ER 1101 |
| 8/21/2017 | K.92 | Email from N. Sorokin to EPA recipients of Office of Public Affairs media clips re: Reuters: Exclusive: U.S. farmers confused by Monsanto's weed killer's complex instructions | ER 1103 |
| 8/20/2017 | K.27 | Email from J. Green (EPA) to D. Kenny (EPA) re: FW: Dicamba update | ER 1106 |

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| 8/18/2017 | K.88 | Email from K. Bradley (University of Missouri) to R. Baris (EPA) regarding WSSA committee | ER 1114 |
| 8/10/2017 | K.21 | Email from Jamie Green (EPA) to Reuben Baris (EPA) re: FW Article from Arkansas times | ER 1116 |
| 8/7/2017 | Q.58 | Pates, Farmers deal with dicamba drift | ER 1127 |
| 8/2/2017 | K.20 | Email-calender invite from E. Ryan to R. Baris re: follow-up on Dicamba with AAPCO/SFIREG and agenda for 8/2/17 | ER 1131 |
| 8/2/2017 | K.100 | Notes from 8/2/17 EPA meeting with various state officials described in Document 20 of the Supplemental Material | ER 1134 |
| 8/1/2017 | K.14 | Email from S. Adeeb to D. Kenny re: Dicamba Notes from July 28 meeting with states on dicamba incidents | ER 1142 |
| 7/28/2017 | K.66 | Email from R. Baris to D. Rosenblatt re: EPA notes taken during dicamba teleconference with state extension representatives | ER 1148 |
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| 5/4/2017 | Q.34 | News.utcrops.com, Recent Midsouth Studies Show Dicamba not Very Effective on some Populations of Glyphosate/PPO-Resistant Palmer Amaranth. | ER 1155 |
| 5/2017 | Q.47 | Hagny, DICAMBA & PALMER PIGWEEDS | ER 1157 |
| 3/10/2017 | Q.38 | Bennett, First Signs of Dicamba Resistance? | ER 1160 |

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| 11/8/2016 | A.674 | Addendum to Dicamba Diglycolamine (DGA) Salt and its Degradate, 3,6-dichlorosalicylic acid (DCSA) Refined Endangered Species Risk Assessments for New Uses on Herbicide-Tolerant Cotton and Soybean in 34 U.S. States....to Account for Listed Species not included in the Original Refined Endangered Species Risk Assessments. | ER 1167 |
| 11/8/2016 | O.110 | DER for MRID 49925703: Gavlick, W.K. 2016. Determination of Plant Response as a Function of Dicamba Vapor Concentration in a Closed Dome System. | ER 1163 |
| 11/3/2016 | A.170 | M-1691 Herbicide, EPA Reg. No. 524- 582 (Active Ingredient: Dicamba Diglycolamine Salt) and M-1768 herbicide, EPA Reg. No. 524-617 (AI: Diglycolamine Salt with VaporGrip™) - Review of EFED Actions and Recent Data Submissions Associated with Spray and Vapor Drift of the Proposed Section 3 New Uses on Dicamba-Tolerant Soybean and Cotton | ER 1212 |
| 6/20/2016 | A.863 | Comment submitted by National Family Farm Coalition | ER 1226 |
| 6/15/2016 | A.57 | Attachment to a comment submitted by S. Wu, Center for Food Safety | ER 1227 |
| 6/15/2016 | A.473 | Comment submitted by Center for Food Safety | ER 1238 |
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| 5/27/2016 | A.34 | Comment submitted by P. D. Williams and D.R. Berdahl, for Kalsec, Inc. | ER 1356 |
| 5/25/2016 | A.840 | Anonymous public comment | ER 1363 |
| 5/25/2016 | A.538 | Anonymous public comment | ER 1364 |
| 5/25/2016 | A.159 | Anonymous public comment | ER 1367 |
| 5/23/2016 | A.668 | Comment submitted by D. Dixon, Field Representative, Hartung Brothers Incorporated | ER 1369 |
| 5/19/2016 | A.743 | Anonymous public comment | ER 1371 |
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| 5/9/2016 | A.405 | Comment submitted by C. Utterback, Secretary, Utterback Farms, Inc. | ER 1378 |
| 4/28/2016 | A.838 | Comment submitted by D. Dolliver | ER 1379 |
| 4/21/2016 | A.696 | Comment submitted by R. Woolsey, Woolsey Bros. Farm Supply | ER 1380 |
| 3/31/2016 | A.565 | Proposed Registration of Dicamba on Dicamba-Tolerant Cotton and Soybean. | ER 1381 |

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| 1/30/2015 | J.70 | EPA document - Dicamba Issues EFED drift volatility | ER 1708 |
| 1/7/2013 | J.150 | Monsanto Document re: Educating Key Stakeholders for Commercialization of the Roundup Ready Xtend Crop System | ER 1710 |
| 3/8/2011 | A.91 | Ecological Risk Assessment for Dicamba and its Degradate, 3,6-dichlorosalicylic acid (DCSA), for the Proposed New Use on Dicamba-Tolerant Soybean (MON 87708). | ER 1712 |
| 9/17/2010 | B.12 | Comment submitted by Bill Freese, The Center for Food Safety | ER 1746 |
| 6/4/2010 | B.0024 | Scott Kilman, *Superweed Outbreak Triggers Arms Race*, Wall St. J. (submitted as an attachment to the comment submitted by Ryan Crumley, The Center for Food Safety) | ER 1754 |
| 8/31/2005 | C.7 | EFED Reregistration Chapter For Dicamba/Dicamba Salts | ER 1760 |
| 1/23/2004 | I.1 | U.S. Environmental Protection Agency. 2004. Overview of the Ecological Risk Assessment Process in the Office of Pesticide Programs, U.S. Environmental Protection Agency. Listed and Threatened Species Effects Determinations. | ER 1776 |

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| 6/7/2016 | J.240 | Monsanto Confidential Document re: Expected Monsanto Submissions to support M1691, Xtendimax & Roundup Xtend Herbicides | ER 1789 |

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| 3/24/2016 | F.6 | Addendum to Dicamba Diglycolamine (DGA) Salt and its Degradate, 3,6-dichlorosalicylic acid (DCSA) Section 3 Risk Assessment: Refined Endangered Species Assessment for Proposed New Uses on Herbicide-Tolerant Cotton and Soybean in 7 U.S. States | ER 1794 |

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| 3/24/2016 | F.5 | Addendum to Dicamba Diglycolamine Salt (DGA) and its Degradate, 3,6-dichlorosalicylic acid (DCSA) Section 3 Risk Assessment: Refined Endangered Species Assessment for Proposed New Uses on Herbicide-Tolerant Soybean and Cotton in 16 states | ER 1958 |
| 2016 | E.527 | Reiss, R.; Sarraino, S. (2016) Downwind Air Concentration Estimates for Dicamba Formulation #2 (MON 119096). Project Number: 1505538000/1236, WBE/2015/0221, WBE/2015/0311. Unpublished study prepared by Exponent | ER 2085 |

# WSSA Research Workshop for Managing Dicamba Off-Target Movement: Final Report

## EXECUTIVE SUMMARY

The Weed Science Society of America (WSSA) sponsored a research workshop on off-target movement of dicamba on April 16 -17, 2018 in Arlington, VA. WSSA invited a broad group of subject experts including weed scientists, state and federal regulators, application technology specialists, and representatives of dicamba registrants to discuss technical issues related to the off-target movement of dicamba observed and reported in 2016 and 2017, and to identify potential research objectives. The research workshop agenda was divided into four topic areas: I) Non-target impacts; II) Volatility; III) Application; and IV) Formulation. Within each topic area, presentations were made to provide an overview and to identify information that was not known and data gaps to be addressed going forward. Following the presentations, discussion was facilitated among participants to identify areas of concern and research questions that were subsequently ranked in order of importance. Following this compilation, suggested action items within each topic area were identified and included the following:

- Compile a comprehensive account of areas planted in dicamba-resistant crop cultivars by county, and quantities of all formulations of dicamba sold at minimum by state.
- Relate reported damage complaints to terrain and weather conditions.
- Improve deficiencies with herbicide labels to address: 1) lack of uniformity in label organization; 2) difficulty in finding and interpreting use instructions; 3) names of dicamba sensitive crops, landscape and native plants, and trees; 4) “neighboring distance” for sensitive crops; 5) descriptions of conditions leading to atmospheric inversions to protect applicators and neighbors.
- Coordinate applicator training such that all trainers present the same detailed message.
- Perform research to better characterize the potential volatility of new herbicide formulations.
- Perform research to better determine: 1) dose vs. damage relationships for key crops; 2) how to protect growers, property owners, and the public from off-target movement; and 3) modes of dicamba movement that are not currently accounted for.

There was sentiment from the group that the widespread non-target movement of dicamba was egregious and resulted in damage to crops, private properties, and native vegetation. Although amelioration of this situation was partly outside of research, attribution of liability should be addressed by appropriate authorities, particularly for horticultural growers who are suffering heavy financial losses. More funding for public research is needed. Concern was expressed that USDA-ARS and USDA-NIFA were not funding the type of research needed to manage off-target pesticide movement.

## Authors

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Dr. Phil Banks, President, Marathon Agricultural Services, Las Cruces, NM, and WSSA Treasurer
Dr. Scott Senseman, Professor and Department Head, University of Tennessee, and WSSA President

## Reviewers

Research Workshop Participants (Appendix 1)
WSSA Environmental Aspects of Weed Management Committee
WSSA Formulation, Adjuvant, and Application Technology Committee

## Citation

Weed Science Society of America (WSSA). 2018. *WSSA Research Workshop for Managing Dicamba Off-Target Movement: Final Report*. www.wssa.net

**About the Weed Science Society of America**

The Weed Science Society of America, a nonprofit scientific society, was founded in 1956 to encourage and promote the development of knowledge concerning weeds and their impact on the environment. The Society promotes research, education and extension outreach activities related to weeds, provides science-based information to the public and policy makers, fosters awareness of weeds and their impact on managed and natural ecosystems, and promotes cooperation among weed science organizations across the nation and around the world. For more information, visit www.wssa.net.

# INTRODUCTION

The Weed Science Society of America (WSSA) sponsored a research workshop for managing dicamba off-target movement on April 16 -17, 2018 at the AMA Executive Conference Centers in Arlington, VA. WSSA invited a select group of weed scientists, agricultural chemical application specialists, representatives of state agrichemical organizations and regulatory agencies, dicamba registrants, and the U. S. Environmental Protection Agency (EPA) to discuss technical issues related to the off-target movement of dicamba that occurred in 2017 and to identify potential research objectives for 2018. A list of research workshop participants is provided in Appendix 1.

The research workshop agenda (Appendix 2) was divided into four topic areas: I) Non-target impacts; II) Volatility; III) Application; and IV) Formulation.

I. **Non-Target Impacts** – Dicamba is an auxin hormone mimic whose herbicidal effect results from its relative potency as a plant growth regulator. Crops in the Leguminosae; Cucurbitaceae, and Solanaceae families are often highly susceptible. Soybeans are extremely susceptible and may demonstrate epinasty below the limit of detection of many analytical methods. The majority of reports of damage from off-target dicamba movement have been to soybeans. However, there is considerable concern for horticultural crops particularly in the Midwest where potential dicamba-treated soybean acreage is high. Damage has also occurred to home gardens, landscape plants, and natural vegetation including trees – cypress and certain oak species, and native herbaceous ground cover that serves as food for pollinators. Effects of low-rate dicamba exposure on native vegetation remain unquantified.

II. **Volatility** – Compared to other herbicides, the parent acid of dicamba is relatively volatile and has a vapor pressure of $4.5 \times 10^{-3}$ Pa at 25 C (Appendix 3). The new dicamba herbicide products are of two different types. Engenia®, produced by BASF, is intended to reduce volatilization by complexing dicamba acid with a *N*,*N*-Bis-(3-aminopropyl) methylamine (BAPMA) salt that has a higher molecular weight (366.29 g/mole) than other previously registered dicamba salt formulations (Appendix 3). The Monsanto and DuPont herbicides, XtendiMax™ With VaporGrip™ and FeXapan™, respectively, are the same as the dicamba diglycolamine (DGA) salt formulation currently registered in Clarity®. Physical drift and post depositional volatilization are different phenomenon. Whereas the new formulations in some studies have been shown to reduce volatilization in comparison to the un-amended DGA formulation, research in several locations including AR, MO, MS, and TN show that the flux of dicamba from treated areas continues for at least three days. The conclusion from a review of the solution chemistry and from volatilization studies is that post depositional release, i.e., volatilization, occurs from the tested formulations in the type of atmospheric conditions likely to occur in agricultural fields during summer months.

III. **Application Issues** – Requirements for application of the new dicamba formulations are quite explicit. There has been concern that certain applicators failed to follow the label instructions. Over 2,700 official complaints of damage to crops, primarily to soybeans (Appendix 4), but also to other crops and vegetation, including orchards and vegetable crops have been received. State regulatory specialists who spoke indicated that while investigations of only a percentage of the reported incidents were completed, incidents of both misapplication and incidents where no identified cause was evident have been observed. State Extension Weed Scientists estimated there were approximately 3.6 million acres of dicamba-injured soybeans in 2017 (Appendix 5). Percentages of unexplained incidents differed among states, but large percentages of unexplained incidents were reported by some states.

IV. **Formulations** – To this point, there has been no comprehensive accounting of the amount of dicamba-resistant crops planted, nor the use of the various dicamba herbicide formulations (new and old) in the 34 states where the new dicamba formulations are approved for use. A survey of 22 weed scientists from 19 states indicated that about 5% of the off-target injury was attributed to the use of non-labeled dicamba formulations in 2017. The estimates for non-labeled dicamba use in that survey ranged from 0 to 20%. Understanding which formulations were used at what locations during 2017 could assist in better understanding dicamba volatility potential.

Each topic area had the same format: 1) presentations (Table 1) on our current state of knowledge; 2) a facilitated discussion; and 3) prioritization of discussion/action items.

**Table 1. List of presenters, affiliation, presentation topic and hyperlink to presentation**

| Presenter | Affiliation | Presentation Topic and Hyperlink |
|---|---|---|
| Bryan Young | Purdue University | Non-Target Impacts: Agronomic Crops |
| Steve Smith | Red Gold, Inc. | Non-Target Impacts: Horticultural Crops |
| Dave Mortensen | Penn State University | Non-Target Impacts: Pollinators |
| Rich Zollinger | AMVAC Chemical Corp. | Volatility: Formulation Chemistry |
| Dan Reynolds | Mississippi State University | Volatility: Small-Scale Studies |
| Tom Mueller | University of Tennessee | Volatility: Large-Scale Studies |
| Stanley Culpepper | University of Georgia | Application Issues: Assessment of Training Programs |
| Rich Grant | Purdue University | Application Issues: Temperature Inversions |
| Andrew Hewitt | University of Queensland | Application Issues: Physics of Particle Drift |
| Kevin Bradley | University of Missouri | Formulations: Assessment of Formulations Used |
| Jean Payne | Illinois Fertilizer & Chemical Association | Formulations: Assessment of Compliance |

Following the presentations within each topic area, Dr. Phil Banks facilitated a discussion among the workshop participants during which they identified areas of concern and research questions that should be considered in order to better manage dicamba off-target movement. These areas of concern and research questions were subsequently ranked in order of importance by the workshop participants (Table 2). Each participant was allowed to select up to two primary areas of concern and two secondary areas of concern within each topic area. Using 2 points for areas of primary concern and 1 point for areas of secondary concern, Dr. Banks tallied the results to determine a ranking of these areas of concern and research questions within each topic area. Differences in the total number of points awarded among the sections reflect in part that the number of participants present were not the same on the two days of the meeting.

**TABLE 2. Ranking of the areas of concern and research questions deemed most important by workshop participants to manage dicamba off-target movement.**

| I. Non-Target Impacts | Sub-topic | Primary (2 pts) | Secondary (1 pt) | Total points | Rank |
|---|---|---|---|---|---|
| Contrast plant exposure response to dicamba aerosol versus dicamba vapor. | Agronomic | 24 | 3 | 51 | 1 |
| Establish dicamba residue tolerance levels in horticultural crops. | Horticulture | 10 | 9 | 29 | 2 |
| Quantify dose vs. damage as a function of duration of exposure. | Agronomic | 5 | 18 | 28 | 3 |
| Determine effect levels from drift on established pollinator plants. | Pollinators | 8 | 8 | 24 | 4 |
| Investigate the interaction of plant stresses and exposure to dicamba. | Agronomic | 2 | 10 | 14 | 5 |
| Assemble all drift data on non-target crops. | Horticulture | 3 | 2 | 8 | 6 |
| Add a tracer to dicamba to confirm exposure. | Agronomic | 2 | 2 | 6 | 7 |
| Populate a map of "hot spots" where dicamba injury has occurred. | Pollinators | 1 | 2 | 4 | 8 |
| Identify pollinator habitats serving multiple insect groups. | Pollinators | 1 | 0 | 2 | 9 |
| Determine if varieties within a crop respond differently to exposure. | Agronomic | 0 | 1 | 1 | 10 |

| II. Volatility | Sub-topic | Primary (2 pts) | Secondary (1 pt) | Total points | Rank |
|---|---|---|---|---|---|
| Determine the effect of tank mix partners on dicamba volatilization | Volatility | 10 | 7 | 27 | 1 |
| Determine the effect of leaf surface moisture pH on unabsorbed dicamba. | Volatility | 12 | 3 | 27 | 2 |
| Conduct large scale environmental monitoring of dicamba flux. | Volatility | 6 | 6 | 18 | 3 |
| Utilize information from plant pathology about leaf/dew chemistry. | Volatility | 4 | 9 | 17 | 4 |
| Differentiate dicamba flux from soil vs. plant canopies. | Volatility | 5 | 3 | 13 | 5 |
| Conduct dicamba absorption studies in controlled environments. | Volatility | 3 | 5 | 11 | 6 |
| Determine the influence of irrigation | Volatility | 1 | 9 | 11 | 7 |
| Use a system similar to that used for reporting soybean rust to report dicamba damage. | Volatility | 4 | 2 | 10 | 8 |
| Correlate landscape-scale condensation patterns with observed dicamba injury. | Volatility | 2 | 2 | 6 | 9 |

| III. Application Issues | Sub-topic | Primary (2 pts) | Secondary (1 pt) | Total points | Rank |
|---|---|---|---|---|---|
| Standardize pesticide labels. | Training Programs | 16 | 17 | 49 | 1 |
| Study large- and small-scale landscape effects on inversions where dicamba injury occurred. | Temperature inversions | 10 | 13 | 33 | 2 |
| Quantify the flux and mass-balance of dicamba product from applications. | Physics of particle drift | 15 | 2 | 32 | 3 |
| Characterize the particle size distribution of applications from air induction nozzles with tank mixtures. | Physics of particle drift | 8 | 13 | 29 | 4 |
| Enhance collaboration between companies of application technology and drift reduction agents (DRAs). | Physics of particle drift | 11 | 5 | 27 | 5 |
| Determine how droplet sizes that reduce drift impact efficacy. | Physics of particle drift | 7 | 6 | 20 | 6 |
| Enhance farm to farm communication about technology use. | Training Programs | 4 | 4 | 12 | 7 |
| Determine if there is a correlation between applicator training and off-target movement. | Training Programs | 2 | 6 | 10 | 8 |
| Ground truth phone/computer apps that predict inversions. | Temperature inversions | 2 | 5 | 9 | 9 |

| IV. Formulations | Sub-topic | Primary (2 pts) | Secondary (1 pt) | Total points | Rank |
|---|---|---|---|---|---|
| Define what is “neighboring distance” | Compliance | vote by show of hands | | | 1 |
| Assess the amount of defensively purchased dicamba-resistant crops. | Compliance | | | | 2 |
| Develop a standard volatility assay. | Compliance | | | | 2 |

# DISCUSSION NOTES

## I. Non-Target Impacts – Agronomic and Horticultural Crops

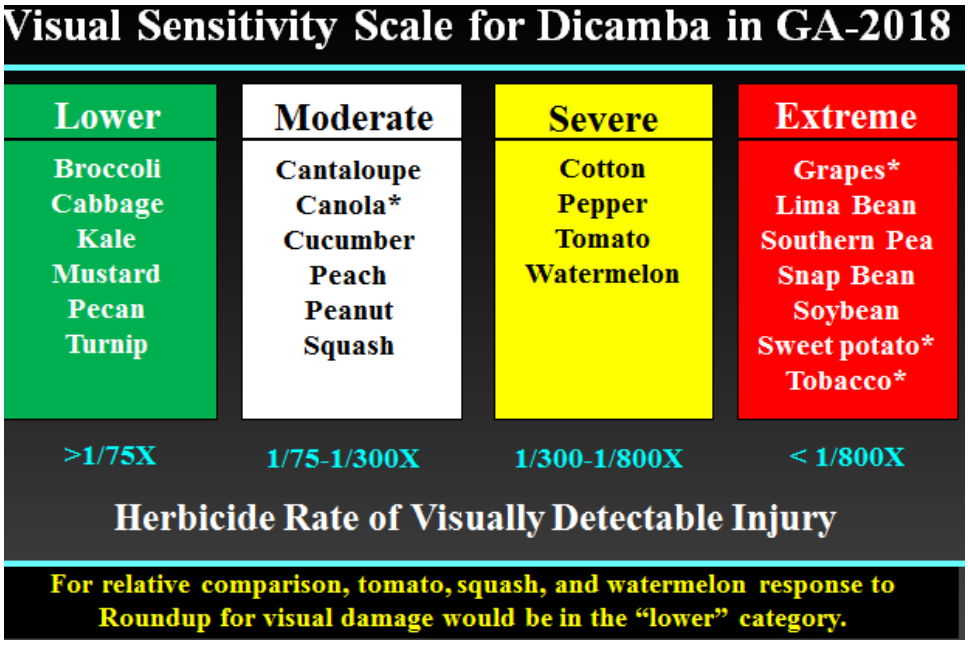
Despite a long history of dicamba use and research, critical questions remain. Dicamba may be reaching agronomic and horticultural crops and natural areas by physical drift and/or post depositional volatilization. Symptoms occur on new growth and may be delayed in appearance depending on the plant growth stage. Since the parent acid of dicamba dissipates fairly quickly in plant tissue (1/2 life of 4 to 20 days), rapid response by the grower, the investigator, and the chemist is needed to identify, collect, and analyze exposed tissue, respectively.

In 2016, the state of Missouri analyzed approximately 1,000 symptomatic plants and found dicamba in only about one half of them. Because of the failure of collection and chemical analysis to detect dicamba when its presence was indicated by visual symptoms, no plants were analyzed in 2017 when there were more symptomatic plants than had occurred in 2016.

The environmental fate of dicamba in soil, water, air and plants is not sufficiently well documented to readily explain the mechanics of exposure from observation of symptomatic plants 2-4 weeks after initial exposure. There is no publicly available experimental information on the buffers (distances) needed to protect susceptible/sensitive crops from dicamba, and only some susceptible/sensitive crops or plants are named on the labels. Moreover, there is little information on the combined effects of prior stress followed by dicamba exposure, or on the relative susceptibility of varieties within crops.

We have a general understanding of the dicamba dose/injury relationship in certain agronomic crops (http://www.arkansas-crops.com/2016/07/07/dicamba-potential-soybean/). However, visual injury symptoms, especially during vegetative stages, are not predictive of final yield loss (Egan et al. 2014). We do not understand dicamba injury relationships well on peanuts and pollinating corn. Crops in the Leguminosae; Cucurbitaceae, and Solanaceae families are often highly susceptible to dicamba (Figure 1). In horticultural crops, dicamba injury can result in financial losses of hundreds of thousands of dollars.

**FIGURE 1. (From Dr. Stanley Culpepper presentation)**




***Data from literature; all other data generated in over 70 University of Georgia field experiments.**

Exposure to horticultural crops is problematic. Many horticultural crops are sensitive and will lose yield if exposed to dicamba. Certain horticultural and certified organic crops have no dicamba residue tolerance and may be rejected by regulation or their contracted buyers. Tolerances need to be established to protect horticultural and certified organic growers from circumstances beyond their control. Registrants have submitted proposed tolerances to the Environmental Protection Agency for many potentially impacted crops. Similarly, if dicamba is widely dispersed at low, but damaging concentration across the environment, horticulturalists and certified organic growers are unprotected from a general environmental risk through no fault of their own. Dr. Kevin Bradley has conducted studies that show that various tree and ornamental species are also highly susceptible to dicamba (FIGURE 2).

**FIGURE 2. Sensitivity of Various Trees and Ornamentals to Injury from Driftable Fractions of Dicamba Products**

| Low (<10% Injury) | Moderate (10-20% Injury) | Extreme (>20% Injury) |
|---|---|---|
| Walnut | Maple | Elderberry |
| Raspberry | Oak | Peach |
| Hydrangea | Apple | Grape |
| Crabapple | Strawberry | Dogwood |
| | Rose | Redbud |
| | Sweetgum | Viburnum |
| | Elm | |
| | Pecan | |

**I. Non-Target Impacts – Pollinators**

There was considerable concern for pollinator habitats and consequently for the pollinator species. We cannot have a solo concern for honey bees (*Apis mellifera*), because there are many wild bees species (up to 30 different species in a corn field, and up to 150 species in apple orchards). There is much plant diversity in field edges. Wild bees pollinate several plants, and their species composition in an area depends on the specific landscape flora. Bohnenblust et al. 2016 showed that simulated dicamba particle drift (~1% of the field application rate) delayed onset of flowering and reduced the number of flowers in alfalfa and common boneset; however, in the same experiment, plants that flowered produced pollen with similar protein concentrations to those of untreated plants.

Dr. Mortensen estimated that when field margin plants were exposed to dicamba doses from simulated drift, the floral and pollinator resource provisioning capacity of the landscape was reduced by ~20% depending on landscape and crop composition (See Mortensen presentation). However, several parameters strongly influenced the model scenarios, including the relative susceptibilities of pollinator plants to the rate of herbicide drift. There appears to be a need for baseline resource estimates for pollinator use of habitats in agricultural landscapes and a need to identify where the most valuable land areas are for important pollinator plant species. Effects on landscape plants should be included in herbicide drift risk assessment and regulatory policy. No research has been done to correlate 2017 dicamba off-target incidents to floral species/pollinators. Nationally, there is little quantification of dicamba drift impact on anything other than crops. Representatives of state agencies in Arkansas, Minnesota and Indiana reported that they did not collect data on field margins or in Conservation Reserve Program land.

Regarding monarch butterflies (which are not pollinators), Dr. Bob Hartzler's work at Iowa State reported that dicamba drift resulted in leaf distortion on common milkweed, but did not affect the number of monarch butterfly eggs found. No one was aware of anyone else doing this type of research. For perennial

plants such as milkweed, it was noted that it's important to use established plants under field conditions and not seedlings. Most common milkweed in the field develops from established rootstocks.

**II. Volatility**

The parent acid of dicamba has a vapor pressure of 4.5 x $10^{-3}$ Pa at 25 C (Appendix 3). Vapor pressure increases with increasing temperature thereby increasing the volatility potential for dicamba acid. Soybeans are extremely sensitive and show injury symptoms at 1/20,000th (0.00005) of the labeled rate (Solomon and Bradley 2014).

The most important factors influencing volatilization, a form of secondary drift, are:

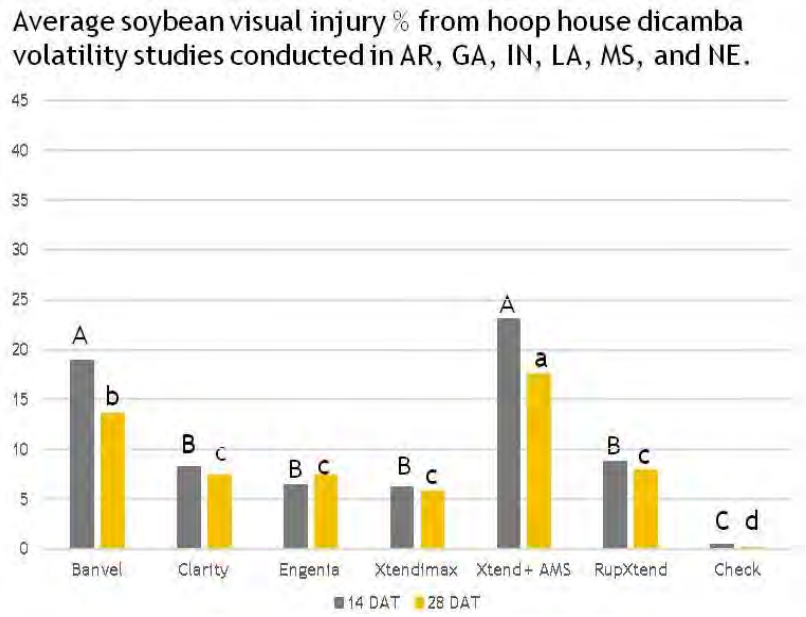
- Formulation – vapor pressure
- Tank-mix additives
- Ambient temperatures during application
- Atmospheric inversions

Methods of measuring volatility:

- Thermogravimetric
- Humidome
- Flux studies / air samplers
- Low tunnels (hoop houses)

Monsanto sponsored a set of dicamba volatilization studies across the South and Midwest in 2017. Studies were done in 20-foot long hoophouses at sites in AR, GA, IN, LA, MS, and NE. Dicamba treated flats of soybeans were placed between two rows of untreated non-dicamba-resistant soybeans in the center of the dome, and plastic sheeting was placed over the dome frame. Dicamba treated flats and plastic sheeting were removed 48 hours after application. Averaged over all sites, soybean injury from Clarity (DGA salt) was the same as from XtendiMax and Engenia (Figure 3). However, the Georgia data set showed more soybean injury from Clarity compared to XtendiMax and Engenia. The Georgia study was the first one established during the growing season. Interpretation of the results will include careful consideration of the environmental data.

**FIGURE 3. (From Dr. Dan Reynolds presentation)**



Dicamba is a weak acid ($pK_a$ of 1.87, Appendix 3) that will split into positively and negatively charged ions or *dissociate* when mixed in water. The volatility of dicamba formulations is suppressed by keeping the parent molecule of dicamba in solution as an anion. Ammonium sulfate or AMS ($(NH_4)_2SO_4$) is typically used as a spray adjuvant with glyphosate to reduce certain cations in hard water ($Ca^{2+}$) from antagonizing glyphosate. This antagonism results from the formation of glyphosate salts of low solubility that are not absorbed as readily into plant foliage. However, when AMS + glyphosate is tank mixed with dicamba, the AMS provides a source of hydrogen ions in solution and reduces the spray pH. The higher concentration of hydrogen ions favors the formation of dicamba acid which is the more volatile form of dicamba. Other questions regarding the fate of dicamba on target leaf or soil surfaces include: After water from the spray droplet has evaporated, what is the fate of dicamba crystals? Is the BAPMA cation associated or dissociated with dicamba? What is the active compound in VaporGrip and how long is it associated with dicamba?

Dicamba readily penetrates plant leaves, roots, and stems (Appendix 3). Dicamba formulations differ in the amount of dicamba absorbed by plants both with and without surfactants (Petersen et al. 1985). Dr. Richard Zollinger presented data showing that 38 to 75% of applied dicamba is absorbed by soybean leaves. Therefore, 62 to 25% of the applied dicamba is unaccounted for in the study for soybeans.

Dicamba is weakly adsorbed to soil and is mobile suggesting that dicamba volatilization from soils also contributes to plant injury. However, Burnside and Lavy 1966 showed that the major form of dicamba degradation is due to soil microbial and/or chemical decomposition. Dr. Tom Mueller has preliminary data that shows that dicamba volatility is greater from plant surfaces than from bare soil. Behrens and Lueschen 1979 showed that soybean injury from the volatilization of the dicamba dimethylamine (DMA) salt was approximately twice as great when 3-ft tall corn was treated compared to 1-ft tall corn under field conditions. Rewetting of the leaf surface reinitiates the volatilization process. The effects of leaf surface pH and the pH of rain or dew are unknown. Dr. Dave Mortensen suggested that we utilize information from plant pathology research on the effects of surface chemistry of leaves on spore germination to inform potential effects of leaf surface and dew chemistry to impact the solubility of dicamba in that environment.

Effects of dicamba vapor are relatively unknown because many studies intended to simulate drift are sprayed at 10 to 15 gallons of spray carrier per acre (GPA). Concentrations of dicamba in such treatment solutions are not the same as the concentration of dicamba spray drift; rather the treatments applied in 10 to 15 GPA resemble concentrations found with spray tank contamination. Herbicides in a spray solution at 15 GPA do not necessarily behave the same as herbicides in vapor form. Also, it is difficult to do research with herbicides in the vapor form. The participants asked:

- How can dicamba vapor be generated at known concentrations?
- How can time of dosing be controlled?
- How should air samplers be positioned in a vapor study?
- How long should the vapor experiment be monitored?

Research is needed on important factors affecting vapor drift:

- Temperature (Egan and Mortensen 2012)
- Effect of evaporation surface (vegetation type, soils) on volatilization
- Effect of rainfall / irrigation on volatility (Behrens and Lueschen 1979)
- Tank-mix additives (what do they do to volatility profile of the solution)

In Northeast AR, the Bootheel of MO, and certain areas of Western TN, entire soybean fields were affected by dicamba with no apparent pattern of drift. Such spatial distributions of symptoms is not consistent with directional drift, but is more consistent with a uniform concentration of dicamba descending upon the fields. Such observations gave rise to the hypothesis of atmospheric loading of

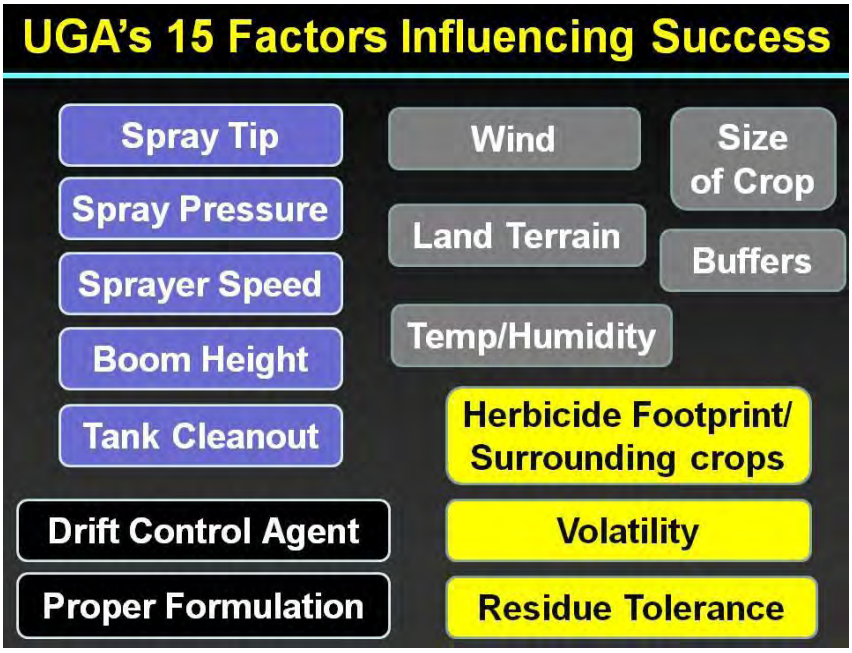
dicamba. However, the scale of the possible loading is unknown. Could it have extended over large areas of several thousand acres or parts of counties? The occurrence of dicamba symptoms was so extensive that the same system used for reporting the appearance of soybean rust could be used to report dicamba injury (sbr.ipmpipe.org).

**III. Application Issues – Training Programs**

Dr. Stanley Culpepper presented important factors from experience gained in the Georgia grower training program "Using Pesticides Wisely."

1. Understand the sensitivity of crops/plants surrounding treated fields -- i.e., better understanding of the auxin footprint (Figure 4).
2. Research is needed to show how far particle drift can go using grower practices.
3. Coordination among the educational providers (Extension, Department of Ag, Industry, EPA, Consultants) is needed so that growers receive the same message.
4. Face to face training was/is critical.
5. Trainers must have an in depth knowledge of both the positives and negatives of the technologies. Unbiased delivery is critical.

**FIGURE 4. (From Dr. Stanley Culpepper presentation)**




Data gaps identified from a pesticide applicator trainer survey included:

1. Volatility
    a. Data that can be trusted from field experiments
    b. Effects of treating large acreages on neighboring fields
    c. Effects of soil moisture, soil texture, and temperature on off-target movement
2. Has there been any progress in designing spray tips to reduce driftable fines?
3. Tank mixtures

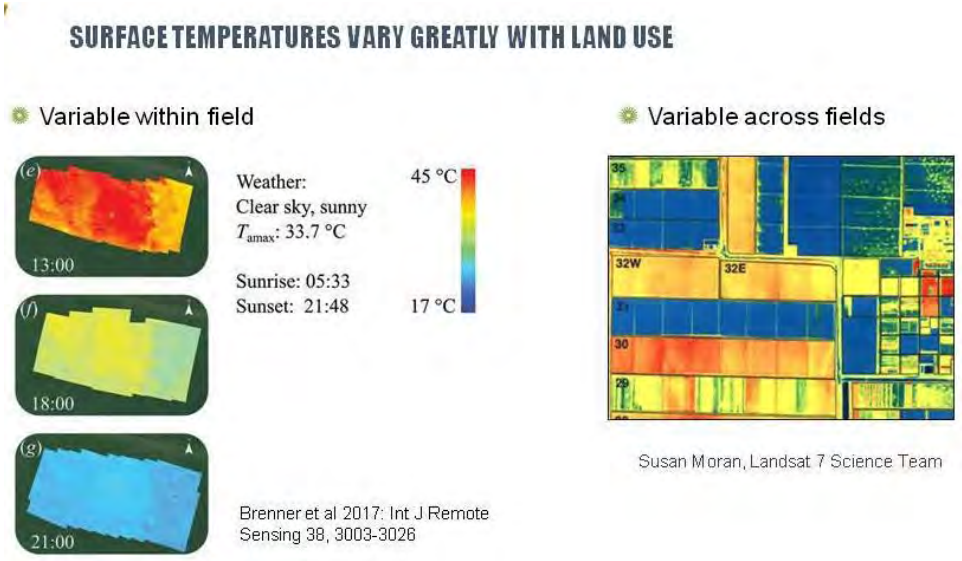
a. Clearer information on what insecticides and/or fungicides can be safely tank-mixed
b. When a product is not approved for tank mixing the rationale must be provided to practitioners to understand the basis for the restriction.

4. Time interval that spray droplets remain in the air at lower wind speeds as influenced by the environment.
5. Movement of product in rain water. Since there is a statement on the label, "Do not make application of this product if rain is expected in the next 24 hours", growers asked "Is there danger of dicamba off-target movement through leaching or run-off?"
6. There was general criticism of the complexity of pesticide labels and a call for greater uniformity in the organization of labels. Many participants agreed that the labels for the new dicamba formulations are the most complex ever. Only 25% of Georgia growers were satisfied with being able to find directions on labels and only 32% of the same growers were satisfied with uniformity across labels.

**III. Application Issues – Temperature Inversions**

Temperature inversions result from surface temperatures decreasing faster than air temperatures, typically as sunset approaches. Inversions vary a great deal across types of landscapes and terrain. Inversions typically develop before, at, or after sunset when there is a 1 to 3 C temperature increase with an increment of height of 2.5 m. Dew usually forms during the spring and summer inversions. Wind moving warm air over cold ground makes advective (horizontal flow) inversions. Because atmospheric temperatures vary greatly with land use (Figure 5), we do not have

**FIGURE 5. (From Dr. Rich Grant presentation)**




a good understanding of how different surface conditions (i.e. soil characteristics and moisture, various crops, variable terrain) or how small a scale of land use variation can affect inversion formation and hence vapor dispersion across fields and landscapes. We also do not know if dicamba is carried long distances during an inversion and we do not know if it mixes again with the surface air the next morning. We need to measure for the presence of dicamba in the residual layer in the evening and morning and also for its presence in the surface layer in the morning. If dicamba is present, we could develop predictive models using characteristic land use, weather, and winds.

Key questions about dicamba and atmospheric inversions were:

- What forms of dicamba residue reside on the leaf surface?
- What is the potential of these forms to volatilize from the leaf?
- What is their physical behavior – solubility and vapor pressure, when they are re-wetted by dew?
- How and where does the vapor disperse under the inversion?

Dicamba that volatilizes from a leaf surface could move horizontally in an atmospheric inversion. Conditions for such movement may not have been present when the herbicide was applied. Rather different conditions may have prevailed after the product was on the crop and soil surface. Meteorological experts said that conditions producing inversions were known, but could occur over a range of temperatures and wind speeds and were not necessarily predictable from daytime conditions. Terrain elevation affects inversion formation resulting from advection in a predictable manner, but inversion formation was also dependent on heating and cooling of the atmosphere as it interacted with surface temperatures and with broader weather patterns. In general, more inversion events occur during slow moving weather patterns compared to fast moving weather patterns.

A caveat related to use of computer/phone apps that predict temperature inversion was raised. Not all such apps were accurate. Following label guidelines, including only using approved tank-mixtures and avoiding ammonium-containing and acidifying tank-mixtures, helps to maintain the reduced volatility benefits of the new formulations. To reduce local inversion risk at the field scale, Dr. Rich Grant recommended that an applicator measure temperatures at boom height and at the surface and also measure wind speeds at boom height. Several participants noted that atmospheric scientists had developed models for atmospheric movement and had cooperated with EPA to predict movement of air pollutants, however these models have poor predictive ability under surface inversion conditions.

**III. Application Issues – Physics of Particle Drift**

Spray fate is a complex process. Modeling can help assess the interaction of key factors such as droplet size, spray release position, meteorological conditions, atmospheric stability, canopy interactions, and others. Spray drift is the movement of droplets off-target at the time of application or soon thereafter, prior to the point of the deposition of the droplets. Spray drift exposure to non-target sensitive areas from an application depends on: a) airborne drift; and b) the direction of the sensitive areas relative to the direction (vertical and horizontal) of the wind.

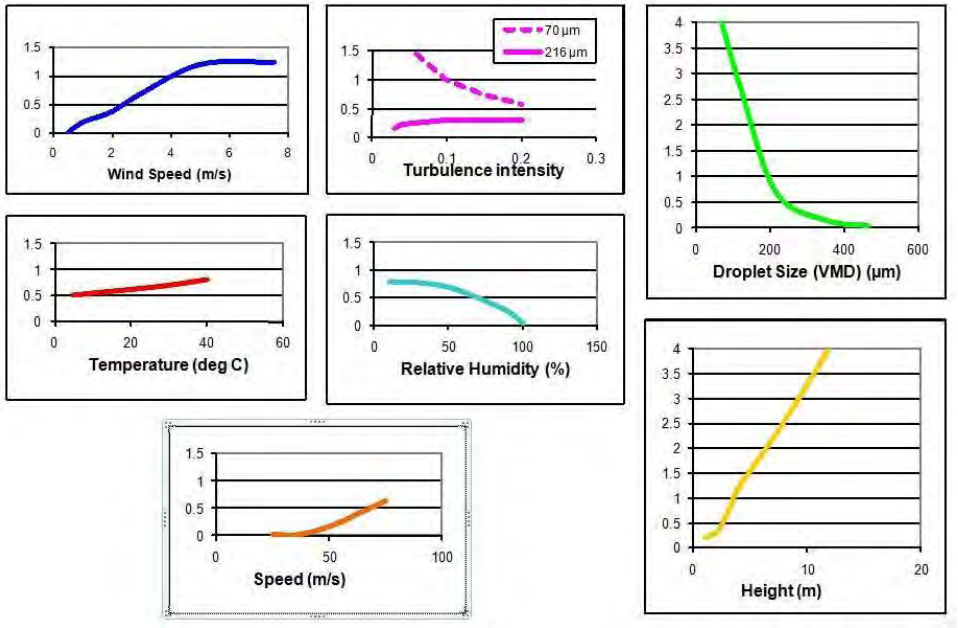
The easy way to avoid spray drift exposure is to not spray small droplets less than 100-150 microns, i.e., *fines*. If there are *fines* in the spray, there can be some mass of the applied spray that can move off-target under unfavorable conditions, but air shields (e.g., spray hoods) can help reduce this. The movement and deposition of *fines* will depend on many factors such as variables associated with the particle size/velocity/shape spectrum, application technique, boom height, sprayer wake/vortices, meteorological and atmospheric conditions, evaporation rate, canopy, barriers, and electrostatic charge (Figure 6).

Spray dynamics are affected by nozzle type, energy input (e.g., spray pressure, rotation rate, air shear) and the physical properties of the tank mix that result from the sum of all the components of the tank mix. Such properties are not always intuitive. Additional data on spray dynamics is always valuable, given the ever-expanding range of nozzles, tank mixes and application scenarios. Further work is ongoing on modeling of ground-based applications. With EPA's Drift Reduction Technology (DRT) program, opportunities exist for new and verified application systems and techniques to avoid/manage spray drift exposure to non-target sensitive areas.

Key questions and concerns about dicamba and physical particle drift were:

- Can we eliminate *fines* with a nozzle? Workshop participants agreed that engineering is narrowing the relative range of particle sizes emitted from the nozzle, but dispersion physics argues against the possibility of totally eliminating *fines*.
- Tank mix solutions play a large factor in the distribution of droplet size. Adjuvant and nozzle manufacturers need to work together.
- How do complex tank mix solutions behave when coming from air induction (AI) nozzles? What is the fate of the air bubbles produced?
- Are Drift Reduction Agents (DRAs) keeping spray droplets intact longer, and are they helping or hurting?
- Quantify the flux and mass-balance of dicamba product from applications to quantify secondary drift dispersion. However, not all dicamba is absorbed; there is no information on where the unabsorbed dicamba is deposited. AgDRIFT does not account for evaporation of volatile compounds.

**FIGURE 6. AgDRIFT Sensitivity Analysis. Relative sensitivity (y-axis) of application parameters on spray drift deposition. (From Dr. Andrew Hewitt presentation)**




## IV. Formulations – Assessment of Formulation Use and Compliance

There has been no comprehensive accounting of the amount of dicamba-resistant crops planted, nor the use of the various dicamba herbicide formulations (new and old) in the 34 states where the new dicamba formulations are approved for use. Based on a survey of 22 weed scientists from 19 states conducted by Dr. Kevin Bradley, estimates of dicamba formulations used on dicamba-resistant soybeans and cotton in 2017 were: Engenia: 50%; XtendiMax: 40%; non-labeled formulations: 5%; and FeXapan: 4%. The estimates for non-labeled dicamba use in that survey ranged from 0 to 20%.

In Arkansas, the only approved formulation for use on dicamba-resistant soybeans and cotton in 2017 was Engenia. A survey of consultants in the Arkansas Agricultural Consultants Association estimated that growers across Arkansas used Engenia 95% of the time. Results from the 2017 Illinois Fertilizer and Chemical Association (IFCA) survey presented by Jean Payne indicated that 89% of IFCA retailers believed that the use of non-labeled dicamba formulations to soybeans was not a major contributor to injury on non-resistant soybeans. Approximately 85% of IFCA retailers experienced dicamba injury

symptoms in adjacent sensitive soybean fields, even when the wind was not blowing toward the field at the time of application. Understanding which formulations were used at what locations during 2017 could assist in better understanding which factors are important for managing dicamba off-target movement.

In Missouri, a large agricultural retailer made 330 applications of labeled-dicamba formulations across the state in 2017, but 16% or 55 of those applications resulted in dicamba off-target movement events. Twenty percent or 11 of those off-target events were attributable to off-label conditions such as inappropriate buffer size, wind speed, etc., however, the remaining 80% of those off-target movement events that resulted in dicamba injury (44 cases or 13% of their total applications) could not be explained and thus were likely due to volatilization and/or temperature inversions.

The Illinois Department of Agriculture received 246 dicamba related complaints in 2017 where complaints increased in the latter half of July and first week of August, which corresponded with dicamba applications made 3 to 4 weeks earlier. Illinois had completed 90% of its investigations and sent out 200 violation letters with 65% going to private applicators and 35% to commercial applicators. The primary violation (a warning letter) was wind speed and direction, followed by downwind susceptible species, but no violations were due to generic (non-approved) dicamba use.

The perception from IFCA retailers was that they had to take on all the risk. The three new dicamba formulations labeled for use in dicamba- resistant cotton and soybeans all clearly state: "*AVOIDING SPRAY DRIFT AT THE APPLICATION SITE IS THE RESPONSIBILITY OF THE APPLICATOR*". Complying with regulations and risk exposure from applying dicamba is too expensive. In order to be licensed as a commercial applicator in Illinois, you have to have insurance. Insurance rates are higher for retailers if they are spraying dicamba. Insurance will cover retailers if they made an accident, but it will not cover them if they made the application according to the label, but dicamba injury still occurred in non-target areas. Insurers say that if no wrongful application is found, it is a product problem. There is also the requirement for third party verification of damage for insurance to cover.

IFCA retailer concerns and suggestions expressed:

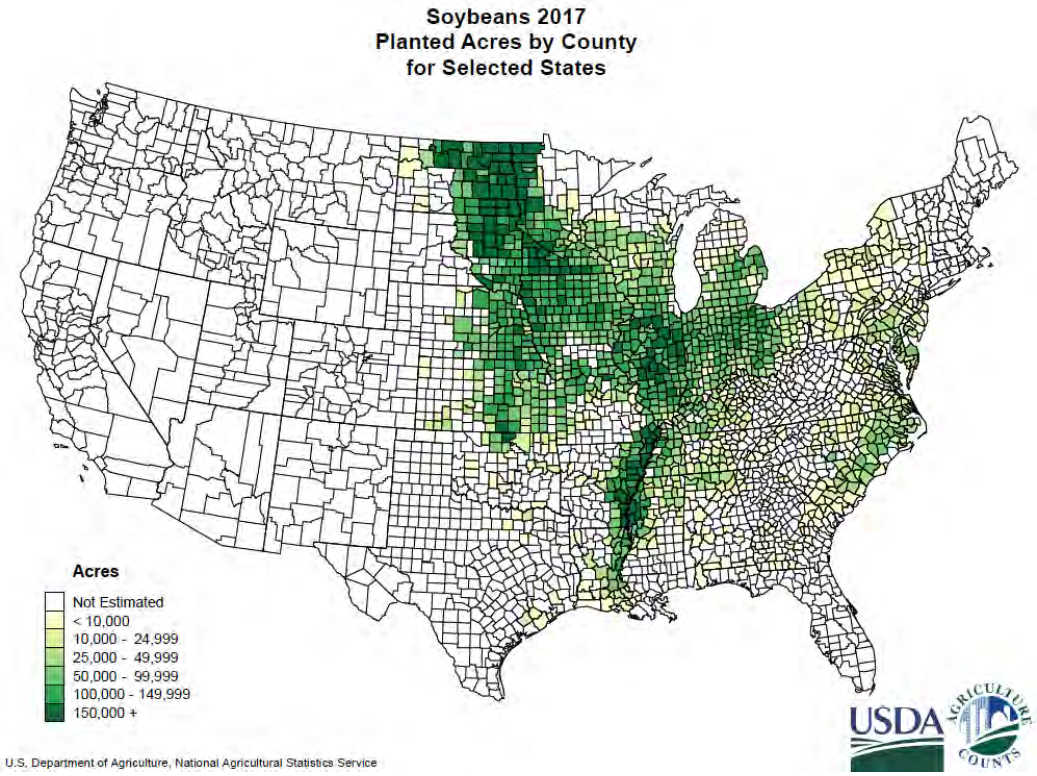
- Manufacturers need to share in the responsibility when all other label conditions are followed.
- This is a good weed control tool, if volatility can be addressed. More research should be required to improve the product.
- The additional expense with specialized equipment and insurance costs make it cost-prohibitive for most custom applicators. However, more farmer application of the product will cause bigger problems.
- Specify that the new dicamba formulations should not be used later than 21 days after soybeans are planted. Greater soybean leaf area increases the chance for post depositional movement.
- Include temperature and humidity restrictions. Lower temperatures and higher humidity reduce both physical drift and volatilization.
- Define a longer setback to sensitive crops. Engenia, XtendiMax, and FeXapan labels state "DO NOT APPLY" when the wind is blowing toward/in the direction of adjacent/neighboring susceptible/sensitive crops.
    - What are the susceptible/sensitive crops and plants? The labels state: "Susceptible/sensitive crops include, but are not limited to …"
    - How far is downwind, i.e., "neighboring distance"? Defining neighboring distance means understanding several factors affecting movement. Registrants say the applicator determines distance based on experience. However, experience is risk. Safety should not be left up to determination of liability.

Certain states have taken efforts to classify stand-alone dicamba products as restricted use products (RUPs). An RUP classification under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

mandates that private and commercial pesticide applicators and pesticide dealers legally maintain records of use and sales that will provide a comprehensive accounting of dicamba formulations used. The point was made that it's very difficult to determine which dicamba product was used once it has been applied. In addition, certain state agencies investigating dicamba complaints reported that they have not seen sufficient paperwork from the dicamba registrants investigating their complaints. Several workshop participants said that industry investigations of dicamba complaints were not typically at the same level of detail as state investigations. It was also noted that there is not a universally accepted procedure for a dicamba volatility assay, but progress is being made.

Seed suppliers and registrants have sales information pertaining to Roundup Ready Xtend cotton and soybean seed, and Engenia, XtendiMax, and FeXapan herbicides. Such information will be (and would have been) very helpful in researching factors to manage dicamba off-target movement. In 2018, Monsanto expects about 40 million acres of Roundup Ready Xtend soybeans and 7 million acres of Roundup Ready Xtend cotton to be planted. It was requested that suppliers of dicamba-resistant cotton and soybean seed provide county-level sales data and that registrants of dicamba formulations (both generic and new) provide state-level sales data from 2016 forward.

**FIGURE 7. USDA Estimated Soybean Acres Planted by County in 2017**




The point was made that the issue of legal vs. illegal use of dicamba formulations remains contentious. If only 5% of the dicamba applications to dicamba-resistant crops were from illegal formulations, then the majority of the damage must be explained by some kind of failure with the registered formulations. Concern was also expressed about soybean growers having to plant dicamba-resistant soybeans defensively.

# SUMMARY

Extensive damage to plants has been documented in claims of off-target movement of dicamba. Anecdotal evidence from multiple state sources suggests that the actual damage to crops may be 5 to 10 times greater than documented in official claims. In addition, damage was also inflicted on public and private gardens, landscape plantings, trees, natural vegetation areas, and pollinator habitats. While use of illegal dicamba formulations was estimated to have occurred in about 5% of the instances where dicamba was actually applied to dicamba-resistant cotton and soybeans, more significant sources of dicamba injury symptoms were attributed to:

1. Volatilization
2. Temperature inversions
3. Physical drift
4. Tank or sprayer contamination
5. Some type of applicator error (incorrect buffer, wind speed, boom height, wrong nozzles, etc.)

In addition, IFCA retail applicators noted that they also observed injury symptoms on non-resistant soybeans from dicamba applications made to corn, since many acres of corn were re-planted in Illinois in 2017 while soybeans were also planted or developing at the same time as the corn. They believe that soybean planting will continue to occur earlier and it is a challenge as a retailer to treat both soybeans and corn in the same time period (it used to be they sprayed corn first, and then switched over to beans). Trends are now for soybeans to be planted earlier.

No data account for the quantitative distribution of dicamba from application to decomposition in a crop system, nor of the dose response relationship between dicamba as applied and the response of sensitive model crops. Crop response data is needed minimally for a legume (alfalfa), a solanaceous crop (tomato), and a cucurbit (cucumber). In addition there is legitimate concern for the effect of exposure and of multiple in-season and multiple annual exposures to herbaceous plants servicing pollinators and to both cultivated and native tree species.

Most university weed scientists expressed concern that there was not adequate public research on the new dicamba formulations prior to product approval. The problems that occurred in 2017 speak for themselves: rising difficulties with weed resistance make retention of this technology important, but we also need answers. More funding for public research is needed. The true cost of the dicamba-resistant crop technology is not being reflected in the price. Cotton and soybean commodity groups are funding some research projects. Concern was expressed that USDA-ARS and USDA-NIFA were not funding the type of research needed to manage off-target pesticide movement as well as other weed science issues, except maybe for pollinator impact. Overall federal funding for weed science research is very small compared to other pest management disciplines and the biggest problem we are facing in the future is herbicide resistance.

- Is there a need for a “registration fee” to support research to help manage dicamba off-target movement?
- Is there a need for an industry led research task force, such as the 2,4-D Task Force, to help manage dicamba off-target movement?

# ACTION ITEMS

- Use of New Formulations:
  - We need a comprehensive accounting of areas planted in the dicamba-resistance trait by county and sales of all formulations of dicamba at minimum by state. Data from registrants and compilation of state data should be reconciled. Funding is needed to compile, analyze, and report these data and link to the reports of damage and damage resolution.
  - There is also a need to relate damage complaints to terrain and weather conditions.

- Application - Deficiencies with labels:
  - Provide uniformity in label organization among herbicides to make instructions on herbicide use easier to find
  - Identify dicamba-sensitive crops, landscape and native plants and trees
  - Define neighboring distance for sensitive crops
  - Delineate conditions leading to atmospheric inversions to protect applicators and neighbors from off-target movement.

- Application - Coordination of Training: All sources should have the same message in detail.

- Volatilization: The potential for the new formulations to volatilize after application is insufficiently characterized and should be revisited.

- Off-Target Damage:
  - More information on dose vs. damage is needed for key crops.
  - Address insufficient protection for growers (particularly of horticultural crops), property owners, and the public from off-target movement.
  - Address ways to assess damage that has occurred with respect to determination of liability.
  - Determine how dicamba is moving in the environment.

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# APPENDIX 1: Workshop Participants

| Last Name | First Name | Affiliation |
|---|---|---|
| Asmus | Chad | BASF |
| Banks | Phil | WORKSHOP FACILITATOR |
| Baris | Reuben | EPA Registration Division |
| Basu | Bilin | EPA Pesticide Re-evaluation Division |
| Bradley | Kevin | University of Missouri |
| Bruss | Bob | Nufarm Americas |
| Bunting | Jeff | GROWMARK |
| Chism | Bill | EPA Biological and Economic Analysis Division |
| Cotie | Arlene | Bayer |
| Culpepper | Stanley | University of Georgia |
| Fleitz | Nick | Pentair - Hypro |
| Frieden | John | Wilbur-Ellis |
| Fritz | Brad | USDA Agricultural Research Service |
| Golus | Jeff | WORKSHOP SECRETARY |
| Goodis | Mike | EPA Registration Division |
| Grant | Rich | Purdue University |
| Hager | Aaron | University of Illinois |
| Herfort | Joachim | Agrotop GmbH |
| Hert | Aaron | Helena Agri-Enterprises |
| Hewitt | Andrew | University of Queensland |
| Keigwin | Rick | EPA Office of Pesticide Programs |
| Kenny | Dan | EPA Registration Division |
| Kruger | Greg | University of Nebraska |
| Ledson | Mark | Syngenta |
| Mortensen | Dave | Penn State University |
| Mueller | Thomas | University of Tennessee |
| Nichols | Susie | Arkansas State Plant Board |
| Nichols | Bob | Cotton Incorporated |
| Norsworthy | Jason | University of Arkansas |
| Payne | Jean | Illinois Fertilizer & Chemical Association |
| Pearson | Steve | TeeJet Technologies |
| Peck | Chuck | EPA Environmental Fate and Effects Division |
| Reiss | Jim | Precision Laboratories |
| Reynolds | Dan | Mississippi State University |
| Schleier | Jerome | Dow AgroSciences |
| Schroeder | Jill | USDA Office of Pest Management Policy |
| Scott | Dave | Office of Indiana State Chemist |

| | | |
|---|---|---|
| Senseman | Scott | University of Tennessee |
| Smith | Steve | Red Gold Inc. |
| Stamper | Josh | Minnesota Department of Agriculture |
| Steckel | Larry | University of Tennessee |
| Sun | Susan | Croda Inc. |
| Thistle | Harold | USDA Forest Service |
| Van Wychen | Lee | Weed Science Society of America |
| Weirich | Jason | MFA Incorporated |
| Whiting | Kelly | United Soybean Board |
| Witten | Ty | Monsanto |
| Young | Bryan | Purdue University |
| Zollinger | Richard | AMVAC Chemical Corporation |

# APPENDIX 2: Workshop Goal, Logistics, and Agenda

## GOAL

A facilitated, constructive discussion among weed scientists, state and federal regulators, application technology specialists, and dicamba vendors to identify the information needed to understand and manage factors leading to off-target movement of dicamba formulations currently registered for use in Roundup Ready Xtend® cotton and soybean cultivars.

## LOGISTICS

**WHO**- Key public weed scientists, regulatory officials, pesticide application technology specialists, and representatives of dicamba vendors. The meeting will be in-person, closed-door, for invited participants only. Dr. Phil Banks will serve as the workshop facilitator.

**WHEN**- April 16-17, 2018. Monday, April 16: meet 1:00-5:00 pm followed by dinner at 5:30 p.m. Tuesday, April 17: meet 8:00 a.m. – 12:00 pm.

**WHERE**- AMA Executive Conference Centers, 2345 Crystal Drive, Suite 200, Arlington, VA 22202. Participants are expected to cover their own travel and lodging cost.

## AGENDA: April 16, Monday

1:00 – 1:15 pm. Introductions- Scott Senseman, WSSA President. "What is the science we are missing?"

1:15 – 3:00 pm. Objective 1) Non-Target Impacts – Critical descriptions of damage/yield loss for sensitive crops and non-crops. Research needed to address impacts on pollinators, monarchs, and endangered species.

- 1:15 - 1:25 pm: Bryan Young - Agronomic Crops
- 1:25 - 1:35 pm: Steve Smith - Horticulture Crops
- 1:35 - 1:45 pm: Dave Mortensen - Pollinators
- 1:45 - 2:15 pm: Facilitated Discussion
- 2:15 - 3:00 pm: Action Items

3:00 – 3:15 pm. Break

3:15 – 5:00 pm. Objective 2) Volatility – Coordinated, public, multi-state research program on potential volatilization of dicamba.

- 3:15 - 3:25 pm: Rich Zollinger - Chemistry
- 3:25 - 3:35 pm: Dan Reynolds - Small scale
- 3:35 - 3:45 pm: Tom Mueller - Field scale
- 3:45 - 4:15 pm: Facilitated Discussion
- 4:15 - 5:00 pm: Action Items

**AGENDA: April 17, Tuesday**

8:00 – 9:45 am. Objective 3) Application – Assessment of training programs, temperature inversions, and the physics of physical particle drift.

8:00 - 8:10 am: Stanley Culpepper - Assessment of training programs
8:10 - 8:20 am: Rich Grant – Temperature Inversions
8:20 - 8:30 am: Andrew Hewitt - Physics of Physical Particle Drift
8:30 - 9:00 am: Facilitated Discussion
9:00 - 9:45 am: Action Items

9:45 – 10:00 am. Break

10:00 – 11:00 am. Objective 4) Formulation – What did applicators use and on how much acreage?

10:00 - 10:10 am: Kevin Bradley - Assessment of formulation use
10:10 - 10:20 am: Jean Payne - Assessment of compliance
10:20 - 10:40 am: Facilitated Discussion
10:40 - 11:00 am: Action Items

11:00 am – 12:00 pm. Summarization and Prioritization. List of prioritized areas of concern to go home with workshop participants

# APPENDIX 3: Herbicide Handbook – 2014, Tenth Edition. Dicamba

## dicamba

3,6-dichloro-2-methoxybenzoic acid

CAS # Acid: 1918-00-9
Dimethylammonium salt: 2300-66-5
Na salt: 1982-69-0

**4(O)**

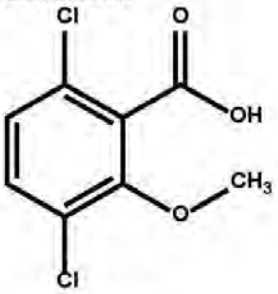
### NOMENCLATURE

**Common name:** dicamba (ANSI, BSI, ISO, WSSA).
**Other name(s):** VEL-58-CS-11; 3,6-dichloro-2-methoxybenzoic acid (IUPAC); 3,6-dichloro-*o*-anisic acid (IUPAC)
**Trade name(s):** BANVEL®; BRASH®; CELEBRITY®; CELEBRITY® PLUS; CLARITY®; DISTINCT®; DYVEL®; DYVEL DSp; ENGENIA™; MARKSMAN®; NORTHSTAR®; ONETIME®; OVERDRIVE®; STATUS®; WEEDMASTER®; YUKON®
**Chemical family:** benzoic acid

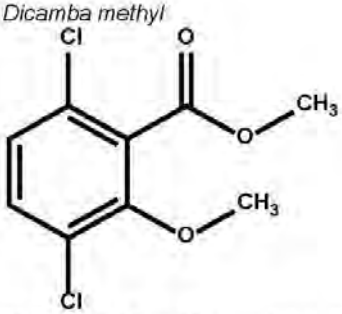
### CHEMICAL AND PHYSICAL PROPERTIES

**Chemical structure:**

*dicamba acid*




*Dicamba methyl*




**Molecular formula:** *Acid* $C_8H_6Cl_2O_3$; *Diglycolamine (diolamine) salt* $C_{12}H_{17}Cl_2NO_5$; *Dimethylammonium (Dma) salt* $C_{10}H_{13}Cl_2NO_3$; *Na salt* $C_8H_5Cl_2NaO_3$; *N, N-Bis-(aminopropyl) methylamine salt* $C_{15}H_{35}Cl_2N_3O_3$
**Molecular weight:** *Acid* 221.04 g/mole; *Diglycolamine salt* 326.18 g/mole; *Dma salt* 266.12 g/mole; *Na salt* 243.02 g/mole
**Description:** Crystalline solid, white (reference grade) or brown (technical grade)
**Density:** 1.35-1.55 g/mL (25 C)
**Melting point:** 114-116 C
**Boiling point:** >200 C
**Vapor pressure:** $4.5 \times 10^{-3}$ Pa (25 C)
**Stability:** Stable; resists oxidation and hydrolysis under normal conditions

**Solubility:**

***Acid***

water 4500 mg/L (25 C)
organic solvents g/100 mL (25 C):

| | |
|---|---|
| acetone 126 | *n*-hexane 0.375 |
| carbon disulfide 127 | methanol 137 |
| chloroform 51.6 | methyl ethyl ketone soluble |
| cyclohexanone 91.6 | 1-octanol 68 |
| diacetone alcohol 91 | pentane insoluble |
| dichloromethane 26 | tetrahydrofuran 139 |
| dioxane 118 | toluene 13 |
| ethanol 92.2 | xylene 20.2 |

heavy aromatic naphthane solvent 5.2

***Dimethylamine salt***

water 720,000 mg/L

**$pK_a$:** 1.87 (weak acid)
**$K_{ow}$:** 0.29

### HERBICIDAL USE

Dicamba provides postemergence control of emerged weeds as well as moderate residual control of germinating weeds. Dicamba can be applied preplant and PRE at 0.56 kg ae/ha in corn, POST at 0.28 kg ae/ha in corn and sorghum, preharvest in sorghum at 0.28 kg ae/ha (Texas and Oklahoma only), POST at 0.07-0.14 kg ae/ha in small grains, POST at 0.28-2.24 kg ae/ha in pasture and rangeland, POST at 0.28-2.2 kg ae/ha in grasses and fallow, POST at 0.28-0.56 kg ae/ha in asparagus (California, Oregon, and Washington only), and POST at 0.28-1.1 kg ae/ha in turf. Dicamba is expected to be registered for PRE and POST applications in dicamba-tolerant cotton and soybean. Additional dicamba-tolerant crops are in development. Dicamba is also used for conservation reserve programs, grass grown for seed, sugarcane, turf, and noncropland sites. Many annual broadleaf weeds such as pigweed spp., wild buckwheat, and lambsquarters are controlled at 0.56 kg ae/ha, whereas certain perennial broadleaf weeds such as Canada thistle, perennial sowthistle, and field bindweed are controlled or suppressed at higher rates. To improve postemergence weed control, surfactants, crop oil concentrates, or sprayable fertilizers may be added. A spray system that delivers coarse droplet size is recommended to prevent off-target drift.

### USE PRECAUTIONS

**Fire hazard:** Formulated products are non-flammable.
**Corrosiveness:** Formulated products are non-corrosive.
**Storage stability:** All formulated products are stable.
**Cleaning glassware/spray equipment:** Wash with detergent and rinse. Use acetone rinse for glassware
**Emergency exposure:** Flush eyes with water until clear; consult a doctor if irritation persists. Wash contaminated skin with mild soap and water and rinse; get medical attention if

skin irritation persists. If ingested, drink 1-2 glasses of water and induce vomiting.

**Incompatibilities:** Compatible with most herbicides and may be applied in liquid fertilizers.

## BEHAVIOR IN PLANTS

**Mechanism of action:** Similar to that of endogenous auxin (IAA) and other auxin-mimicking herbicides. (more details on page 12)

**Symptomology:** Symptoms include twisting and curling of stems and petioles (epinasty), stem swelling (particularly at nodes) and elongation, and leaf cupping. These symptoms are followed by chlorosis at the growing points, growth inhibition, wilting, and necrosis. At low application rates, the tips of new leaves may develop into narrow extensions of the midrib, and puckering of the young leaves may develop.

**Absorption:** Dicamba readily penetrates plant leaves, roots, and stems, but apparently not as rapidly as the phenoxyacetic acids such as 2,4-D (5). The dimethylamine formulation penetrates plant foliage more than other formulations (3). Dicamba transport across the plasmalemma may occur by passive diffusion as well as by an active, protein-mediated process (1) normally functioning in IAA transport.

**Translocation:** Dicamba is transported by both symplastic (including phloem) and apoplastic (including xylem) pathways and accumulates at the growing points. Translocation generally is slower in grasses and other tolerant species. Differential translocation among species has been associated with differential sensitivity. Dicamba translocates primarily apoplastically in wheat, but mostly symplastically in susceptible wild buckwheat (4). Following translocation to the roots, substantial percentages of dicamba exit into the surrounding medium (3).

**Metabolism in plants:** Dicamba metabolism generally is more rapid in tolerant species such as grasses than in susceptible broadleaf species (1). A number of metabolic reactions have been identified, including hydroxylation of dicamba to 5-hydroxy-2-methoxy-3-6-dichlorobenzoic acid, demethylation to salicylic acid derivatives, conjugation of dicamba or the demethylated and hydroxylated metabolites with glucose, and decarboxylation to unidentified metabolites.

**Non-herbicidal biological properties:** Auxin-like plant growth regulator.

**Mechanism of resistance in weeds:** A biotype of wild mustard from Western Canada is resistant to dicamba and other auxin herbicides. Although the mechanism of resistance has not been determined, resistance may be due to an insensitive target site (2). Populations of kochia in the U.S. Great Plains have also been documented as resistant to dicamba.

## BEHAVIOR IN SOIL

**Sorption:** Weakly adsorbed to soil

**$K_{oc}$:** Average is 2 mL/g (8)

**Transformation:**

**Photodegradation:** Dicamba is slowly photodegraded on soil under a xenon lamp, with a half-life equivalent to 269 d (40° N lattitude, springtime sunlight at noon). Thus, the contribution of photolysis to field dissipation likely is negligible (7).

**Other degradation:** Dicamba is metabolized to $CO_2$ in aerobic soil, with 3,6-dichlorosalicylic acid as the only major metabolite and low levels of 2,5-dihydroxy-3,6-dichlorosalicylic acid. Dicamba degrades more slowly in anaerobic soils. Non-biological degradation is negligible. At 52 and 95 wk after treatment with $^{14}$C-dicamba, 18 and 3%, respectively, of the applied $^{14}$C was unextractable.

**Persistence:** Studies and experience have shown that dicamba may be leached out of the zone of activity in humid regions in a period of 3-12 wk. Dicamba may persist significantly longer under conditions of low soil moisture and rainfall. Dicamba has a half-life of <14 d under conditions amenable to rapid metabolism.

**Field experiments:** Half-life of 4.4 d in a loam soil in Indiana.

**Mobility:** Low to medium leaching potential. Dicamba is mobile in soil but degrades rapidly. Low potential for runoff due to rapid degradation.

**Volatilization:** NA

## TOXICOLOGICAL PROPERTIES

Toxicity tests were conducted with technical grade dicamba acid unless otherwise indicated.

**Acute toxicity:**

Oral $LD_{50}$ rat, 1707 mg/kg; Dermal $LD_{50}$ rabbit, >2000 mg/kg; 4-h inhalation $LC_{50}$ rat, >9.6 mg/L; Skin irritation rabbit, slight; Skin sensitization guinea pig, possible in sensitive individuals; Eye irritation rabbit, extreme

**BANVEL:** Oral $LD_{50}$ rat, 2629 mg/kg; Dermal $LD_{50}$ rabbit, >2000 mg/kg; 4-h inhalation $LC_{50}$ rat, >5.4 mg/L; Skin irritation rabbit, mild to moderate; Skin sensitization guinea pig, no; Eye irritation rabbit, extreme

**WEEDMASTER:** Oral $LD_{50}$ rat, >5000 mg/kg; Dermal $LD_{50}$ rabbit, >20,000 mg/kg; 4-h inhalation $LC_{50}$ rat, >20.3 mg/L; Skin irritation rabbit, minimal; Eye irritation rabbit, minimal

**Subchronic toxicity:**

**90-d dietary, rat:** NOEL ~250 mg/kg/d (5000 mg/kg); decreased body weight and microscopic liver effects at 10,000 mg/kg

**Chronic toxicity:**

**18-mo dietary, mouse:** NOEL 115 mg/kg/d (1000 mg/kg); not oncogenic

**24-mo dietary, rat:** NOEL 125 mg/kg/d (2500 mg/kg); not oncogenic; no other effects

**12-mo dietary, dog:** NOEL 60 mg/kg/d (2500 mg/kg); no effects

**Teratogenicity:**

**Rat:** NOEL maternal 160 mg/kg/d, fetal 400 mg/kg/d; three pregnant dams treated with 400 mg/kg/d died on or before the second d and one non-gravid female died in this group; not teratogenic

**Rabbit:** NOEL maternal 30 mg/kg/d, fetal 300 mg/kg/d; abortions among females at 150 and 300 mg/kg/d were associated with maternal toxicity manifested as ataxia, weight loss, and reduced feed consumption; no effects on embryo/fetal viability or development at 300 mg/kg/d; not teratogenic.

**Reproduction:**

**Rat:** NOAEL 40 mg/kg/d (500 mg/kg); no effects on reproductive performance at up to 400 mg/kg/d (5000 mg/kg)

Mutagenicity:

**Gene mutation:** Ames test, negative

**Structural chromosome aberration:** CHO, negative

**DNA damage/repair:** *B. subtilis*, positive

**Wildlife:**

Bobwhite quail oral $LD_{50}$, 216 mg/kg, 8-d dietary $LC_{50}$, >10,000 mg/kg; Mallard duck, oral $LD_{50}$ 1373 mg/kg, 8-d dietary $LC_{50}$, >10,000 mg/kg; Daphnia 48-h $TL_{50}$, 110 mg/L; Bluegill sunfish 96-h $TL_{50}$, 135 mg/L; Rainbow trout 96-h $TL_{50}$, 135 mg/L; Sheepshead minnow 96-h $TL_{50}$, >180 mg/L; Fiddler crab 96-h $TL_{50}$, >180 mg/L

**BANVEL:** Bobwhite quail 8-d dietary $LC_{50}$, >4640 mg/kg; Mallard duck oral $LD_{50}$, >2510 mg/kg, 8-d dietary $LC_{50}$, >4640 mg/kg; Daphnia 48-h $LC_{50}$, 1600 mg/L; Bluegill sunfish 96-h $LC_{50}$, >1000 mg/L; Rainbow trout 96-h $LC_{50}$, 1000 mg/L

**WEEDMASTER:** Bobwhite quail 8-d dietary $LC_{50}$, >4640 mg/kg; Mallard duck oral $LD_{50}$, >4640 mg/kg, 8-d dietary $LC_{50}$, >4640 mg/kg; Daphnia 48-h $LC_{50}$, >1800 mg/L; Bluegill sunfish 96-h $LC_{50}$, >1000 mg/L; Rainbow trout 96-h $LC_{50}$, >1000 mg/L

**Use classification:** General use for most products. MARKSMAN is Restricted use because of groundwater contamination concerns with atrazine.

## SYNTHESIS AND ANALYTICAL METHODS

**Synthesis:** NA

**Purification of technical:** NA

**Analytical methods:** Residue analysis via extraction with aqueous acid and clean-up using SPE columns. Quantified by GLC of a suitable ester.

**Historical:** Invented by S. B. Richter. U.S. patent 3,013,054 was awarded in 1958.

## MANUFACTURER(S) AND INFORMATION SOURCES:

**Industry source(s):** Albaugh/Agri Star; Arysta; BASF; DuPont Crop Protection; Gowan; Helena; Loveland; Monsanto; Nufarm; PBI Gordon; Prokoz; Syngenta Crop Protection; Tenkoz; Winfield

**Reference(s):**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4. Quimby and Nalewaja. 1971. Weed Sci. 19:598.
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6. Scott and Norris. 1970. Nature 227:1366.
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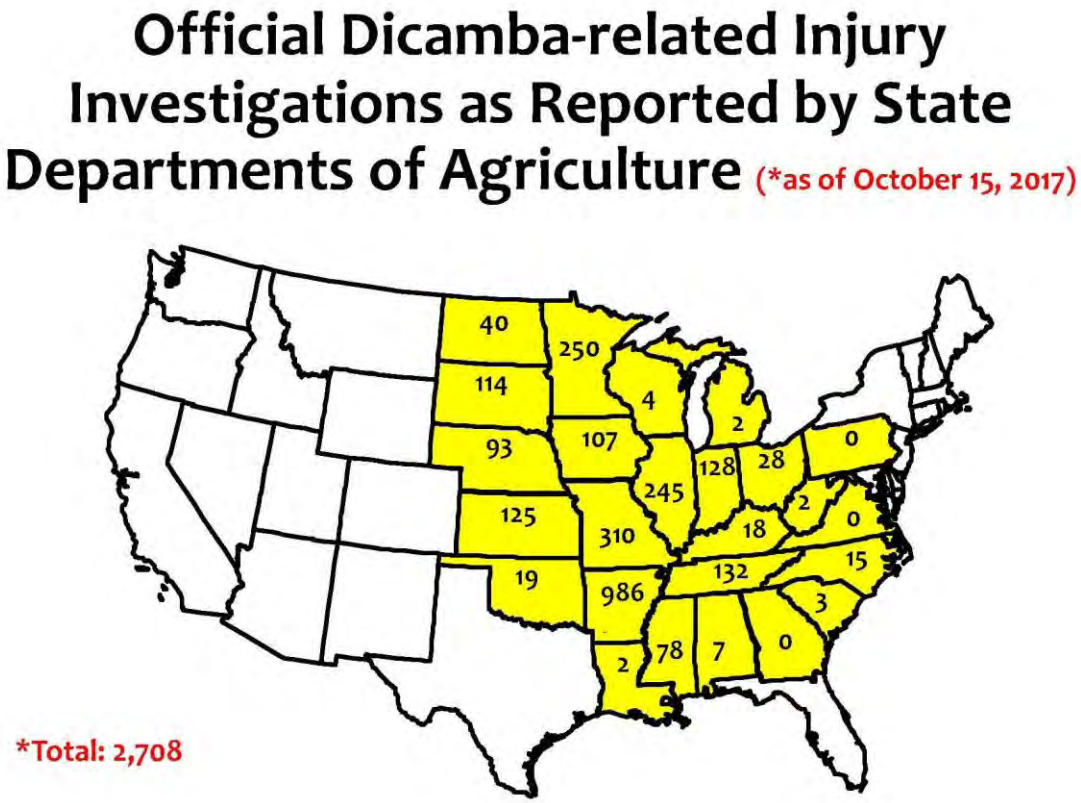
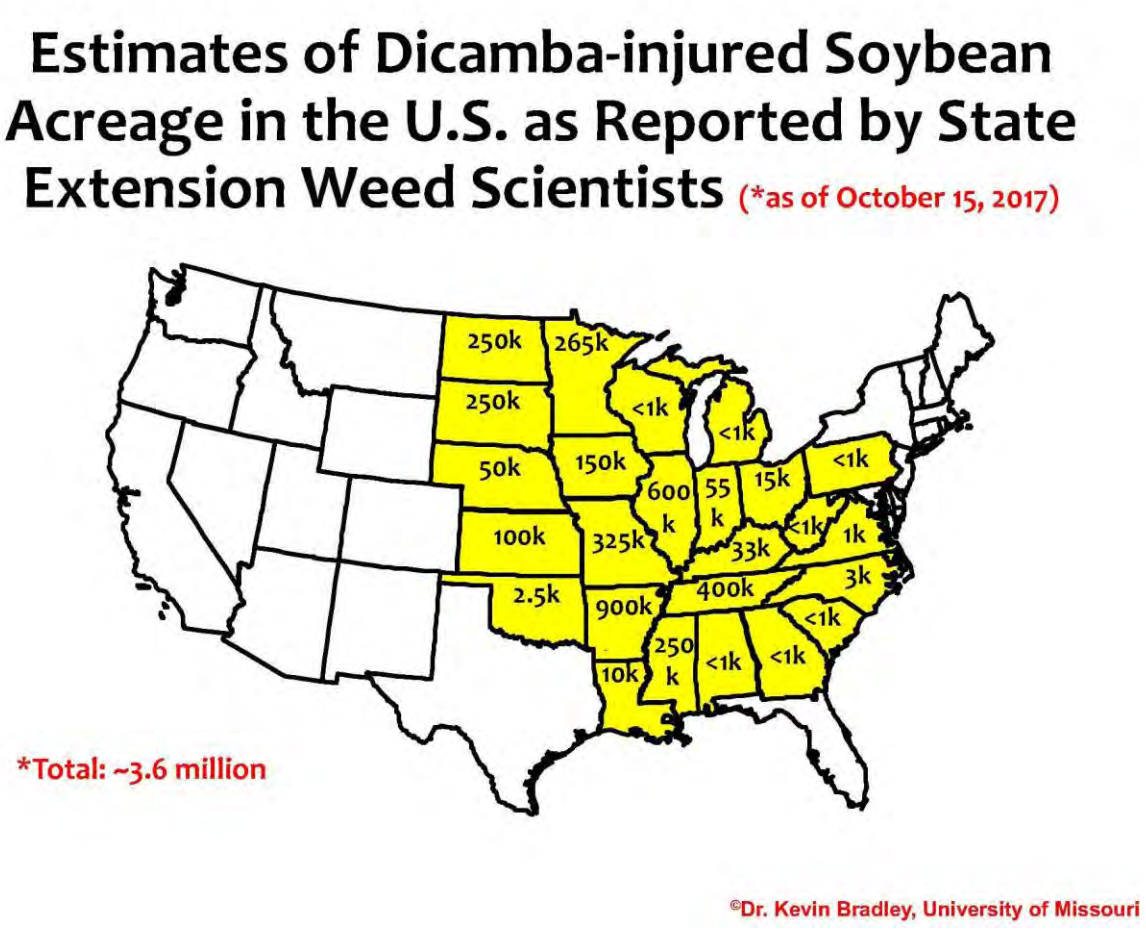
9. Klingaman, T. D. et al. 2012. North Central Weed Sci. Soc. Proc. p8.

**APPENDIX 4: Dicamba-related Injury Investigations - 2017**



**APPENDIX 5: Estimates of Dicamba-injured Soybean Acreage - 2017**



# Learnings from 2018 on Off-target Movement of Auxin Herbicides


## Jason K. Norsworthy

**Professor and Elms Farming Chair of Weed Science**

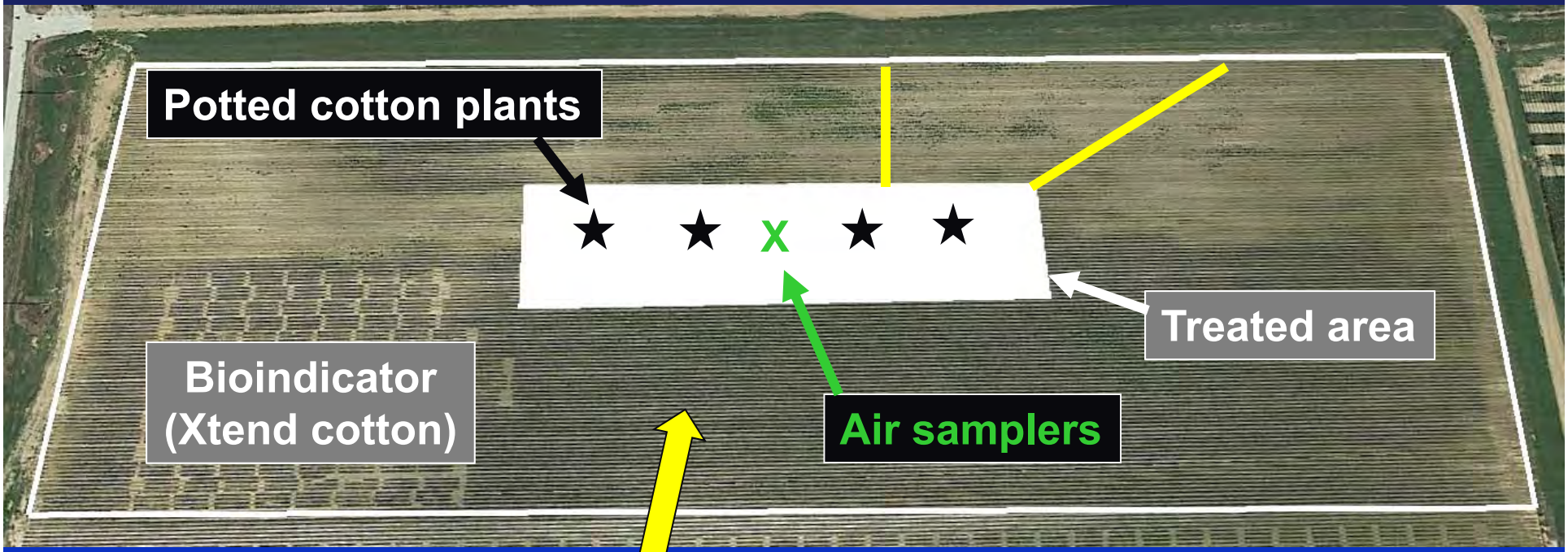
**Tom Barber, Jeremy Ross, & Cammy Willett**


UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE

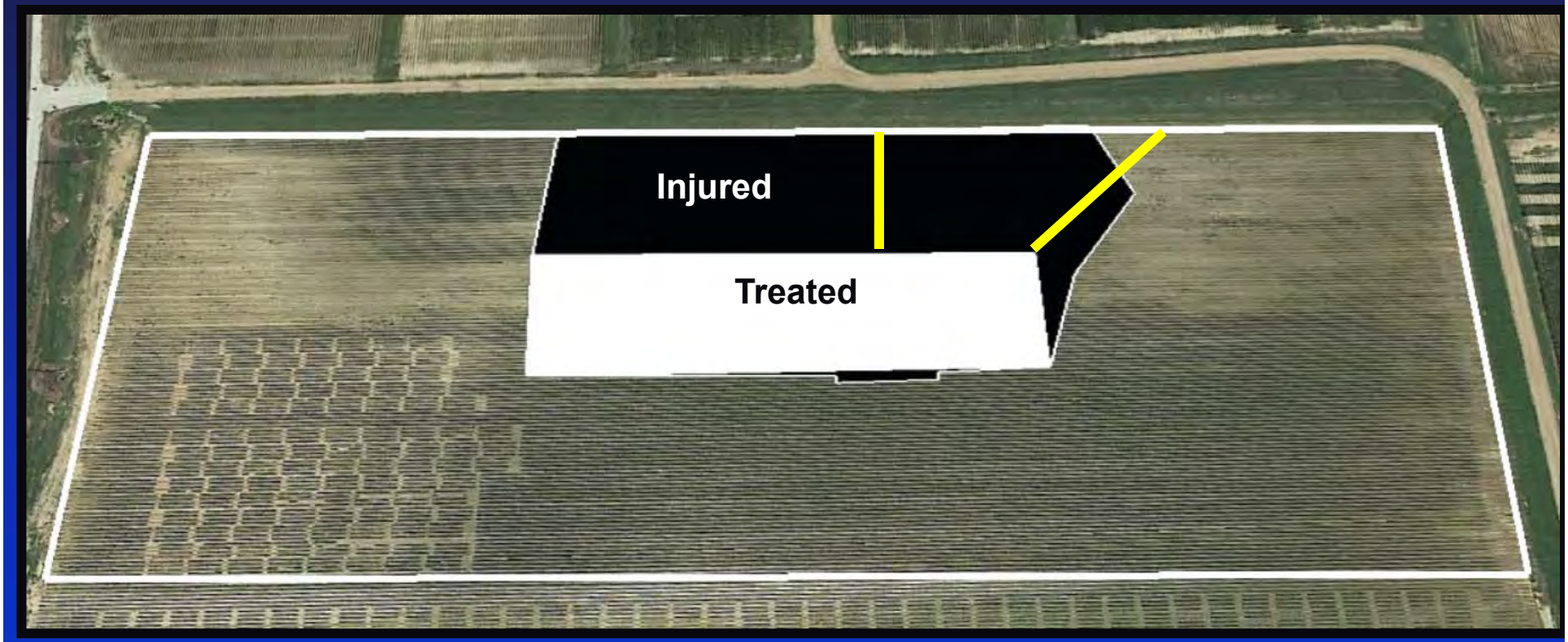

UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE

- Objective: Assess the likely causes for off-target movement of Enlist One with a commercial application
- Cotton: XtendFlex
- Application: 1 qt/A Enlist One + 1 qt/A Liberty
- Date: August 6, 2018 (1:55 to 2:05 PM)
- Sprayer setup
  - 25 ft boom; 8 mph; 10 GPA, 24 inch height
  - AIXR 11003 nozzles
- Environmental conditions during application
  - Avg. 8.0 mph; Range of 7.0 to 9.5 mph
  - 89 F and 54% RH

# Enlist One Drift Trial
## (Field Setup)

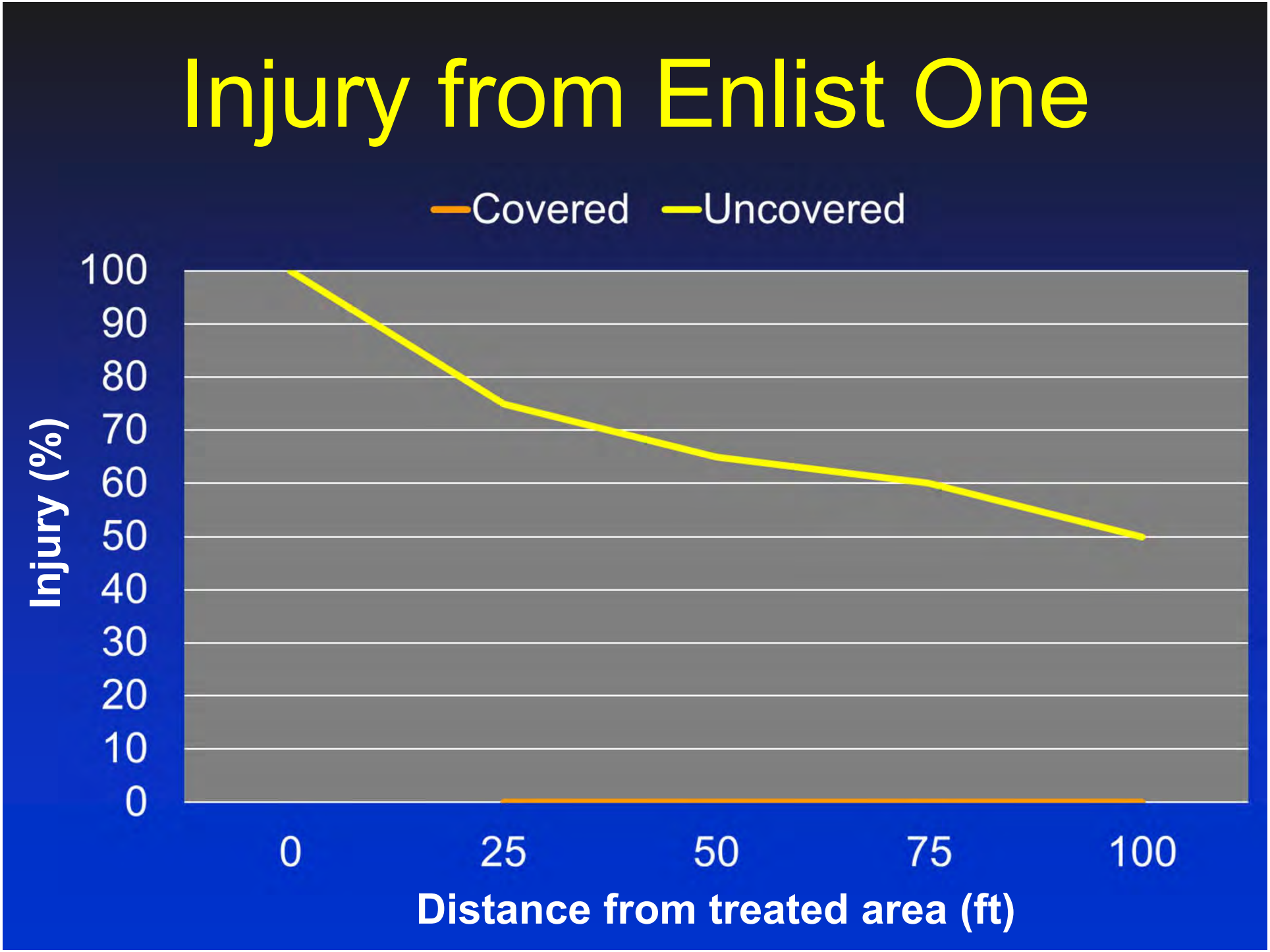


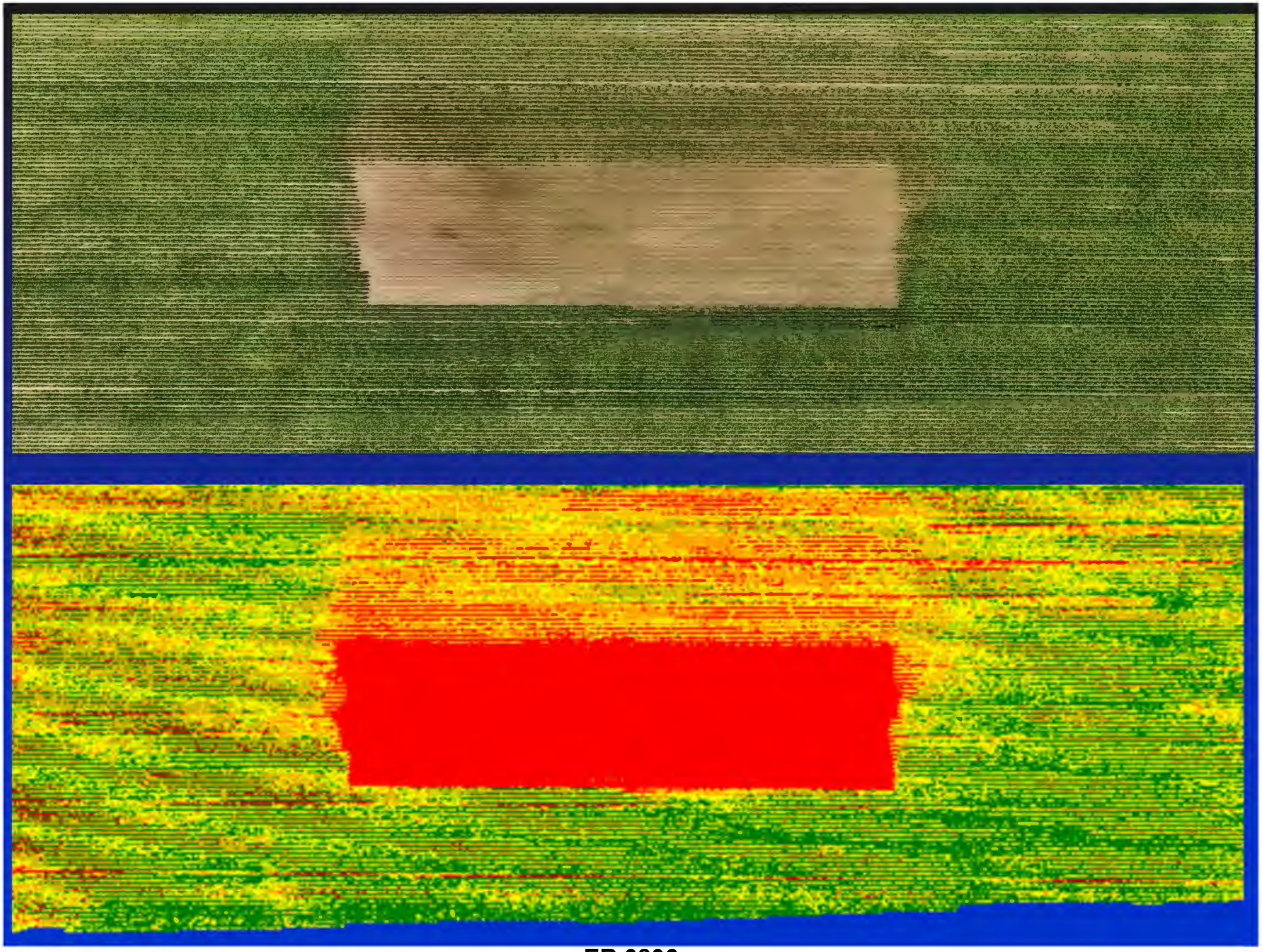
# Injury to Cotton

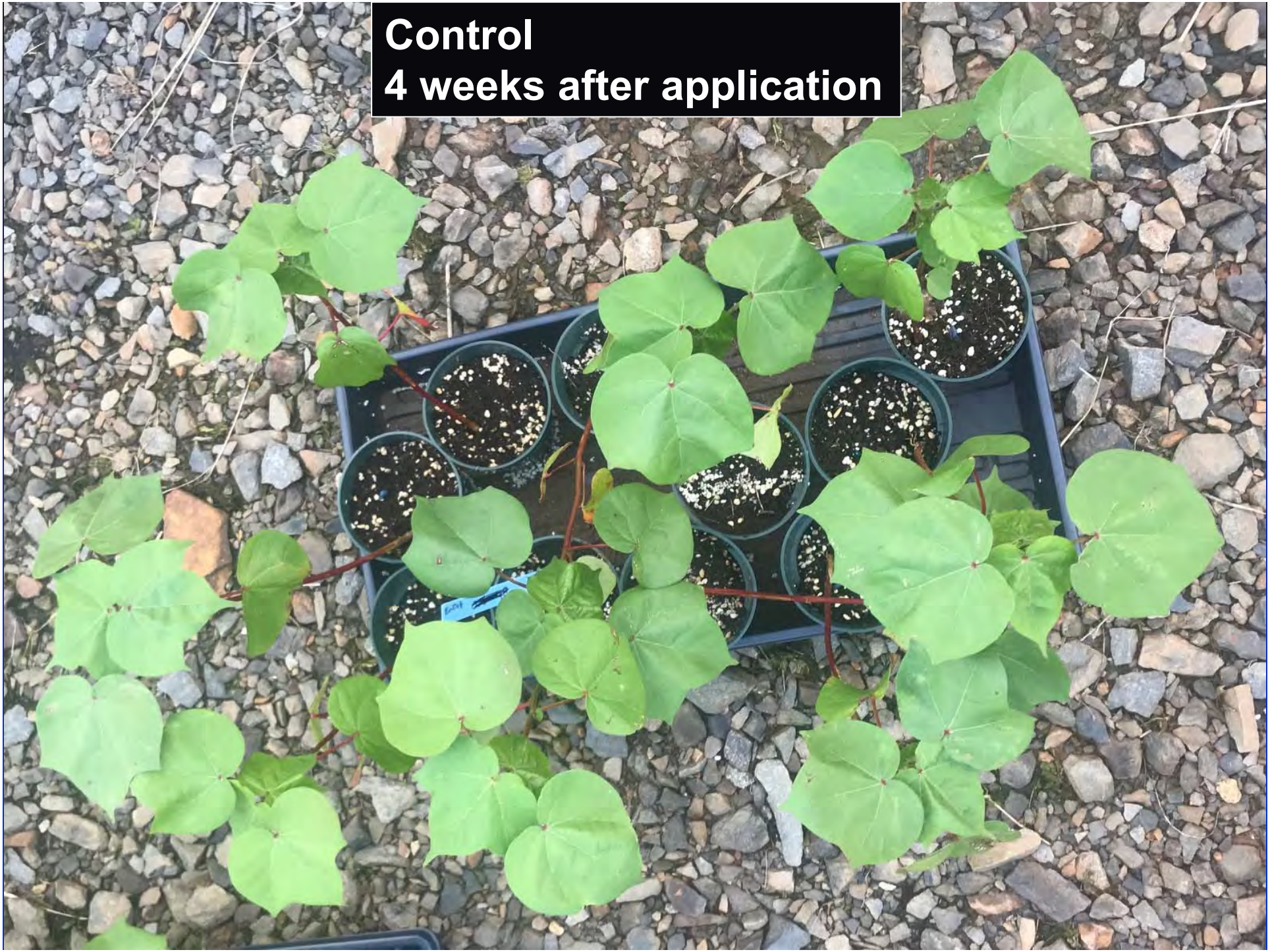


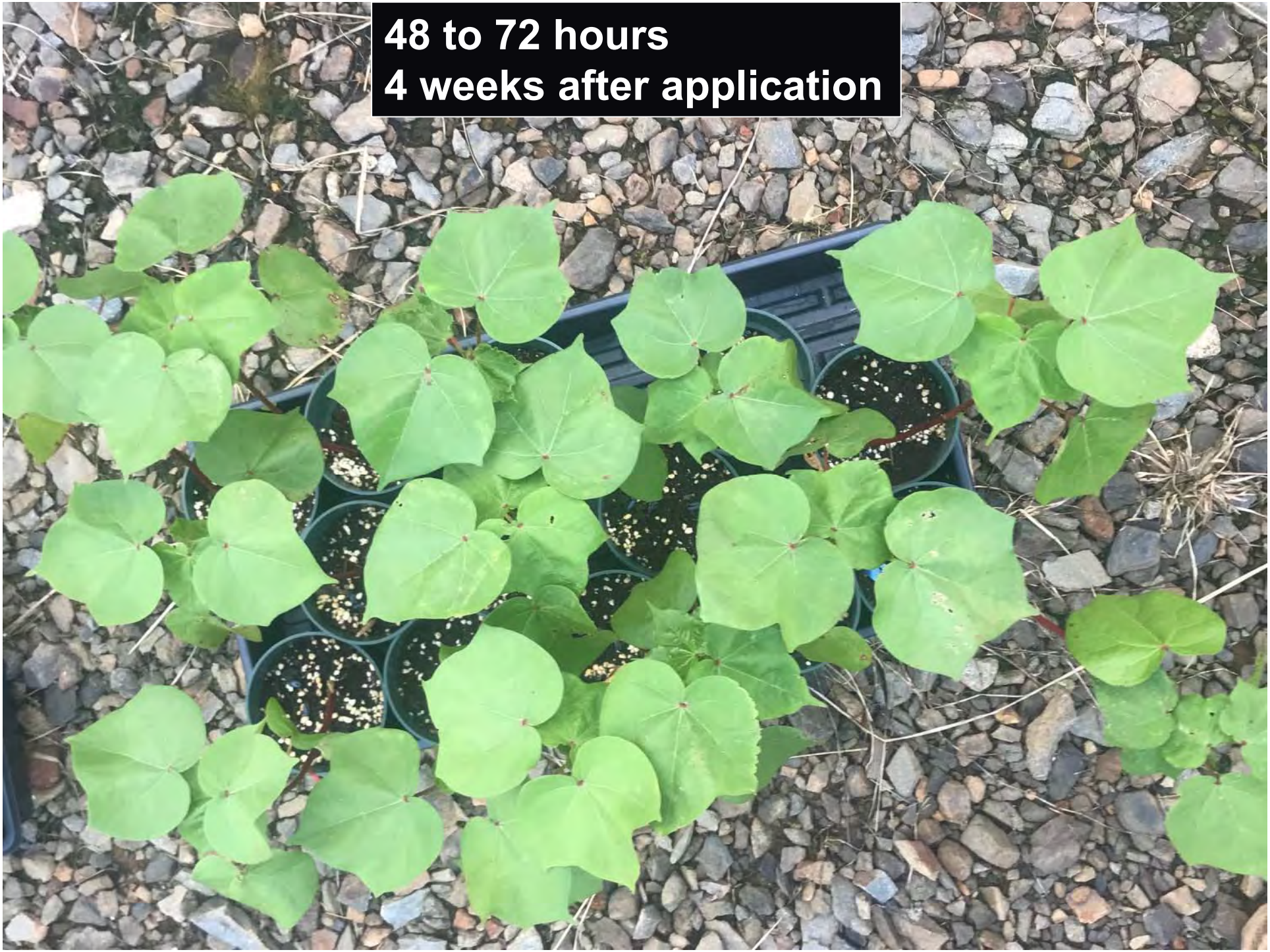

29 days after application

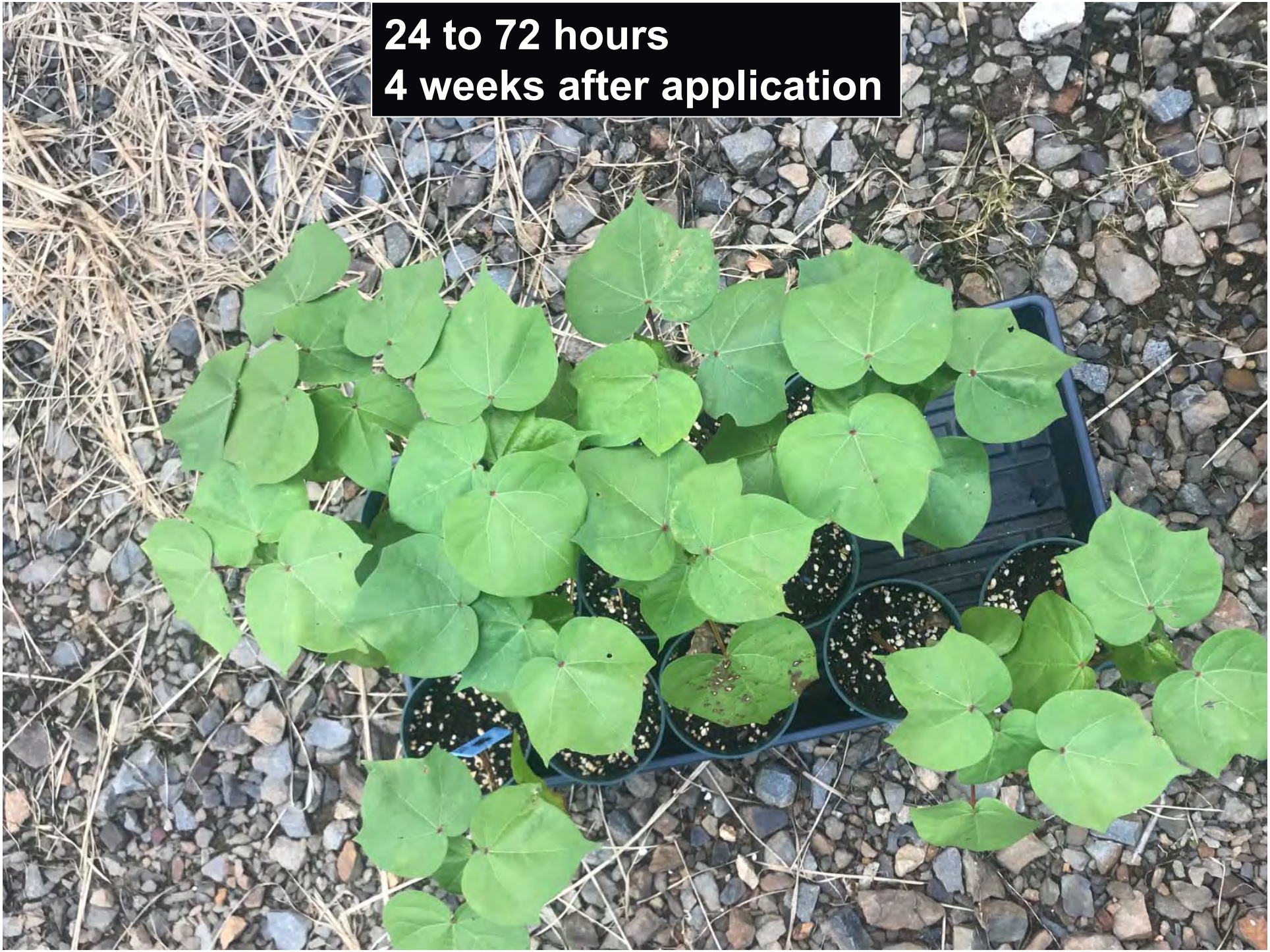
# Injury from Enlist One

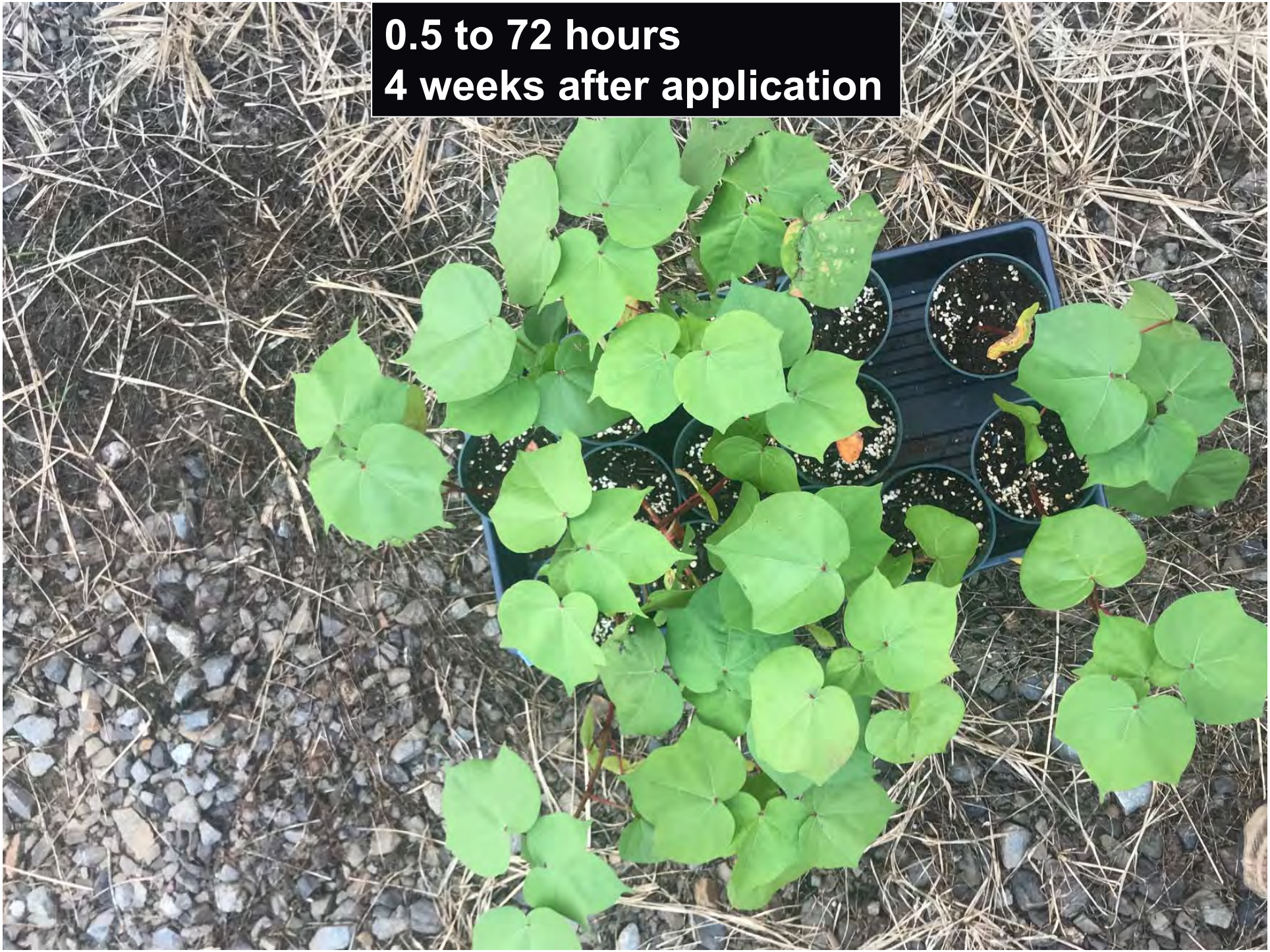




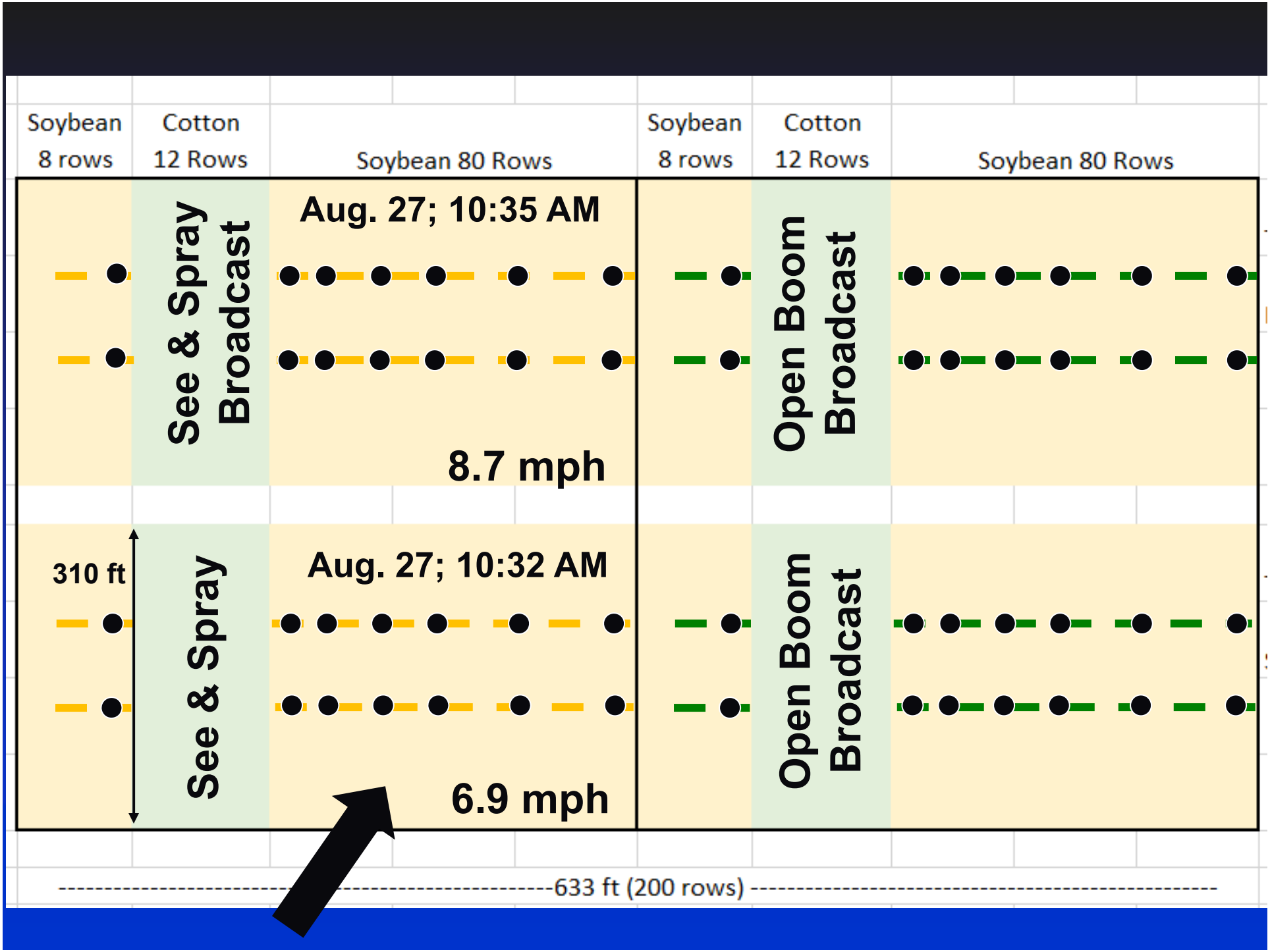


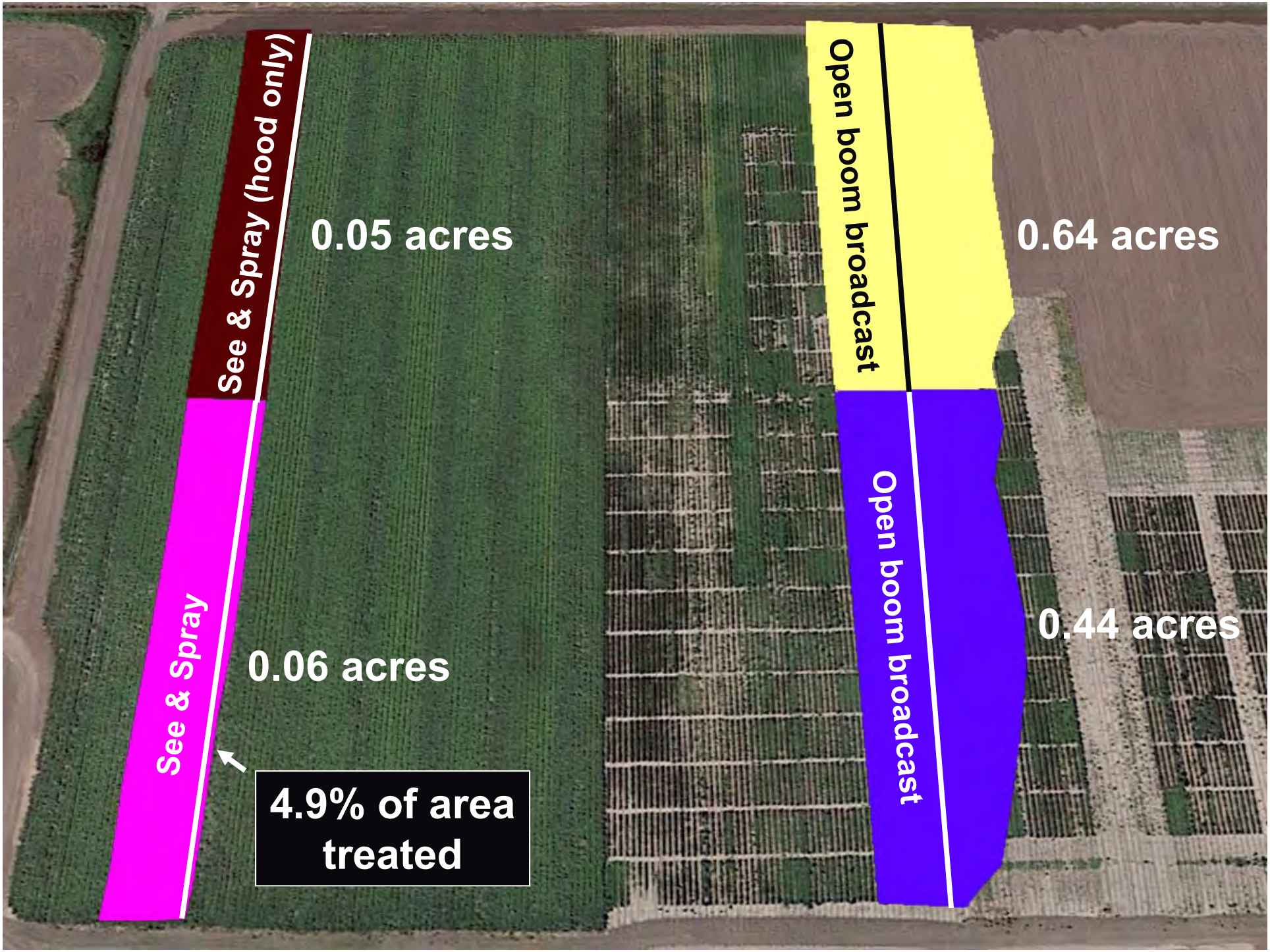






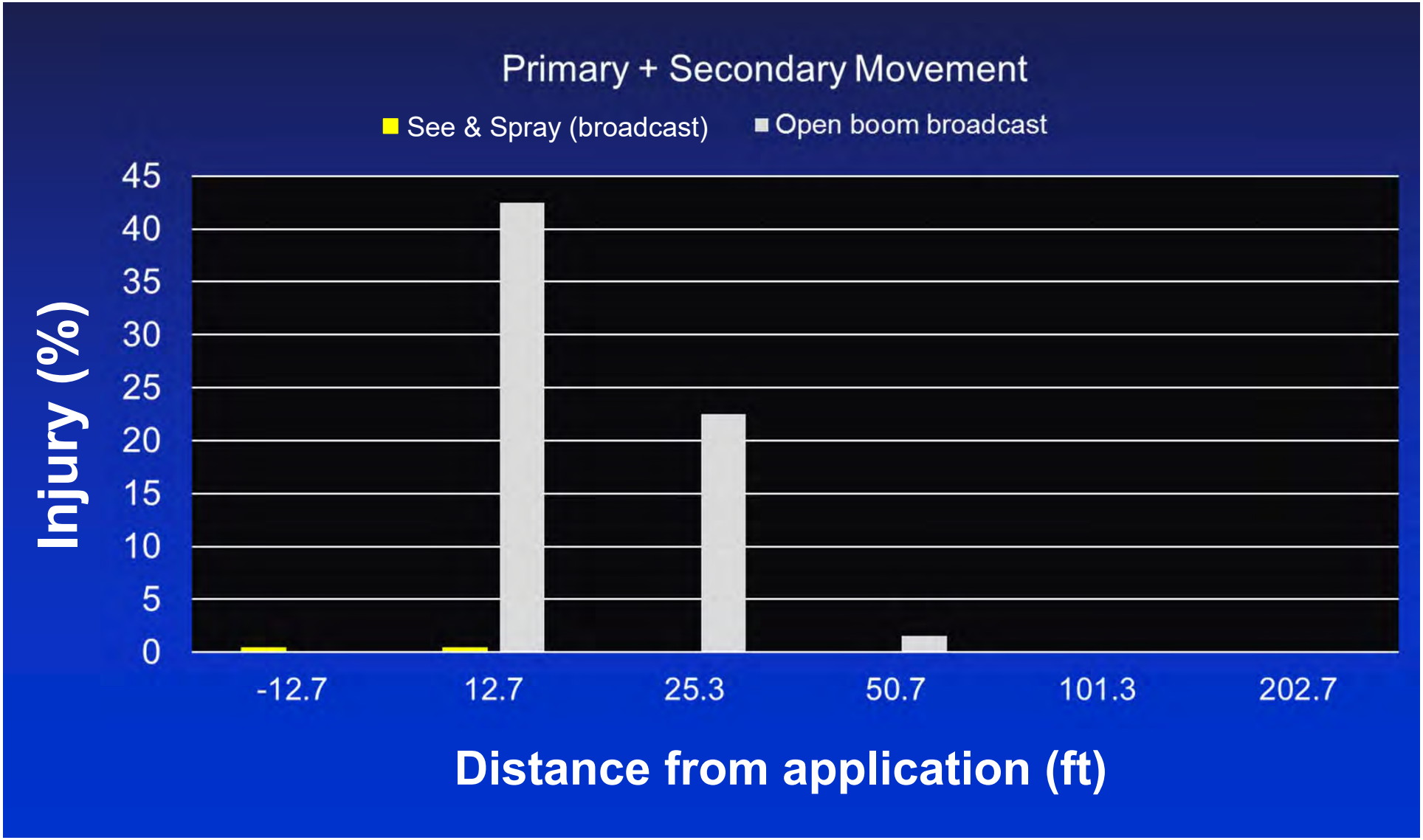
- Objective: Assess the ability of the See-and-Spray system to reduce off-target movement of dicamba
- Location: Keiser, AR
- Treatments:
  - Open boom broadcast vs. See-and-Spray hooded boom broadcast
  - Open boom broadcast vs. See-and-Spray
- Engenia + Roundup PowerMax + Intact





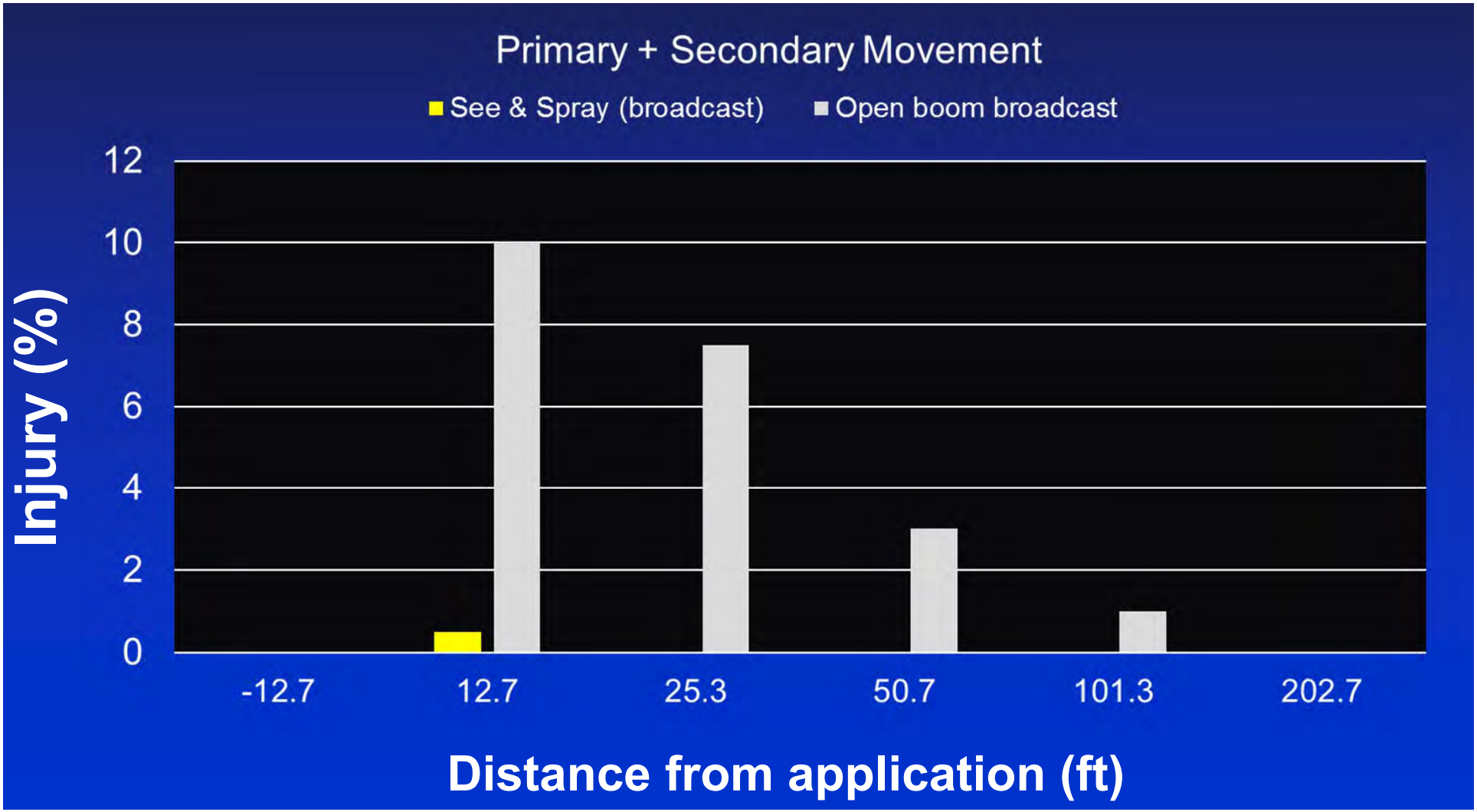
# See & Spray vs. Open Boom

## (15 days after application)



# See & Spray (Broadcast) vs. Open Boom (Broadcast)

## (15 days after application)



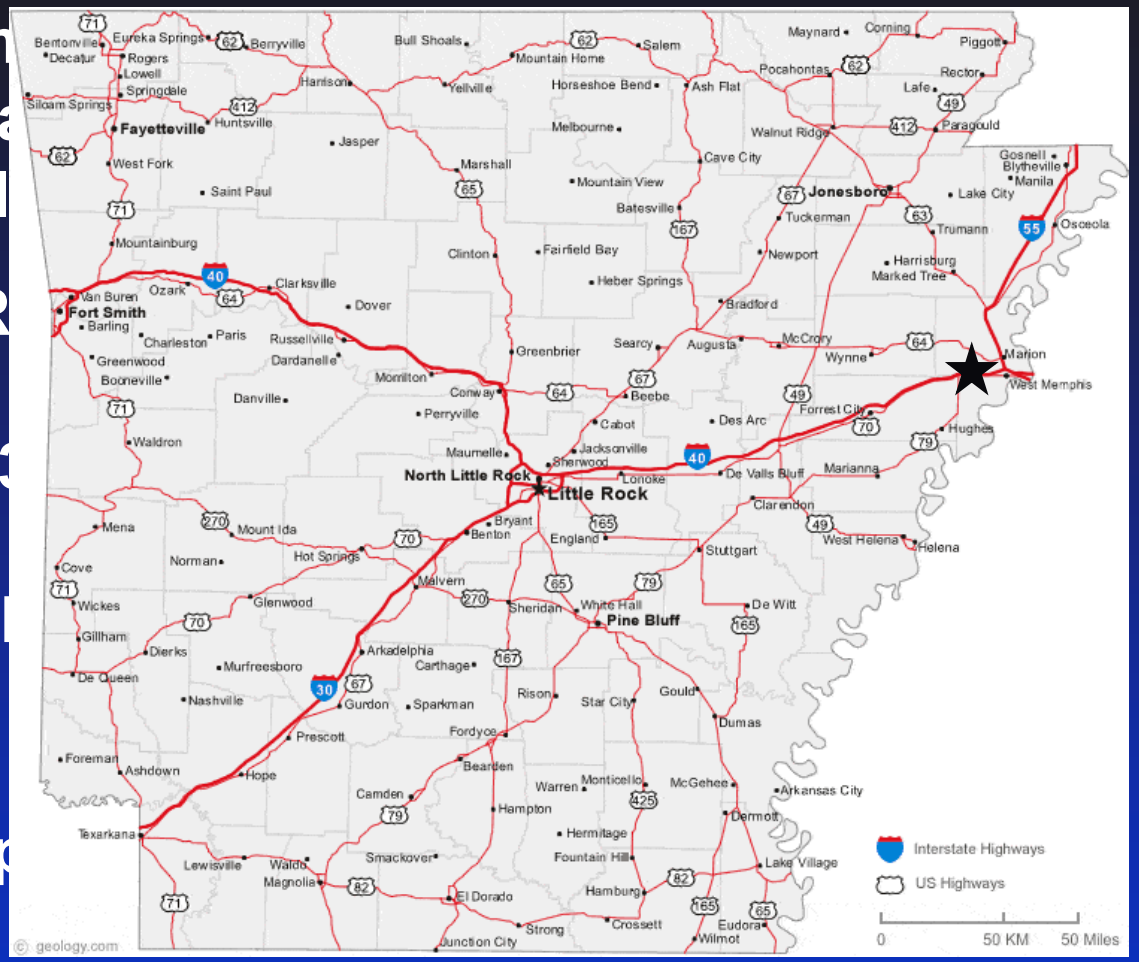
**Goal:** Determine the m
movement of dicamba
commercial field appl

**Location:** Proctor, AR

**Trial size:** 240 acres (3

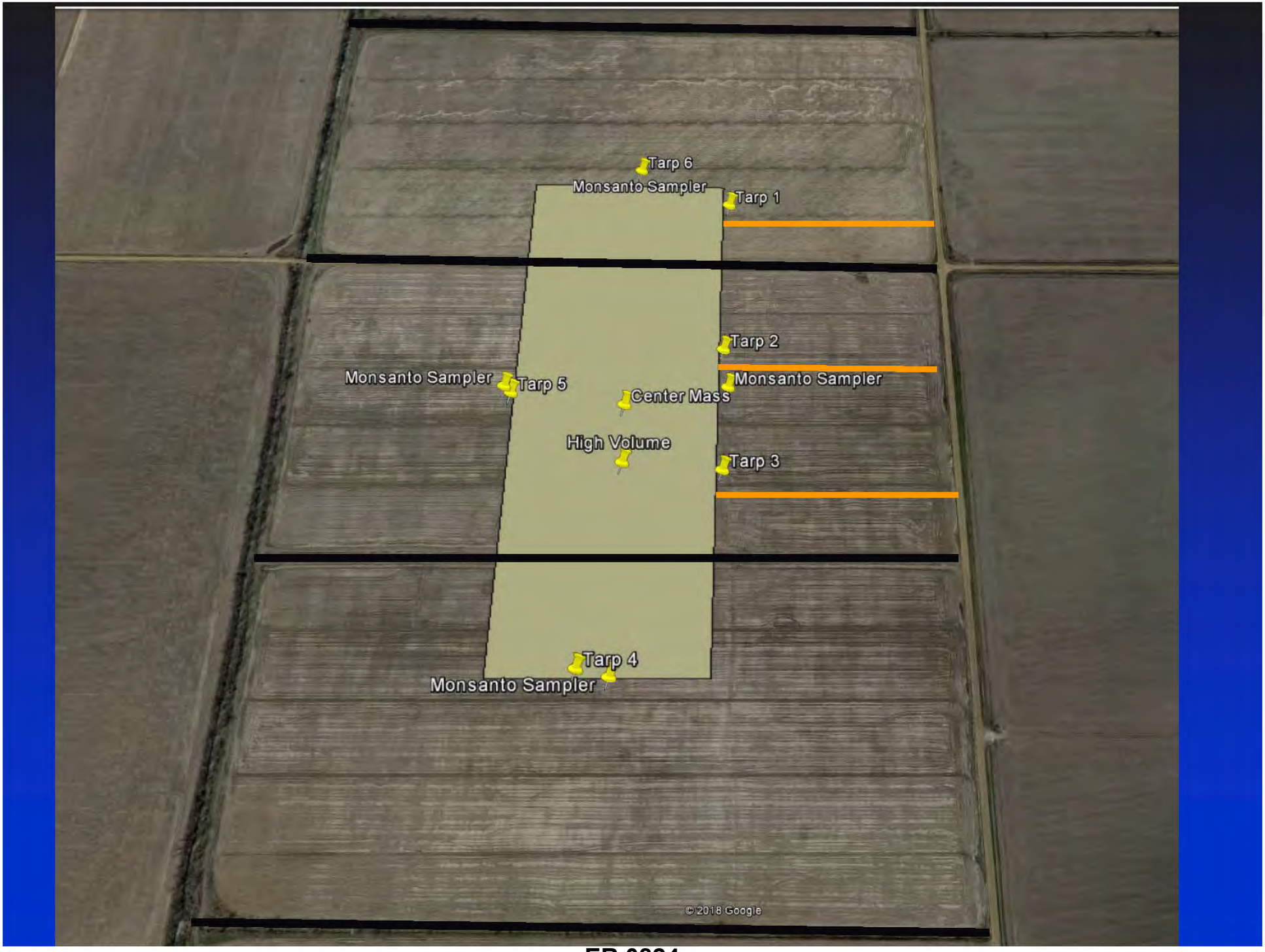
**Cooperators:** Mike &

**Treatment:**
XtendiMax + Roundup

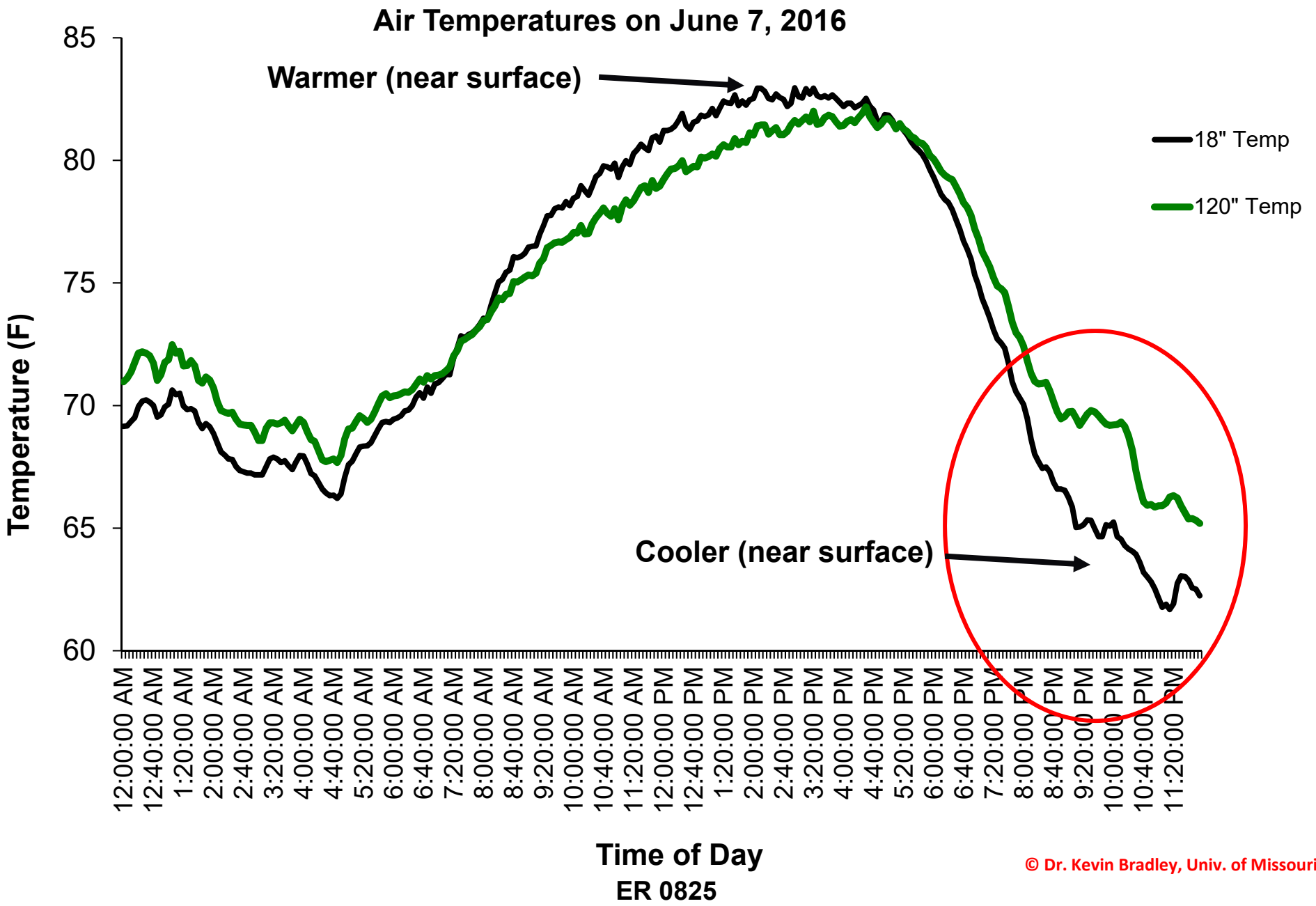



**From July 9 at 1:00 PM – July 16 at 2:58 PM there were no sustained wind speeds above 3 mph for a sufficient period to spray**

**Application made July 16 at 2:58 PM**

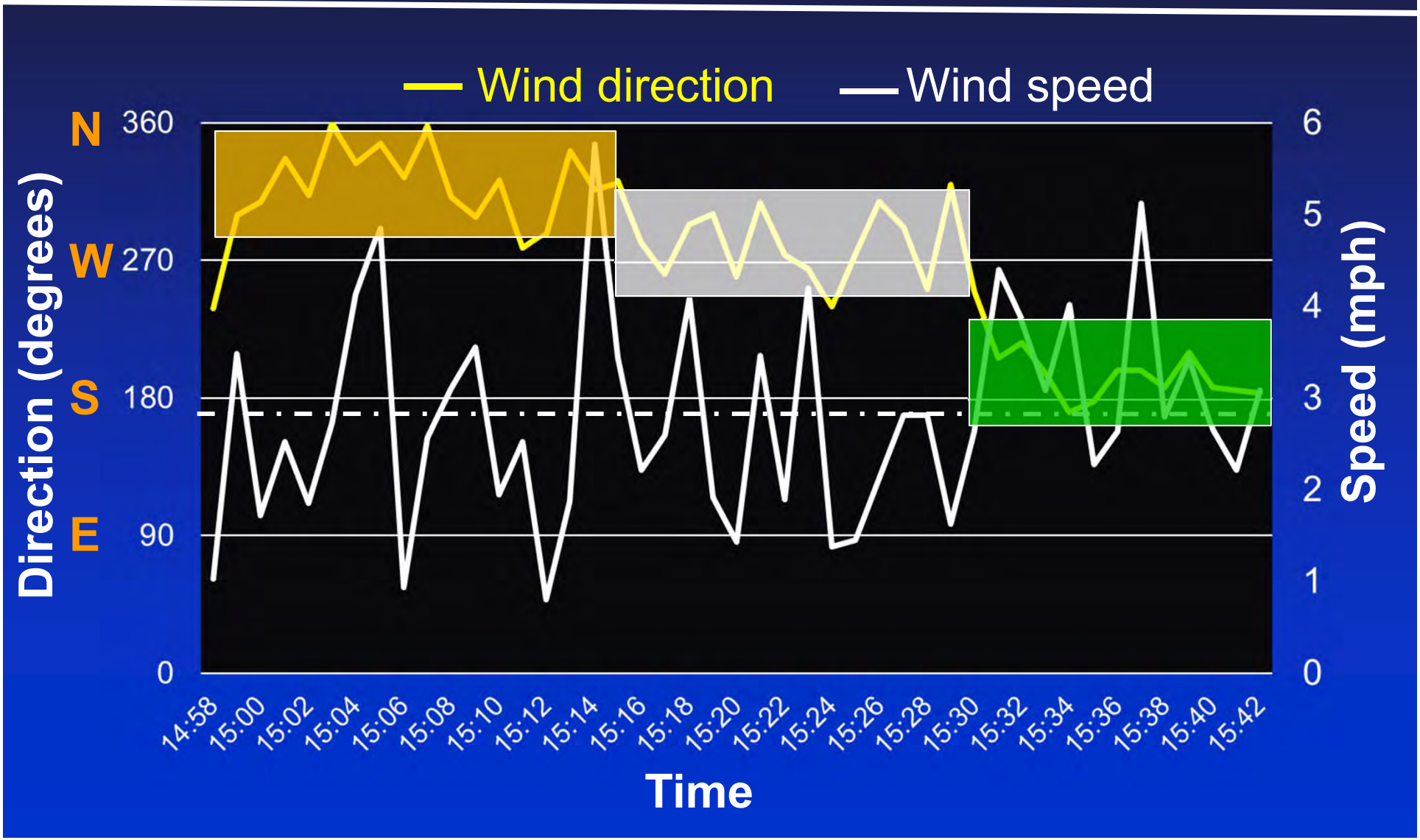

Tarp 6
Monsanto Sampler
Tarp 1
Tarp 2
Monsanto Sampler
Monsanto Sampler
Tarp 5
Center Mass
High Volume
Tarp 3
Tarp 4
Monsanto Sampler
© 2018 Google

# An Example Temperature Inversion in Southeast Missouri in 2016



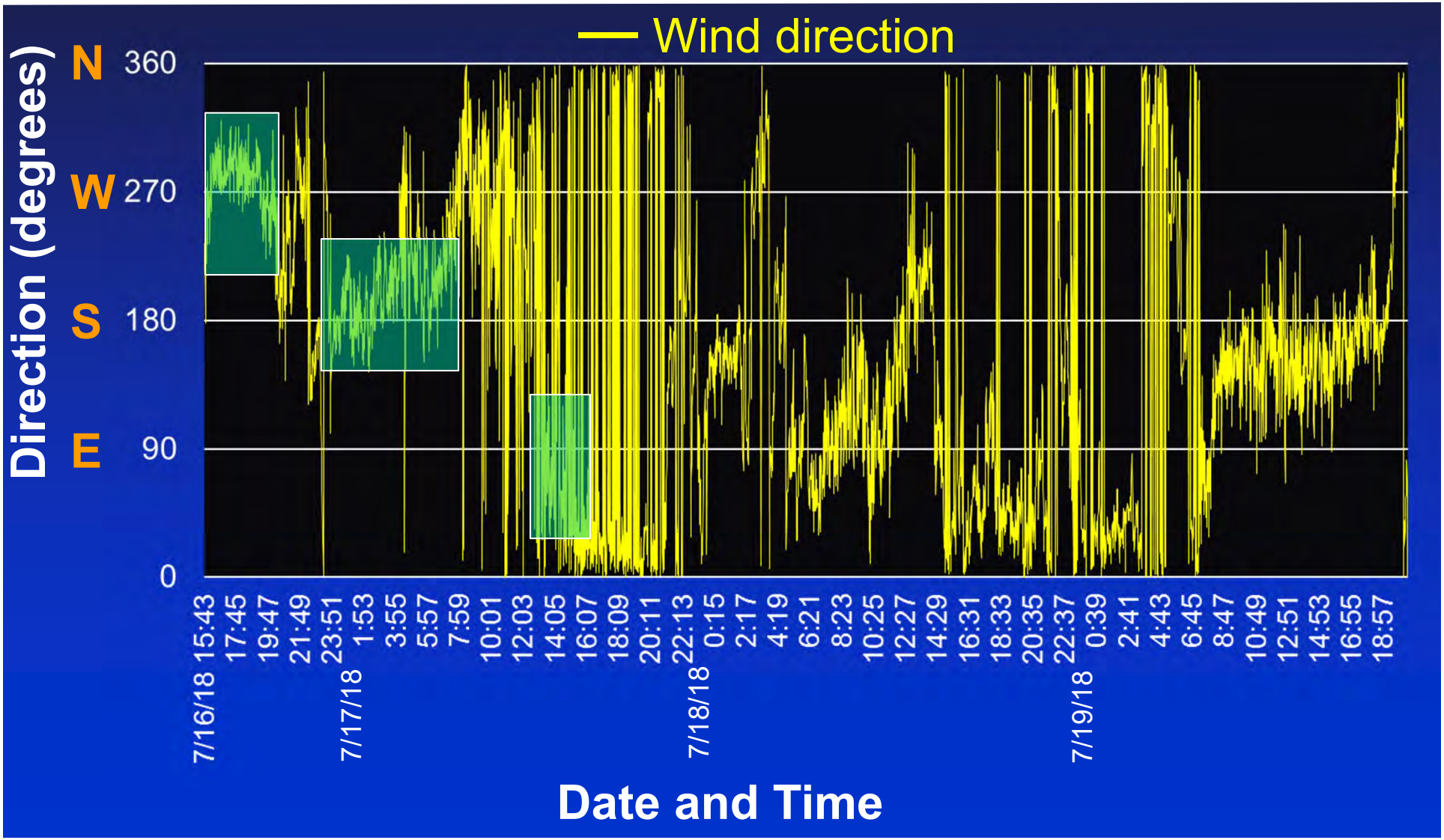
# Temperature During and After Application

# Wind Direction and Speed During Application at Boom Height



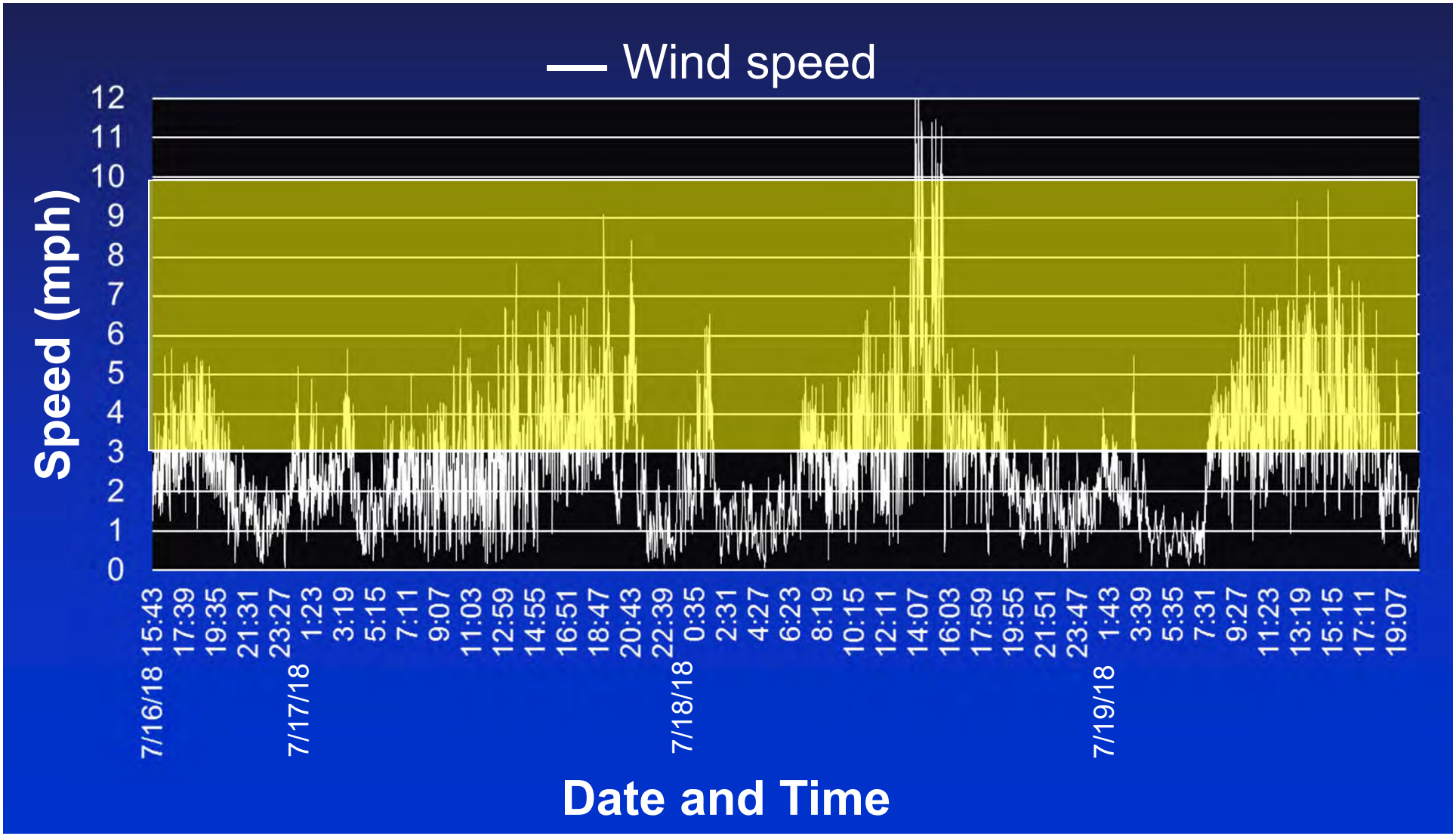

ER 0827

# Wind Direction Following Application at Boom Height



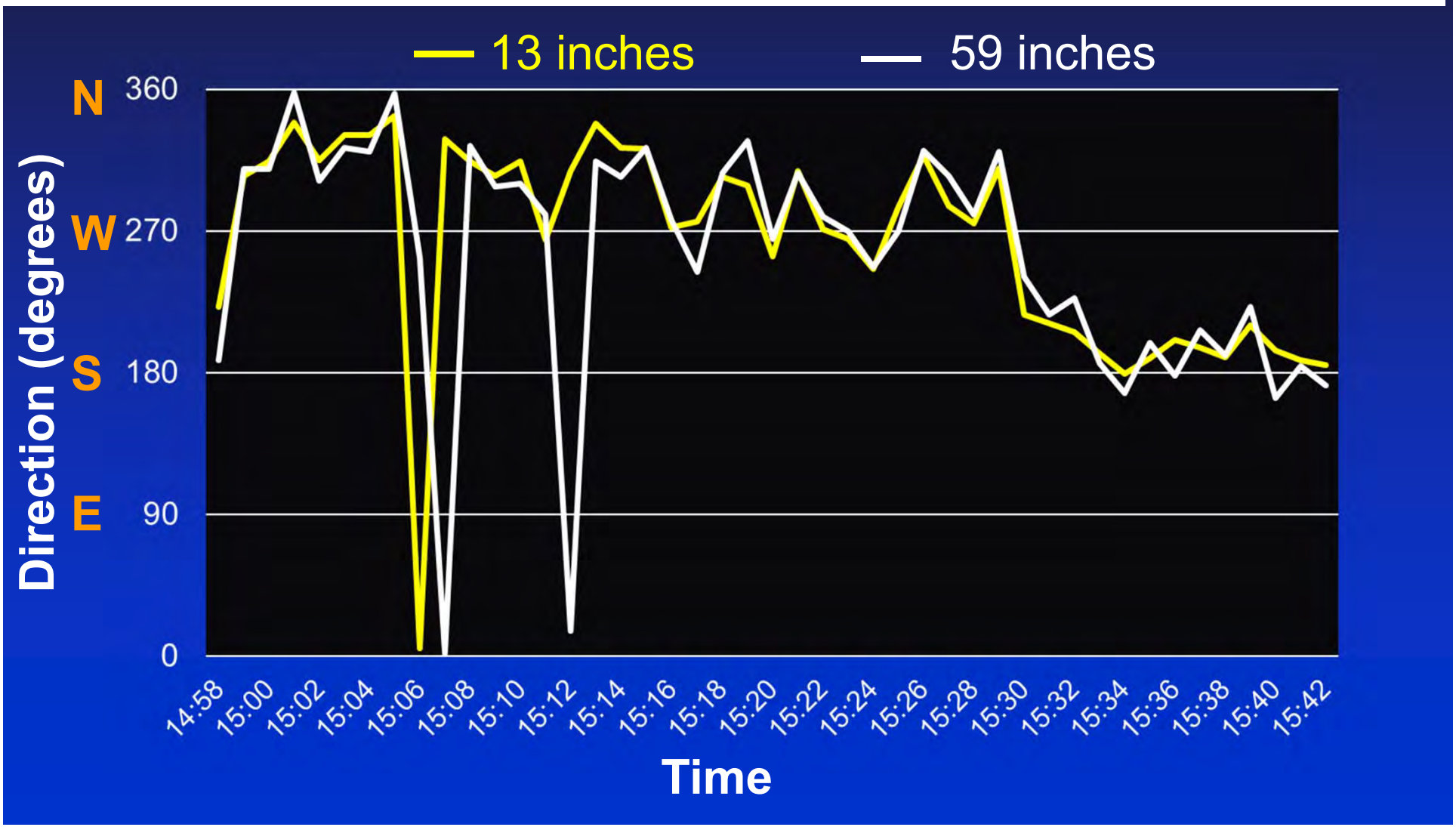

ER 0829

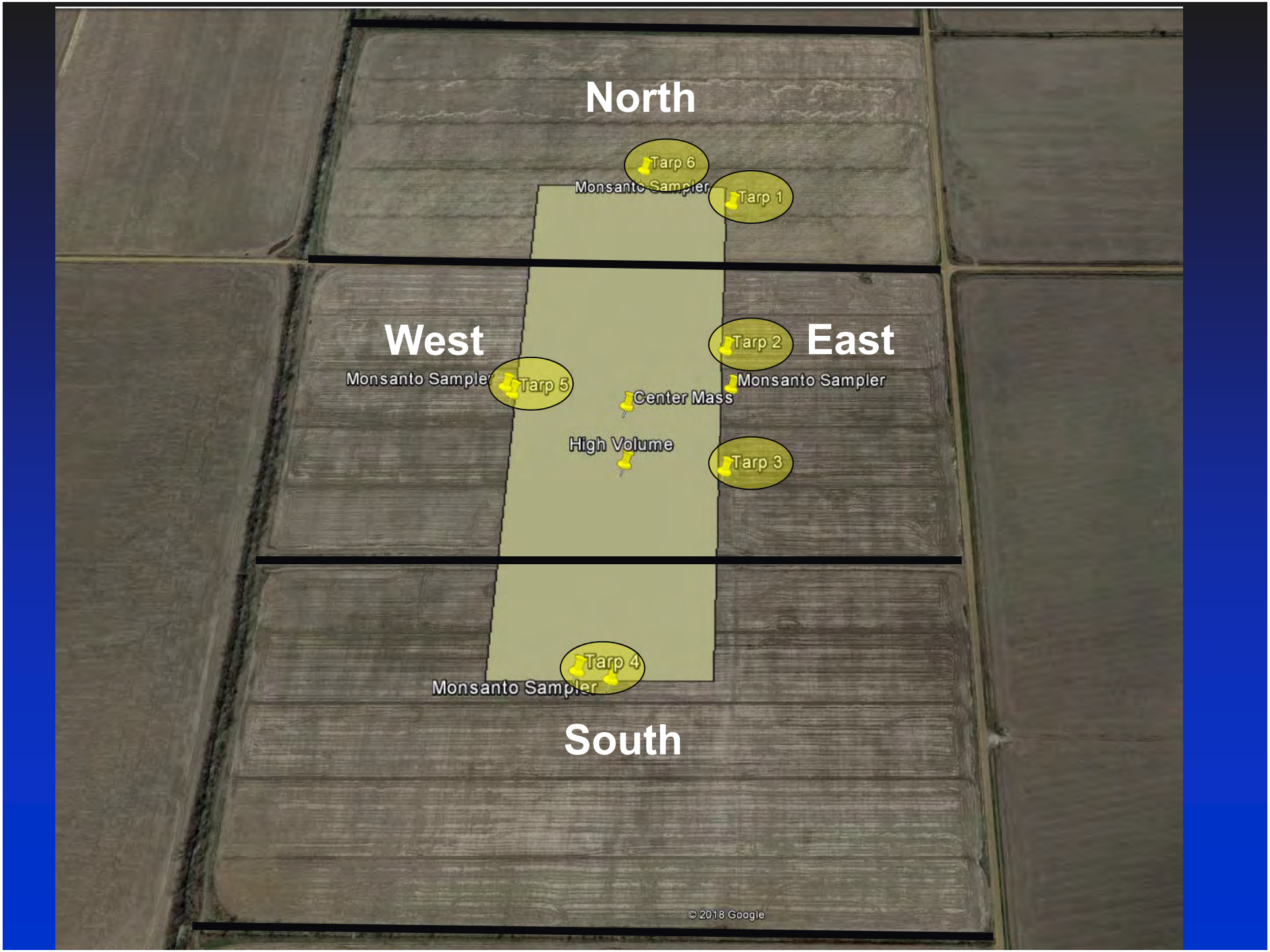
# Wind Speed Following Application at Boom Height



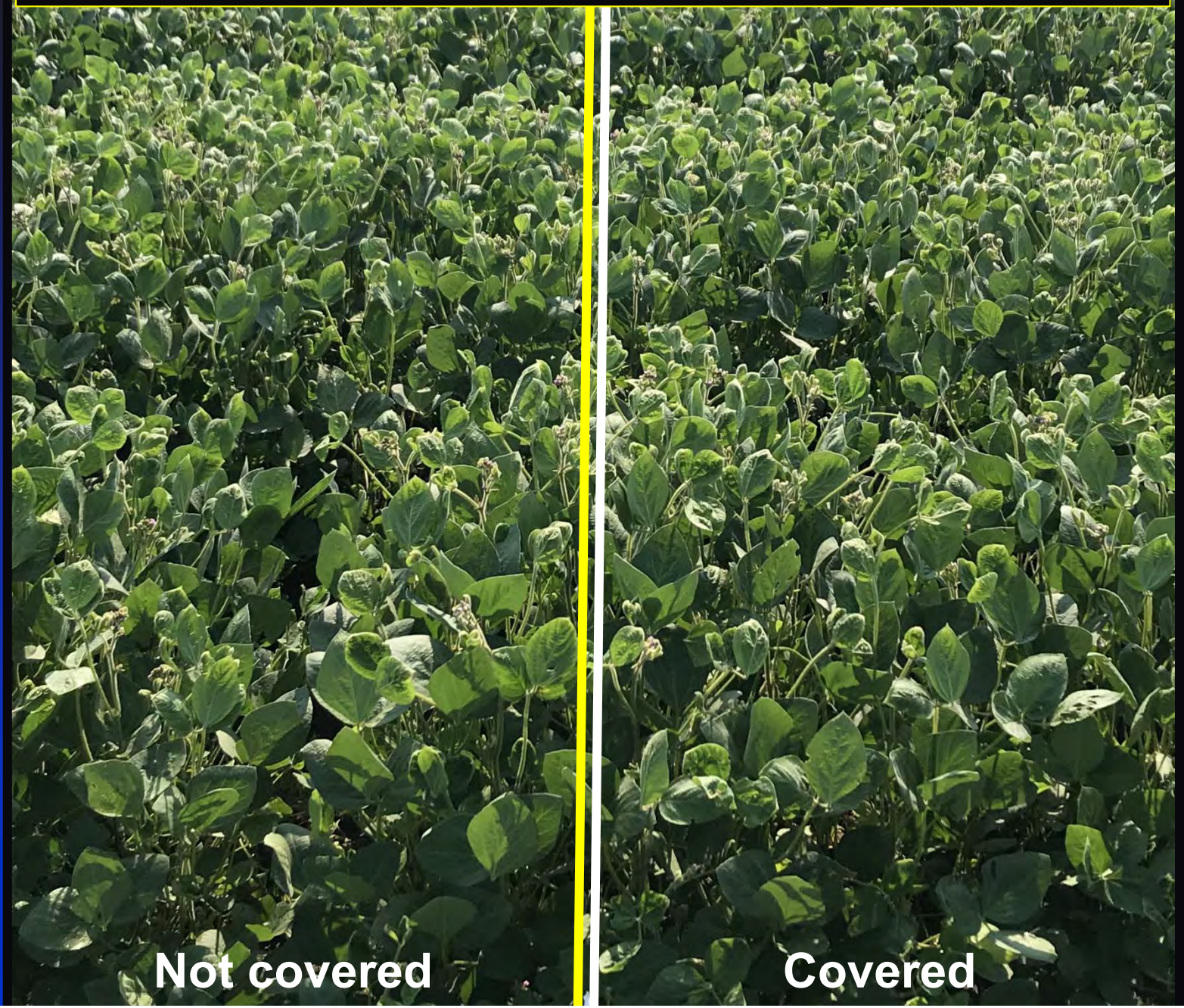

ER 0830

# Wind Direction at Two Heights During Application

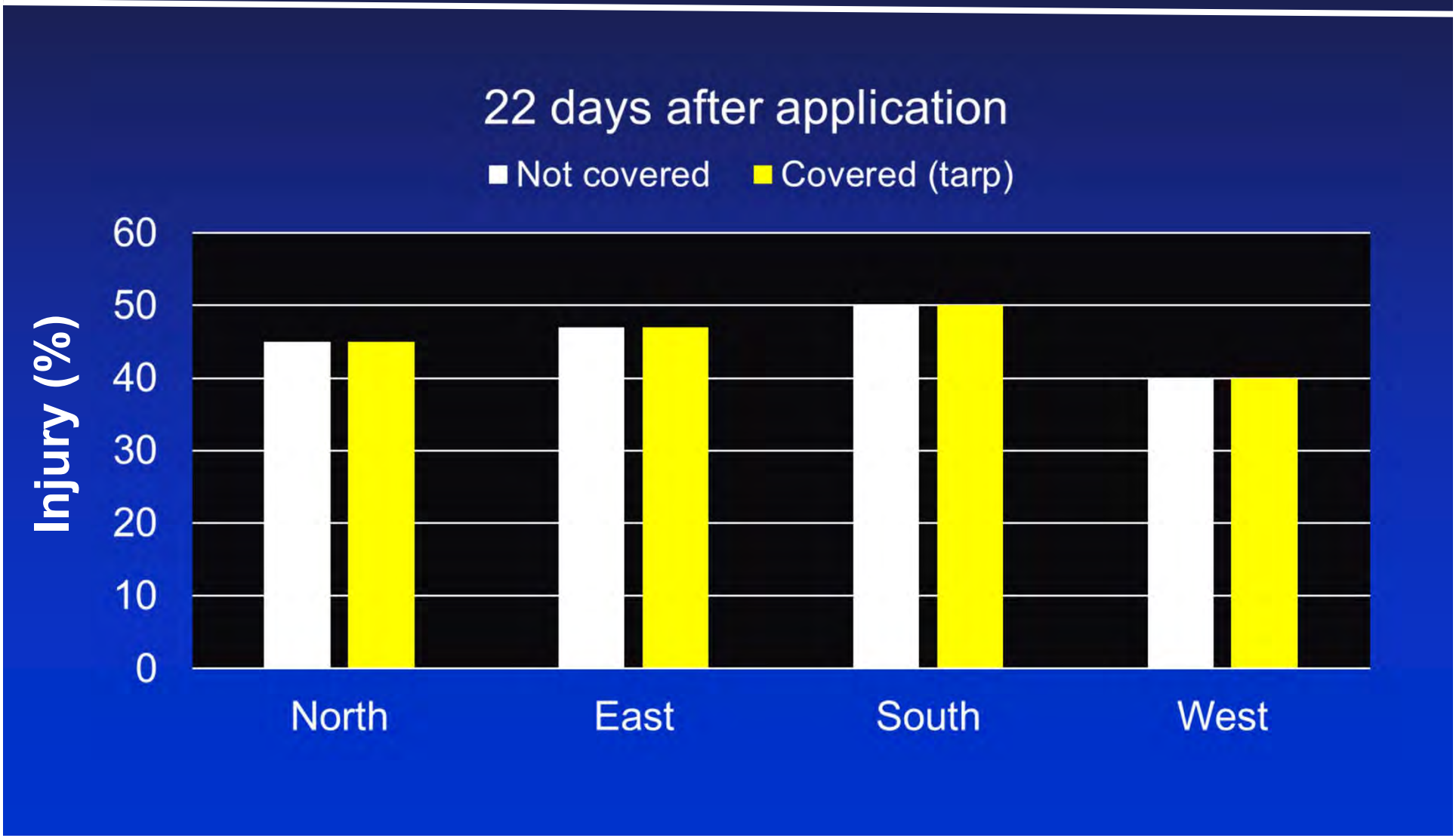




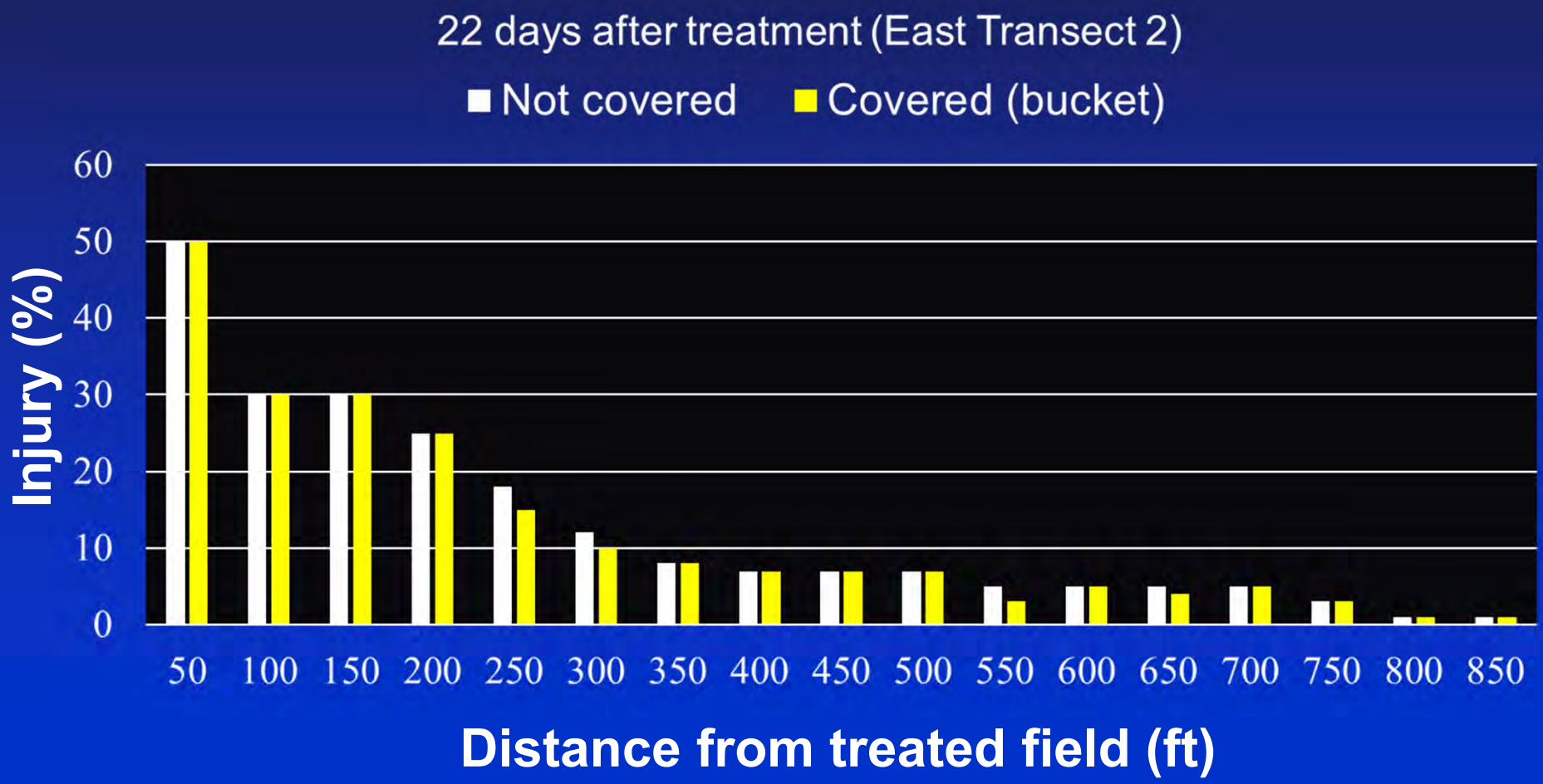
# Tarp Covered Soybean Outside Treated Area

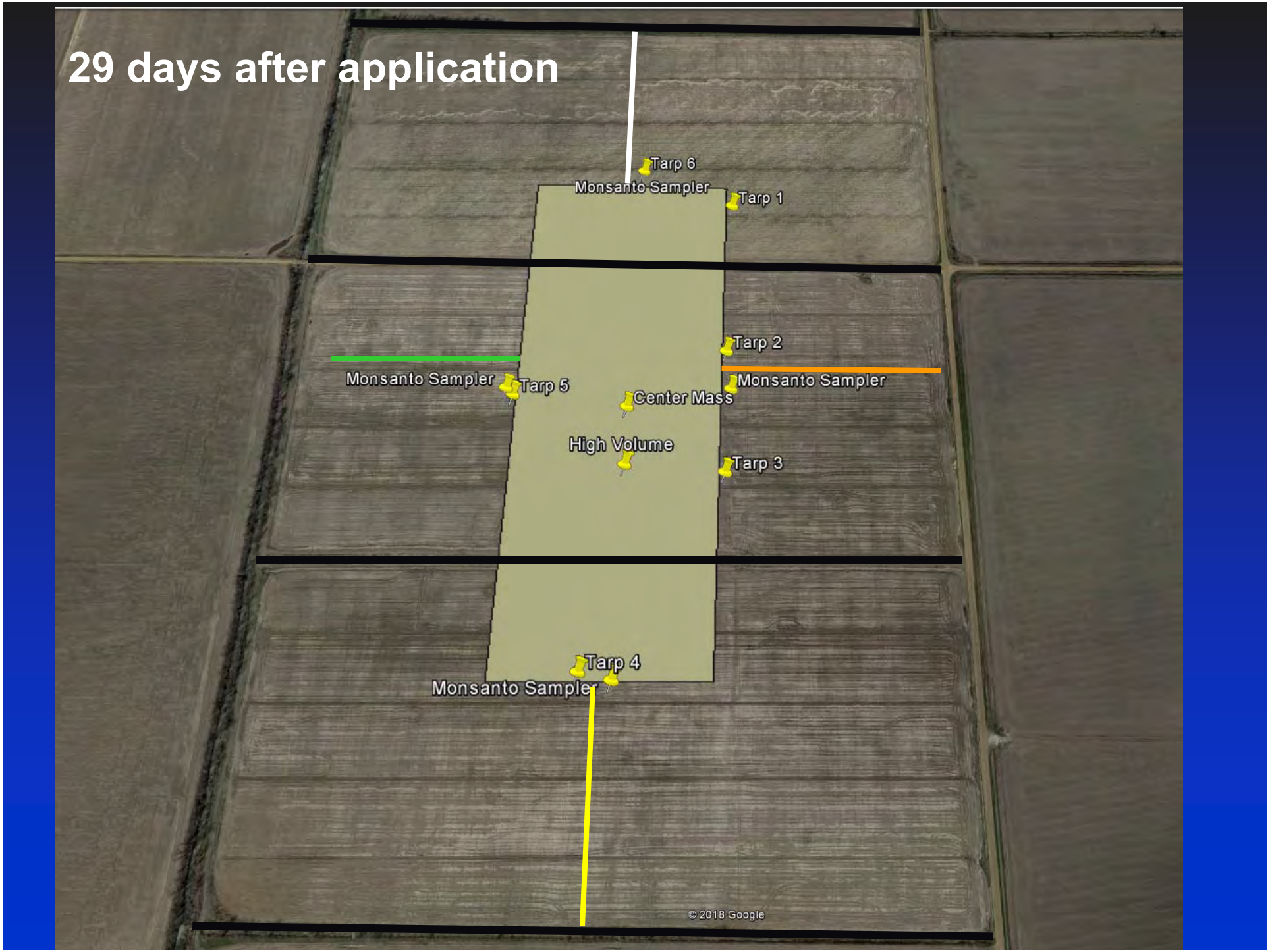


# Injury to Soybean Adjacent to and Beneath Tarps

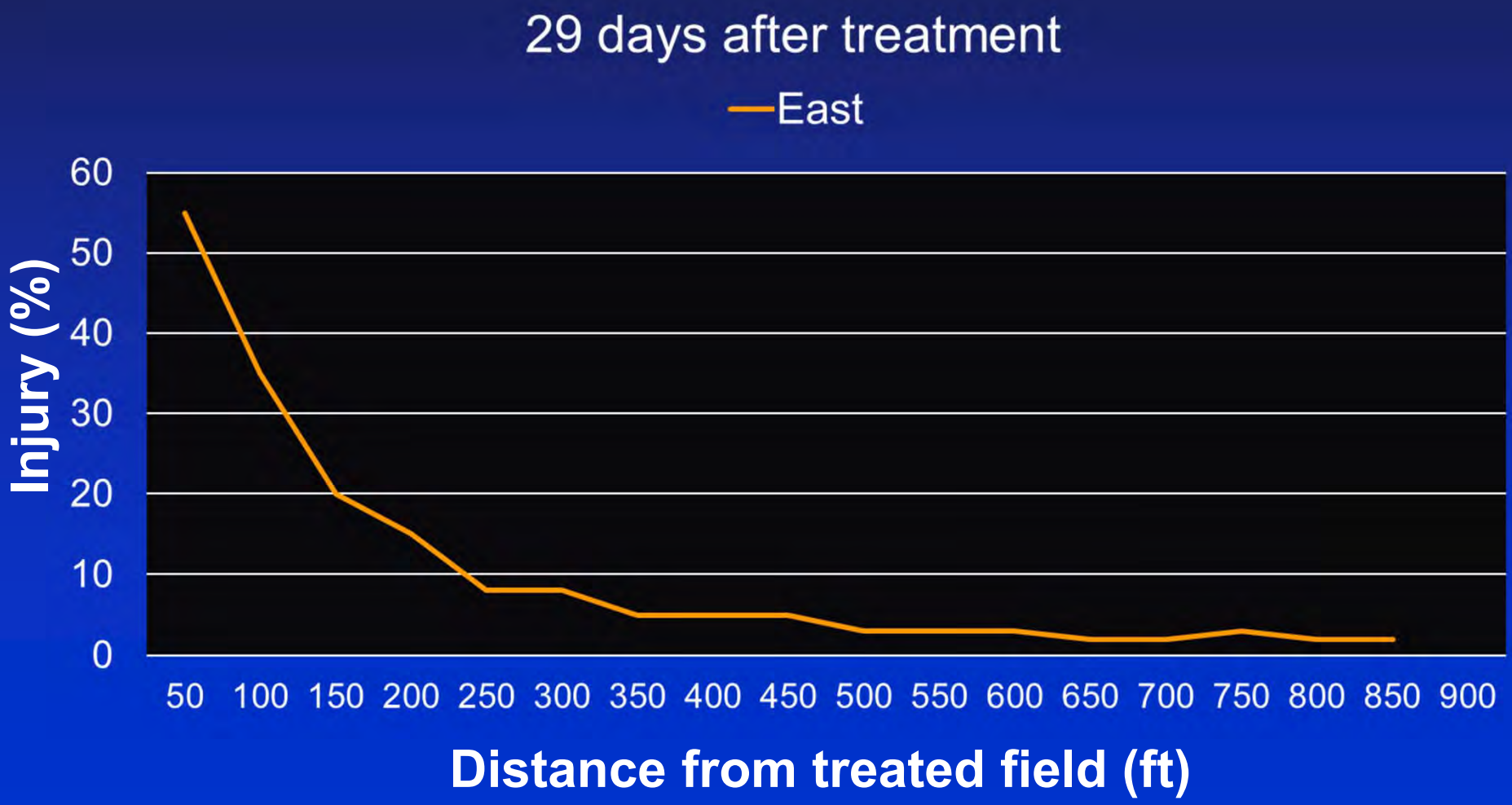


# Contribution of Secondary Movement to Overall Soybean Injury

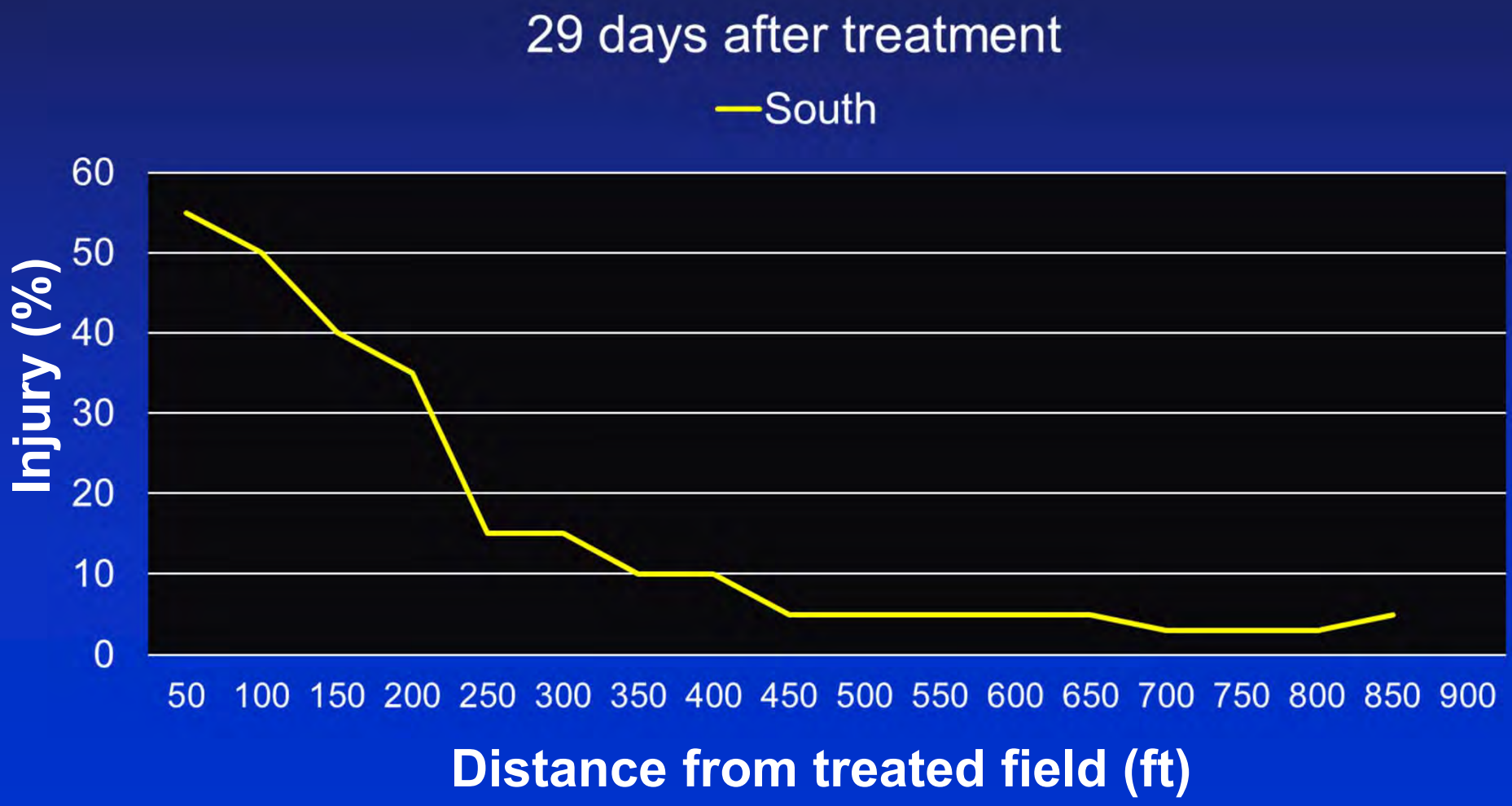




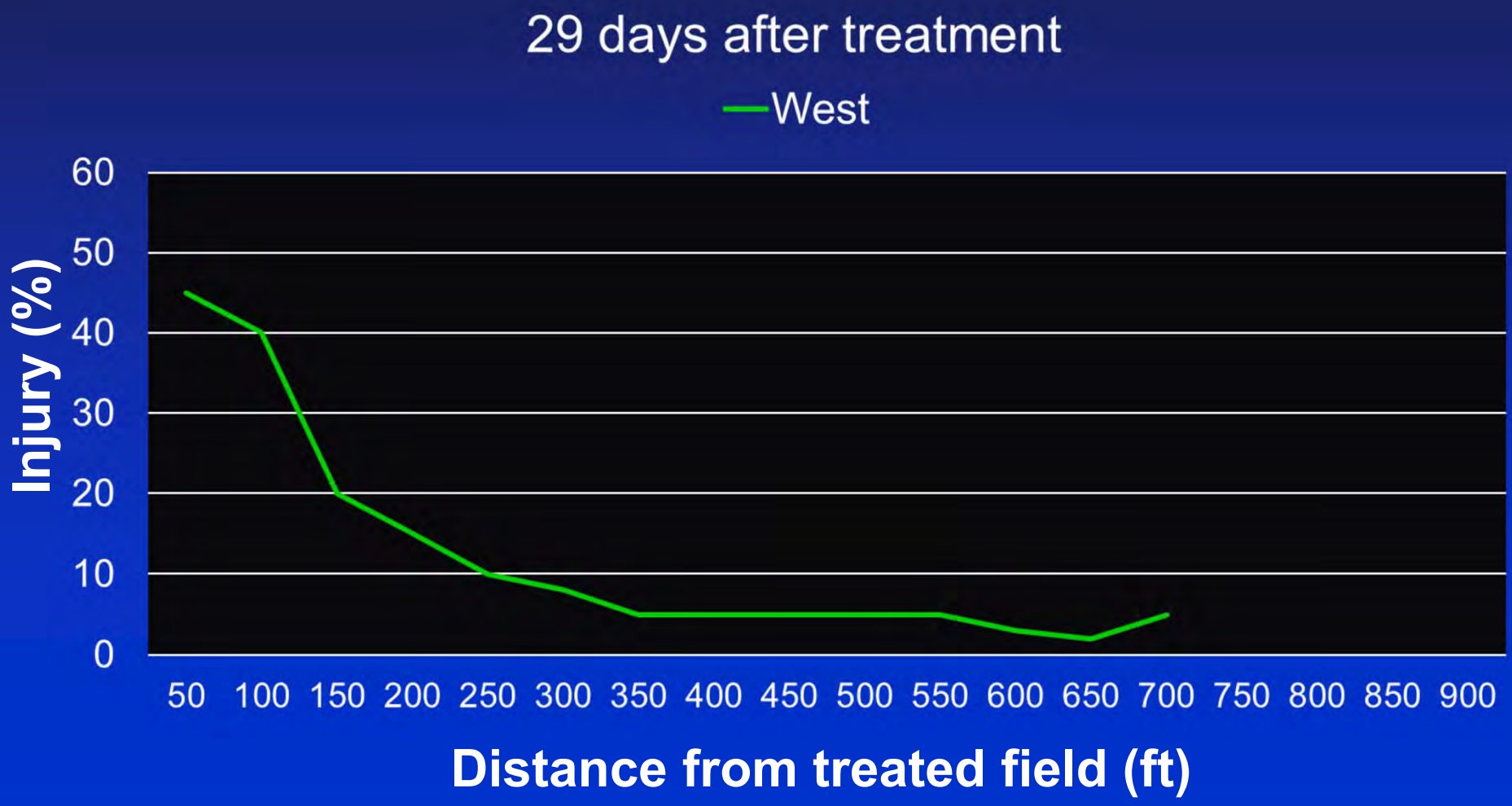
# Injury to Soybean on East of Treated Field



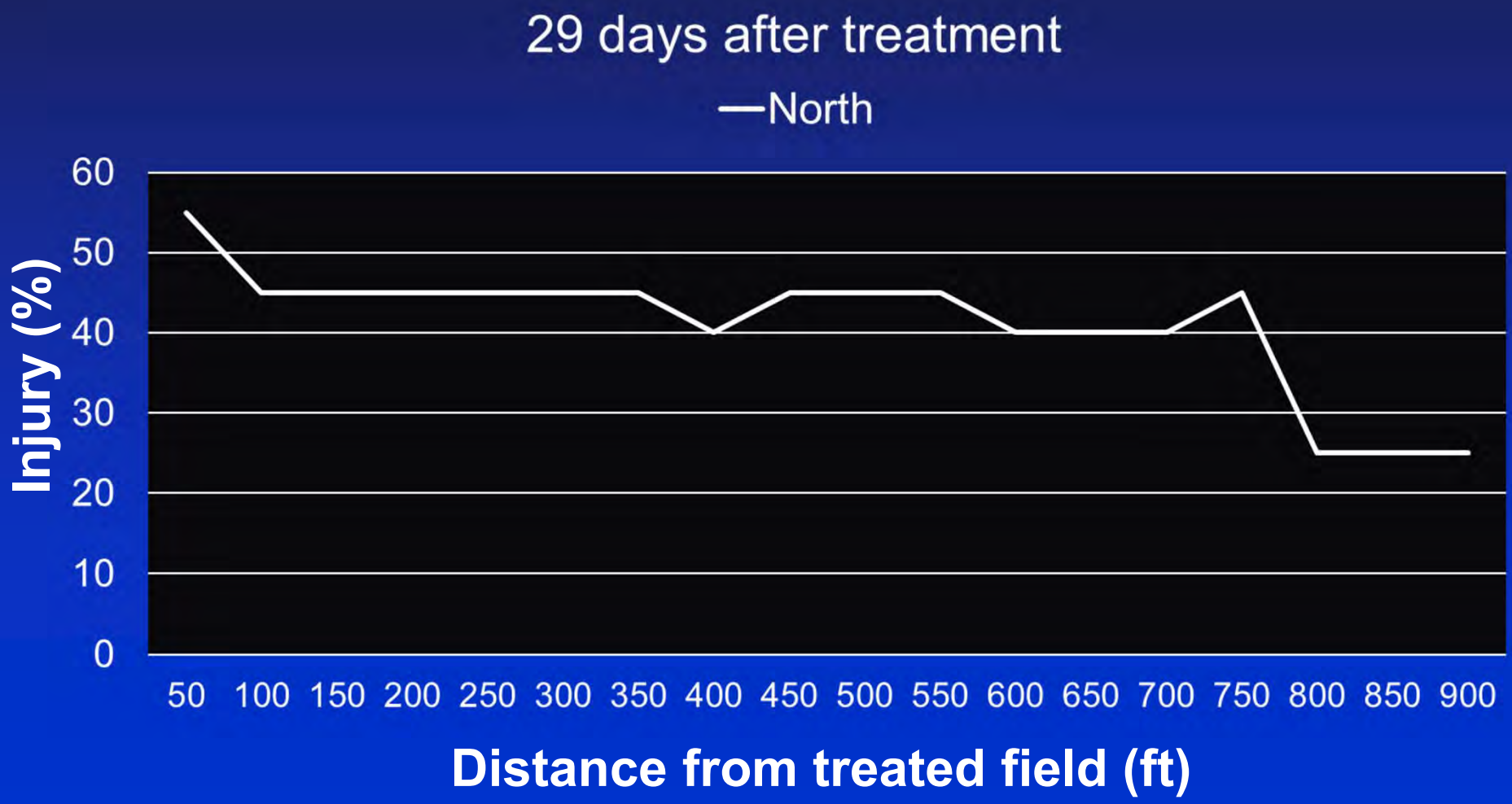
# Injury to Soybean on South Side of Treated Field



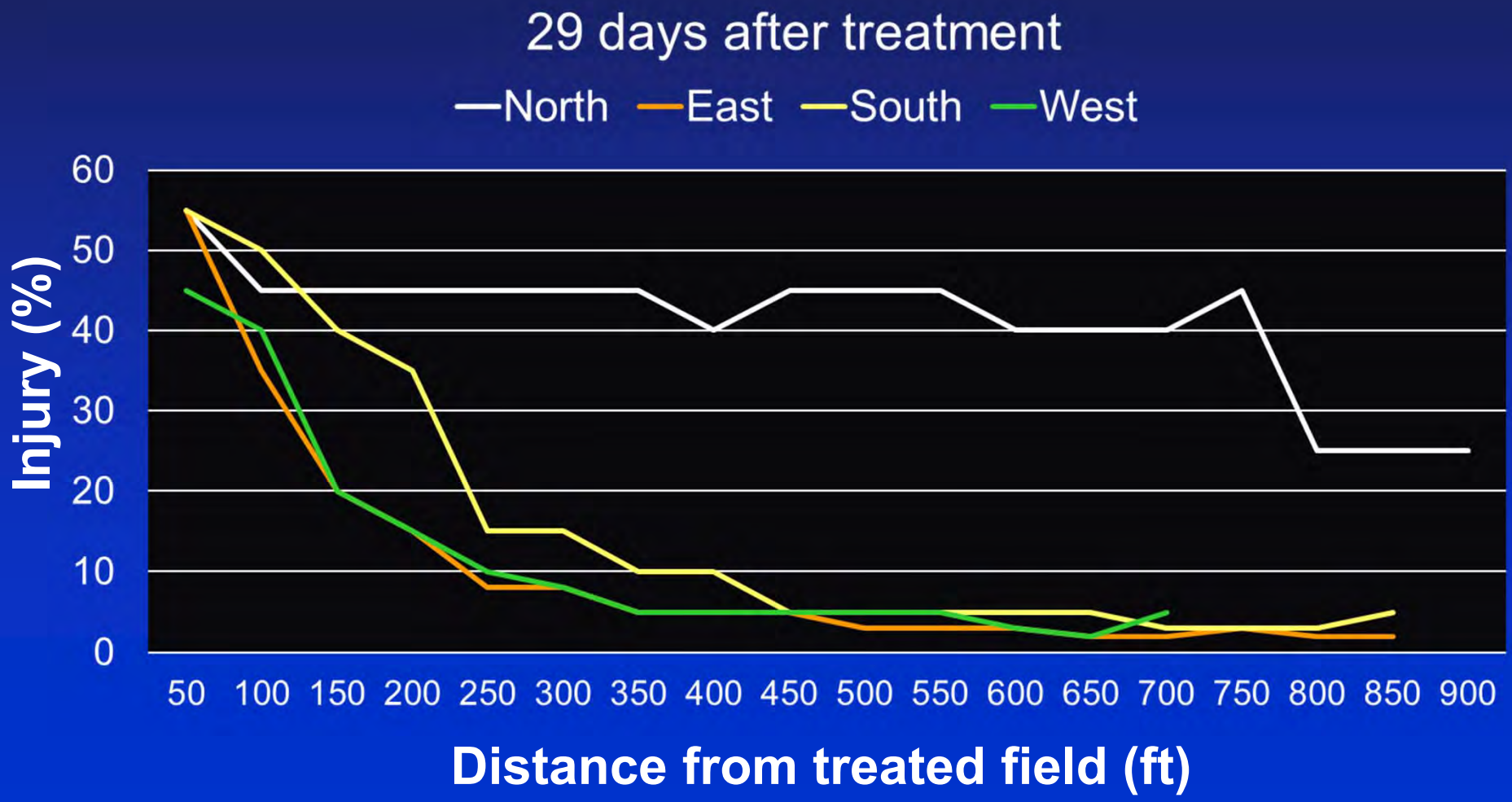
# Injury to Soybean on West Side of Treated Field

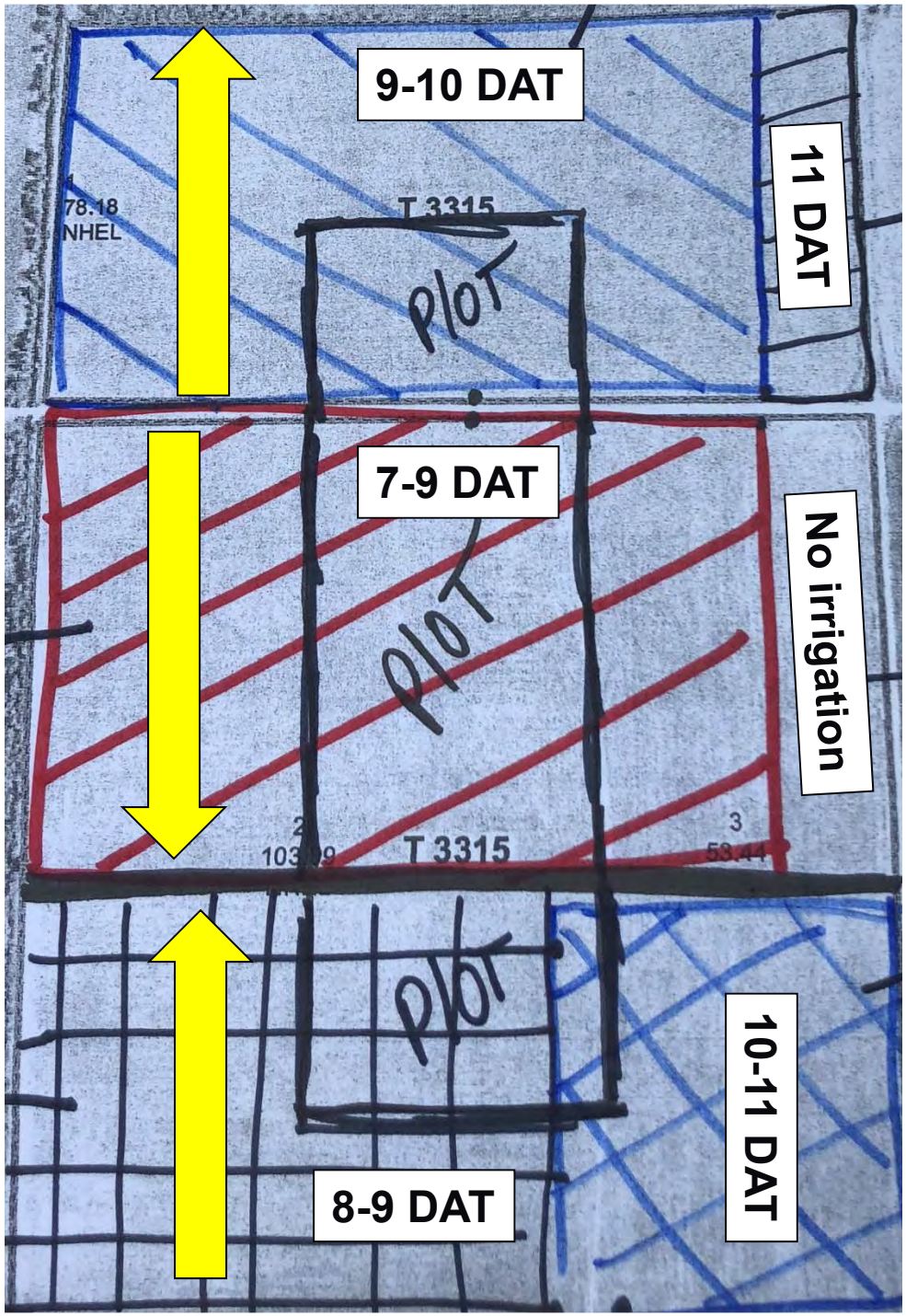


# Injury to Soybean on North Side of Treated Field



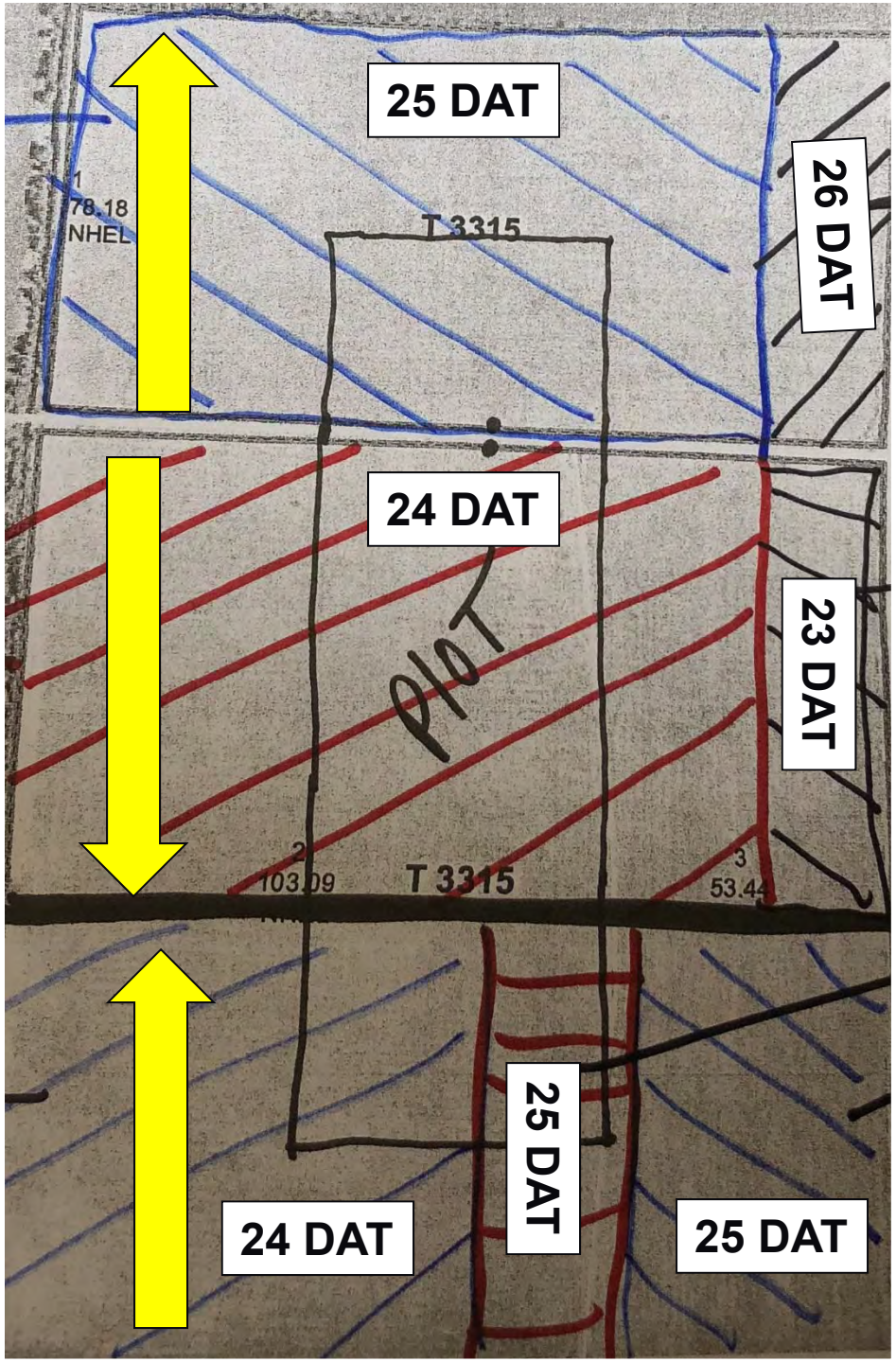
# Injury to Soybean on Each Side of Treated Field






# Irrigation Schedule

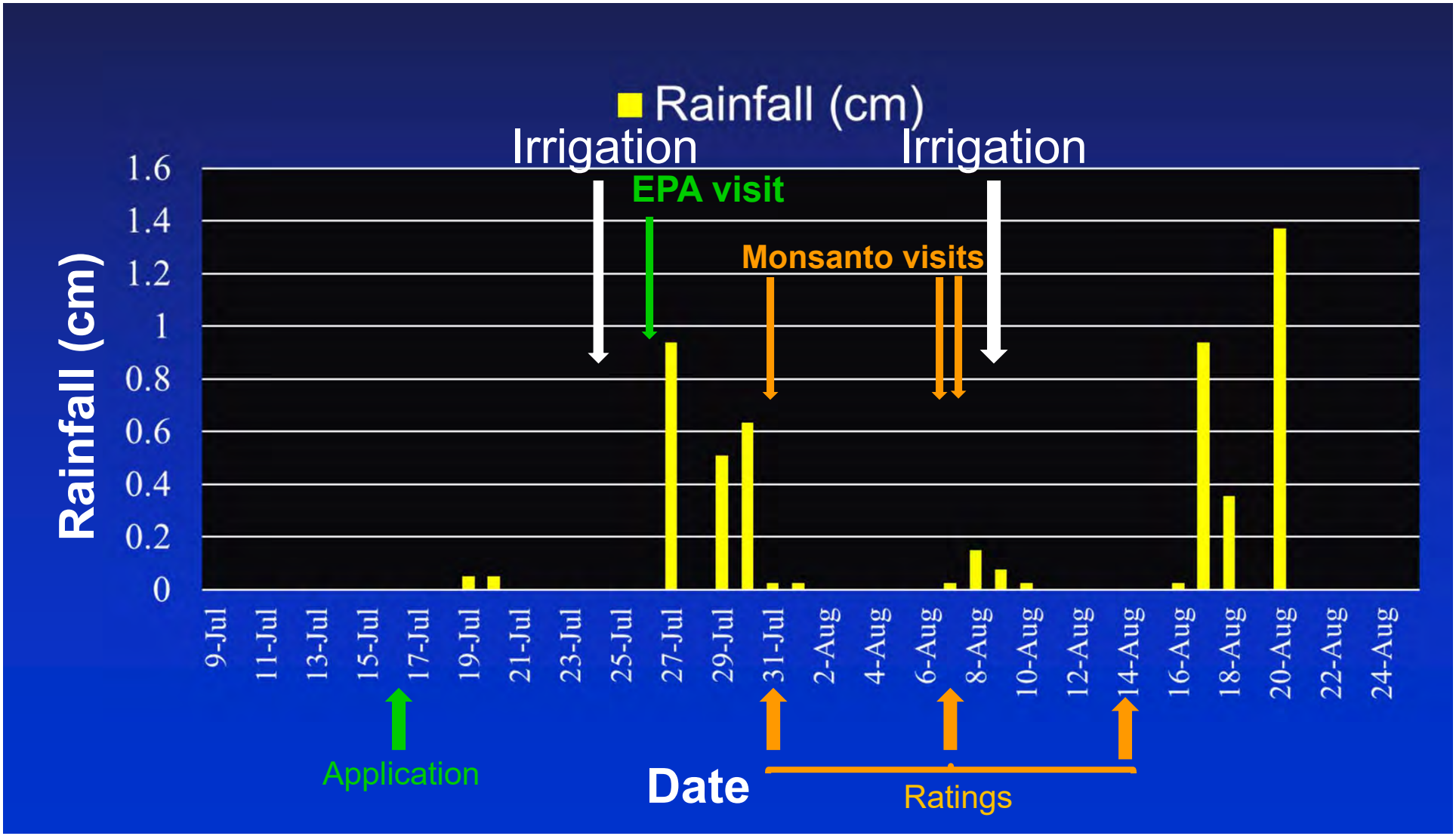
## Plot sprayed July 16




# Irrigation Schedule

## Plot sprayed July 16

# Rainfall, Irrigation, & Field Visits

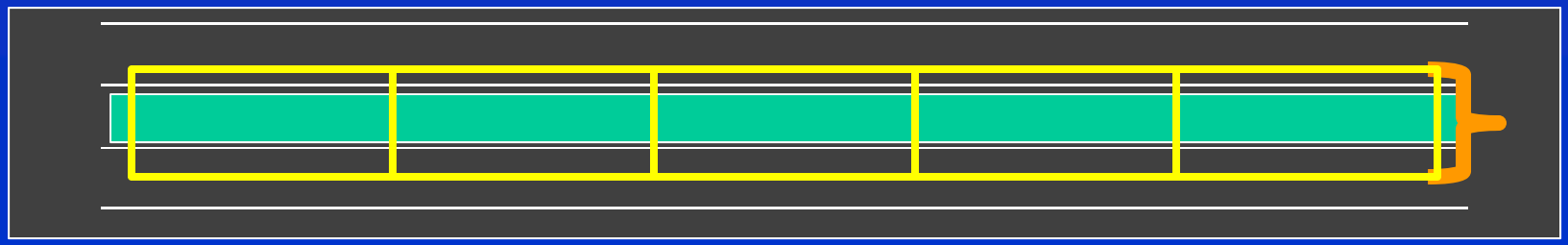


# Takeaways from Trial

- Symptomology observed on all four sides of field
- Secondary movement contributed greatly to observed damage
  - Volatility
  - Irrigation and possibly rainfall
- Damaged area from dicamba exceeded size of treated area

# Irrigation with Contaminated Tailwater

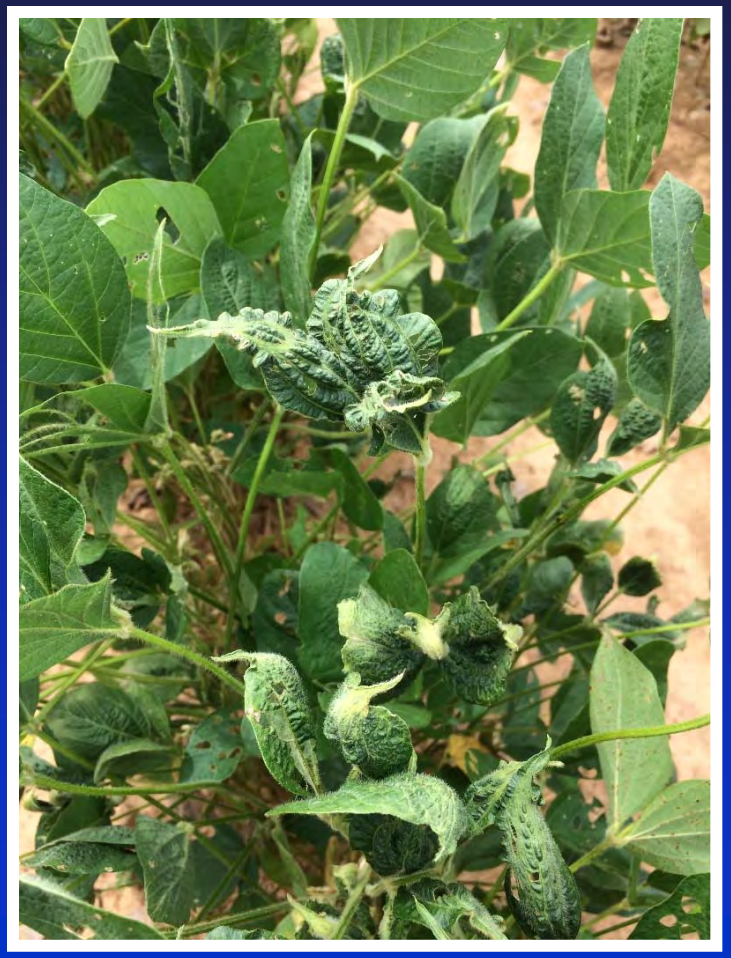
- Dicamba dissolved in irrigation water at five known concentrations
- Applied as 1 acre inch of water via furrow irrigation
  - Held water on field with in-furrow soil dams to facilitate timely application of all treatments
- Ratings collected from zones within a furrow
  - Mid-furrow ratings represent “average” impact
  - Bottom of furrow ratings represent max impact

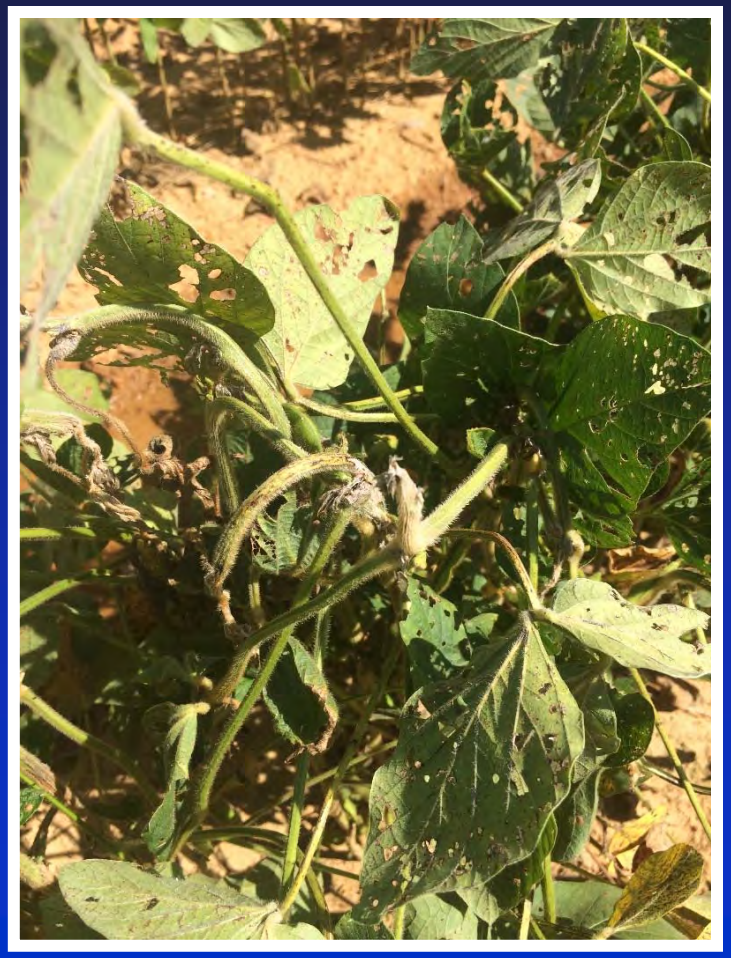


# Damage from dicamba in irrigation water applied at V3 stage

**None** **0.1 ppm** **0.5 ppm** **5 ppm**

# Dicamba in irrigation water applied at V3 and R1 growth stages





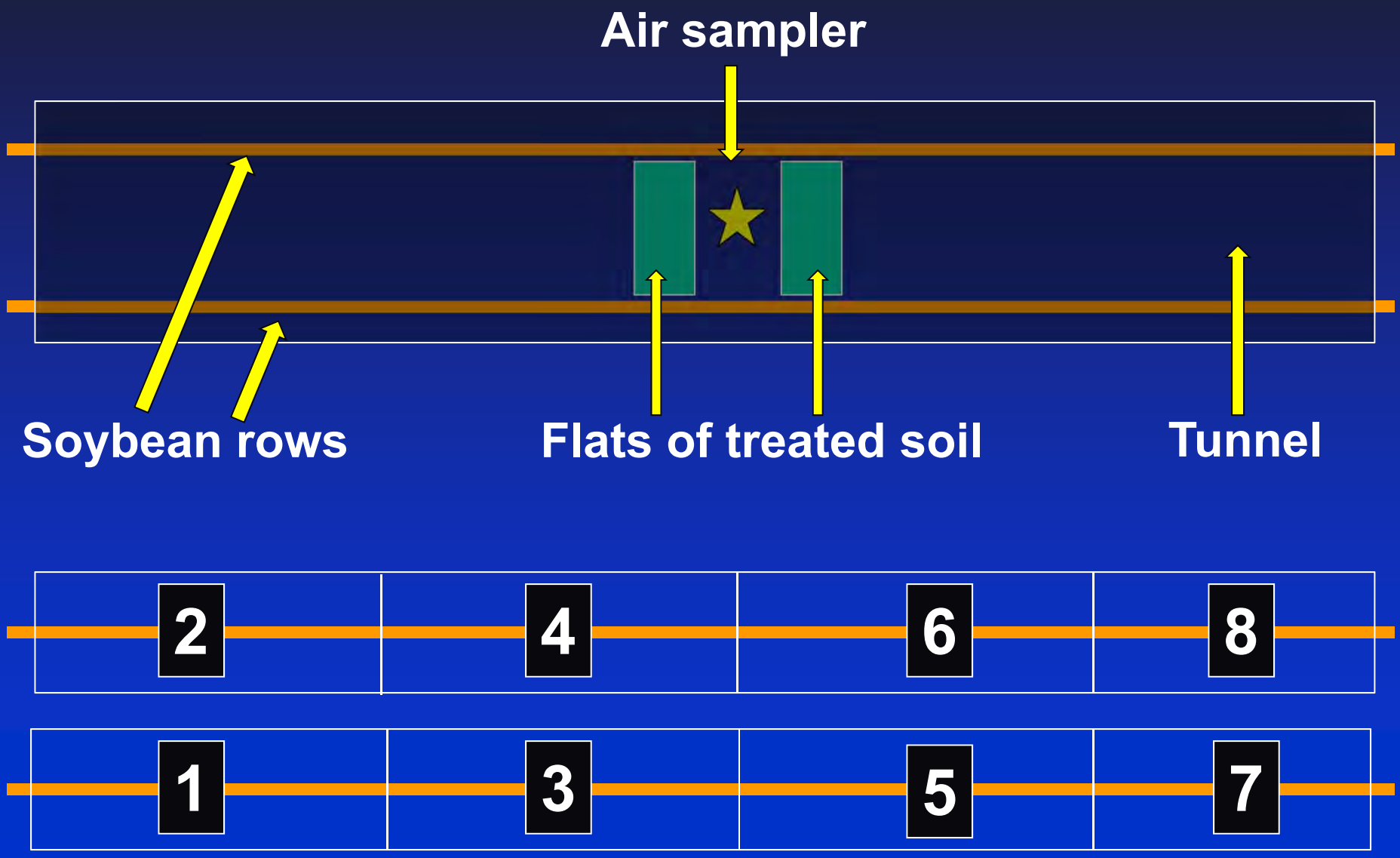
**V3** **0.1 ppm** **R1**

**ER 0851**

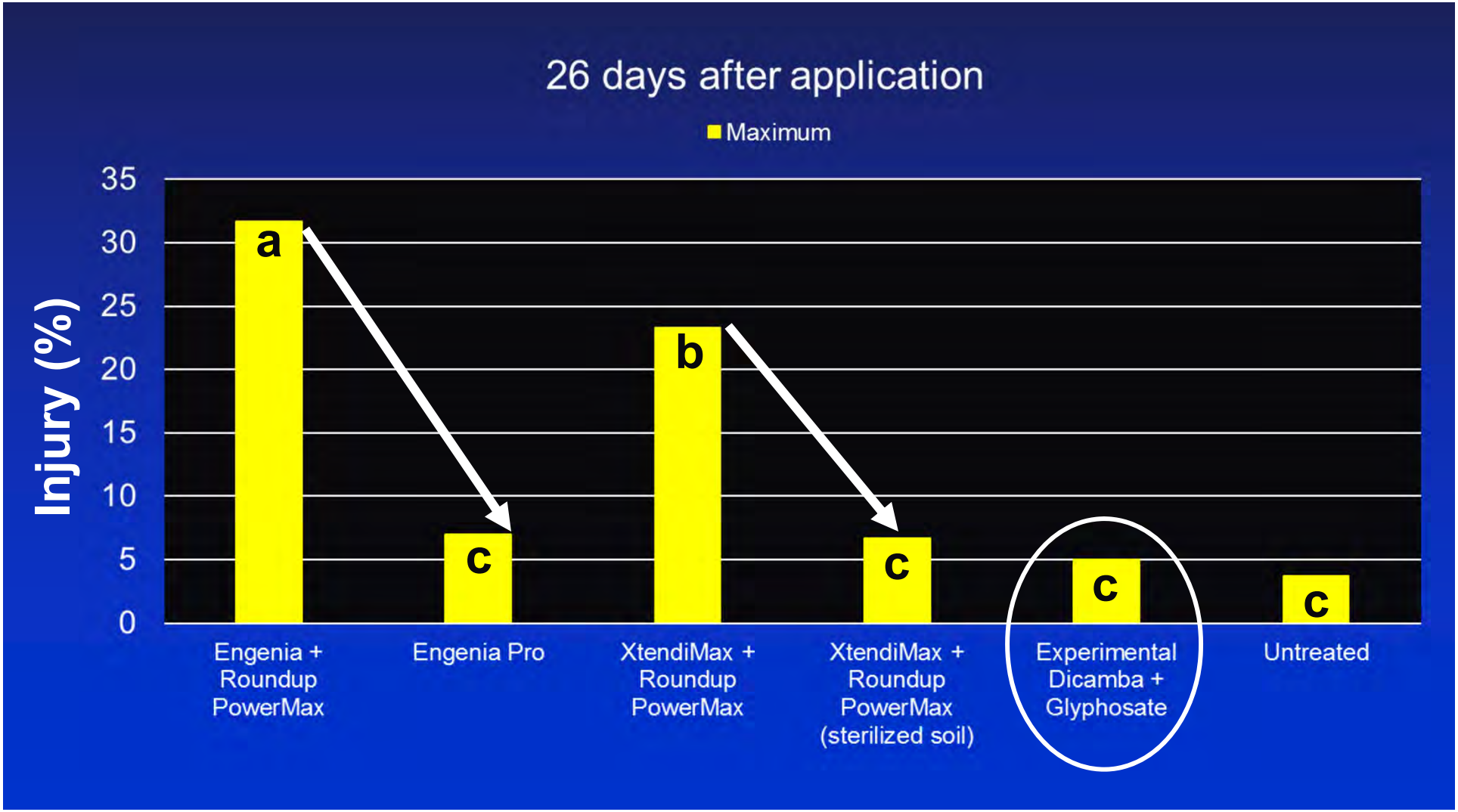
**Symptoms following irrigation with dicamba contaminated water**

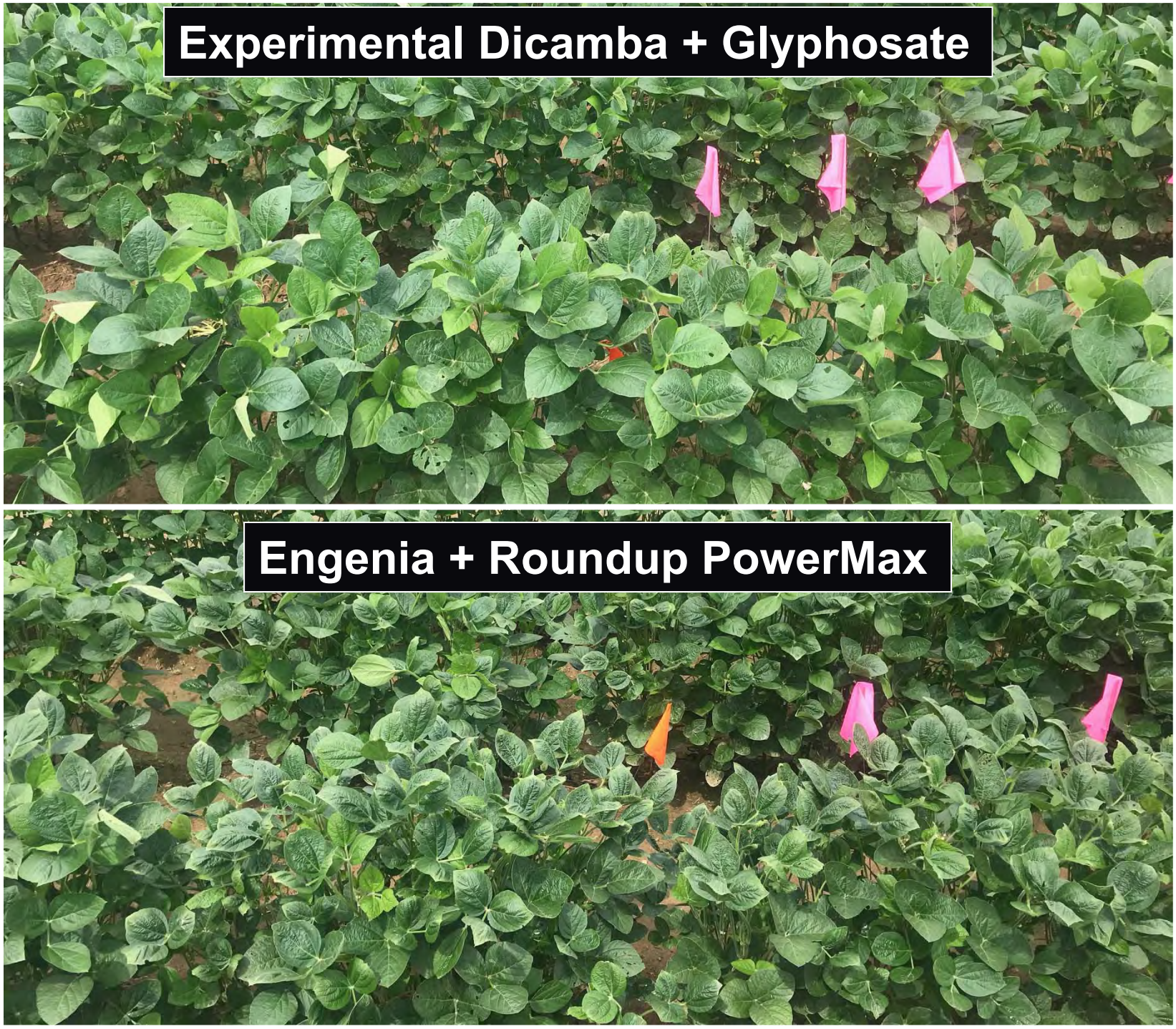
- Objective: Assess relative differences in volatility of auxin products in the field inside of low tunnels
- Location: Fayetteville, Lonoke, & Tillar
- Growth stage: V2 to V6
- Tunnels and treated soil removed 48 hours after application

# Low Tunnel Volatility Setup



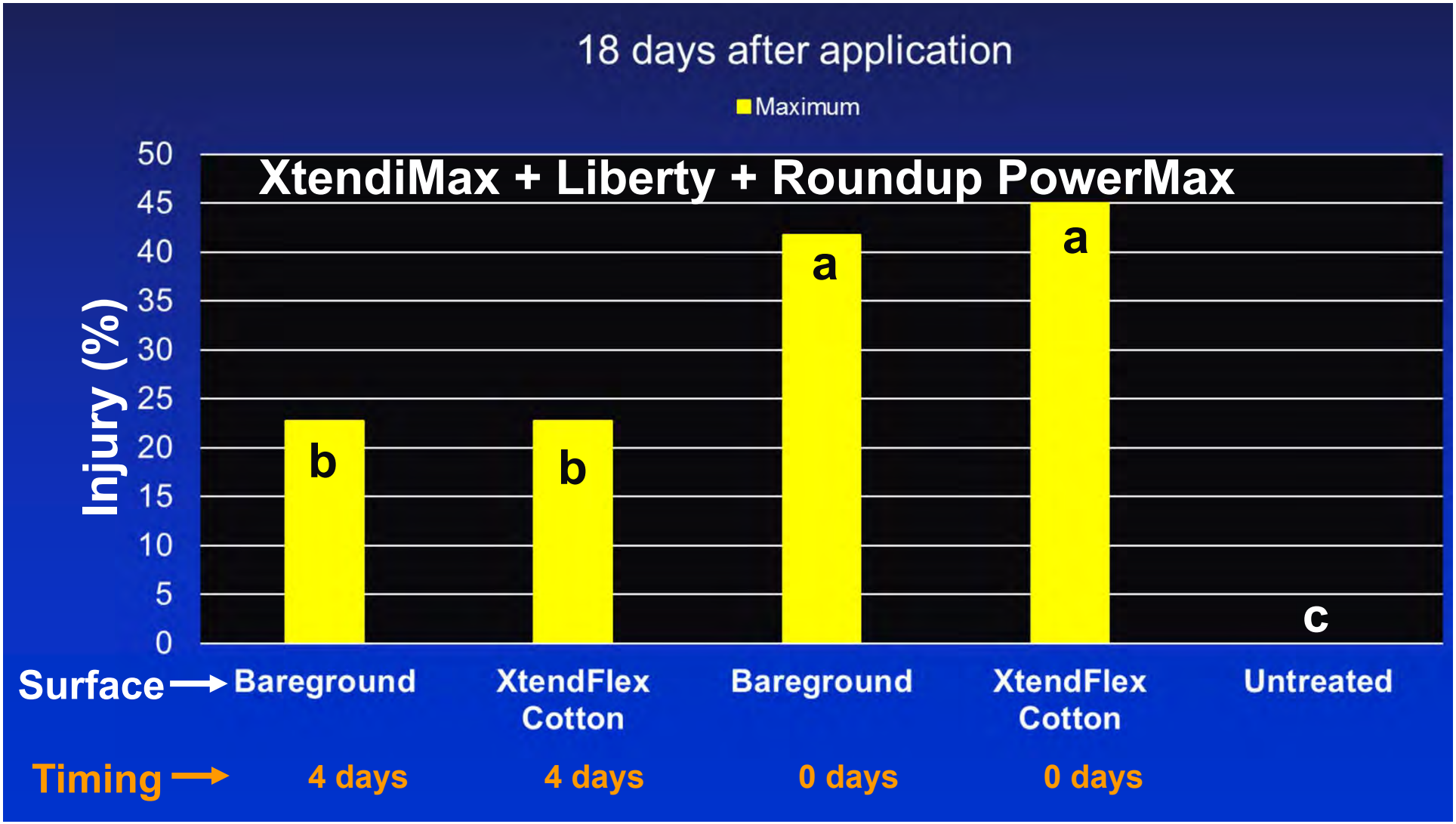
# Low Tunnel Volatility Evaluation of Dicamba Formulations



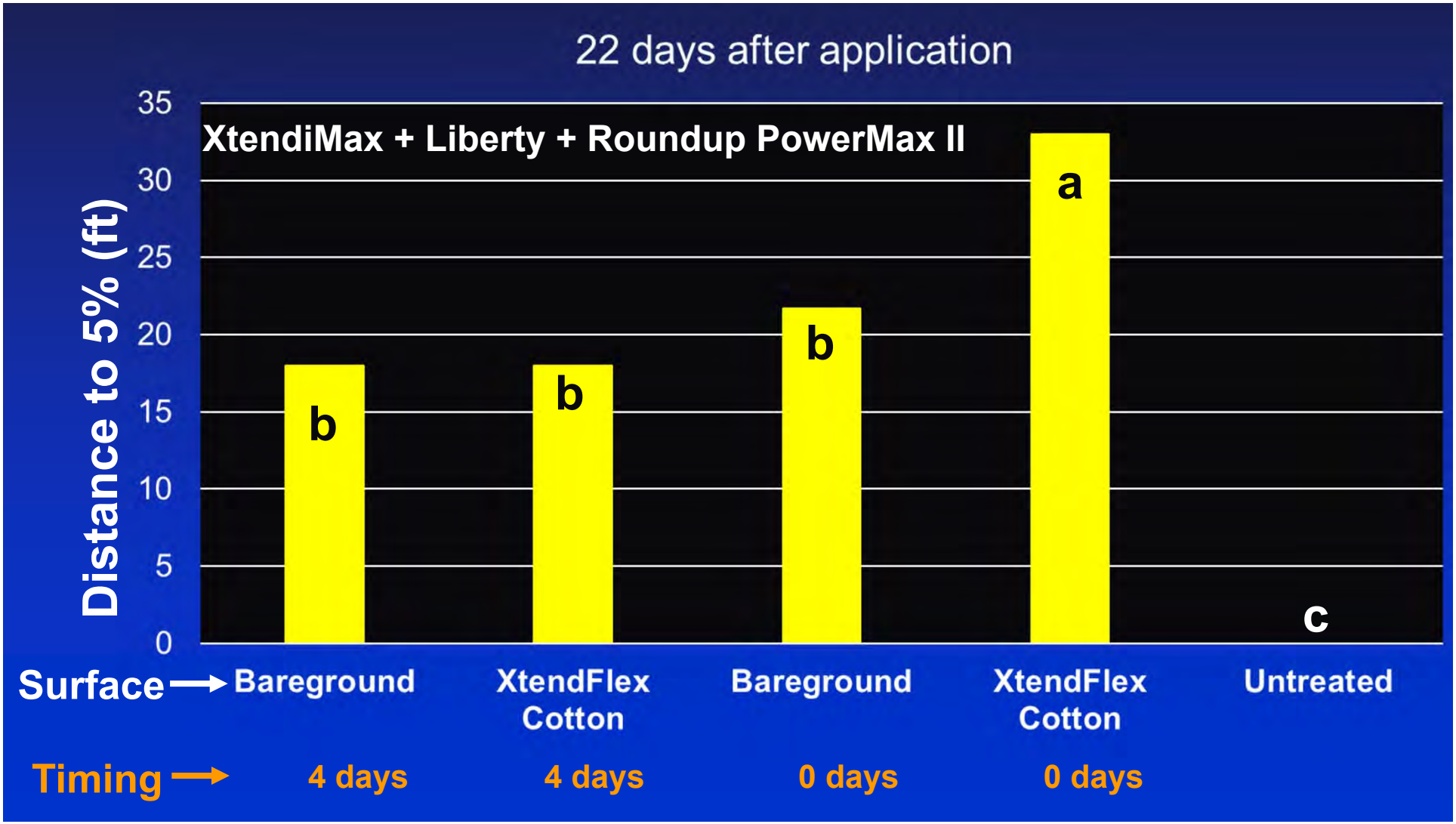


# Xtend Cotton

# Low Tunnel Volatility Evaluation (Surface and Timing)



# Low Tunnel Volatility Evaluation (Surface and Timing)

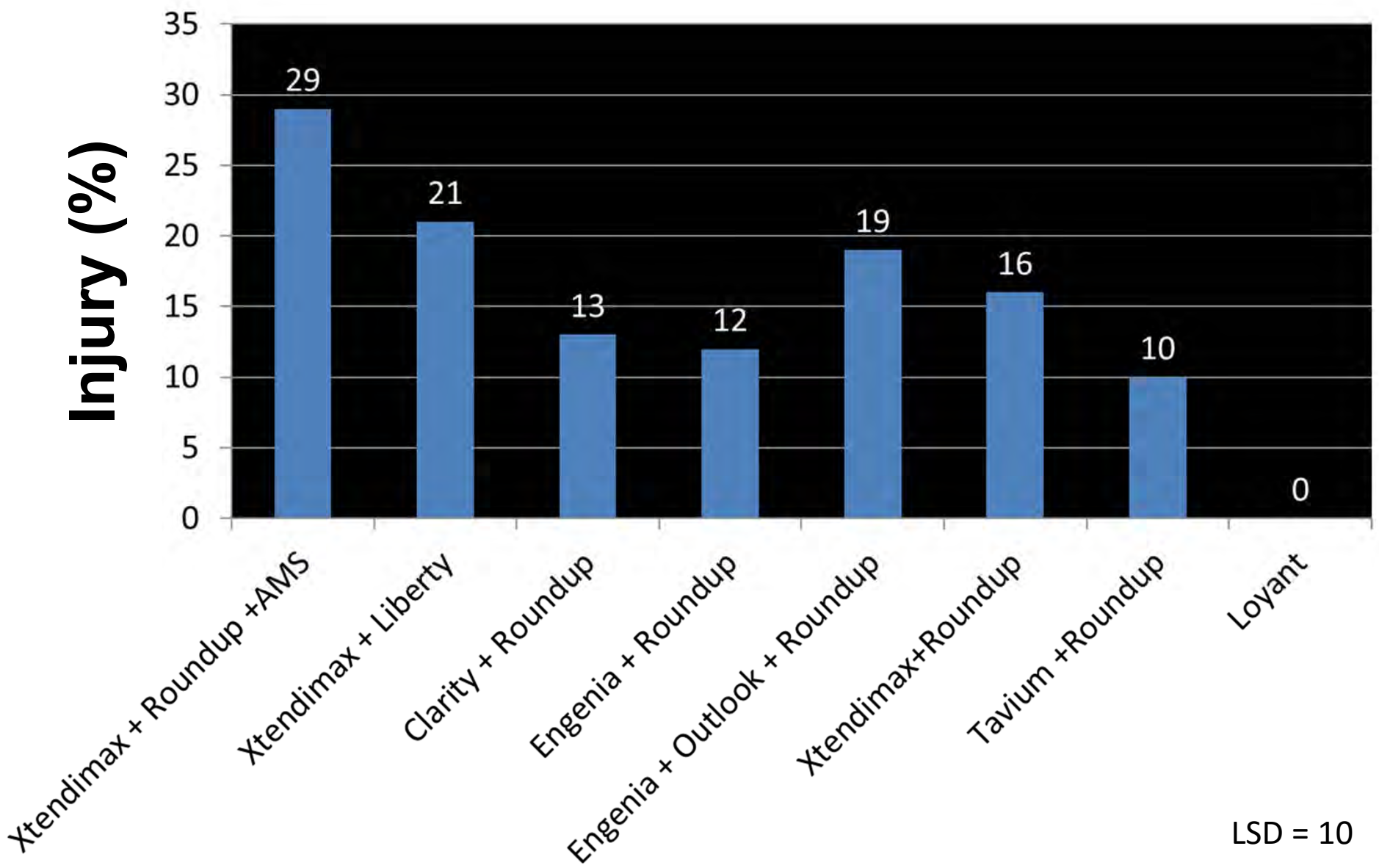



0 days


4 days

# 2018 Lonoke Low Tunnel Study

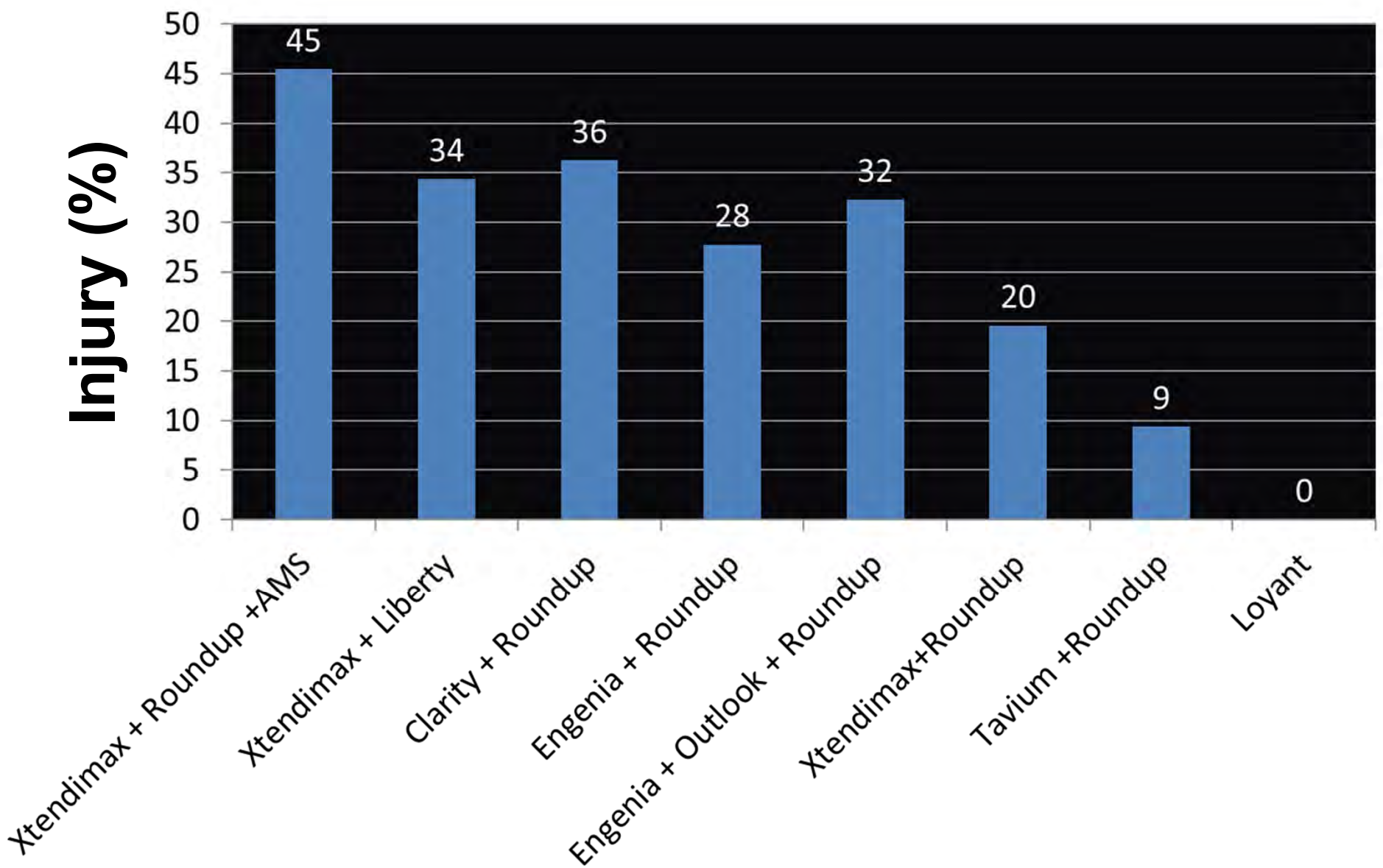
14 Days After Treatment

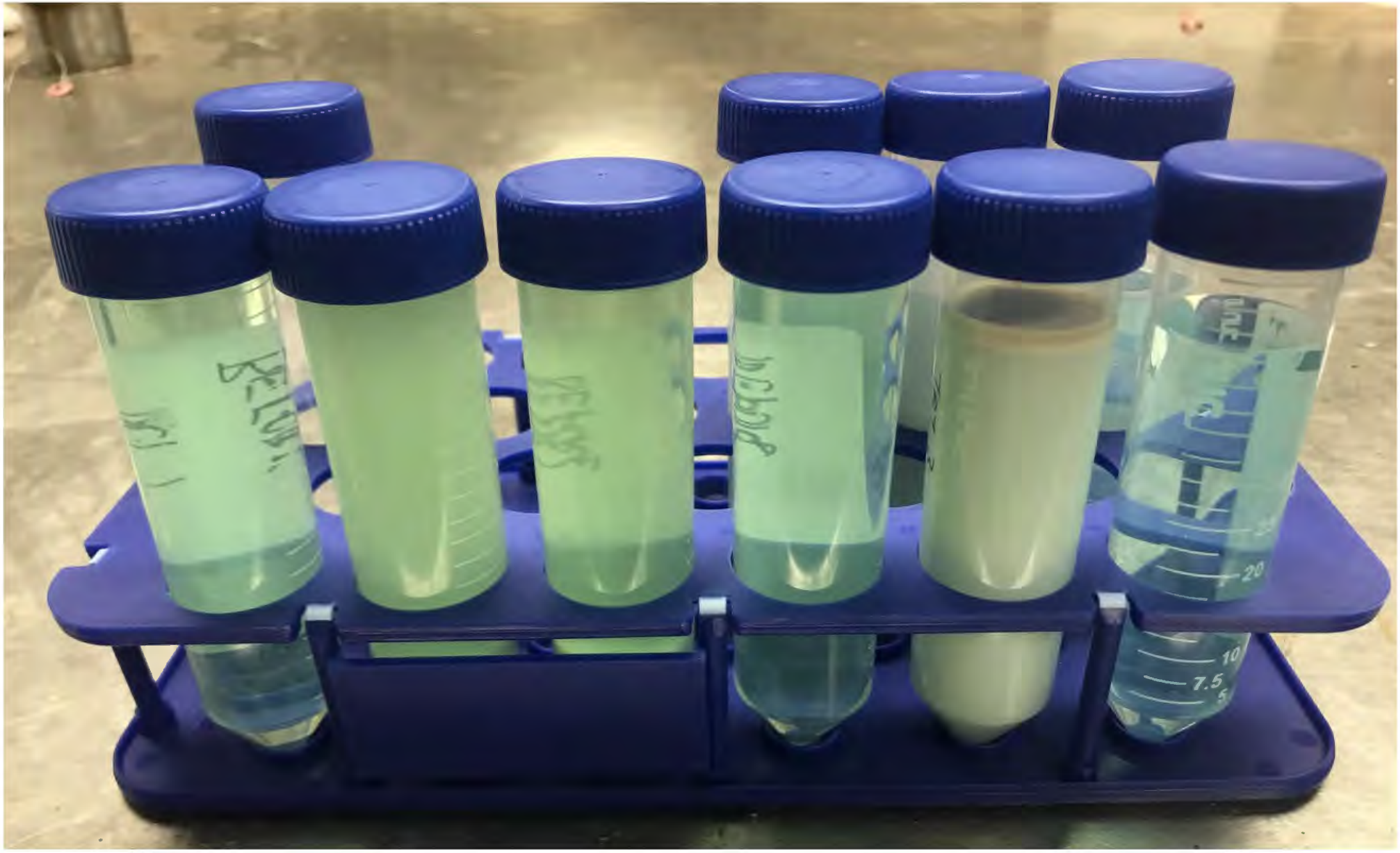



LSD = 10

# 2018 Tillar Low Tunnel Study

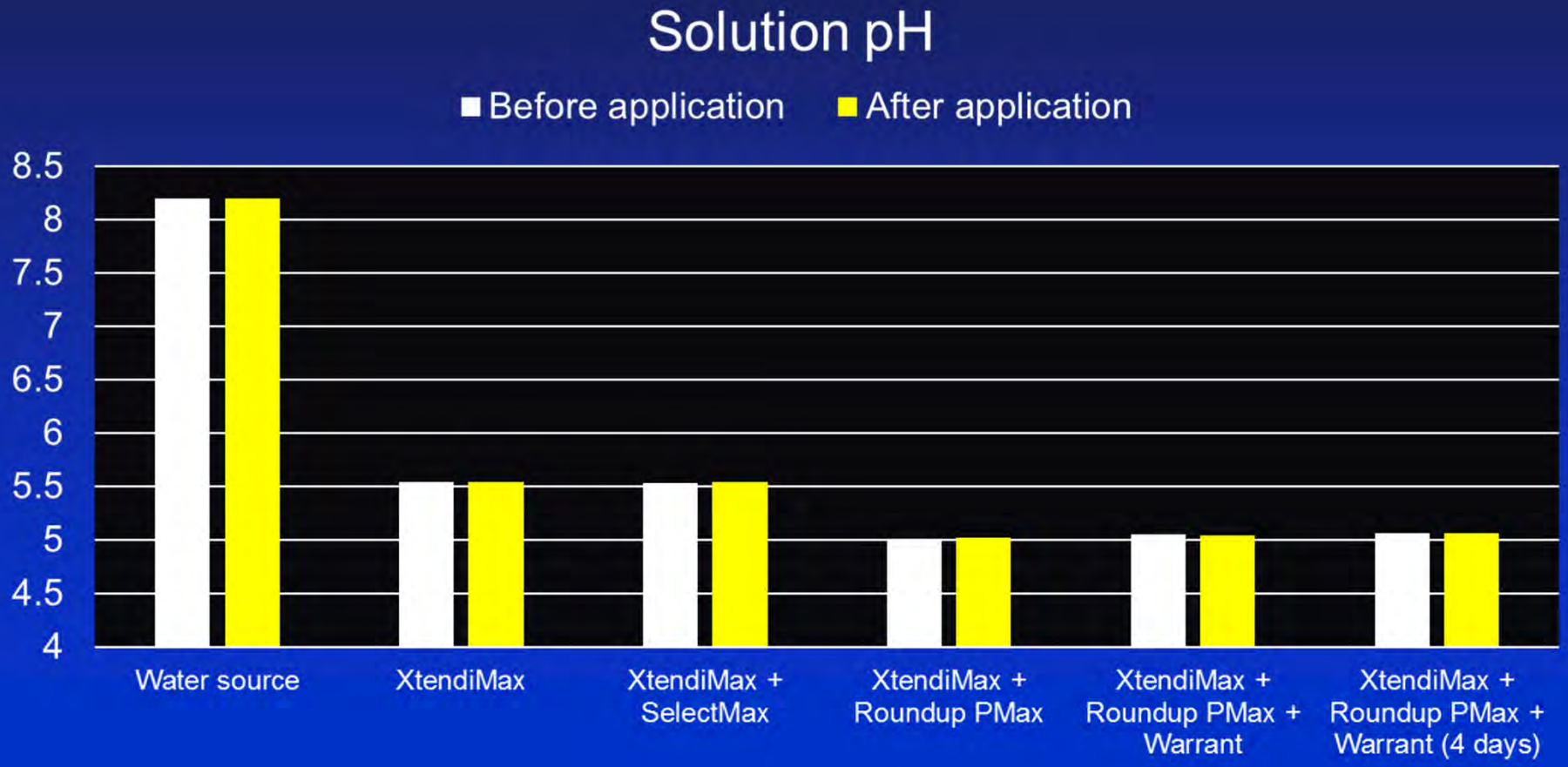
14 Days After Treatment



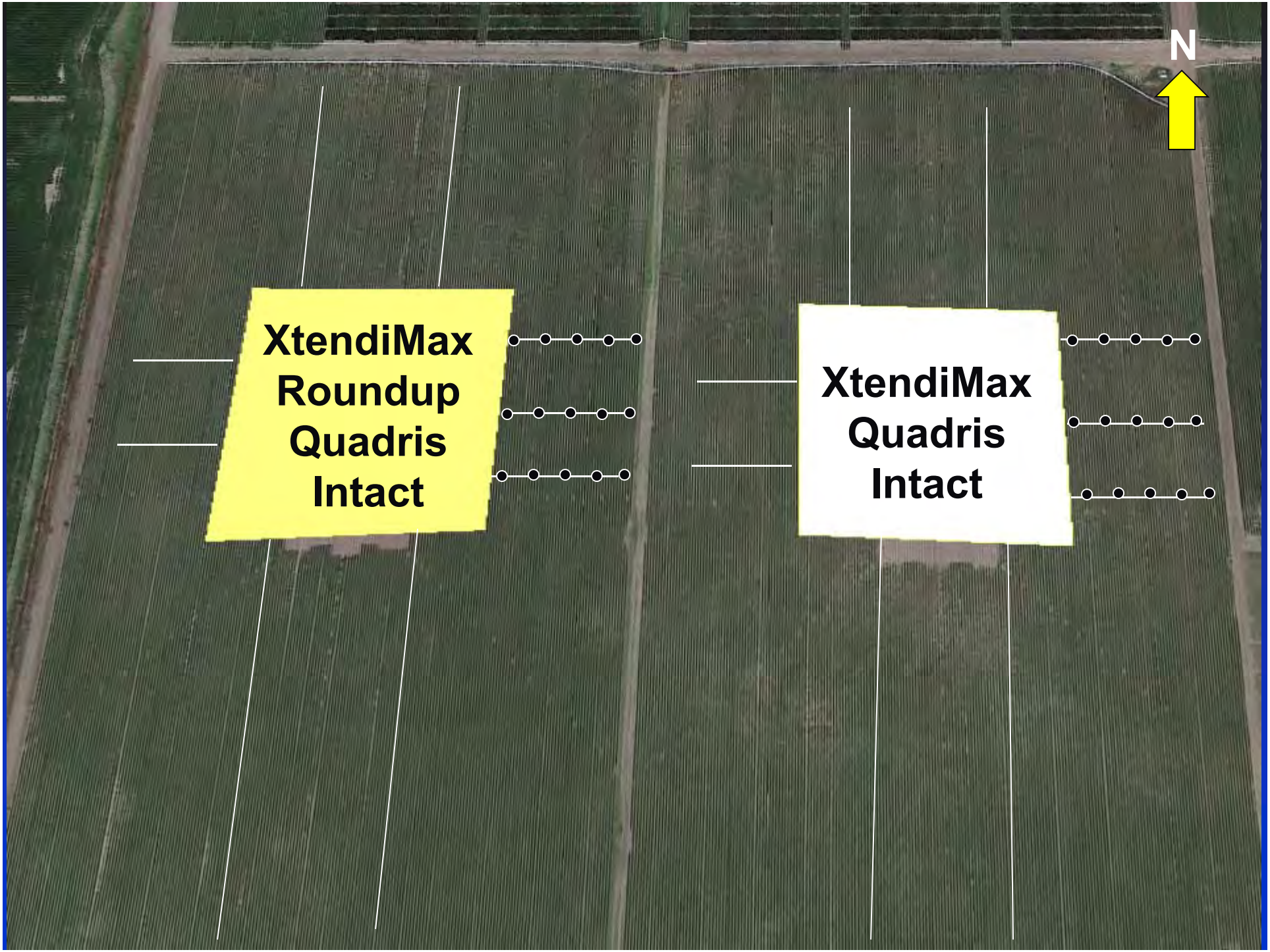

XtendiMax
XtendiMax + SelectMax
XtendiMax + Rdp PMax
XtendiMax + Rdp Pmax + Warrant
XtendiMax + Rdp Pmax + Warrant (4 days)
XtendiMax + Rdp PMax

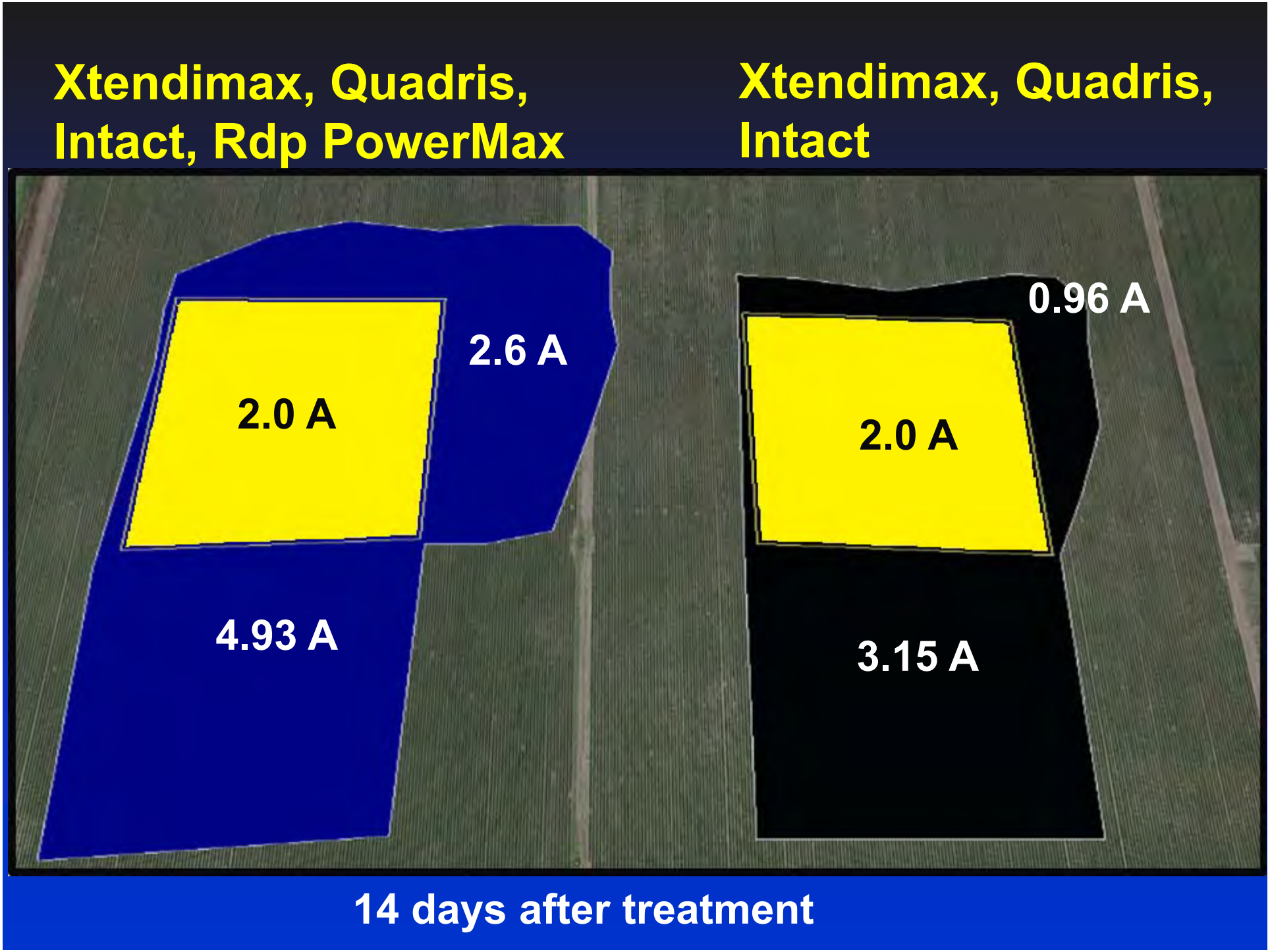
ER 0865

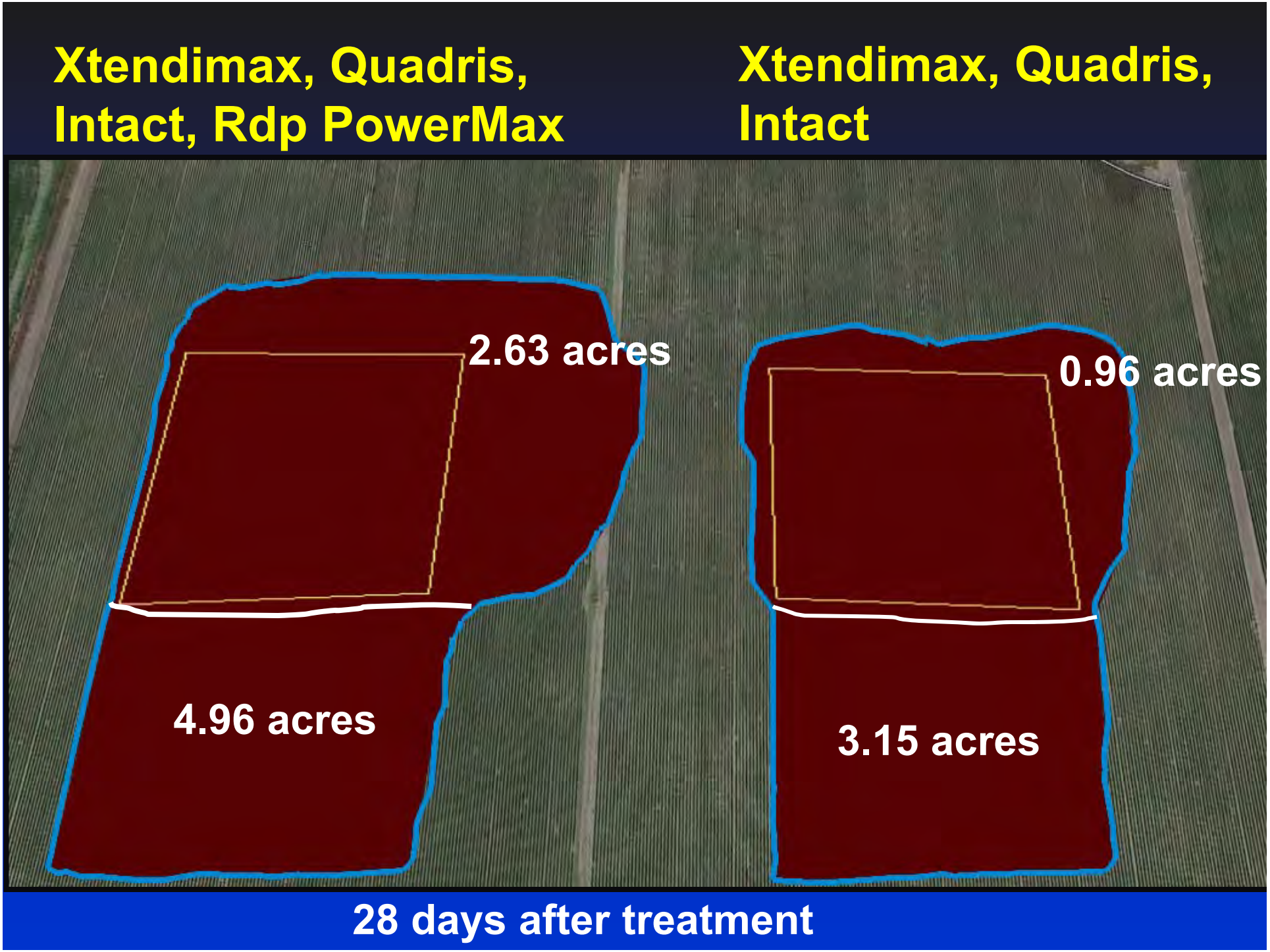
# pH of XtendiMax Spray Solutions



- Objectives: Determine if Roundup PowerMax increases off-target movement of XtendiMax
- Soybean: LibertyLink
- Applications:
  1. XtendiMax + Roundup PowerMax + Quadris + Intact
  2. XtendiMax + Quadris + Intact
- Date: August 13, 2018
- Sprayer setup:
  - 25 ft boom; 6 mph; 15 GPA, 24 inch height
  - TTI 11003 nozzles
- Environmental conditions:
  - Avg. 3.2 mph; range 0 to 5.7 mph
  - Daily max. 93 F



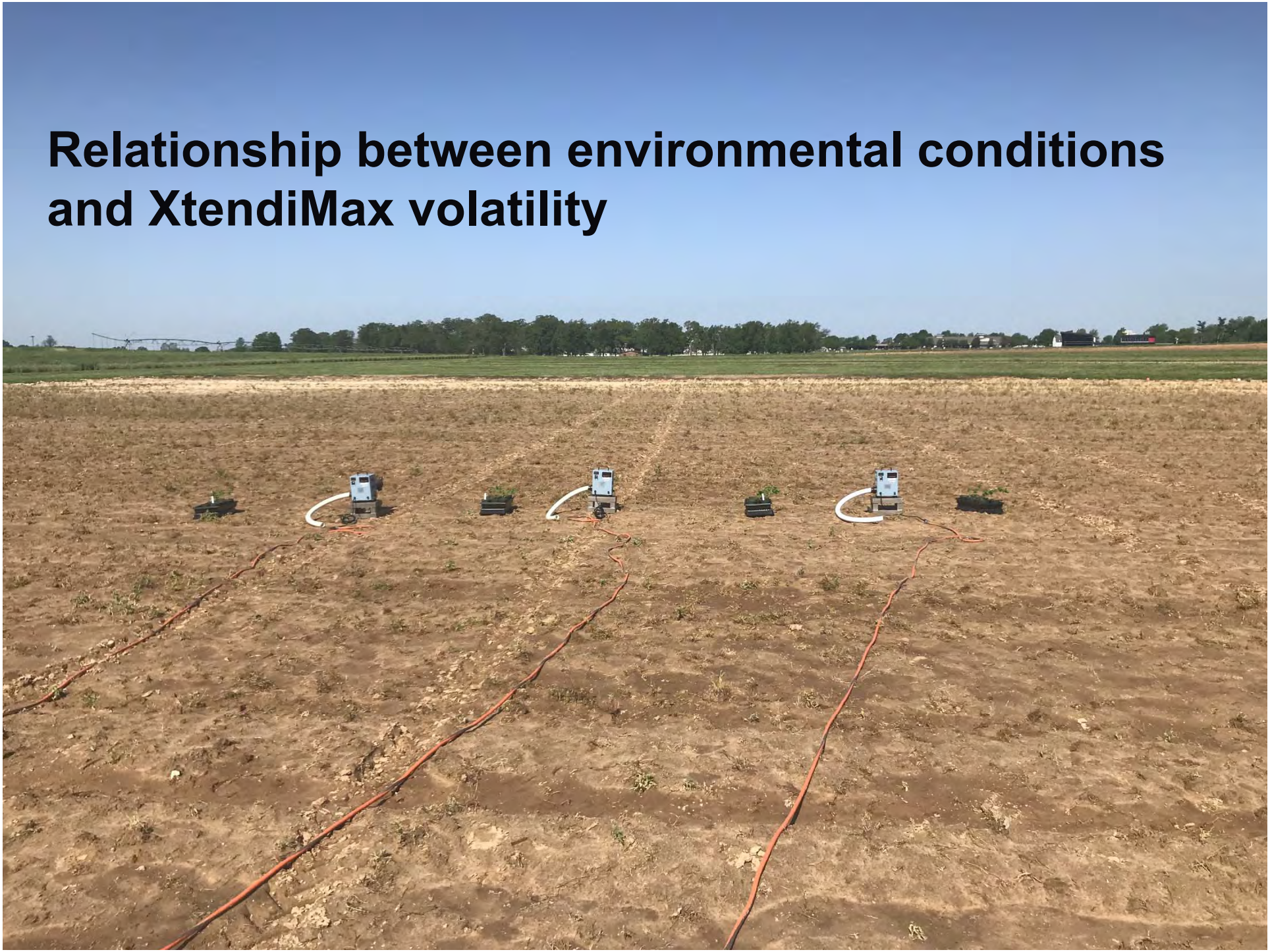




- Objective: Determine if non-Xtend soybean varieties differ in tolerance to drift rates of dicamba
- Location: Fayetteville, AR
- Rate: 1/250X
  (0.002 lb/A or 0.088 fl oz/A XtendiMax)
- Growth stage: V3 & R1

# Air Sampler Comparison

# Relationship between environmental conditions and XtendiMax volatility



# Inversion Frequency

Mississippi County

Crittenden County

Lee County

Washington County

# Conclusions thus far from 2018

- Damaged to soybean caused by Loyant was not a result of volatility
- Off-target damage caused by Enlist One is a result of physical drift or tank contamination
- Addition of Roundup PowerMax to dicamba products increases volatility and off-target movement
- Irrigation from tailwater recovery systems in areas where dicamba is used should be a concern
- Volatility continues to be a significant contributor to off-target movement of dicamba during the summer months

# Additional On-going Projects

- Can SelectMax substitute for Roundup PowerMax as a dicamba tank-mix partner without increasing volatility?
- Does length of time in spray tank influence volatility?
- Does soil pH influence volatility of dicamba?
- Relationship between dicamba air concentration and symptomology on soybean?
- Influence of rainfall or irrigation on XtendiMax volatility

# Encouragement through research

- Experimental dicamba is superior to XtendiMax & Engenia (Is this good enough?)
- The relationship between XtendiMax volatility and temperature in the field soon be better understood
  - Complicated by interaction with other factors
- Removing Roundup PowerMax from the spray and replacing with SelectMax
- Use of See-and-Spray will reduce off-target movement from physical drift and volatility

# 2018 Support

- Direct or indirect support
  - Mike & Dusty Carlson
  - U of A Systems Division of Agriculture
  - Arkansas State Plant Board
  - Northeast Research and Extension Center
  - Lon Mann Cotton Branch Station
  - Arkansas Agricultural Research Center
  - BASF, Corteva, & Bayer CropScience
  - United Soybean Board
- $350,000 spent on volatility research

# Questions?

AgFax

# Dicamba, 2018: States Struggle with Application Restrictions – DTN

**undefined**

December 14, 2017

http://agfax.com/2017/12/14/dicamba-2018-states-struggle-with-application-restrictions-dtn/

The drama over dicamba herbicide use continued this week as some states wrestled with requiring spray regulations over and beyond new federal labels.

Evidence of continued turmoil came on Dec. 12, as an **Arkansas Legislative Council subcommittee** kicked a proposed ban on in-crop use of the herbicide from April 16 through Oct. 31 back to the **Arkansas State Plant Board** (ASPB). The committee approved a motion by Sen. Bill Sample (R-Hot Springs) to hold the rule for final consideration and recommended the state board revise it, using the following: scientific-based evidence; a dividing line to create north and south zones in the state; and ambient temperature and humidity applicable to temperature inversion during night-time hours.

Earlier **Monsanto**, the developer of the genetic trait that allows soybeans and cotton to withstand dicamba applications, had asked Pulaski County Circuit Judge Chris Piazza for preliminary and permanent injunctions against the Plant Board's spray ban. In the lawsuit, Monsanto called the action arbitrary and "not based on science." A group of farmers has also initiated legal action against the ASPB regarding what would be the nation's toughest line on dicamba herbicide.

The ASPB received nearly 1,000 dicamba-related complaints this year of damage to soybeans, cotton and other sensitive crops and landscape trees and plants. The proposal to limit the application period originated from a specially appointed dicamba task force and was approved on Nov. 8 during a public hearing that attracted hundreds of farmers. The ASPB has met more than 50 times on the issue of dicamba over the past five years, board members told DTN.

However, according to news reports, the subcommittee's vote isn't final. It is subject to review Friday by the Legislative Council, a group of lawmakers that conducts the General Assembly's business when it is not in session. ASPB members have indicated to DTN some tweaking of the dates of the ban might be possible without prolonged public comment periods.

While Arkansas has been in the dicamba spotlight, other states also are taking action. Last week, weed scientists gathering in St. Louis for the **North Central Weed Science Society** meeting stressed the need for farmers and retail applicators to monitor specific state requirements that might go over and above new federal restrictions. New federal rules were put into place in October on **Engenia, FeXapan and XtendiMax** herbicides.

Most of the state-by-state changes are being made, they stated, because the federal EPA labels do not address herbicide volatility. The herbicide industry has hotly contested volatility as an explanation for at least some of the more than 2,700 official complaints of injury reported in 2017 across the cotton and soybean belts.

## MINNESOTA MOVES

On Tuesday, the **Minnesota Department of Agriculture** (MDA) announced new restrictions on the use of the

herbicide dicamba in Minnesota for the 2018 growing season. The decision follows the MDA's ongoing investigation and an informal survey last summer into reports of crop damage from alleged dicamba off-target movement.

In a news release, Minnesota Agriculture Commissioner Dave Frederickson said he thoroughly reviewed the new EPA label restrictions, the MDA's survey results, peer reviewed literature, and sought extensive input from the **Minnesota Soybean Growers Association Drift Task Force**, University of Minnesota Extension weed scientists, and the pesticide manufacturers on the underlying causes of damage.

Based on the review, the Commissioner set forth these additional protocols for dicamba use for the 2018 growing season:

**Cutoff date:** Do not apply after June 20. Setting an application cutoff date of June 20 is expected to help reduce the potential for volatility (movement). The majority of Minnesota soybeans are still in the vegetative growth stage by June 20 and research has shown that plants in the vegetative stage are less affected than those in the reproductive stage.

**Cutoff temperature:** Do not apply if the air temperature of the field, at the time of application, is more than 85 degrees Fahrenheit or if the National Weather Service's forecasted high temperature for the nearest available location for the day exceeds 85 degrees Fahrenheit. Research has shown that dicamba volatilization injury increased with an increase in temperatures.


## AgFax Weed Solutions

- **Texas Cotton, Soybeans: "Hit the Target" Website, Other Tools Help with Dicamba Training**
- **Dicamba: New Label Includes Downwind Buffers and Susceptible Crop Restrictions**
- **Minnesota: Dicamba In 2018 – Let's Clear Up Confusing Points**
- **Spraying Weeds One At A Time? The Idea Shows Promise – Deere Sure Thinks So**
- **Georgia: Too Cold To Spray So Far?**


"Dicamba is an important tool for soybean growers to manage weeds and I believe these additional restrictions will minimize the off-target movement," Frederickson said. He added that the state will be closely monitoring the herbicide's performance with these restrictions in 2018."

## STATE BY STATE

**Indiana, North Dakota, Missouri, and Tennessee** are some of the other states that have increased or are in the process of fine-tuning dicamba application restrictions.

In Missouri, for example, certified applicators must complete an online Dicamba Notice of Application form daily prior to each application. Cut-off dates for applications in that state also differ by county.

In North Dakota, no applications of the three new-generation dicamba herbicides may be made after June 30 or after the first bloom (R1 growth phase), whichever comes first. No applications may be made if air temperature of the field at the time of application is over 85 degrees Fahrenheit or if the forecasted National Weather Service high temperature for the day exceeds 85 degrees Fahrenheit.

In writing the regulations, it was noted that North Dakota has a unique climate that is different than other soybean-producing states. The application season typically has low humidity. The dry and less humid environment can significantly increase product evaporation and potential off-target movement. Applications of

the product may only be made from one hour after sunrise to one hour before sunset.

Applicators must maintain a speed of 12 miles per hour or less when applying products. Applications must be made with a minimum of 15 gallons of spray solution per acre. No applications may be made using nozzles that have an 80-degree or less spray pattern.

## APPLICABLE TO ALL

Anyone buying, applying or even working under the supervision of a certified applicator must complete a dicamba-specific training course, said Kevin Johnson, **Illinois Fertilizer and Chemical Association (IFCA)** director of government and industry relations. Applicators that cross state lines will need to understand and abide by the specific rules in that state, Johnson added.

While farmers hiring custom applicators are not technically required to attend application class, Johnson strongly encourages the training for anyone planning to plant Xtend varieties and potentially use the herbicides labeled for those varieties. “The labels for these products are complex and there may be cases where a commercial applicator cannot spray. The education will help explain those situations,” Johnson said.

For more information on state dicamba regulations go to:

North Dakota: https://www.nd.gov/…

Minnesota: http://www.mda.state.mn.us/…

Missouri: http://agriculture.mo.gov/…

Tennessee: https://www.tn.gov/…

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Tags: Arkansas State Plant Board, dicamba, dicamba applications, dicamba injury, Engenia, FeXapan, herbicides, Indiana, Minnesota, Missouri, Monsanto, North Dakota, off-target movement, soybeans, Tennessee, XtendiMax

MPRnews

# Minn. farmers' harvest hit hard by drifting weed killer

Mark Steil · Near Trimont, Minn. · Nov 13, 2017 Business

Southern Minnesota farmer Tom Peterson, standing on his farm Trimont, Minn., last week, says he suffered a yield loss after dicamba herbicide from a neighbor's land drifted onto his soybean field during the growing season. *Mark Steil | MPR News*

## LISTEN Story audio

**4min 16sec** (https://www.mprnews.org/listen?name=/minnesota/news/features/2017/11/13/mn_farmer_harvest_hit_by_weed_killer_20171113_128.mp3)

Tom Peterson first noticed the shriveled leaves and stunted growth in two of his soybean fields last June.

"At one point, my beans were about a foot tall and looked like heck," he said.

But in his neighbor's field, the crop looked fine, Peterson said. "His beans were about two and a half feet tall. I mean it was quite a dramatic change from one field to the next."

The culprit: the controversial weed killer dicamba. When applied to soybeans genetically modified to withstand it, dicamba works as an herbicide. But the problems occur when dicamba drifts to neighboring non-tolerant soybean fields, like Peterson's. Wind may blow it off-target, or the chemical can vaporize and move.

Now, as farmers finish up fall harvest, crop damage from dicamba is cutting into yields — and profits. More than 200 Minnesota farmers say a neighbor's use of the herbicide dicamba damaged their crops, and it could cost them about $7 million collectively. And many farmers aren't sure if they'll find any compensation for their loss.

"In the farming game the more bushels you have to sell, the much better chance you have of profit," said Peterson. "So, yeah, every bushel lost is a concern."

Crop consultants believe dicamba drift caused rounded, cupped leaves on these soybean plants. *Mark Steil | MPR News file*

Peterson lost two to four bushels per acre of his soybean crop, a third of what he expected. Still, the dicamba damage hurt, costing him roughly $3,000 lost revenue on just over 100 acres of soybeans.

Southern Minnesota crop consultant Jim Nesseth said he's seen heavier damage than what Peterson experienced. In some cases, it was between 10 and 12 bushels per acre lost.

The later the dicamba arrived in the growth cycle, the worse the damage, said Nesseth. Dicamba applications in the warmer and more humid conditions of June appear to have caused the most damage.

**· In July: State investigating Monsanto weed killer after farmers' complaints (https://www.mprnews.org/story/2017/07/20/state-investigating-monsanto-weed-killer-after-farmers-complaints)**

Even so, Nesseth hopes dicamba can remain an option for farmers because it does a good job killing weeds that have become resistant to other herbicides.

The major makers of dicamba — Monsanto, BASF and DuPont — have agreed to change their application guidelines (https://www.mprnews.org/story/2017/10/16/epa-oks-new-curbs-on-controversial-weed-killer) next year to try reducing the drift problem. The changes include requiring farmers to maintain records of their dicamba use, limiting when and under what sorts of wind conditions the chemical can be sprayed, and mandating that only certified herbicide applicators with special dicamba training apply the herbicide.

Dicamba has caused problems across the country. The U.S. Environmental Protection Agency says more than 3.5 million acres of crops in 25 states were damaged, including about 250,000 acres in Minnesota.

**· Crime in the fields: How Monsanto and scofflaw farmers hurt soybeans in Arkansas (https://www.mprnews.org/story/2016/08/01/npr-crime-in-the-fields-how-monsanto-and-scofflaw-farmers-hurt-soybeans-in-arkansas)**

Farmers hurt by dicamba drift are wondering if they're going to see any compensation for their losses. A majority of Minnesota soybean fields are insured through the U.S. agriculture department's crop insurance program. But the federal insurance package will not cover dicamba damage.

For most farmers, it may take some neighbor-to-neighbor negotiations to settle things. Peterson said because it could be difficult to prove definitively that dicamba caused his yield reduction, he's just going to take the loss.

Plus, he doesn't want to upset the good relations he has with the neighbor who sprayed the chemical.

"We've been friends forever and we're going to continue to be that way," said Peterson. "I mean, he feels bad. It's not anything he had intended to happen."

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# Integrated Pest Management

Integrated Pest & Crop Management

## A Final Report on Dicamba-injured Soybean Acres

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PUBLISHED: OCTOBER 30, 2017

Throughout the summer we have attempted to provide updates as to the extent of dicamba-injured soybean throughout the United States, either in the form of official dicamba-related cases that are currently under investigation by the state Departments of Agriculture, or as estimates of injured acreage from university extension weed scientists (see Ag Industry, Do we have a problem yet? and Update on Dicamba-related Injury Investigations and Estimates of Injured Soybean Acreage). In an attempt to bring some sort of "finality" to this issue for 2017, we requested this information one last time and have compiled this information into the figures below. As shown in Figures 1 and 2, the (hopefully) final numbers indicate that there are 2,708 dicamba-related injury cases currently under investigation by various state departments of agriculture around the U.S., and that there were approximately 3.6 million acres of soybean that were injured by off-site movement of dicamba at some point during 2017. These numbers were up slightly from the August 10th report of 2,242 cases and approximately 3.1 million soybean acres, primarily due to the changes that occurred in some of the northern states like Minnesota, North Dakota, and South Dakota.

As I'm sure everyone who is familiar with this issue is well aware of by now, several weeks ago the EPA issued new labels for XtendiMax, Engenia, and FeXapan with tighter use restrictions. At this point, many state departments of agriculture are deciding whether or not they will impose any additional state requirements for the use of these products. Needless to say, there is much more that will be discussed on these issues and many more decisions that will be made in the coming weeks and months. Stay tuned.

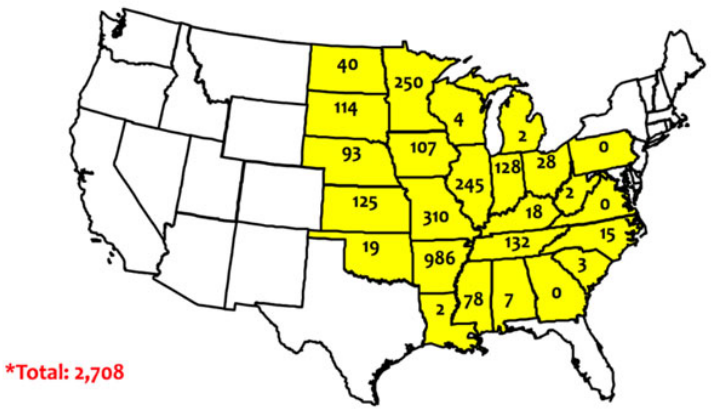


Figure 1. Official dicamba-related injury investigations as reported by state departments of agriculture (as of October 15, 2017).

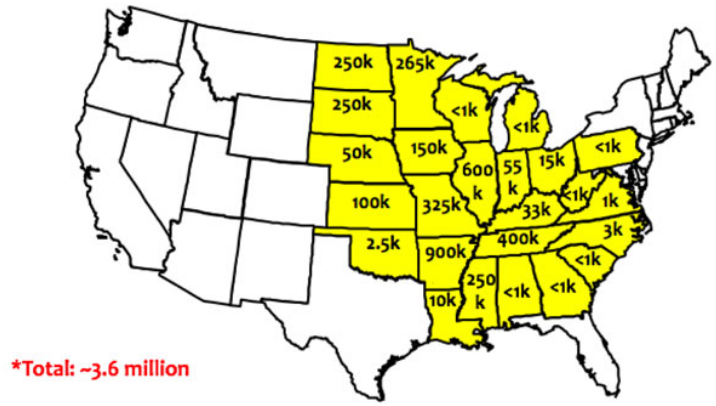


Figure 2. Estimates of dicamba-injured soybean acreage as reported by state extension weed scientists (as of October 15, 2017).

REVISED: February 21, 2017

NEWS

Perry Ostmo of Sharon, N.D., surveys his Roundup-ready soybeans -- 12 inches tall in the foreground -- were susceptible to a dicamba herbicide applied to his neighbor's chest-high fields, just behind him. He thinks some of the unabsorbed chemical volatilized and drifted onto his beans like a cloud. Photo taken July 31, 2017, at Sharon, N.D. (Forum News Service/Agweek/Mikkel Pates)

# Farmers deal with dicamba drift

By **Mikkel Pates / Agweek Staff Writer** on Aug 7, 2017 at 8:30 a.m.

SHARON, N.D. — Perry Ostmo doesn't blame the "local guys" — the neighbor or the applicator for damages to his soybeans this year. He doesn't even want to be too hard on BASF, the company who developed a chemical formulation he thinks is important but needs improvement.

Ostmo is a board member of the North Dakota Soybean Council. His views do not represent the council, which has not taken a position on dicamba.

Dicamba formulations also are produced by Monsanto and Dupont, in addition to BASF. Several states, including Missouri, Arkansas and Tennessee, have placed restrictions on when and how it can be used due to the possibility of drift and volatility.

Ostmo believes the herbicide applied to the soybeans next to his soybean field somehow "volatilized" and spread like a cloud over his soybeans, curling the leaves and stunting their growth.

"We all get along," Ostmo says. But he thinks something should be done to

prevent a kind of spray drift that can happen a day or even two days after the actual spraying, even if applicators have followed the labels.

The neighbor's dicamba-resistant beans are waist-high and green, flourishing in early August, while his are a foot tall. He thinks some might yield only 5 or 10 bushels per acre, rather than at least 30 bushels an acre he expected.

## Puzzling pieces

Dr. Richard Zollinger, a North Dakota State University extension weed specialist in Fargo, N.D., says he's getting a daily stream of calls from people — farmers, crop consultants, county agents — reporting problems. It's too soon to draw conclusions, he says.

Zollinger says he's working to set up a reporting system, either through the North Dakota Department of Agriculture, or through NDSU's AgDakota listserv. A survey could be up and running in the next week or two.

Jeff Gunsolus, University of Minnesota extension weed specialist, on Aug. 1 in his blog announced a similar survey effort to collect information on dicamba damage to beans so the public can indicate acres, fields, and counties that may be involved.

"The big unknown in fields presenting dicamba injury symptoms will be dicamba's impact on soybean yield," Gunsolus says. He says sensitivity of non-Xtend soybeans to dicamba makes injury symptoms not reliable indicators of yield loss.

A North Dakota survey would allow an indication of location and the kinds of injury. Zollinger thinks yield loss won't be known until harvest and may be confused by other phenomena, such as a "rapid-growth syndrome," or hormone-type symptom that glyphosate could produce.

Chemical manufacturers BASF and Monsanto both created new formulations. The products and application recommendations were carefully geared to avoid "particle drift." Zollinger says he's heard of academics in southern states doing tests to see whether "volatilization" explains damage on some acres.

## 15 percent damaged

Ostmo planted 1,400 acres of soybeans and thinks 200 are damaged due to the volatilization drift. He also planted 300 acres of barley, 700 acres of durum wheat and 500 acres of spring wheat.

His beans are "plain Roundup Ready" — genetically-modified soybeans to be

resistant to glyphosate herbicide but not to dicamba. Ostmo's beans were planted May 25, and applied with a pre-emerge herbicide shortly after.

The neighbor planted some of the new dicamba-resistant soybeans about two weeks earlier. He'd hired a commercial applicator to spray a dicamba product in early July.

Two weeks later, Ostmo's crop scout consultant called his attention to leaf-curling.

"The stunting had taken place — kind of a dull color, not the nice green ones like my neighbors had," he says. They took plant tissue samples to freeze for later verification. He contacted the applicator who "admitted that some of that drift was theirs." BASF officials came to look.

## 'Obvious' damage

"It was obvious that some of it was maybe 'direct drift,' but most of it was volatilization," Ostmo says, describing the phenomena where the applied herbicide evaporates from the leaves and drifts in a kind of a cloud, off-target.

"The volatilization probably went for a half-mile to a mile away," he says. It seemed "pretty clear where it hit" because he could see "lines in the field where the volatilization ended, and the unaffected soybeans stood next to them."

In the first week of August, Ostmo can't predict how much yield will be affected by the damage. He's had to spray for weeds because the volatilized drift herbicide affects mostly beans. He's sprayed to control a second flush of weeds, and tank-mixed with an insecticide to kill heavy infestation of soybean aphids.

"I'm not worried about (compensation)" Ostmo says. "We'll come to some agreement," but he doesn't say with whom. He thinks the chemical manufacturers should be more at fault from the volatilization than anyone.

On the other hand, Ostmo says farmers need the new chemistry.

"We have to take that into consideration. If they control the volatilization, it'll be really popular. Until then there's going to be a lot less of those beans seeded," he predicts.

If applicators are held liable for damage from volatilization, "applicators may just refuse to spray it next year," Ostmo says. "I know one local applicator who hasn't sprayed any yet, and he won't spray them, and he's glad he didn't."

## LATEST

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FOOD FOR THOUGHT

# Monsanto Attacks Scientists After Studies Show Trouble For Its New Weedkiller

October 26, 2017 · 4:57 AM ET
Heard on Morning Edition

DAN CHARLES

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Bob Scott, an expert on weeds with the University of Arkansas, in a research plot where soybeans were exposed to dicamba vapor.

*Dan Charles/ NPR*

In a normal year, Kevin Bradley, a professor of weed science at the University of Missouri, would have spent his summer testing new ways to control a troublesome little plant called water hemp.

This has not been a normal year.

"I don't even talk about weed management anymore," Bradley tells me, and he sounds disgusted. "Nobody calls me and ask me those questions. I barely have time to even work with my graduate students. Everything is about dicamba. Every single day."

Dicamba, an old weedkiller that's now being used in new ways, has thrust Bradley and half a dozen other university weed scientists into the unfamiliar role of whistleblower, confronting what they believe are misleading and scientifically unfounded claims by one of the country's biggest seed and pesticide companies: Monsanto.

"It's not comfortable. I'm like anybody else, I don't like [it when] people are unhappy with me," says Mike Owen, a weed specialist at Iowa State University. Then he chuckles. "But sometimes, like John Wayne said, a man's got to do what a man's got to do!"

"Certainly, there's not a weed scientist in any of these states who would back down, who would change their story," says Aaron Hager, at the University of Illinois.

THE SALT

A Wayward Weedkiller Divides Farm Communities, Harms Wildlife

The tensions between Monsanto and the nation's weed scientists actually began several years ago, when Monsanto first moved to make dicamba the centerpiece of a

new weedkilling strategy. The company tweaked the genes in soybeans and cotton and created new genetically modified varieties of those crops that can tolerate doses of dicamba. (Normally, dicamba kills those crops.) This allowed farmers to spray the weedkiller directly on their soybean or cotton plants, killing the weeds while their crops survived.

It's an approach that Monsanto pioneered with crops that were genetically modified to tolerate glyphosate, or Roundup. After two decades of heavy exposure to glyphosate, however, devastating weeds like Palmer amaranth, or pigweed, evolved resistance to it. Farmers are looking for new weedkilling tools.

Dicamba, however, has a well-known defect. It's volatile; it tends to evaporate from the soil or vegetation where it's been sprayed, creating a cloud of plant-killing vapor that can spread in unpredictable directions. It happens more in hot weather, and Monsanto's new strategy inevitably would mean spraying dicamba in the heat of summer.

Monsanto and two other chemical companies, BASF and DuPont, announced that they had solved this problem with new "low-volatility" formulations of dicamba that don't evaporate so easily. Yet the companies — especially Monsanto — made it difficult for university scientists to verify those claims with independent tests before the products were released commercially.

"I wish we could have done more testing. We've been asking to do more testing for several years, but the product was not made available to us," says Bob Scott, a weed scientist at the University of Arkansas. "These are proprietary products. Until they release those formulations for testing, we're not allowed to [test them]."

To make matters worse, Monsanto started selling its new dicamba-tolerant soybeans in 2016, before the new low-volatility formulations of dicamba were even approved for sale. It tempted farmers to use older versions of dicamba on these crops, illegally, and

some farmers couldn't resist that temptation. In Arkansas, there were widespread reports that dicamba was damaging neighboring fields that didn't have the benefit of Monsanto's new genes. In one case, a dispute between farmers led to a fatal shooting.

THE SALT

Arkansas Defies Monsanto, Moves To Ban Rogue Weedkiller

That fall, at a meeting of weed scientists, Hager confronted Monsanto's representatives. According to Hager, he told the company that "you knowingly released these varieties in an area of the U.S. where you knew that glyphosate resistance [in weeds] was rampant. When you did that ... you knew what was going to happen!"

"I got a blank stare," Hager recalls.

This past summer, the floodgates on dicamba use opened. The new formulations of dicamba were approved for use (although Arkansas only allowed farmers to use BASF's product, not Monsanto's) and farmers rushed to adopt the new technology. They planted dicamba-tolerant crops on 26 million acres.

A farmer's nightmare weed, glyphosate-resistant Palmer amaranth, or pigweed, in a soybean field in Arkansas.
*Dan Charles /NPR*

"The demand for it is overwhelming. The need to control these difficult-to-manage weeds is huge," says Scott Partridge, Monsanto's Vice President of Global Strategy.

When spraying started, complaints rolled in. The new "low volatility" versions of dicamba didn't stay where they belonged. They drifted into nearby fields, damaging crops there — mostly soybeans, but also vegetables and orchards. There were reports of damage from Mississippi to Minnesota, but the problem was worst in Arkansas, Missouri and Tennessee.

"By the end of May, first of June, it became impossible; the calls were coming in, three or four a day. Sometimes eight or 12 a day," says the University of Arkansas' Scott.

"There is no precedent for what we've seen this year."

At first, the companies selling these herbicides — both Monsanto and BASF — seemed unconcerned.

"All I got was denial that there was a problem," Bradley says. "What I kept hearing was, it's not a big problem nationwide; we always have these kinds of mistakes or accidents with the introduction of any new technology."

So Bradley, a past president of the Weed Science Society of America, started collecting data on crop damage from across the country, mapping the epidemic. By the end of the summer, Bradley estimated that at least 3.1 million acres of crops had shown some injury from drifting dicamba.

With the scale of dicamba damage increasingly clear, a fierce debate erupted over its cause.

Monsanto's executives insist that it's because the people who sprayed dicamba were just learning how to do it properly, and didn't follow directions. Scott Partridge says his company checked out more than a thousand cases of dicamba damage, "and in 88 percent of those instances, the label was not followed." Farmers or pesticide applicators sprayed dicamba too close to neighboring fields, didn't clean out their equipment properly, or used the wrong nozzles.

"Every one of those [mistakes] is fixable by education," Partridge says.

University weed scientists say that's only part of the explanation, and the problem can't be fixed so easily.

Bradley, Scott and their colleagues in other states say that much of the damage they saw this year didn't appear to come from "physical drift" of windblown droplets of dicamba, coming directly from a sprayer. Physical drift, they say, typically produces a

plume of damage that diminishes with distance from the source of the spray. Instead, they saw entire hundred-acre fields of soybeans with cupped leaves, and the damage was uniform from one end to the other. They also saw damage in orchards and fields that were far removed from any fields sprayed with dicamba.

This pattern, they say, looks more like what they'd feared all along: volatilization.

Lyle Hadden, a soybean farmer, holds leaves and a stalk from a soybean plant in a field he's planted that shows signs of being affected by Dicamba.

*The Washington Post/Getty Images*

What's more, the scientists say, field experiments that they finally carried out this summer point toward evaporating dicamba as a cause.

Bob Scott shows me one such experiment, a field of soybeans at a research station near Lonoke, Ark. Here, soybeans were injured by dicamba that definitely did not enter the field through mistakes in spraying.

"It's important to remember, we did not spray this plot," Soott says. Instead, at a location far away from this field, he and his colleagues sprayed trays of soil with various dicamba-containing herbicides. Then they carried the trays into this field and placed them between the rows of soybeans for 48 hours. The trays and soybeans were protected underneath plastic hoops — essentially, miniature greenhouses — that were open at each end. The dicamba evaporated from the trays and injured the soybean plants nearby, curling their leaves and stunting their growth.

"A lot of people were very disappointed when they saw the plots," Scott says. "A lot of people didn't want to see what they were seeing, and were in disbelief."

These observations have huge implications. If the new formulations of dicamba evaporate and spread, they cannot easily be controlled.

"If this were any other product, I feel like it would be just pulled off the market, and we'd be done with it," Scott says.

But dicamba, and the crops created to tolerate it, aren't just any products. There's big money behind them. Monsanto, seed dealers, farmers who are struggling with weed problems — they all have a stake in this technology. The university scientists who are pointing out problems with them are confronting an economic juggernaut.

Monsanto — and farmers who want to use dicamba — have been fighting back. In Arkansas, where state regulators proposed a ban on dicamba during the growing season next year, Monsanto recently sued the regulators, arguing that the ban was based on "unsubstantiated theories regarding product volatility that are contradicted by science." The company called on regulators to disregard information from Jason Norsworthy, one of the University of Arkansas' weed researchers, because he'd recommended that farmers use a non-dicamba alternative from a rival company. Monsanto also attacked the objectivity of Ford Baldwin, a former university weed scientist who now works as a consultant to farmers and herbicide companies.

"I read it as an attack on all of us, and anybody who dares to [gather] outside data," Bob Scott says. "And some of my fellow weed scientists read it that way as well."

Kevin Bradley, at the University of Missouri, says executives from Monsanto have made repeated calls to his supervisors. "What the exact nature of those calls [was], I'm not real sure," Bradley says. "But I'm pretty sure it has something to do with not being happy with what I'm saying."

I contacted three academic deans at the University of Missouri, asking for details about the calls. A university spokesman said they were too busy to respond. Monsanto's Scott Partridge, for his part, says that "we are not attacking Dr. Bradley. We respect him, his position, opinion, and his work. We respect him, and academics in general."

Bradley says criticism from people in Missouri's farming community whom he's known for years hits him even harder. "To have somebody say that what [I'm] saying is bad for Missouri agriculture, that's a hard one to take," he says. "There's not a lot of glory in these positions, or major financial incentive. We chose these jobs to help the farmers in our states."

Monsanto's explanation for what happened this summer, and how to prevent it, seems to be carrying the day in Washington, D.C. Two weeks ago, the Environmental Protection Agency announced that it will allow continued use of dicamba next year. The EPA is imposing a few additional restrictions on who can spray it, and when. Those restrictions will have little effect, or none at all, on damage caused by volatilization.

Arkansas' proposal to ban use of dicamba during the growing season next summer has not yet received final approval. A public hearing on the proposal is set for Nov. 8.

Kevin Bradley thinks there's one positive result from the controversy. "It has made more farmers aware of what we do, and that is, unbiased research and calling it like we see it," he says.

Over the course of recent decades, publicly funded agricultural extension services have shrunk, and farmers have turned to seed and chemical companies for advice. "It's become so weighted towards — well, the companies did their research, and it said this, so that must be the way it is!" Bradley says. "You know what? Maybe that's not the way it is."

**From:** Baris, Reuben
**To:** "MARVIN, THOMAS [AG/1920]"
**Subject:** terms and conditions (comments)
**Date:** Tuesday, October 10, 2017 6:45:00 PM
**Attachments:** Response to Terms and Conditions Page1 - Monsanto revisions - EPA comments 10-11-17.docx

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As promised. Please share with Phil.

REUBEN BARIS | ACTING CHIEF | HERBICIDE BRANCH
U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF PESTICIDE PROGRAMS | (703) 305-7356

1. Stickering, new paper label (*i.e.* supplemental labeling to accompany the product):

   - Sticker – Sticker that was submitted to EPA for approval contains the following information:
     - "Restricted Use Pesticide"-;
     - "Product cannot be used if user does not possess new label(ing) that can be found at www.xtendimaxapplicationrequirements.com; and
     - "User must comply in all respects with new label(ing), regardless of any contrary language on existing label."
   - In addition to the new label being available on the website listed above, paper labels will be provided to accompany stickered products.

2. Registrant will take all reasonable steps to:

   - As soon as new glossy labeling (booklets) become available, affix the new label to XtendiMax products at the time of manufacture in registered facilities;
   - Notify EPA, within one week of the booklet becoming available, of the date the booklet became available. All product manufactured after the booklet is available must contain the new glossy label;
   - For other XtendiMax products – whether in retail inventories, in the distribution chain, or for which manufacturing will occur before new glossy label booklets become available – produce and distribute sufficient quantities of stickers and new paper labels to update product (recognizing that stickering must occur in a registered establishment);
   - ~~Inform retailers of the need to sticker and supply new paper labels for products currently in inventory and products received with the former label;~~
   - Inform retailers of the need to sticker and supply new labels for products currently in inventory and products received with the former label as well as ~~…Provide~~ provide specific instructions to the retailers that are registered establishments on how to affix the sticker on the label and provide the ~~as well as that the~~ supplemental label ~~be provided~~ at time of purchase;
   - Inform retailers that are not yet EPA registered establishments about the importance of stickering the products currently in their inventory and products received with the former label ~~in their possession and~~ and that stickering and providing the new labels can only occur in an EPA registered establishment~~s~~; inform retailers of the process for establishment registration and reporting; communicate that retailers should not sell product until stickering is appropriately conducted.
   - Inform retailers who do not intend to become registered establishments the importance of -the new labeling and ~~stickering product in their possession and~~ to contact Monsanto immediately, so that Monsanto can reclaim the retailer inventory and provide replacement product with labeling updated in a registered

**Commented [A1]:** Deleted this bullet and incorporated it into the following bullets

**Commented [A2]:** Copied the language from the next bullet to help address the issue of not wanting unregistered establishments to sell older labeled products

establishment. Communicate that retailers should not sell product until stickering is appropriately conducted;

- Provide a copy to EPA of the communications used to inform retailers and others as described above.
- Provide access to new label through an internet webpage located at www xtendimaxapplicationrequirements.com.

**From:** Philip.Perry@lw.com
**To:** Knorr, Michele; Baris, Reuben; thomas.marvin@monsanto.com
**Subject:** Response to Terms and Conditions Page1 - EPA comments (3).docx
**Date:** Tuesday, October 10, 2017 4:59:36 PM
**Attachments:** Response to Terms and Conditions Page1 - EPA comments (3).docx

Michele and Reuben:

Attached please find our response on the terms and conditions. We are providing a clean copy because the redline was difficult to follow. We accepted a number of the proposed changes, but did not incorporate all the iterative communications with retailers proposed in the last draft. In particular, we are concerned that those iterative communications might require a potentially significant period of time to complete. Instead, we believe the better course is to move quickly, with a clear letter explaining the fundamental points of the plan to retailers – specifically including instructions that unregistered retailers cannot sticker the products, and must either register with EPA or contact Monsanto immediately (so that Monsanto can reclaim the product). This should mitigate concerns that unregistered establishments might engage in unauthorized stickering themselves. We are currently working on that letter and hope to supply it to you soon.

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1. Stickering, new paper label (*i.e.* supplemental labeling to accompany the product):

    - Sticker – Sticker that was submitted to EPA for approval contains the following information:
        - "Restricted Use Pesticide" ;
        - "Product cannot be used if user does not possess new label(ing) that can be found at www.xtendimaxapplicationrequirements.com; and
        - "User must comply in all respects with new label(ing), regardless of any contrary language on existing label."
    - In addition to the new label being available on the website listed above, paper labels will be provided to accompany stickered products.

2. Registrant will take all reasonable steps to:

    - As soon as new glossy labeling (booklets) become available, affix the new label to XtendiMax products at the time of manufacture in registered facilities;
    - Notify EPA, within one week of the booklet becoming available, of the date the booklet became available. All product manufactured after the booklet is available must contain the new glossy label;
    - For other XtendiMax products – whether in retail inventories, in the distribution chain, or for which manufacturing will occur before new glossy label booklets become available – produce and distribute sufficient quantities of stickers and new paper labels to update product;
    - Inform retailers of the need to sticker and supply new paper labels for products currently in inventory and products received with the former label;
    - Provide specific instructions to the retailers that are registered establishments on how to affix the sticker on the label as well as that the supplemental label be provided at time of purchase;
    - Inform retailers that are not yet EPA registered establishments that stickering can only occur in an EPA registered establishment; inform retailers of the process for establishment registration and reporting;
    - Inform retailers who do not intend to become registered establishments to contact Monsanto immediately, so that Monsanto can reclaim the retailer inventory and provide replacement product with labeling updated in a registered establishment. Communicate that retailers should not sell product until stickering is appropriately conducted;
    - Provide a copy to EPA of the communications used to inform retailers and others as described above.
    - Provide access to new label through an internet webpage located at www.xtendimaxapplicationrequirements.com.

**From:** Baris, Reuben
**To:** "MARVIN, THOMAS [AG/1920]"
**Subject:** Label comments
**Date:** Tuesday, October 10, 2017 6:43:00 PM
**Attachments:** MASTER LABEL 524-617_ADDDTuses_Oct102017_EPAreview- EPA comments.pdf
35008R1-39 Xtendimax VPG Tech Restricted Use Pesticide Sticker2 - EPA comments.pdf

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Please share with your team. Like I said, no surprises.

Reuben Baris | Acting Chief | Herbicide Branch
U.S. Environmental Protection Agency, Office of Pesticide Programs | (703) 305-7356

# RESTRICTED USE PESTICIDE

**Xtendimax® with VaporGrip® Technology**

EPA REG. No. 524-617

Product cannot be used if user does not possess new (substitute) label(ing) which can be found at www.xtendimaxapplicationrequirements.com

User must comply in all respects with new (substitute) label(ing) [regardless of any contrary language on existing label]

QR Code

35008R1-39

**MASTER LABEL FOR EPA REG. NO. 524-617**

# RESTRICTED USE PESTICIDE

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification

Primary Brand Name:

## M1768 Herbicide

Alternate Brand Name:

## Xtendimax® With VaporGrip® Technology

# RESTRICTED USE PESTICIDE

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification

## XtendiMax® With VaporGrip® Technology

**Complete Directions for Use**

This labeling expires on 11/09/2018, unless the U.S. EPA determines before that date that off-site incidents are not occurring at unacceptable frequencies or levels. Do not use or distribute this product after 11/09/2018, unless you visit www.xtendimaxapplicationrequirements.com and can verify that EPA has amended this expiration date

EPA Reg. Number: 524-617

**For weed control in asparagus, conservation reserve programs, corn, cotton, fallow croplands, general farmstead (noncropland), sorghum, grass grown for seed, hay, proso millet, pasture, rangeland, small grains, sod farms and farmstead turf, soybean, sugarcane, cotton with XtendFlex Technology, and Roundup Ready 2 Xtend Soybean.**

**This label supersedes any previously issued labeling for this product.**

**XtendiMax® With VaporGrip® Technology** is approved by U.S. EPA for all uses specified on this label in the following states, subject to county restriction as noted: Alabama, Arkansas, Arizona, Colorado, Delaware, Florida (excluding Palm Beach County), Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee (excluding Wilson County), Texas, Virginia, West Virginia, Wisconsin.

Check the registration status of each product in each state before using.

READ THE ENTIRE LABEL FOR **XTENDIMAX® WITH VAPORGRIP® TECHNOLOGY**
BEFORE PROCEEDING WITH THE USE DIRECTIONS CONTAINED IN THIS LABEL

READ AND FOLLOW ALL APPLICABLE DIRECTIONS, RESTRICTIONS, AND PRECAUTIONS ON THE CONTAINER LABEL AND BOOKLET AND WWW.XTENDIMAXAPPLICATIONREQUIREMENTS.COM.

Read the "LIMIT OF WARRANTY AND LIABILITY" statement at the end of the label before buying or using. If terms are not acceptable, return at once unopened.

Net contents:

EPA Establishment No.:

**CONTENTS**

## 1.0 INGREDIENTS

**ACTIVE INGREDIENT:**

Diglycolamine salt of dicamba (3,6-dichloro-*o*-anisic acid)* ..... 42.8%
OTHER INGREDIENTS: ..... 57.2%

**TOTAL:** ..... 100.0%
* contains 29.0%, 3,6-dichloro-*o*-anisic acid (2.9 pounds acid equivalent per U.S. gallon or 350 grams per liter).

## 2.0 IMPORTANT PHONE NUMBERS

1. FOR PRODUCT INFORMATION OR ASSISTANCE IN USING THIS PRODUCT, CALL TOLL-FREE, 1-800-332-3111.
2. IN CASE OF AN EMERGENCY INVOLVING THIS HERBICIDE PRODUCT, OR FOR MEDICAL ASSISTANCE, CALL COLLECT, DAY OR NIGHT, (314)-694-4000.

**IN CASE OF SPILL:**

**Steps to be taken in case material is released or spilled:**

Dike and contain the spill with inert material (sand, earth, etc.) and transfer liquid and solid diking material to separate containers for disposal. Remove contaminated clothing, and wash affected skin areas with soap and water. Wash clothing before re-use. Keep the spill out of all sewers and open bodies of water.

## 3.0 PRECAUTIONARY STATEMENTS

### 3.1 Hazards to Humans and Domestic Animals

Keep out of reach of children.

CAUTION!

Causes moderate eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet.

| FIRST AID | |
|---|---|
| **IF IN EYES** | • Hold eye open and rinse slowly and gently with water for 15 to 20 minutes.<br>• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.<br>• Call a poison control center or doctor for treatment advice. |
| **IF SWALLOWED:** | • Call a poison control center or doctor immediately for treatment advice.<br>• Have person sip a glass of water if able to swallow.<br>• Do not induce vomiting unless told to do so by a poison control center or doctor.<br>• Do not give anything by mouth to an unconscious person. |
| **IF ON SKIN OR CLOTHING:** | • Take off contaminated clothing.<br>• Rinse skin immediately with plenty of water for 15 to 20 minutes.<br>• Call a poison control center or doctor for treatment advice. |
| • Have the product container or label with you when calling a poison control center or doctor, or going | |

for treatment.
- You can call **(314) 694-4000**, collect day or night, for emergency medical treatment information.
- This product is identified as **XtendiMax® With VaporGrip® Technology, EPA Registration No. 524-617.**

**PERSONAL PROTECTIVE EQUIPMENT (PPE)**

**All mixers, loaders, applicators and other handlers must wear:**
- Long-sleeved shirt and long pants
- Waterproof gloves
- Shoes plus socks

See "Engineering Controls Statement" for additional requirements.
Follow the manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

**ENGINEERING CONTROLS STATEMENT**

When handlers use closed systems, or enclosed cabs in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

IMPORTANT: When reduced PPE is worn because a closed system is being used, handlers must be provided all PPE specified above for "all mixers, loaders, applicators and other handlers" and have such PPE immediately available for use in an emergency, such as a spill or equipment breakdown.

**USER SAFETY RECOMMENDATIONS**

Users should:
- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

### 3.2 Environmental Hazards

Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters or rinsate. Apply this product only as directed on the label.

This chemical is known to leach through soil into ground water under certain conditions as a result of agricultural use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination.

**Ground and Surface Water Protection**

**Point source contamination** - To prevent point source contamination, do not mix or load this pesticide product within 50 feet of wells (including abandoned wells and drainage wells), sink holes, perennial or intermittent streams and rivers, and natural or impounded lakes and reservoirs. Do not apply pesticide product within 50 feet of wells. This setback does not apply to properly capped or plugged abandoned wells and does not apply to impervious pad or properly diked mixing/loading areas as described below.

Mixing, loading, rinsing, or washing operations performed within 50 feet of a well are allowed only when conducted on an impervious pad constructed to withstand the weight of the heaviest load that may be on or move across the pad. The pad must be self-contained to prevent surface water flow over or from the pad. The pad capacity must be maintained at 110% that of the largest pesticide container or application equipment used on the pad and have sufficient capacity to contain all product spills, equipment or container leaks, equipment wash waters, and rainwater that may fall on the pad. The containment capacity does not apply to vehicles delivering pesticide shipments to the mixing/loading site. States may have in effect additional requirements regarding wellhead setbacks and operational containment.

Care must be taken when using this product to prevent: a) back siphoning into wells, b) spills or c) improper disposal of excess pesticide, spray mixtures or rinsates. Check valves or anti-siphoning devices must be used on all mixing equipment.

**Movement by surface runoff or through soil** - Do not apply under conditions which favor runoff. Do not apply to impervious substrates such as paved or highly compacted surfaces in areas with high potential for ground water contamination. Ground water contamination may occur in areas where soils are permeable or coarse and ground water is near the surface. Do not apply to soils classified as sand with less than 3% organic matter and where ground water depth is shallow. To minimize the possibility of ground water contamination, carefully follow application rate recommendations as affected by soil type in the Crop Specific Information section of this label.

**Movement by water erosion of treated soil** - Do not apply or incorporate this product through any type of irrigation equipment nor by flood or furrow irrigation. Ensure treated areas have received at least one-half inch rainfall (or irrigation) before using tailwater for subsequent irrigation of other fields.

**Endangered Species Concerns**
The use of any pesticide in a manner that may kill or otherwise harm an endangered species or adversely modify their habitat is a violation of federal law.

### 3.3 Physical or Chemical Hazards

Do not store or heat near oxidizing agents, hazardous chemical reaction may occur.

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## 4.0 DIRECTIONS FOR USE

It is a violation of Federal law to use this product in any manner inconsistent with its labeling. This product can only be used in accordance with the Directions for Use on this label. This labeling must be in the user's possession during application.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulations.

This is a restricted use pesticide.

### 4.1 Training

Prior to applying this product in the 2018 growing season and each growing season thereafter, applicator(s) must complete dicamba or auxin-specific training. If training is available and required by the state where the applicator intends to apply this product, the applicator must complete that training. If the state where the application is intended does not require auxin or dicamba-specific training, then the applicator must complete dicamba or auxin-specific training provided by one of the following sources: a) a registrant of a dicamba product approved for in-crop use with dicamba-tolerant crops, or b) a state or state-authorized provider.

### 4.2 Record Keeping

Record keeping is required for applications of this product. **The certified applicator must keep the following records for a period of two years**; records must be generated as soon as practical but no later than 14 days after application and a record must be kept for each application. Records must be made available to State Pesticide Control Official(s), USDA, and EPA upon request. An example form summarizing record keeping requirements can be found on www.xtendimaxapplicationrequirements.com.

1. All Items required by 7 CFR Part 110 (RECORDKEEPING ON RESTRICTED USE PESTICIDES BY CERTIFIED APPLICATORS) including:
    a. The brand or product name
    b. The EPA registration number
    c. The total amount applied
    d. The month, day, and year
    e. The location of the application
    f. The crop, commodity, stored product, or site
    g. The size of treated area
    h. The name of the certified applicator
    i. The certification number of the certified applicator
2. Training: Date and provider of required training completed and proof of completion.
3. Receipts of Purchase: Receipts for the purchase of this product.
4. Product Label: A copy of this product label, and any state special local needs label that supplements this label.
5. Buffer Requirement: Record of the buffer distance calculation and any areas included within the buffer distance calculations as allowed in Section 9.1.4.a.
6. Susceptible Crops Awareness: Record that a sensitive crop registry was consulted; or document surveying neighboring fields for any susceptible crops prior to application. At a minimum, records must include the name of the sensitive crop registry and the date it was consulted or the survey of neighboring fields and the date conducted (read Section 9.1.4.b for additional information).
7. Start and Finish Times of Each Application: Record of the time at which the application was initiated and the time when the application was completed.
8. Application Timing: Record of the type of application (for example: pre-emergence, post-emergence) and number of days after planting if post-emergence.
9. Air Temperature: Record of the air temperature in degrees Fahrenheit at the start and completion of each application.
10. Wind Speed and Direction: Record of the wind speed and direction (the direction from which the wind is blowing) at boom height at the start and completion of each application of this product (Read Section 9.1.1 for information on wind speed).
11. Nozzle and Pressure: Record of the spray nozzle manufacturer/brand, type, orifice size, and operating pressure used during each application of this product (Read Section 9.1.1 for information on nozzles and pressures.)
12. Tank Mix Products: Record of the brand names and EPA registration numbers (if available) for all products (pesticides, adjuvants, and other products) that were tank mixed with this product for each application (Read Section 8.0 for more information on tank mixing.)
13. Spray System Cleanout: Record of compliance with the section of this label titled Section 9.5: Proper Spray System Equipment Cleanout. At a minimum, records must include the confirmation that the spray system was clean before using this product and that the post-application cleanout was completed in accordance with Section 9.5.

**AGRICULTURAL USE REQUIREMENTS**

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about Personal Protective Equipment (PPE), and restricted-entry intervals. The requirements in this box only apply to uses of this product that are covered by the WPS.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 24 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as, plants, soil, or water is:

- Coveralls worn over short-sleeved shirt and short pants
- Chemical-resistant footwear plus socks
- Waterproof gloves
- Chemical-resistant headgear for overhead exposure
- Protective eyewear

**NON-AGRICULTURAL USE REQUIREMENTS**

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Do not enter or allow people (or pets) to enter the treated area until sprays have dried. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Do not enter or allow other people or pets to enter until sprays have dried.

## 5.0 STORAGE AND DISPOSAL

Proper pesticide storage and disposal are essential to protect against exposure to people and the environment due to leaks and spills, excess product or waste, and vandalism. Do not allow this product to contaminate water, foodstuffs, feed or seed by storage and disposal. Open dumping is prohibited. This product may not be mixed, loaded, or used within 50 feet of all wells including abandoned wells, drainage wells, and sinkholes. This setback does not apply to properly capped or plugged abandoned wells and does not apply to impervious pad or properly diked mixing/loading areas as described above

### 5.1 Pesticide Storage

Groundwater contamination may be reduced by diking and flooring of permanent liquid bulk storage sites with an impermeable material. Spillage or leakage should be contained and absorbed with clay granules, sawdust, or equivalent material for disposal.
Store in original container in a well-ventilated and away from food, pet food, feed, seed, fertilizers, and veterinary supplies. Avoid cross-contamination with other pesticides. Keep container closed to prevent spills and contamination.

### 5.2 Pesticide Disposal

To avoid wastes, use all material in this container, including rinsate, by application according to label directions. If wastes cannot be avoided, offer remaining product to a waste disposal facility or pesticide

disposal program. Such programs are often run by state or local governments or by industry. All disposal must be in accordance with applicable federal, state and local regulations and procedures.
[*Alternate PESTICIDE DISPOSAL statement for transport vehicles only:* To avoid wastes, empty as much product from this transport vehicle as possible for repackaging or use in accordance with label directions. If wastes cannot be avoided, offer remaining product or rinsate to a waste disposal facility or pesticide disposal program. All disposal must be in accordance with applicable federal, state and local regulations and procedures.]

### 5.3 Container Handling and Disposal

[*Optional label statement if applicable*: See container label for container handling and disposal instructions and refilling limitations.]

[*CONTAINER HANDLING AND DISPOSAL STATEMENTS AND REFILLING LIMITATIONS FOR CONTAINER LABELS*]

[*CONTAINER HANDLING AND DISPOSAL STATEMENT AND REFILLING LIMITATION FOR NONREFILLABLE RIGID CONTAINERS OF LESS THAN 1-GALLON CAPACITY*]

Nonrefillable container. Do not reuse or refill this container.

[*Alternate container statement:* Nonrefillable container. Do not reuse this container to hold materials other than pesticides or dilute pesticides (rinsate). After emptying and cleaning, it may be allowable to temporarily hold rinsate or other pesticide-related materials in the container. Contact your state regulatory agency to determine allowable practices in your state.]

Triple rinse this container promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

Then offer this container for recycling, if available. If recycling is not available, dispose of in accordance with federal, state and local regulations and procedures, which may include puncturing the properly rinsed container and disposing in a sanitary landfill.

[*Alternate container disposal statement:* Once properly rinsed, some agricultural plastic pesticide containers can be taken to a container collection site or picked up for recycling. To find the nearest site, contact your chemical dealer or Monsanto at 1-800-ROUNDUP (1-800-768-6387). If recycling is not available, dispose of in accordance with federal, state and local regulations and procedures, which may include puncturing the properly rinsed container and disposing in a sanitary landfill.]

[*CONTAINER HANDLING AND DISPOSAL STATEMENT AND REFILLING LIMITATION FOR NONREFILLABLE RIGID PLASTIC 2.5-GALLON CONTAINERS AND OTHER NONREFILLABLE CONTAINERS OF GREATER THAN 1-GALLON BUT EQUAL TO OR LESS THAN 5-GALLON CAPACITY*]

Nonrefillable container. Do not reuse this container to hold materials other than pesticides or dilute pesticides (rinsate). After emptying and cleaning, it may be allowable to temporarily hold rinsate or other pesticide-related materials in the container. Contact your state regulatory agency to determine allowable practices in your state.

[*Alternate container statement:* Nonrefillable container. Do not reuse or refill this container.]

Triple rinse or pressure rinse (or equivalent) this container promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Once properly rinsed, some agricultural plastic pesticide containers can be taken to a container collection site or picked up for recycling. [*Optional container disposal statement:* To find the nearest site, contact your chemical dealer or Monsanto at 1-800-ROUNDUP (1-800-768-6387)]. If recycling is not available, dispose of in accordance with federal, state and local regulations and procedures, which may include puncturing the properly rinsed container and disposing in a sanitary landfill.

[*Alternate container disposal statement:* Then offer this container for recycling, if available. If recycling is not available, dispose of in accordance with federal, state and local regulations and procedures, which may include puncturing the properly rinsed container and disposing in a sanitary landfill.]

[*CONTAINER HANDLING AND DISPOSAL STATEMENT AND REFILLING LIMITATION FOR NONREFILLABLE RIGID PLASTIC 30-GALLON CONTAINERS AND OTHER NONREFILLABLE CONTAINERS OF GREATER THAN 5-GALLON CAPACITY*]

Nonrefillable container. Do not reuse or refill this container.

[*Alternate container statement:* Nonrefillable container. Do not reuse this container to hold materials other than pesticides or dilute pesticides (rinsate). After emptying and cleaning, it may be allowable to temporarily hold rinsate or other pesticide-related materials in the container. Contact your state regulatory agency to determine allowable practices in your state.]

Triple rinse or pressure rinse (or equivalent) this container promptly after emptying.

Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times.

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Once properly rinsed, some agricultural plastic pesticide containers can be taken to a container collection site or picked up for recycling. [*Alternate container disposal statement:* To find the nearest site, contact your chemical dealer or Monsanto at 1-800-ROUNDUP (1-800-768-6387)]. If recycling is not available, dispose of in accordance with federal, state and local regulations and procedures, which may include puncturing the properly rinsed container and disposing in a sanitary landfill.

[*Alternate container disposal statement:* Then offer the container for recycling, if available. If recycling is not available, dispose of in accordance with federal, state and local regulations and procedures, which may include puncturing the properly rinsed container and disposing in a sanitary landfill.]

[*Optional container label statement:* Return Properly Rinsed Container to Monsanto for Recycling Contact: 1-800-ROUNDUP (1-800-768-6387)]

[*CONTAINER HANDLING AND DISPOSAL STATEMENT AND REFILLING LIMITATION FOR ALL REFILLABLE CONTAINERS, EXCEPT TRANSPORT VEHICLES*]

Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose.

Cleaning this container before refilling is the responsibility of the refiller. Cleaning this container before final disposal is the responsibility of the person disposing of the container.

To clean this container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times. Then offer this container for recycling, if available.

[*Optional container disposal statement:* To obtain information about recycling refillable containers, contact Monsanto Company at 1-800-ROUNDUP (1-800-768-6387)]

[*Optional container label statement:* Return Properly Rinsed Container to Monsanto for Recycling, Call 1-800-ROUNDUP (1-800-768-6387)]

[*CONTAINER HANDLING AND DISPOSAL STATEMENT FOR ALL TRANSPORT VEHICLES AS DEFINED IN 40 CFR 156.3]*

**THIS LABEL FOR USE WITH TRANSPORT VEHICLES ONLY**

Emptied container retains vapor and product residue. Observe all precautions stated on this label until the container is cleaned, reconditioned or destroyed. Prior to refilling, inspect carefully for damage such as cracks, punctures, abrasions, and worn-out threads and closures. Clean thoroughly before reuse for transportation of a material of different composition or before retiring this transport vehicle from service.

[Alternative label statement: NET CONTENTS: See Bill of Lading]

[Alternative label statement: LOT: See Bill of Lading]

[Alternative label statement: For Net Contents and Lot Number, see Bill of Lading]

## 6.0 PRODUCT INFORMATION

XtendiMax® With VaporGrip® Technology is approved by U.S. EPA for all uses specified on this label in the following states, subject to county restriction as noted: Alabama, Arkansas, Arizona, Colorado, Delaware, Florida (excluding Palm Beach County), Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New Mexico,

New York, North Carolina, North Dakota, Oklahoma, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee (excluding Wilson County), Texas, Virginia, West Virginia, Wisconsin.

Additional state restrictions and requirements may apply. The applicator must comply with any additional state requirements and restrictions.

This product is a water-soluble formulation intended for control and suppression of many annual, biennials, and perennial broadleaf weeds, as well as woody brush and vines listed in the WEEDS CONTROLLED section of this label. This product may be used for control of these weeds in asparagus, corn, cotton, conservation reserve programs, fallow cropland, grass grown for seed, hay, proso millet, pasture, rangeland, general farmstead (noncropland), small grains, sod farms and farmstead turf, sorghum, soybean, sugarcane, Cotton with XtendFlex Technology and Roundup Ready 2 Xtend Soybean.

XtendiMax® With VaporGrip® Technology is a contact, systemic herbicide which can have moderate residual control on small seeded broadleaf weeds, including waterhemp, lambsquarters and Palmer pigweed, depending on rainfall and soil type.

XtendiMax® With VaporGrip® Technology is readily absorbed by plants through shoot and root uptake, translocates throughout the plant's system, and accumulates in areas of active growth. XtendiMax® With VaporGrip® Technology interferes with the plant's growth hormones (auxins) resulting in death of many broadleaf weeds.

Failure to properly clean the entire spray system can result in inadvertent contamination of the spray system. You must ensure that the spray system used to apply this product is clean before using this product.

**Rainfast period:** Rainfall or irrigation occurring within 4 hours after postemergence applications may reduce the effectiveness of this product.

Refer to the CROP-SPECIFIC INFORMATION and CROPS WITH XTEND TECHNOLOGY sections for application timing and other crop-specific details.

### 6.1 Restrictions

The applicator must read the entire label, including product labeling and follow all restrictions for XtendiMax® With VaporGrip® Technology**.** Restrictions included, but are not limited to:

- DO NOT APPLY THIS PRODUCT AERIALLY.
- DO NOT TANK MIX WITH PRODUCTS CONTAINING AMMONIUM SALTS SUCH AS AMMONIUM SULFATE (AMS) AND UREA AMMONIUM NITRATE. Small quantities of AMS can greatly increase the volatility potential of dicamba. Read the TANK MIXING INSTRUCTIONS of this label (Section 8.0) for instructions regarding other tank mix products.
- DO NOT APPLY TO CROPS UNDER STRESS DUE TO LACK OF MOISTURE, HAIL DAMAGE, FLOODING, HERBICIDE INJURY, MECHANICAL INJURY, INSECTS, OR WIDELY FLUCTUATING TEMPERATURES AS INJURY MAY RESULT.
- DO NOT APPLY THROUGH ANY TYPE OF IRRIGATION EQUIPMENT. DO NOT TREAT IRRIGATION DITCHES OR WATER USED FOR CROP IRRIGATION OR DOMESTIC PURPOSES.
- DO NOT MAKE APPLICATION OF THIS PRODUCT IF RAIN IS EXPECTED IN THE NEXT 24 HOURS THAT COULD RESULT IN WATER RUNOFF FROM AREA OF APPLICATION.

Review the entire label including, specific crop use direction sections for additional restrictions.

## 7.0 WEED RESISTANCE MANAGEMENT

| GROUP | 4 | HERBICIDE |
|---|---|---|

Dicamba mimics auxin (a plant hormone) resulting in a hormone imbalance in susceptible plants that interferes with normal cell division, cell enlargement, and protein synthesis. Dicamba active ingredient is a Group 4 herbicide based on the mode of action classification system of the Weed Science Society of America. Any weed population can contain plants naturally resistant to Group 4 herbicides. Weed species resistant to Group 4 herbicides can be effectively managed utilizing another herbicide from a different Group, or by using other cultural or mechanical practices.

### 7.1 Weed Management Practices

Certain agronomic practices can delay or reduce the likelihood that resistant weed populations will develop and can be utilized to manage weed resistance once it occurs.

Do not use less than the labeled rate of this product in a single application. Using the appropriate application rate can minimize the selection for resistant weeds.

Proactively implementing diversified weed control strategies to minimize selection for weed populations resistant to one or more herbicides is a best practice. A diversified weed management program may include the use of multiple herbicides with different sites of action and overlapping weed spectrum with or without tillage operations and/or other cultural practices. Research has demonstrated that using the labeled rate and directions for use is important to delay the selection for resistance.

The continued effectiveness of this product depends on the successful implementation of a weed resistance management program.

To aid in the prevention of developing weeds resistant to this product:

- Scout fields before application to ensure herbicides and rates will be appropriate for the weed species and weed sizes present.
- Start with a clean field, using either a burndown herbicide application or tillage.
- Control weeds early when they are relatively small (less than 4 inches).
- Apply full rates of XtendiMax® With VaporGrip® Technology for the most difficult to control weed in the field at the specified time (correct weed size) to minimize weed escapes.
- Avoid tank mixtures with other herbicides that reduce the efficacy of this product (through antagonism), or with ones that encourage application rates of this product below those specified on this label.
- Scout fields after application to detect weed escapes or shifts in weed species.
- Control weed escapes before they reproduce by seed or proliferate vegetatively.
- Report any incidence of non-performance of this product against a particular weed species to your Monsanto retailer or representative or call 1-844-RRXTEND (1-844-779-8363).
- If resistance is suspected, treat weed escapes with an herbicide having a site of action other than Group 4 and/or use non-chemical methods to remove escapes, as practical, with the goal of preventing further seed production.

Additionally, users should follow as many of the following herbicide resistance management practices as is practical:

- Use a broad spectrum soil-applied herbicide with other sites of action as a foundation in a weed control program.
- Utilize sequential applications of herbicides with alternative sites of action.

- Rotate the use of this product with non-Group 4 herbicides.
- Avoid making more than two applications of dicamba and any other Group 4 herbicides within a single growing season unless mixed with an herbicide with a different mechanism of action with an overlapping spectrum for the difficult to control weeds.
- Incorporate non-chemical weed control practices, such as mechanical cultivation, crop rotation, cover crops and weed-free crop seeds, as part of an integrated weed control program.
- Use good agronomic principles that enhance crop development and crop competitiveness.
- Thoroughly clean plant residues from equipment before leaving fields suspected to contain resistant weeds.
- Manage weeds in and around fields, during and after harvest to reduce weed seed production.

Contact the local agricultural extension service, Monsanto representative, agricultural retailer or crop consultant for further guidance on weed control practices as needed.

### 7.2 Management of Dicamba-Resistant Biotypes

Appropriate testing is critical in order to determine if a weed is resistant to dicamba. Contact your Monsanto representative to determine if resistance in any particular weed biotype has been confirmed in your area, or visit on the Internet www.weedresistancemanagement.com or www.weedscience.org.

Monsanto Company is not responsible for any losses that result from the failure of this product to control dicamba-resistant weed biotypes.

The following good agronomic practices can reduce the spread of confirmed dicamba-resistant biotypes:

- If a naturally occurring resistant biotype is present in your field, this product may be tank-mixed or applied sequentially with an appropriately labeled herbicide with a different mode of action to achieve control (read Section 8.0 for more information on tank mixing).
- Cultural and mechanical control practices (e.g., crop rotation or tillage) can also be used as appropriate.
- Scout treated fields after herbicide application and control weed escapes, including resistant biotypes, before they set seed.
- Thoroughly clean equipment, as practical, for all weed seeds before leaving fields known to contain resistant biotypes.

## 8.0 TANK MIXING INSTRUCTIONS

XtendiMax® With VaporGrip® Technology may only be tank-mixed with products that have been tested and found not to adversely affect the offsite movement potential of XtendiMax® With VaporGrip® Technology. A list of those products may be found at www.xtendimaxapplicationrequirements.com.

The applicator must check the list of tested products found not to adversely affect the offsite movement potential of XtendiMax® With VaporGrip® Technology at www.xtendimaxapplicationrequirements.com no more than 7 days before applying XtendiMax® With VaporGrip® Technology.

DO NOT tank mix any product with XtendiMax® With VaporGrip® Technology unless:

1. The intended tank-mix product is identified on the list of tested products;
2. The intended products are not prohibited on either this label or the label of the tank mix product; and
3. All requirements and restrictions on www.xtendimaxapplicationrequirments.com are followed.

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TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, MONSANTO MAKES NO RECOMMENDATION OR WARRANTY HEREIN REGARDING THE USE OF ANY PRODUCT THAT

MAY APPEAR ON THE WEBSITE REFERENCED ABOVE, REGARDLESS OF WHETHER SUCH PRODUCT IS USED ALONE OR IN A TANK MIX WITH XTENDIMAX® WITH VAPORGRIP® TECHNOLOGY. BUYER AND ALL USERS ARE SOLELY RESPONSIBLE FOR ANY LACK OF PERFORMANCE, LOSS, OR DAMAGE IN CONNECTION WITH THE USE OR HANDLING OF ANY SUCH PRODUCT ALONE OR IN A TANK MIX WITH XTENDIMAX® WITH VAPORGRIP® TECHNOLOGY. See the section titled "LIMIT OF WARRANTY AND LIABILITY" herein for more information.

### 8.1 Compatibility Test for Mix Components

Before mixing components, always perform a compatibility jar test.

- For 20 gallons per acre spray volume, use 3.3 cups (800 mL) of water. For other spray volumes, adjust rates accordingly. Only use water from the intended source at the source temperature.
- Add components in the sequence indicated in the Mixing Order section below using 2 teaspoons for each pound or 1 teaspoon for each pint of labeled use rate per acre.
- Cap the jar and invert 10 cycles between component additions.
- When the components have all been added to the jar, let the solution stand for 15 minutes.
- Evaluate the solution for uniformity and stability. The spray solution should not have free oil on the surface; fine particles that precipitate to the bottom; or thick (clabbered) texture. If the spray solution is not compatible, repeat the compatibility test with the addition of a suitable compatibility agent. If the solution is then compatible, use the compatibility agent as directed on its label. If the solution is still incompatible, then do not mix the ingredients in the same tank.

### 8.2 Mixing Order

Only use approved tank mix products as directed on www.xtendimaxapplicationrequirements.com. Always read and follow label directions for all products in the tank mixture.

1. Ensure application and mixing equipment are clean and in proper working order
2. Water - Begin by agitating a thoroughly **clean sprayer** tank three-quarters full of clean water.
3. Agitation - Maintain constant agitation throughout mixing and application.
4. Drift Reducing Adjuvants (DRA)-(when applicable)
5. Inductor - If an inductor is used, rinse it thoroughly after each component has been added.
6. Products in PVA bags - Place any product contained in water-soluble PVA bags into the mixing tank. Wait until all water-soluble PVA bags have fully dissolved and the product is evenly mixed in the spray tank before continuing.
7. Water-dispersible products (dry flowables, wettable powders, suspension concentrates, or suspo-emulsions)
8. Water-soluble products (such as XtendiMax® With VaporGrip® Technology)
9. Emulsifiable concentrates (such as oil concentrate when applicable)
10. Water-soluble additives (when applicable)
11. Add remaining quantity of water.

Maintain constant agitation during application

### 8.3 Adjuvants, Drift Reducing Adjuvants, Surfactants, and Other Tank Mixed Products

**See Section 8.0 TANK MIXING INSTRUCTIONS for tank mixing instructions for adjuvants, drift reducing adjuvants, surfactants, and other tank mixed products.**

## 9.0 APPLICATION EQUIPMENT AND TECHNIQUES

DO NOT APPLY THIS PRODUCT USING AERIAL SPRAY EQUIPMENT.

XtendiMax® With VaporGrip® Technology can be applied to actively growing weeds as broadcast, band, or spot spray applications using water as a carrier. For best results, treat weeds early when they are relatively small (less than 4 inches). Timely application to small weeds early in the season will improve control and reduce weed competition. Refer to Table 1 for XtendiMax® With VaporGrip® Technology application rates for control or suppression by weed type and growth stage. For crop-specific application timing and other details, refer to the CROP-SPECIFIC INFORMATION section of this label.

APPLY THIS PRODUCT USING PROPERLY MAINTAINED AND CALIBRATED EQUIPMENT CAPABLE OF DELIVERING THE REQUIRED VOLUMES.

Using a hooded sprayer or other drift reduction technology in combination with approved nozzles may further reduce drift potential.

**Cultivation:** Do not cultivate within 7 days after applying this product.

**Table 1. XtendiMax® With VaporGrip® Technology Application Rates for Control or Suppression by Weed Type and Growth Stage**

Use rate limitations are given in sections 9 (RESTRICTIONS) and 10 (CROP-SPECIFIC INFORMATION)

| Weed Type and Stage | Rate Per Acre | Weed Type and Stage | Rate Per Acre |
|---|---|---|---|
| **Annual**[1] | | **Perennial** | |
| Small, actively growing | 11 – 22 fluid ounces | Top growth suppression | 11 – 22 fluid ounces |
| | | Top growth control and root suppression | 22 – 44 fluid ounces |
| Established weed growth | 22 – 33 fluid ounces | Noted perennials (footnote 1 in Section 10.0). | 44 fluid ounces |
| | | er perennials[3] | 44 fluid ounces |
| **Biennial** | | **Woody Brush & Vines** | |
| Rosette diameter 1 – 3” | 11 – 22 fluid ounces | Top growth suppression | 22 – 44 fluid ounces |
| | | Top growth control[2,3] | 44 fluid ounces |
| Rosette diameter 3” or more | 22 – 44 fluid ounces | Stems and stem suppression[3] | 44 fluid ounces |
| Bolting | 44 fluid ounces | | |

[1] Rates below 11 fluid ounces per acre may provide control or suppression but should typically be applied with other herbicides that are effective on the same species and biotype.

pecies noted will require tank mixes for adequate control.

[3] For species noted do not broadcast apply more than 44 fluid ounces per acre in any single application. One sequential application of up to 44 fluid ounces may be required for adequate control. Use the higher level listed rate ranges when treating dense vegetative growth or perennial weeds with well established root growth.

### 9.1 Spray Drift Management

Do not allow herbicide solution to mist, drip, drift or splash onto desirable vegetation because severe injury or destruction to desirable broadleaf plants could result.

The most effective way to reduce drift potential is to apply large droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if the application is made improperly, or under unfavorable environmental conditions (see the **"Temperature and Humidity"** and "**Temperature Inversions"** sections of this label).

### 9.1.1 Sprayer Setup

The following sprayer setup requirements for drift management must be followed:

- **Nozzle type.** The applicator must use an approved nozzle within a specified pressure range as found at www.xtendimaxapplicationrequirements.com when applying XtendiMax® With VaporGrip® Technology. Do not use any other nozzle and pressure combination not specifically listed on this website.

- **Spray Volume.** The applicator must apply this product in a **minimum of 15 gallons of spray solution per acre**. See Section 8.0 for information on approved tank mix products.

- **Equipment Ground Speed.** Do not exceed a **ground speed of 15 miles per hour**. Select a ground speed that will deliver the desired spray volume while maintaining the desired spray pressure, but slower speeds generally result in better spray coverage and deposition on the target area. Provided the applicator can maintain the required nozzle pressure, it is recommended that tractor speed is reduced to 5 miles per hour at field edges.

- **Spray boom Height.** Do not exceed a **boom height of 24 inches** above target pest or crop canopy. Excessive boom height will increase the drift potential.

- **Wind Speed.** Do not apply when wind speeds are **less than 3 MPH or greater than 10 MPH**. Only apply when wind speed at boom height is between 3 and 10 mph.

### 9.1.2 Temperature and Humidity

When making applications in low relative humidity or temperatures above 91 degrees Fahrenheit, set up equipment to produce larger droplets to compensate for evaporation (for example: increase orifice size and/or increase spray volume as directed on www.xtendimaxapplicationrequirements.com). Larger droplets have a lower surface to volume ratio and can be impacted less by temperature and humidity. Droplet evaporation is most severe when conditions are both hot and dry.

### 9.1.3 Temperature Inversions

Do not apply this product during a temperature inversion as the off-target movement potential is high.
Do not apply this product between sunset and sunrise. In general, temperature inversions are more likely during night time hours.

- During a temperature inversion, the atmosphere is very stable and vertical air mixing is restricted, which can cause small, suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light, variable winds common during inversions.
- Temperature inversions can be characterized by increasing temperatures with altitude and can be common on evenings and nights with limited cloud cover and light to no wind. Cooling of air at the earth's surface takes place and warmer air is trapped above it. Temperature inversions can begin to form as the sun sets and often continue into the morning.

- Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.
- The inversion will typically dissipate with increased winds (above 3 miles per hour) or at sunrise when the surface air begins to warm (generally 3°F from morning low).

### 9.1.4 Buffer Requirements and Protection of Susceptible Crops

**Do not apply under circumstances where drift may occur to food, forage, or other plantings that might be damaged or the crops rendered unfit for sale, use, or consumption.**

#### 9.1.4.a. Buffer Requirement

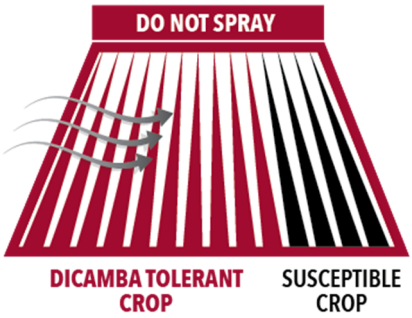
The applicator **must always maintain** a 110 foot downwind buffer (when applying up to 22 fluid ounces of this product per acre) or a 220 foot downwind buffer (when applying greater than 22 up to 44 fluid ounces of this product per acre) between the last treated row and the nearest downwind field edge (in the direction the wind is blowing).


The following areas may be included in the buffer distance calculation when directly adjacent to the treated field edges:

- Roads, paved or gravel surfaces.
- Planted agricultural fields containing: corn, dicamba tolerant cotton, dicamba tolerant soybean, sorghum, proso millet, small grains and sugarcane. If the applicator intends to include such crops as dicamba tolerant cotton and/or dicamba tolerant soybeans in the buffer distance calculation, the applicator must confirm the crops are in fact dicamba tolerant.
- Agricultural fields that have been prepared for planting.
- Areas covered by the footprint of a building, silo, or other man made structure with walls and or roof.

#### 9.1.4.b. Susceptible Crops

**DO NOT APPLY** this product when the wind is blowing toward adjacent non-dicamba tolerant susceptible crops; this includes **NON-DICAMBA TOLERANT SOYBEAN AND COTTON.**




**Before making an application, the applicator must survey the application site for adjacent non-target susceptible crops. The applicator must also consult applicable sensitive crop registries to identify any commercial specialty or certified organic crops that may be located near the application site**.

**Susceptible crops include, but are not limited to non-dicamba tolerant soybeans and cotton, tomatoes and other fruiting vegetables (EPA crop group 8), fruit trees, cucurbits (EPA crop group 9), grapes, beans, flowers, ornamentals, peas, potatoes, sunflower, tobacco, other broadleaf plants, and including plants in a greenhouse. Severe injury or destruction could occur if any contact between this product and these plants occurs.**

### 9.1.5 Application Awareness

AVOIDING SPRAY DRIFT AT THE APPLICATION SITE IS THE RESPONSIBILITY OF THE APPLICATOR.

The interaction of equipment and weather related factors must be monitored to maximize performance and on-target spray deposition. The applicator is responsible for considering all of these factors when making a spray decision. The applicator is responsible for compliance with state and local pesticide regulations, including any state or local pesticide drift regulations.

## 9.2 Ground Application (Banding)

When applying XtendiMax® With VaporGrip® Technology by banding, determine the amount of herbicide and water volume needed using the following formula:

$$\frac{\text{Bandwidth in inches}}{\text{Row width in inches}} \times \text{Broadcast rate per acre} = \text{Banding herbicide rate per acre}$$

$$\frac{\text{Bandwidth in inches}}{\text{Row width in inches}} \times \text{Broadcast volume per acre} = \text{Banding water volume per acre}$$

## 9.3 Ground Application (Broadcast)

**Water Volume:** Use a **minimum of 15 gallons** of spray solution per broadcast acre for optimal performance. Use 20 gallons per acre when treating dense or tall vegetation.

**Application Equipment:** Select nozzles (refer to section 9.1.1 Nozzle type of this product label) designed to produce minimal amounts of fine spray particles. Spray with nozzles as close to the weeds as practical for good weed coverage.

Using a hooded sprayer or other drift reduction technology in combination with approved nozzles may further reduce drift potential.

### 9.4 Ground Application (Wipers)

XtendiMax® With VaporGrip® Technology may be applied through wiper application equipment to control or suppress actively growing broadleaf weeds, brush and vines. Use a solution containing 1 part XtendiMax® With VaporGrip® Technology to 1 part water. Do not apply greater than 1 lb dicamba acid equivalent (1 quart of this product) per acre per application. Do not contact desirable vegetation with herbicide solution. Wiper application may be made to crops (including pastures) and non-cropland areas described in this label except for non-dicamba-tolerant cotton, sorghum, and non-dicamba-tolerant soybean.

### 9.5 Proper Spray System Equipment Cleanout

You must ensure that the spray system used to apply this product is clean before using this product.

Failure to properly clean the entire spray system can result in inadvertent contamination of the spray system.

Small quantities of dicamba may cause injury to non-dicamba tolerant soybeans and other susceptible crops (see Section 9.1.4 of this label for more information).

**Clean equipment immediately after using this product**, using a triple rinse procedure as follows:

1. After spraying, drain the sprayer (including boom and lines) immediately. Do not allow the spray solution to remain in the spray boom lines overnight prior to flushing.
2. Flush tank, hoses, boom and nozzles with clean water. If equipped, open boom ends and flush.
3. Inspect and clean all strainers, screens and filters.
4. Prepare a cleaning solution with a commercial detergent or sprayer cleaner or ammonia according to the manufacturer's directions.
5. Take care to wash all parts of the tank, including the inside top surface. Start agitation in the sprayer and thoroughly recirculate the cleaning solution for at least 15 minutes. All visible deposits must be removed from the spraying system.
6. Flush hoses, spray lines and nozzles for at least 1 minute with the cleaning solution.
7. Remove nozzles, screens and strainers and clean separately in the cleaning solution after completing the above procedures.
8. Drain pump, filter and lines.
9. Rinse the complete spraying system with clean water.
10. Clean and wash off the outside of the entire sprayer and boom.
11. All rinse water must be disposed of in compliance with local, state, and federal guidelines.

## 10.0 ADDITIONAL RESTRICTIONS

**Maximum Application Rates:** The maximum application or use rates stated throughout this label are given in units of volume (fluid ounces or quarts) of this product per acre. However, the maximum allowed application rates apply to this product combined with the use of any and all other herbicides containing the active ingredients dicamba, whether applied separately or as a tank mixture, on a basis of total

pounds of dicamba (acid equivalents) per acre. If more than one dicamba-containing product is applied to the same site within the same year, you must ensure that the total use of dicamba (pounds acid equivalents) does not exceed 2 pounds/A per year from all applications. See the INGREDIENTS section of this label for necessary product information.

**Maximum seasonal use rate:** Refer to Table 2. Crop-Specific Restrictions for crop-specific maximum seasonal use rates. Do not exceed 88 fluid ounces of XtendiMax® With VaporGrip® Technology (2 pounds acid equivalent) per acre, per year.

**Preharvest Interval (PHI)**: Refer to the CROP-SPECIFIC INFORMATION section for preharvest intervals.

**Restricted Entry Interval (REI): 24 hours**

**Crop Rotational Restrictions**

No rotational cropping restrictions apply when rotating to Roundup Ready 2 Xtend® Soybeans or cotton seed with XtendFlex® Technology (including Bollgard® 3 XtendFlex® Cotton, Bollgard II® XtendFlex® Cotton, or XtendFlex® Cotton). For other crops the interval between application and planting rotational crop is given below. When counting days from the application of this product, do not count days when the ground is frozen. Planting at intervals less than specified below may result in crop injury. Moisture is essential for the degradation of this herbicide in soil. If dry weather prevails, use cultivation to allow herbicide contact with moist soil.

**Planting/replanting restrictions at application rates of 33 fluid ounces of this product per acre per season or less**: Follow the planting restrictions in the directions for use for Preplant application in the Crop Specific Information section of this label. For corn, cotton (except cotton seed with XtendFlex® Technology), sorghum, and soybean (except Roundup Ready 2 Xtend® Soybean), follow the planting restrictions in the directions for use for preplant application in **Section 11. Crop-Specific Information** of this label. Do not plant barley, oat, wheat, and other grass seedings for 15 days for every 11 fluid ounces of this product applied per acre east of the Mississippi River and 22 days for every 11 fluid ounces per acre applied west of the Mississippi River. No planting restrictions apply beyond 120 days after application of this product.

**Planting/replanting restrictions at application rates of more than 33 fluid ounces and up to 88 fluid ounces of this product per acre per season:** Wait a minimum of 120 days after application of this product before planting corn, sorghum and cotton (except cotton seed with XtendFlex® Technology) east of the Rocky Mountains and before planting all other crops (except Roundup Ready 2 Xtend® Soybean) grown in areas receiving 30 inches or more rainfall annually. Wait a minimum of 180 days before planting crops in areas with less than 30 inches of annual rainfall. Wait a minimum of 30 days for every 22 fluid ounces of this product applied per acre before planting barley, oat, wheat, and other grass seedings east of the Mississippi River and 45 days for every 22 fluid ounces of this product applied per acre west of the Mississippi River.

**Table 2. Crop-Specific Restrictions[1]**

| Crop | Maximum Rate Per Acre Per Application (fl oz) | Maximum In-Crop Rate Pre Acre Per Season (fl oz) | Livestock Grazing or Feeding |
|---|---|---|---|
| Asparagus | 22 | 22 | Yes |

| | | | |
|---|---|---|---|
| Barley; Fall<br>Spring | 11<br>11 | 16.5<br>15 | Yes |
| Conservation Reserve Program (CRP) | 44 | 88 | Yes |
| Corn | 22 | 33 | Yes[2] |
| Cotton | 11 | 11 | Yes |
| Cotton with XtendFlex Technology | 44 | 88 | Yes |
| Fallow Ground | 44 | 88 | Yes |
| Grass grown for seed | 44 | 88 | Yes |
| Oats | 5.5 | 5.5 | Yes |
| Pastureland | 44 | 44 | Yes |
| Proso Millet | 5.5 | 5.5 | Yes |
| Small grains grown for grass, forage, fodder, hay and/or pasture | 22 | 22 | Yes |
| Sorghum | 11 | 22 | Yes |
| Soybean | 44 | 44 | Yes |
| Roundup Ready 2 Xtend Soybean | 44 | 88 | Yes |
| Sugarcane | 44 | 88 | Yes |

| | | | |
|---|---|---|---|
| Triticale | 5.5 | 5.5 | Yes |
| Sod farms and farmstead turf | 44 | 44 | Yes |
| Wheat | 11 | 22 | Yes |
| [1]Refer to section **11. CROP-SPECIFIC INFORMATION** and section **12. CROPS WITH XTEND TECHNOLOGY** for more details.<br>[2]Once the crop reaches the ensilage (milk) stage or later in maturity | | | |

## 11.0 CROP-SPECIFIC INFORMATION

Read Sections: 8.0 for Tank Mixing Instructions and 9.1.4 for Buffer Requirements and Susceptible Crops for information on tank mixing, buffer requirements, and susceptible crops.

### 11.1 Asparagus

Apply XtendiMax® With VaporGrip® Technology to emerged and actively growing weeds in 40 - 60 gallons of diluted spray per treated acre immediately after cutting the field, but at least 24 hours before the next cutting. Multiple applications may be made per growing season.

If spray contacts emerged spears, crooking (twisting) of some spears may result. If such crooking occurs, discard affected spears.

Rates: Apply 11-22 fluid ounces of XtendiMax® With VaporGrip® Technology to control annual sowthistle, black mustard, Canada and Russian thistle, and redroot pigweed (carelessweed).

Apply 22 fluid ounces of XtendiMax® With VaporGrip® Technology to control common chickweed, field bindweed, nettleleaf goosefoot, and wild radish. Up to 2 applications may be made per growing season. Do not exceed a total of 22 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre, per crop year.

Do not harvest prior to 24 hours after treatment.

[Optional: Do not use in the Coachella Valley of California]

### 11.2 Between Crop Applications

**Preplant Directions (Postharvest, Fallow, Crop Stubble, Set-Aside) for Broadleaf Weed Control:**

XtendiMax® With VaporGrip® Technology can be applied either postharvest in the fall, spring, or summer during the fallow period or to crop stubble/set-aside acres. Apply XtendiMax® With VaporGrip® Technology as a broadcast or spot treatment to emerged and actively growing weeds after crop harvest (postharvest) and before a killing frost or in the fallow cropland or crop stubble the following spring or summer.

See the “Crop Rotational Restrictions” in Section 10 of this label for the recommended interval between application and planting to prevent crop injury.

**Rates and Timings:**

Apply 5.5 – 44 fluid ounces of XtendiMax® With VaporGrip® Technology per acre. Refer to Table 1 to determine use rates for specific targeted weed species. For best performance, apply XtendiMax® With

VaporGrip® Technology when annual weeds are less than 4" tall, when biennial weeds are in the rosette stage and to perennial weed regrowth in late summer or fall following a mowing or tillage treatment. The most effective control of upright perennial broadleaf weeds such as Canada thistle and Jerusalem artichoke occurs if XtendiMax® With VaporGrip® Technology is applied when the majority of weeds have at least 4 - 6" of regrowth or for weeds such as field bindweed and hedge bindweed that are in or beyond the full bloom stage.

Avoid disturbing treated areas following application. Treatments may not kill weeds that develop from seed or underground plant parts such as rhizomes or bulblets, after the effective period for XtendiMax® With VaporGrip® Technology. For seedling control, a follow-up program or other cultural practices could be instituted. For small grain in-crop uses of XtendiMax® With VaporGrip® Technology, refer to the small grain section for details.

### 11.3 Conservation Reserve Program (CRP)

XtendiMax® With VaporGrip® Technology is recommended for use on both newly seeded and established grasses grown in Conservation Reserve or federal Set-Aside Programs. Treatments of XtendiMax® With VaporGrip® Technology will injure or may kill alfalfa, clovers, lespedeza, wild winter peas, vetch, and other legumes.

**Newly Seeded Areas**

XtendiMax® With VaporGrip® Technology may be applied either preplant or postemergence to newly seeded grasses or small grains such as barley, oats, rye, sudanqrass, wheat, or other grain species grown as a cover crop. Postemergence applications may be made after seedling grasses exceed the 3-leaf stage. Rates of XtendiMax® With VaporGrip® Technology greater than 22 fluid ounces per treated acre may severely injure newly seeded grasses.

Preplant applications may injure new seedlings if the interval between application and grass planting is less than 45 days per 22 fluid ounces of XtendiMax® With VaporGrip® Technology applied per treated acre west of the Mississippi River or 20 days per 22 fluid ounces applied east of the Mississippi River.

**Established Grass Stands**

Established grass stands are perennial grasses planted one or more seasons prior to treatment. Certain species (bentgrass, carpetgrass, smooth brome, buffalograss, or St. Augustinegrass) may be injured when treated with more than 22 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre.

When applied at recommended rates, XtendiMax® With VaporGrip® Technology will control many annual and biennial weeds and provide control or suppression of many perennial weeds.

**Rates and Timings**

Apply 5.5 - 44 fluid ounces of XtendiMax® With VaporGrip® Technology per acre. Refer to **Table 1** for rates based on target weed species. Retreatments may be made as needed; however, do not exceed a total of 88 fluid ounces (4 pints) of XtendiMax® With VaporGrip® Technology per acre per year.

### 11.4 Corn (Field, Pop, Seed, And Silage)

Direct contact of XtendiMax® With VaporGrip® Technology with corn seed must be avoided. If corn seeds are less than 1.5" inches below the surface, delay application until corn has emerged.

Applications of XtendiMax® With VaporGrip® Technology to corn during periods of rapid growth may result in temporary leaning. Corn will usually become erect within 3 to 7 days. Cultivation should be delayed until after corn is growing normally to avoid breakage.

Corn may be harvested or grazed for feed once the crop has reached the ensilage (milk) stage or later in maturity.

Up to 2 applications of XtendiMax® With VaporGrip® Technology may be made during a growing season. Sequential applications must be separated by 2 weeks or more.

Do not apply XtendiMax® With VaporGrip® Technology to seed corn or popcorn without first verifying with your local seed corn company (supplier) the selectivity of XtendiMax® With VaporGrip® Technology on your inbred line or variety of popcorn. This precaution will help avoid potential injury of sensitive varieties.

Avoid using crop oil concentrates after crop emergence as crop injury may result. Use crop oil concentrates only in dry conditions when corn is less than 5" tall when applying XtendiMax® With VaporGrip® Technology.

Use of sprayable fluid fertilizer as the carrier is not recommended for applications of XtendiMax® With VaporGrip® Technology made after corn emergence.

XtendiMax® With VaporGrip® Technology is not registered for use on sweet corn.

**Preplant and Preemergence Application in No-Tillage Corn:**

**Rates:** Apply 22 fluid ounces of XtendiMax® With VaporGrip® Technology per acre on medium- or fine-textured soils containing 2.5% or greater organic matter. Use 11 fluid ounces per acre on coarse soils (sand, loamy sand, and sandy loam) or medium- and fine-textured soils with less than 2.5% organic matter.

Timing: XtendiMax® With VaporGrip® Technology can be applied to emerging weeds before, during, or after planting a corn crop. When planting into a legume sod (e.g., alfalfa or clover), apply XtendiMax® With VaporGrip® Technology after 4 - 6" of regrowth has occurred

**Preemergence Application in Conventional or Reduced Tillage Corn:**

**Rates:** Apply 22 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre on medium- or fine-textured soils containing 2.5% organic matter or more. Do not apply to coarse textured soils (sand, loamy sand, or sandy loam) of any soil with less than 2.5% organic matter until after corn emergence (See Early Postemergence uses below).

Timing: XtendiMax® With VaporGrip® Technology may be applied after planting and prior to corn emergence. Pre-emergence application of XtendiMax® With VaporGrip® Technology does not require mechanical incorporation to become active. A shallow mechanical incorporation is recommended if application is not followed by adequate rainfall or sprinkler irrigation. Avoid tillage equipment (e.g., drags, harrows) which concentrates treated soil over seed furrow as seed damage could result.

Preemergence control of cocklebur, jimsonweed, and velvetleaf may be reduced if conditions such as low temperature or lack of soil moisture cause delayed or deep germination of weeds.

**Early Postemergence Application in All Tillage Systems:**

**Rates:** Apply 22 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre. Reduce the rate to 11 fluid ounces per treated acre if corn is growing on coarse textured soils (sand, loamy sand, and sandy loam).

Timing: Apply between corn emergence and the 5-leaf stage or 8" tall, whichever occurs first. Refer to Late Postemergence Applications if the sixth true leaf is emerging from whorl or corn is greater than 8" tall.

**Late Postemergence Application:**

**Rate:** Apply 11 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre.

Timing: Apply XtendiMax® With VaporGrip® Technology from 8 - 36" tall corn or 15 days before tassel emergence, whichever comes first. For best performance, apply when weeds are less than 3" tall.

Apply directed spray when corn leaves prevent proper spray.

### 11.5 Cotton

For directions for use with crops with Xtend Technology see the "CROPS WITH XTEND TECHNOLOGY" section of this label.

**Preplant Application:**

Apply up to 11 fluid ounces of XtendiMax® With VaporGrip® Technology per acre to control emerged broadleaf weeds prior to planting cotton in conventional or conservation tillage systems.

For best performance, apply XtendiMax® With VaporGrip® Technology when weeds are in the 2 - 4 leaf stage and rosettes are less than 2" across.

Following application of XtendiMax® With VaporGrip® Technology and a minimum accumulation of 1" of rainfall or overhead irrigation, allow a minimum of 21 days between treatment and planting per application of 11 fluid ounces per acre or less. This plant back interval must be observed prior to planting cotton.

Do not apply preplant to cotton west of the Rockies.

Do not make XtendiMax® With VaporGrip® Technology preplant applications to cotton in geographic areas with average annual rainfall less than 25".

If applying a spring preplant treatment following application of a fall preplant (postharvest) treatment, then the combination of both treatments may not exceed 2 pounds acid equivalent per acre.

### 11.6 Grass Grown For Seed

Apply 11 - 22 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre on seedling grass after the crop reaches the 3 -5 leaf stage. Apply up to 44 fluid ounces of XtendiMax® With VaporGrip® Technology on well-established perennial grass. For best performance, apply XtendiMax® With VaporGrip® Technology when weeds are in the 2 - 4 leaf stage and rosettes are less than 2" across. Use the higher level of listed rate ranges when treating more mature weeds or dense vegetative growth.

To suppress annual grasses such as brome (downy and ripgut), rattail fescue, and windgrass, apply up to 44 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre in the fall or late summer after harvest and burning of established grass seed crops. Applications should be made immediately following the first irrigation when the soil is moist and before weeds have more than 2 leaves.

Do not apply XtendiMax® With VaporGrip® Technology after the grass seed crop begins to joint.

Refer to the Pasture, Hay, Rangeland, and General Farmstead section for grazing and feeding restrictions.

### 11.7 Proso Millet

**For use only within Colorado, Nebraska, North Dakota, South Dakota, [**Optional: **and Wyoming].**

XtendiMax® With VaporGrip® Technology combined with an appropriate tank-mix partner will provide control or suppression of the annual broadleaf weeds listed in **Section 13.**

### 11.8 Pasture, Hay, Rangeland, And General Farmstead (Noncropland)

XtendiMax® With VaporGrip® Technology is recommended for use on pasture, hay, rangeland, and general farmstead (non-cropland) (including fencerows and non-irrigation ditch banks) for control or suppression of broadleaf weed and brush species listed in Section 12.

XtendiMax® With VaporGrip® Technology may also be applied to non-cropland areas to control broadleaf weeds in noxious weed control programs, districts, or areas including broadcast or spot treatment of roadsides and highways, utilities, railroad, and pipeline rights-of-way. Noxious weeds must be recognized at the state level, but programs may be administered at state, county, or other level.

XtendiMax® With VaporGrip® Technology uses described in this section also pertain to grasses and small grains (forage sorghum, rye, sudangrass, or wheat) grown for grass, forage, fodder, hay and/or pasture use only. Grasses and small grains not grown for grass, forage, fodder, hay and/or pasture must comply with crop-specific uses in this label. Some perennial weeds may be controlled with lower rates of XtendiMax® With VaporGrip® Technology (refer to **Table 1**).

**Rates and Timings**

Refer to **Table 1** for rate selection based on targeted weed or brush species.

Rates above 44 fluid ounces of XtendiMax® With VaporGrip® Technology per acre are for spot treatments only. Spot treatment is defined as no more than a total of 1000 square feet of treated area per acre. Do not broadcast apply more than 44 fluid ounces per acre.

Retreatments may be made as needed; however, do not exceed a total of 44 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre during a growing season.

Grass grown for hay requires a minimum of 7-days between treatment and harvest.

**Crop-Specific Restrictions**

Do not apply more than 22 fluid ounces of XtendiMax® With VaporGrip® Technology per acre to small grains grown for pasture.

Newly seeded areas may be severely injured if more than 22 fluid ounces of XtendiMax® With VaporGrip® Technology is applied per acre.

Established grass crops growing under stress can exhibit various injury symptoms that may be more pronounced if herbicides are applied. Bentgrass, carpetgrass, buffalograss, and St. Augustin grass may be injured if more than 22 fluid ounces of XtendiMax® With VaporGrip® Technology is applied per acre. Usually colonial bent grasses are more tolerant than creeping types. Velvet grasses are most easily injured. Treatments will kill or injure alfalfa, clovers, lespedeza, wild winter peas, vetch, and other legumes.

**Table 3** lists the timing restrictions for grazing or harvesting hay from treated fields. There are no grazing restrictions for animals other than lactating dairy animals.

**Table 3. Timing Restrictions for Lactating Dairy Animals Following Treatment**

| **XtendiMax® With VaporGrip® Technology Rate per Treated Acre (fluid ounces)** | **Days Before Grazing (days)** | **Days Before Hay Harvest (days)** |
|---|---|---|
| Up to 22 | 7 | 37 |
| Up to 44 | 21 | 51 |

- **Spot Treatments:** XtendiMax® With VaporGrip® Technology may be applied to individual clumps or small areas of undesirable vegetation using handgun or similar types of application equipment. Apply diluted sprays to allow complete wetting (up to runoff) of foliage and stems.

**Cut Surface Treatments:**

XtendiMax® With VaporGrip® Technology may be applied as a cut surface treatment for control of unwanted trees and prevention of sprouts of cut trees.

**Rate:** Mix 1 part XtendiMax® With VaporGrip® Technology with 1 - 3 parts water to create the application solution. Use the lower dilution rate when treating difficult-to-control species.

- **For Frill or Girdle Treatments**: Make a continuous cut or a series of overlapping cuts using an axe to girdle tree trunk. Spray or paint the cut surface with the solution.
- **For Stump Treatments:** Spray or paint freshly cut surface with the water mix. The area adjacent to the bark should be thoroughly wet.

**Applications For Control of Dormant Multiflora Rose**:

XtendiMax® With VaporGrip® Technology can be applied when plants are dormant as an undiluted spot treatment directly to the soil or as a Lo-Oil basal bark treatment using an oil-water emulsion solution.

- **Spot treatments:** Spot treatment applications of XtendiMax® With VaporGrip® Technology should be applied directly to the soil as close as possible to the root crown but within 6 - 8" of the crown. On sloping terrain, apply XtendiMax® With VaporGrip® Technology to the uphill side of the crown. Do not apply when snow or water prevents applying XtendiMax® With VaporGrip® Technology directly to the soil. The use rate of XtendiMax® With VaporGrip® Technology depends on the canopy diameter of the multiflora rose.

  **Examples:** Use 0.34, 1.38, or 3.23 fluid ounces of XtendiMax® With VaporGrip® Technology respectively, for 5, 10, or 15 feet canopy diameters.

- **Lo-Oil basal bark treatments:** For Lo-Oil basal bark treatments, apply XtendiMax® With VaporGrip® Technology to the basal stem region from the ground line to a height of 12 - 18". Spray until runoff, with special emphasis on covering the root crown. For best results, apply XtendiMax® With VaporGrip® Technology when plants are dormant. Do not apply after bud break or when plants are showing signs of active growth. Do not apply when snow or water prevents applying XtendiMax® With VaporGrip® Technology to the ground line.

  To prepare approximately 2 gallons of a Lo-Oil spray solution:

  1) Combine 1.5 gallons of water, 1 ounce of emulsifier, 22 fluid ounces of XtendiMax® With VaporGrip® Technology, and 2.5 pints of No. 2 diesel fuel.
  2) Adjust the amounts of materials used proportionately to the amount of final spray solution desired.

  Do not exceed 8 gallons of spray solution mix applied per acre, per year.

## 11.9 SMALL GRAINS

### 11.9.1 Small Grains Not Underseeded To Legumes (fall- and spring-seeded barley, oat, triticale and wheat)

Refer to the specific crop sections below for use rates. When treating difficult to control weeds such as kochia, wild buckwheat, cow cockle, prostrate knotweed, Russian thistle, and prickly lettuce or when dense vegetative growth occurs, use the 4.12 – 5.5 fluid ounces of XtendiMax® With VaporGrip® Technology per acre.

**Timings:** Apply XtendiMax® With VaporGrip® Technology before, during, or after planting small grains. See specific small grain crop uses below for maximum crop stage. For best performance, apply

XtendiMax® With VaporGrip® Technology when weeds are in the 2 - 3 leaf stage and rosettes are less than 2" across. Applying XtendiMax® With VaporGrip® Technology to small grains during periods of rapid growth may result in crop leaning. This condition is temporary and will not reduce crop yields.

Restrictions for small grain areas that are grazed or cut for hay are indicated in **Table 3** in Pasture, Hay, Rangeland, and General Farmstead section of this label.

### 11.9.2 Small Grains: Barley (fall- and spring-seeded)

**Early season applications:**

Apply 2.75 – 5.5 fluid ounces of XtendiMax® With VaporGrip® Technology to fall-seeded barley prior to the jointing stage. Apply 2.75 – 4.12 fluid ounces of XtendiMax® With VaporGrip® Technology before spring-seeded barley exceeds the 4-leaf stage.

**Note:** For spring barley varieties that are seeded during the winter months or later, follow the rates and timings given for spring-seeded barley.

**Preharvest applications:**

XtendiMax® With VaporGrip® Technology can be used to control weeds that may interfere with harvest of fall and spring-seeded barley. Apply 11 fluid ounces of XtendiMax® With VaporGrip® Technology per acre as a broadcast or spot treatment to annual broadleaf weeds when barley is in the hard dough stage and the green color is gone from the nodes (joints) of the stern. Best results will be obtained if application can be made when weeds are actively growing, but before weeds canopy.

Allow a minimum of 7 days between treatment and harvest. Do not use preharvest-treated barley for seed unless a germination test is performed on the seed with an acceptable result of 95% germination or better.

[Optional: Do not make preharvest applications in California.]

### 11.9.3 Small Grains: Oats (fall- and spring-seeded)

**Early season applications:**

Apply 2.75 – 5.5 fluid ounces of XtendiMax® With VaporGrip® Technology per acre to fall-seeded oat prior to the jointing stage. Apply 2.75 – 5.5 fluid ounces of XtendiMax® With VaporGrip® Technology before spring-seeded oat exceed the 5-leaf stage.

Do not tank mix XtendiMax® With VaporGrip® Technology with 2,4-D in oat.

Allow a minimum of 7 days between treatment and harvest.

### 11.9.4 Small Grains: Triticale (fall- and spring-seeded)

**Early season applications:**

Apply 2.75 – 5.5 fluid ounces of XtendiMax® With VaporGrip® Technology to triticale.

Early season applications to fall-seeded triticale must be made prior to the jointing stage.

Early season applications to spring-seeded triticale must be made before triticale reaches the 6-leaf stage.

### 11.9.5 Small Grains: Wheat (fall- and spring-seeded)

**Early Season Applications**:

Apply 2.75 – 5.5 fluid ounces of XtendiMax® With VaporGrip® Technology to wheat unless using one of the fall-seeded wheat specific programs below.

Early season applications to fall-seeded wheat must be made prior to the jointing stage.

Early season applications to spring-seeded wheat must be made before wheat exceeds the 6-leaf stage.

Early developing wheat varieties such as TAM 107, Madison, or Wakefield must receive application between early tillering and the jointing stage. Care should be taken in staging these varieties to be certain that the application occurs prior to the jointing stage.

**Specific use programs for fall-seeded wheat only:**

**[**Optional: XtendiMax® With VaporGrip® Technology may be used at 8.25 fluid ounces on fall-seeded wheat in Western Oregon as a spring application only.] In Colorado, Kansas, New Mexico, Oklahoma, and Texas, up to 11 fluid ounces of XtendiMax® With VaporGrip® Technology may be applied on fall-seeded wheat after it exceeds the 3-leaf stage for suppression of perennial weeds, such as field bindweed. Applications may be made in the fall following a frost but before a killing freeze.

**Preharvest applications:**

XtendiMax® With VaporGrip® Technology can be used to control weeds that may interfere with harvest of wheat. Apply 11 fluid ounces XtendiMax® With VaporGrip® Technology per acre as a broadcast or spot treatment to annual broadleaf weeds when wheat is in the hard dough stage and the green color is gone from the nodes (joints) of the stem. Best results will be obtained if application can be made when weeds are actively growing but before weeds canopy.

Allow a minimum of 7 days between treatment and harvest. Do not use preharvest-treated wheat for seed unless a germination test is performed on the seed with an acceptable result of 95% germination or better.

[Optional: Do not make preharvest applications in California.]

### 11.10 Sorghum

XtendiMax® With VaporGrip® Technology may be applied preplant, postemergence, or preharvest in sorghum to control many annual broadleaf weeds and to reduce competition from established perennial broadleaf weeds, as well as control their seedlings.

Do not graze or feed treated sorghum forage or silage prior to mature grain stage. If sorghum is grown for pasture or hay, refer to Pasture, Hay, Rangeland, and General Farmstead section of this label for specific grazing and feeding restrictions.

Do not apply XtendiMax® With VaporGrip® Technology to sorghum grown for seed production.

**Preplant Application:**

Up to 11 fluid ounces of XtendiMax® With VaporGrip® Technology may be applied per acre if applied at least 15 days before sorghum planting.

**Postemergence Application:**

Up to 11 fluid ounces of XtendiMax® With VaporGrip® Technology per acre may be applied after sorghum is in the spike stage (all sorghum emerged) but before sorghum is 15" tall. For best performance, apply XtendiMax® With VaporGrip® Technology when the sorghum crop is in the 3 - 5 leaf stage and weeds are small (less than 3" tall). Use drop pipes (drop nozzles) if sorghum is taller than 8".

Keep the spray off the sorghum leaves and out of the whorl to reduce the likelihood of crop injury and to improve spray coverage of weed foliage. Applying XtendiMax® With VaporGrip® Technology to sorghum during periods of rapid growth may result in temporary leaning of plants or rolling of leaves. These effects are usually outgrown within 10 - 14 days. Delay harvest until 30 days after a preharvest treatment.

**Preharvest uses in Texas and Oklahoma only**: Up to 11 fluid ounces of XtendiMax® With VaporGrip® Technology per acre may be applied for weed suppression any time after the sorghum has reached the soft dough stage. An agriculturally approved surfactant may be used to improve performance (read Section 8.0 for tank mixing instructions). Delay harvest until 30 days after a preharvest treatment.

**Split Application:**

XtendiMax® With VaporGrip® Technology may be applied in split applications: preplant followed by postemergence or preharvest; or postemergence followed by preharvest. Do not exceed 11 fluid ounces per acre, per application or a total of 22 ounces per acre, per season.

### 11.11 Soybean

For directions for use with crops with Xtend Technology see the “CROPS WITH XTEND TECHNOLOGY” section of this label.

**Preplant Applications**:

Apply 5.5 -22 fluid ounces of XtendiMax® With VaporGrip® Technology per acre to control emerged broadleaf weeds prior to planting soybeans. Do not exceed 22 fluid ounces of XtendiMax® With VaporGrip® Technology per acre in a spring application prior to planting soybeans.

Following application of XtendiMax® With VaporGrip® Technology and a minimum accumulation of 1" rainfall or overhead irrigation, allow a minimum of 14 days between treatment and planting for applications of 11 fluid ounces per acre or less, and allow a minimum of 28 days between treatment and planting for applications of 22 fluid ounces per acre. These plant back intervals must be observed prior to planting soybeans or crop injury may occur.

Do not make XtendiMax® With VaporGrip® Technology preplant applications to soybeans in geographic areas with average annual rainfall less than 25”.

**Preharvest Applications**:

XtendiMax® With VaporGrip® Technology can be used to control many annual and perennial broadleaf weeds and control or suppress many biennial and perennial broadleaf weeds in soybean prior to harvest (refer to **Section 10**). Apply 11 - 44 fluid ounces of XtendiMax® With VaporGrip® Technology per acre as a broadcast or spot treatment to emerged and actively growing weeds after soybean pods have reached mature brown color and at least 75% leaf drop has occurred.

Do not harvest soybeans until 7 days after application.

Treatments may not kill weeds that develop from seed or underground plant parts, such as rhizomes or bulblets, after the effective period for XtendiMax® With VaporGrip® Technology. For seedling control, a follow-up program or other cultural practice could be instituted.

Do not use preharvest-treated soybean for seed unless a germination test is performed on the seed with an acceptable result of 95% germination or better.

Do not feed soybean fodder or hay following a preharvest application of XtendiMax® With VaporGrip® Technology.

[Optional: Do not make preharvest applications in California.]

### 11.12 Sugarcane

Apply XtendiMax® With VaporGrip® Technology for control of annual, biennial, or perennial broadleaf weeds listed in Section 11. Apply 11 - 33 fluid ounces of XtendiMax® With VaporGrip® Technology per acre for control of annual weeds, 22 - 44 fluid ounces for control of biennial weeds, and 44 fluid ounces for control or suppression of perennial weeds.

Use the higher level of listed rate ranges when treating dense vegetative growth.

A single retreatment may be made as needed, however, do not exceed a total of 88 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre during a growing season.

Timing: XtendiMax® With VaporGrip® Technology may be applied to sugarcane any time after weeds have emerged, but before the close-in stage of sugarcane. Applications of 44 fluid ounces of XtendiMax® With VaporGrip® Technology per acre made over the top of actively growing sugarcane may result in crop injury.

When possible, direct the spray beneath the sugarcane canopy to minimize the likelihood of crop injury. Using directed sprays will also help maximize the spray coverage of weed foliage.

Allow a minimum of 87 days between treatment and harvest.

### 11.13 Farmstead Turf (noncropland) and Sod Farms

Do not use on residential sites.

For use in general farmstead (noncropland) and sod farms, apply 4.12 – 44 fluid ounces of XtendiMax® With VaporGrip® Technology per acre to control or suppress growth of many annual, biennial, and some perennial broadleaf weeds commonly found in turf. XtendiMax® With VaporGrip® Technology will also suppress many other listed perennial broadleaf weeds and woody brush and vine species. Refer to Table 1 for rate recommendations based on targeted weed or brush species and growth stage.

Repeat treatments may be made as needed; however, do not exceed 44 fluid ounces of XtendiMax® With VaporGrip® Technology per acre, per growing season.

Apply 30 - 200 gallons of diluted spray per treated acre (3 - 17 quarts of water per 1,000 square feet), depending on density or height of weeds treated and on the type of equipment used.

To avoid injury to newly seeded grasses, delay application of XtendiMax® With VaporGrip® Technology until after the second mowing. Furthermore, applying more than 16 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre may cause noticeable stunting or discoloration of sensitive grass species such as bentgrass, carpetgrass, buffalograss, and St. Augustinegrass.

In areas where roots of sensitive plants extend, do not apply more than 5.5 fluid ounces of XtendiMax® With VaporGrip® Technology per treated acre on coarse-textured (sandy-type) soils, or in excess of 8 fluid ounces per treated acre on fine-textured soils. Do not make repeat applications in these areas for 30 days and until previous applications of XtendiMax® With VaporGrip® Technology have been activated in the soil by rain or irrigation.

## 12.0 CROPS WITH XTEND® TECHNOLOGY

COTTON WITH XTENDFLEX® TECHNOLOGY (INCLUDING BOLLGARD II® XTENDFLEX® COTTON, BOLLGARD® 3 XTENDFLEX® COTTON, OR XTENDFLEX® COTTON) AND ROUNDUP READY 2 XTEND® SOYBEAN CONTAIN A PATENTED GENE THAT PROVIDES TOLERANCE TO DICAMBA, THE ACTIVE INGREDIENT IN THIS PRODUCT. THIS PRODUCT WILL CAUSE SEVERE CROP INJURY OR DESTRUCTION AND YIELD LOSS IF APPLIED TO COTTON AND SOYBEAN THAT ARE NOT DICAMBA TOLERANT, INCLUDING COTTON AND SOYBEAN WITH A TRAIT ENGINEERED TO CONFER TOLERANCE TO AUXIN HERBICIDES OTHER THAN DICAMBA. FOLLOW THE REQUIREMENTS SET FORTH HEREIN TO PREVENT SEVERE CROP INJURY OR DESTRUCTION AND YIELD LOSS. CONTACT WITH FOLIAGE, GREEN STEMS, OR FRUIT OF CROPS, OR ANY

DESIRABLE PLANTS THAT DO NOT CONTAIN A DICAMBA TOLERANCE GENE OR ARE NOT NATURALLY TOLERANT TO DICAMBA, COULD RESULT IN SEVERE PLANT INJURY OR DESTRUCTION.

Information on cotton with XtendFlex® Technology and Roundup Ready 2 Xtend® Soybean can be obtained from your seed supplier or Monsanto representative. Cotton with XtendFlex® Technology and Roundup Ready 2 Xtend® Soybean must be purchased from an authorized licensed seed supplier.

Note: Cotton with XtendFlex® Technology and Roundup Ready 2 Xtend® Soybean and methods of controlling weeds and applying dicamba in a Cotton with XtendFlex® Technology and Roundup Ready 2 Xtend® Soybean crop are protected under U.S. patent law. No license to use Cotton with XtendFlex® Technology and Roundup Ready 2 Xtend® Soybean is granted or implied with the purchase of this herbicide product. Cotton with XtendFlex® Technology and Roundup Ready 2 Xtend® Soybean are owned by Monsanto and a license must be obtained from Monsanto before using it. Contact your Authorized Monsanto Retailer for information on obtaining a license to Cotton with XtendFlex® Technology and Roundup Ready 2 Xtend® Soybean.

### 12.1 Cotton with XtendFlex® Technology

DO NOT combine these instructions with other instructions in the “COTTON” Section of **this** label for use over crops that do not contain the dicamba tolerance trait.

**TYPES OF APPLICATIONS:** Burndown/Early Preplant; Preplant; At-Planting; Preemergence; Postemergence (In-crop)

**USE INSTRUCTIONS**
Apply this product in a minimum of 15 gallons of spray solution per acre as a broadcast application. For best performance, control weeds early when they are less than 4 inches. Timely application will improve control and reduce weed competition. Refer to the following table for maximum application rates of this product with cotton with XtendFlex® Technology.

| Maximum Application Rates | |
|---|---|
| Combined total per year for all applications | 88 fluid ounces per acre<br>(2.0 lb. a.e. dicamba per acre) |
| Total of all Burndown/Early Preplant, Preplant, At-Planting, and Preemergence applications | 44 fluid ounces per acre<br>(1.0 lb. a.e. dicamba per acre) |
| Total of all In-crop applications from emergence up to 7 days pre-harvest | 88 fluid ounces per acre<br>(2.0 lb. a.e. dicamba per acre) |
| Maximum In-crop, single application | 22 fluid ounces per acre<br>(0.5 lb. a.e. dicamba per acre) |

a.e. – acid equivalent

Refer to Table 1 for application rates for weed type and growth stage controlled by this product. Maximum in-crop application rate should be used when treating tough to control weeds, dense vegetative growth or weeds with a well-established root system.

**Preplant, At-Planting, Preemergence**
USE INSTRUCTIONS: This product may be used to control broadleaf weeds and may be applied before, during or immediately after planting cotton with XtendFlex® Technology. Refer to the "WEEDS CONTROLLED" section of this label for XtendiMax® With VaporGrip® Technology for specific weeds controlled.

RESTRICTIONS:
- The maximum combined quantity of this product that may be applied for all burndown/early preplant, preplant, at-planting, and preemergence applications is 44 fluid ounces (1.0 lb a.e. dicamba) per acre per season.
- The maximum application rate for a single, burndown/early preplant, preplant, at-planting, or preemergence application must not exceed 44 fluid ounces (1.0 lb a.e. dicamba) per acre.
- Do not apply less than 22 fluid ounces (0.5 lb a.e. dicamba) per acre.

**Postemergence (In-crop)**
USE INSTRUCTIONS: This product may be used to control broadleaf weeds in cotton with XtendFlex® Technology. In-crop applications of this product can be made from emergence up to 7 days prior to harvest. The maximum and minimum rate for any single, in-crop application is 22 fluid ounces (0.5 lb a.e. dicamba) per acre. Using the appropriate application rate may reduce the selection for resistant weeds. For best performance, control weeds early when they are less than 4 inches. To the extent permitted by applicable law, Monsanto Company does not warrant product performance of applications to labeled weeds greater than 4 inches in height. Sequential applications of this product may be necessary to control new flushes of weeds or on tough-to-control weeds. Allow at least 7 days between applications. A pre-harvest application of this product may be made up to 7 days before harvest.

Postemergence applications of this product mixed with adjuvants may cause a leaf response to cotton with XtendFlex® Technology. The symptoms usually appear as necrotic spots on fully expanded leaves. EC-based products that are tank mixed with products containing dicamba may increase the severity of the leaf damage.

RESTRICTIONS:
- The combined total applied from crop emergence up to 7 days prior to harvest must not exceed 88 fluid ounces (2.0 lb a.e. dicamba) per acre.

- The maximum single, in-crop application rate must not exceed 22 fluid ounces (0.5 lb a.e. dicamba).
- The combined total per year for all applications must not exceed 88 fluid ounces (2.0 lb a.e. dicamba) per acre. For example, if a preplant application of 44 fluid ounces (1.0 lb a.e. dicamba) per acre was made, then the combined total in-crop applications must not exceed 44 fluid ounces (1.0 lb a.e. dicamba) per acre.
- Allow at least 7 days between applications and allow at least 7 days between final application and harvest or feeding of cottonseed and cotton gin by-products.

### 12.2 Roundup Ready 2 Xtend® Soybean

DO NOT combine these instructions with other instructions in the "SOYBEAN" Section of **this** label for use over crops that do not contain the dicamba tolerance trait.

**TYPES OF APPLICATIONS:** Burndown/Early Preplant; Preplant; At-Planting; Preemergence; Postemergence (In-crop)

**USE INSTRUCTIONS**
Apply this product in a minimum of 15 gallons of spray solution per acre as a broadcast application. For best performance, control weeds early when they are less than 4 inches. Timely application will improve control and reduce weed competition. Refer to the following table for maximum application rates of this product with Roundup Ready 2 Xtend® Soybean.

| Maximum Application Rates | |
|---|---|
| Combined total per year for all applications | 88 fluid ounces per acre<br>(2.0 lb. a.e. dicamba per acre) |
| Total of all Burndown/Early Preplant, Preplant, At-Planting, and Preemergence applications | 44 fluid ounces per acre<br>(1.0 lb. a.e. dicamba per acre) |
| Total of all In-crop applications from emergence up to and including beginning bloom (R1 stage soybeans) | 44 fluid ounces per acre<br>(1.0 lb. a.e. dicamba per acre) |
| Maximum In-crop, single application | 22 fluid ounces per acre<br>(0.5 lb. a.e. dicamba per acre) |

a.e. – acid equivalent

Refer to Table 1 for application rates for weed type and growth stage controlled by this product. Maximum in-crop application rate should be used when treating tough to control weeds, dense vegetative growth or weeds with a well-established root system.

**Preplant, At-Planting, Preemergence**
USE INSTRUCTIONS: This product may be used to control broadleaf weeds and may be applied before, during or immediately after planting Roundup Ready 2 Xtend® Soybean. Refer to the "WEEDS CONTROLLED" section of this label for specific weeds controlled.

RESTRICTIONS:
- The maximum combined quantity of this product that may be applied for all burndown/early preplant, preplant, at-planting, and preemergence applications is 44 fluid ounces (1.0 lb a.e. dicamba) per acre per season.
- The maximum application rate for a single, burndown/early preplant, preplant, at-planting, or preemergence application must not exceed 44 fluid ounces (1.0 lb a.e. dicamba) per acre.
- Do not apply less than 22 fluid ounces (0.5 lb a.e. dicamba) per acre.

**Postemergence (In-crop)**
USE INSTRUCTIONS: This product may be used to control broadleaf weeds in Roundup Ready 2 Xtend® Soybean. In-crop applications of this product can be made from emergence (cracking) up to and including beginning bloom (R1 growth stage of soybeans). Do not make in-crop applications of this product after beginning bloom (R1 growth stage of soybeans). The maximum and minimum rate for any single, in-crop application is 22 fluid ounces (0.5 lb a.e. dicamba) per acre. Using the appropriate application rate may reduce the selection for resistant weeds. For best performance, control weeds early when they are less than 4 inches. To the extent permitted by applicable law, Monsanto Company does not warrant product performance of applications to labeled weeds greater than 4 inches in height.

A second application of this product up to the R1 crop growth stage may be necessary to control new flushes of weeds. Allow at least 7 days between applications. For best results, apply XtendiMax® With VaporGrip® Technology after some weed re-growth has occurred.

Application of this product postemergence and under stressful environments may cause temporary loss of turgor, a response commonly described as leaf droop in Roundup Ready 2 Xtend® Soybean. Typically, affected plants recover in 1-3 days depending on the level of droop and environmental conditions.

RESTRICTIONS:

- The combined total application rate from crop emergence up to and including R1 must not exceed 44 fluid ounces (1.0 lb. a.e. dicamba) per acre.
- Do not make in-crop applications of this product after beginning bloom (R1 growth stage of soybeans).
- The maximum single, in-crop application rate must not exceed 22 fluid ounces (0.5 lb. a.e. dicamba) per acre.The combined total per year for all applications must not exceed 88 fluid ounces (2.0 lb. a.e. dicamba) per acre.
- Allow at least 7 days between final application and harvest or feeding of soybean forage.
- Allow at least 14 days between final application and harvest or feeding of soybean hay.

## 13.0 WEEDS CONTROLLED

**General Weed List, Including ALS-, Glyphosate, and Triazine-Resistant Biotypes**

**Annuals**

Alkanet
Amaranth, Palmer, Powell, Spiny
Aster, Slender
Bedstraw, Catchweed
Beggarweed, Florida
Broomweed, Common
Buckwheat, Tartary, Wild
Buffalobur
Burclover, California
Burcucumber
Buttercup, Corn, Creeping, Roughseed, Western Field
Carpetweed
Catchfly, Nightflowering
Chamomile, Corn
Chevil, Bur
Chickweed, Common
Clovers
Cockle, Corn, Cow, White
Cocklebur, Common
Copperleaf, Hophornbeam
Cornflower (Bachelor Button)
Croton, Tropic, Woolly
Daisy, English
Dragonhead, American
Eveningprimrose, Cutleaf
Falseflax, Smallseed
Fleabane, Annual
Flixweed
Fumitory
Goosefoot, Nettleleaf
Hempnettle
Henbit
Jacobs-Ladder
Jimsonweed
Knawel (German Moss)
Knotweed, Prostrate
Kochia
Ladysthumb
Lambsquarters Common
Lettuce, Miners, Prickly
Mallow, Common, Venice
Marestail (Horseweed)
Mayweed
Morningglory, Ivyleaf, Tall
Mustard, Black, Blue, Tansy, Treacle, Tumble, Wild, Yellowtops
Nightshade, Black, Cutleaf
Pennycress, Field (Fanweed, Frenchweed, Stinkweed)
Pepperweed, Virginia (Peppergrass)

Pigweed, Prostrate, Redroot (Carelessweed), Rough, Smooth, Tumble
Pineappleweed
Poorjoe
Poppy, Red-horned
Puncturevine
Purslane, Common
Pusley, Florida
Radish, Wild
Ragweed, Common, Giant (Buffaloweed), Lance-Leaf
Rocket, London, Yellow
Rubberweed, Bitter (Bitterweed)
Salsify
Senna, Coffee
Sesbania, Hemp
Shepherdpurse
Sicklepod
Sida, Prickly (Teaweed)
Smartweed, Green, Pennsylvania
Sneezeweed, Bitter
Sowthistle, Annual, Spiny
Spanish Needles
Spikeweed, Common
Spurge, Prostrate, Leafy
Spurry, Corn
Starbur, Bristly
Starwort, Little
Sumpweed, Rough
Sunflower, Common (Wild), Volunteer
Thistle, Russian
Velvetleaf
Waterhemp, Common, Tall
Waterprimrose, Winged
Wormwood

**Biennials**

Burdock, Common
Carrot, Wild (Queen Anne's Lace)
Cockle, White
Eveningprimrose, Common
Geranium, Carolina
Gromwell
Knapweed, Diffuse, Spotted
Mallow, Dwarf
Plantain, Bracted
Ragwort, Tansy
Starthistle, Yellow
Sweetclover
Teasel
Thistle, Bull, Milk, Musk, Plumeless

**Perennials**

Alfalfa[1]
Artichoke, Jerusalem
Aster, Spiny, Whiteheath
Bedstraw, Smooth
Bindweed, Field, Hedge
Blueweed, Texas
Bursage, Woollyleaf[1] (Bur Ragweed, Povertyweed)
Buttercup, Tall
Campion, Bladder
Chickweed, Field, Mouseear
Chicory[1]
Clover[1], Hop
Dandelion[1], Common
Dock[1] Broadleaf (Bitterdock), Curly
Dogbane, Hemp
Dogfennel[1] (Cypressweed)
Fern, Bracken
Garlic, Wild
Goldenrod, Canada, Missouri
Goldenweed, Common
Hawkweed
Henbane, Black[1]
Horsenettle, Carolina
Ironweed
Knapweed, Black, Diffuse, Russian[1], Spotted
Milkweed, Climbing, Common, Honeyvine, Western Whorled
Nettle, Stinging
Nightshade, Silverleaf (White Horsenettle)
Onion, Wild
Plaintain, Broadleaf, Buckhorn
Pokeweed
Ragweed, Western
Redvine
Sericia Lespedeza
Smartweed, Swamp
Snakeweed, Broom
Sorrel[1], Red (Sheep Sorrel)
Sowthistle[1], Perennial
Spurge, Leafy
Sundrops
Thistle, Canada, Scotch
Toadflex, Dalmatian
Tropical Soda Apple
Trumpetcreeper (Buckvine)
Vetch
Waterhemlock, Spotted
Waterprimrose, Creeping
Woodsorrel[1], Creeping, Yellow
Wormwood, Absinth, Louisiana
Yankeeweed
Yarrow, Common[1]

[1] Noted perennials may be controlled using lower rates of **XtendiMax® With VaporGrip® Technology** than those recommended for other listed perennial weeds.

**Woody Species**

Alder
Ash
Aspen
Basswood
Beech
Birch
Blackberry[2]
Blackgum[2]
Cedar[2]
Cherry
Chinquapin
Cottonwood
Creosotebush[2]
Cucumbertree
Dewberry[2]
Dogwood[2]
Elm
Grape

| | | |
|---|---|---|
| Hawthorn (Thornapple)[2] | Mesquite | Sassafras |
| Hemlock | Oak | Serviceberry |
| Hickory | Oak, Poison | Spicebush |
| Honeylocust | Olive, Russian | Spruce |
| Honeysuckle | Persimmon, Eastern | Sumac |
| Hornbeam | Pine | Sweetgum[2] |
| Huckleberry | Plum, Sand (Wild Plum)[2] | Sycamore |
| Huisache | Poplar | Tarbush |
| Ivy, Poison | Rabbitbrush | Willow |
| Kudzu | Redcedar, Eastern[2] | Witchhazel |
| Locust, Black | Rose[2], McCartney, Multiflora | Yaupon[2] |
| Maple | Sagebrush, Fringed[2] | Yucca[2] |

[2]Growth suppression only

## 14.0 LIMIT OF WARRANTY AND LIABILITY

Monsanto Company warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes set forth in the Complete Directions for Use label booklet ("Directions") when used in accordance with those Directions under the conditions described therein. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, NO OTHER EXPRESS WARRANTY OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE. This warranty is also subject to the conditions and limitations stated herein. Specifically, and without limiting the foregoing, MONSANTO MAKES NO RECOMMENDATION OR WARRANTY HEREIN REGARDING THE USE OF ANY PRODUCTS THAT MAY APPEAR ON THE WEBSITE REFERENCED IN THE TANK-MIXING INSTRUCTIONS HEREIN, REGARDLESS OF WHETHER SUCH PRODUCT IS USED ALONE OR IN A TANK MIX WITH XTENDIMAX® WITH VAPORGRIP® TECHNOLOGY. BUYER AND ALL USERS ARE SOLELY RESPONSIBLE FOR ANY LACK OF PERFORMANCE, LOSS, OR DAMAGE IN CONNECTION WITH THE USE OR HANDLING OF ANY SUCH PRODUCT ALONE OR IN A TANK MIX WITH XTENDIMAX® WITH VAPORGRIP® TECHNOLOGY.

Buyer and all users shall promptly notify this Company of any claims whether based in contract, negligence, strict liability, other tort or otherwise.

To the extent consistent with applicable law, buyer and all users are responsible for all loss or damage from use or handling which results from conditions beyond the control of this Company, including, but not limited to, incompatibility with products other than those set forth in the Directions, application to or contact with desirable vegetation, failure of this product to control weed biotypes which develop resistance to dicamba, unusual weather, weather conditions which are outside the range considered normal at the application site and for the time period when the product is applied, as well as weather conditions which are outside the application ranges set forth in the Directions, application in any manner not explicitly set forth in the Directions, moisture conditions outside the moisture range specified in the Directions, or the presence of products other than those set forth in the Directions in or on the soil, crop or treated vegetation.

This Company does not warrant any product reformulated or repackaged from this product except in accordance with this Company's stewardship requirements and with express written permission from this Company.

For in-crop (over-the-top) uses on crops with Xtend® Technology, crop safety and weed control performance are not warranted by Monsanto when this product is used in conjunction with "brown bag" or "bin run" seed saved from previous year's production and replanted.

TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF THE LIABILITY OF THIS COMPANY OR ANY OTHER SELLER FOR ANY AND ALL LOSSES, INJURIES OR DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT (INCLUDING CLAIMS BASED IN CONTRACT, NEGLIGENCE, STRICT LIABILITY,

OTHER TORT OR OTHERWISE) SHALL BE THE PURCHASE PRICE PAID BY THE USER OR BUYER FOR THE QUANTITY OF THIS PRODUCT INVOLVED, OR, AT THE ELECTION OF THIS COMPANY OR ANY OTHER SELLER, THE REPLACEMENT OF SUCH QUANTITY, OR, IF NOT ACQUIRED BY PURCHASE, REPLACEMENT OF SUCH QUANTITY. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, IN NO EVENT SHALL THIS COMPANY OR ANY OTHER SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES.

Upon opening and using this product, buyer and all users are deemed to have accepted the terms of this LIMIT OF WARRANTY AND LIABILITY which may not be varied by any verbal or written agreement. If terms are not acceptable, return at once unopened.

Bollgard II®, Bollgard®, Degree Xtra®, Field Master®, Harness®, Roundup Ready®, Roundup Ready 2 Xtend®, Roundup PowerMAX®, RT 3®, Roundup WeatherMAX®, XtendiMax®, XtendFlex® and VaporGrip® are registered trademarks of Monsanto Technology LLC. All other trademarks are the property of their respective owners.

EPA Reg. No. 524-617

EPA Establishment No. [insert appropriate est. no.]

Lot number [insert appropriate lot number]

Net contents [insert net contents]

Packed for:
MONSANTO COMPANY
800 N. Lindbergh Blvd.
ST. LOUIS, MISSOURI, 63167 U.S.A.

**From:** Green, Jamie
**To:** Baris, Reuben; Kenny, Daniel; Lott, Don; Trivedi, Adrienne; Wormell, Lance
**Subject:** FW: New dicamba non-crop complaints
**Date:** Tuesday, October 10, 2017 9:57:41 AM

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FYI – likely info you have previously received but passing along.

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**From:** Shields, Amy
**Sent:** Tuesday, October 10, 2017 8:48 AM
**To:** Hackett, Shawn <hackett.shawn@epa.gov>; Cook, Charles <Cook.Charles@epa.gov>; Frizzell, Damon <Frizzell.Damon@epa.gov>; Green, Jamie <Green.Jamie@epa.gov>
**Subject:** FW: New dicamba non-crop complaints

FYI

**Amy Shields, Ph.D.** | U.S. Environmental Protection Agency Region 7 |11201 Renner Boulevard, Lenexa, KS 66219 | ☎ (913) 551-7396 | ✉ shields.amy@epa.gov

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**From:** Cybulski, Walter
**Sent:** Tuesday, October 10, 2017 8:46 AM
**To:** Shields, Amy <Shields.Amy@epa.gov>
**Subject:** New dicamba non-crop complaints

Passing this along. Not sure if you are hearing any of these new complaints about dicamba. See there is one Iowa bullet in there.

**Complaints surge about weed killer dicamba's damage to oak trees** – As soybean and cotton farmers across the Midwest and South continue to see their crops ravaged from the weed killer dicamba, new complaints have pointed to the herbicide as a factor in widespread damage to oak trees.

"• In Iowa, the Department of Natural Resources has received more than 1,000 complaints about oak tree damage from unknown pesticides, some of which cited dicamba as a cause."

**From:** Philip.Perry@lw.com
**To:** Knorr, Michele; Baris, Reuben
**Cc:** thomas.marvin@monsanto.com
**Subject:** Implementation Terms and Conditions
**Date:** Monday, October 09, 2017 4:01:07 PM
**Attachments:** Response to Terms and Conditions Page1.docx

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Michele:

Attached are our thoughts regarding the implementation terms and conditions. You can reach me in the office today at 202-637-2244, and tonight on my cell. Thanks again.

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1. What will be done for product currently in retail inventories, in the distribution chain (package released for shipment), and product that will be manufactured before new glossy label booklets are available:
    - Sticker – Sticker will contain the following information:
        - Restricted Use requirements;
        - "Product cannot be used if user does not possess new (substitute) label(ing)";
        - How/where to get new (substitute) label(ing); and
        - "User must comply in all respects with new (substitute) label(ing), regardless of any contrary language on existing label."
    - New paper label will be provided to accompany each stickered product.

2. Registrant will:
    - As soon as new glossy label booklets become available, apply the new label to XtendiMax products at the time of manufacture in Monsanto registered facilities;
    - For other XtendiMax products – whether in retail inventories, in the distribution chain, or for which manufacturing will occur before new glossy label booklets become available – produce and distribute sufficient quantities of stickers and new paper labels to update product;
    - Inform retailers of the need to sticker and supply new paper labels for products currently in inventory and products received with the former label;
    - For those retail establishments who are not yet EPA registered establishments, inform those retailers that stickering can only occur in an EPA registered facility and inform retailers of the process for registration and reporting;
    - Inform retailers that in the event that any retailer is not registered and does not intend to register before stickering would occur, Monsanto will reclaim the retailer inventory and appropriately update labeling in a registered establishment; and
    - Provide access to new label through an internet webpage.

3. Consequences of noncompliance with Paragraph 2

    If Registrant does not fulfill any of its obligations under paragraph 2, Registrant will be subject to the procedures set forth at 7 U.S.C. § 136d and 40 C.F.R. Part 164.

**From:** Baris, Reuben
**To:** "MARVIN, THOMAS [AG/1920]"
**Cc:** Kenny, Daniel
**Subject:** draft
**Date:** Thursday, October 05, 2017 6:33:00 PM
**Attachments:** dicamba proposed registration conditions - deliberative.docx

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1. What will be done
    - Sticker or label - will the existing label be totally covered by a sticker or a new label, or is the old label going to be visible when product is sold?
    - If sticker but no complete new label – what will sticker say? We recommend the following:
        - Restricted Use requirements;
        - "Product cannot be used if user does not possess new (substitute) label(ing)";
        - How/where to get new (substitute) label(ing); and
        - "User must comply in all respects with new (substitute) label(ing), [regardless of any contrary language on existing label]."

2. Registrant will:
    - Produce and distribute sufficient quantities of stickers;
    - Assure that stickering takes place in a registered establishment and complies with any other relevant requirements under FIFRA and its implementing regulations;
    - If retailers are handing out new (substitute) label(ing), assure that retailers have sufficient quantities of new (substitute) label(ing) and that retailers hand it out to purchasers;
    - If retailers are handing out new (substitute) label(ing), the retailers must be registered establishments.
    - Assure that users can get new (substitute) label(ing) through an internet webpage; and
    - Assure that users have products (purchased after a certain date) that are appropriately stickered and that users have the new substitute labeling in their possession.

3. Consequences of noncompliance with Paragraph 2
    - If Registrant does not fulfill any of its obligations under paragraph 2, EPA may cancel the registration by order without a formal hearing subject to procedures in paragraph 4.

4. Procedure for cancellation because of noncompliance with Paragraph 2
    a. Intent to Cancel - If EPA determines that Registrant has failed to comply in any respect with an obligation under Paragraph 2, EPA may notify Registrant in writing (which can be done via email) of EPA's determination that Registrant has failed to comply with a requirement of Paragraph 2 and that EPA intends to cancel the registration by order without hearing under this Paragraph. The notice to Registrant will include a description of the noncompliance warranting cancellation.
    b. Right to be heard – Registrant may respond to any notice under subparagraph (a) in writing (which can be done via email) no later than [10][14][21] days after first receipt of the notice and challenge the factual determination of noncompliance

and/or the appropriate consequence of the noncompliance. If Registrant does not respond in the required time frame, EPA may issue a cancellation order as described in subparagraph e.

c. EPA will respond to Registrant's response under subparagraph (b) in writing (which can be done via email) and determine whether Registrant failed to comply in any respect with an obligation under Paragraph 2 and, if so, whether cancellation is appropriate.

d. If Registrant is dissatisfied with EPA's response under subparagraph (c), Registrant may request a meeting with the Director of OPP to appeal the decision to cancel the registration under this Paragraph. Any such request for a meeting must be in writing (which can be done via email) and must be received by the Director of OPP no later than [7][10][14] days after the Registrant receives EPA's response under subparagraph (c). The Director will agree to be available for a meeting which must occur at a mutually agreeable time and date, but no later than [14][21] days after the Director receives the request for a meeting. If Registrant does not request a meeting with the Director of OPP within the time period set forth in subparagraph (d), EPA may issue a cancellation order as described in subparagraph e.

e. After any meeting under subparagraph (d), or if Registrant does not agree to a meeting within [14][21] days after the Director receives the request for a meeting, the Director may issue a final written determination of whether Registrant has failed to comply with a requirement of Paragraph 2 and if so, if the Director determines that cancellation is appropriate. If the Director determines cancellation is appropriate, he may cancel the registration by order without hearing. Any such cancellation shall be in writing and shall include a cancellation order, which shall include an explanation of the basis for cancellation, the effective date of cancellation, and provisions governing the sale, distribution, and use of existing stocks. The Director's determination and cancellation order shall be provided to the Registrant both electronically and by mail, and shall be deemed a final agency action for purpose of judicial review.

**From:** Green, Jamie
**To:** Baris, Reuben; Kenny, Daniel; Lott, Don; Vizard, Elizabeth; Wormell, Lance
**Subject:** FW: Shared with you: Paul.Bailey@mda.mo.gov
**Date:** Wednesday, September 27, 2017 11:32:49 AM

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MDA requested I pass this information along.

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**From:** webmaster [mailto:webmaster@deltafarmpress.com]
**Sent:** Wednesday, September 27, 2017 8:39 AM
**To:** Green, Jamie <Green.Jamie@epa.gov>
**Subject:** Shared with you: Paul.Bailey@mda.mo.gov

Shared with you by MO Dept of Ag - Pesticide Control.

Jamie:

# Might dicamba be affecting pollinators?

Beekeepers among those claiming problems with dicamba-tolerant crops

Copy and paste this URL into your browser: http://www.deltafarmpress.com/soybeans/might-dicamba-be-affecting-pollin...

DELTA FarmPress

CROPS > SOYBEANS

# Might dicamba be affecting pollinators?

*Beekeepers among those claiming problems with dicamba-tolerant crops*

David Bennett | Sep 26, 2017

Since Xtend crops have been planted in the Mid-South, the focus of off-target damage from dicamba has largely been on soybeans. But what about some of the damage to more peripheral, but no less vital, players in the agricultural chain?

Before getting to that, it's important to know that Richard Coy isn't a man afraid to take a stand for his farming partners. Coy, Vice President of Coy's Honey Farm, manages some 13,000 bee hives scattered throughout Arkansas, Mississippi, Missouri, and California. The family honey business is the largest in Arkansas.

"I know what it means to operate a 'family business' and I know the pressures of operating a large-scale farm," Coy recently testified before the Arkansas Dicamba Task Force. "During my 26 years as a commercial beekeeper, I have developed and maintained good relationships with many of the agriculture industry leaders in Arkansas and throughout the nation. Within the past two years, I have written letters on behalf of cotton, and grain sorghum producers requesting Section 18's for Transform. I recently met with EPA officials in Memphis, Tenn., and voiced my support for neonics as a seed treatment. Also, I have worked closely with the University of Arkansas Division of Agriculture Research and Extension along with various aspects of the USDA."

## Dicamba and bees

Coy says he first began noticing issues with increased dicamba use and its relationship with his hives in 2016.

"I was finally able to pinpoint it this year. But I began noticing the problem last year when my production was off in the area around (northeast Arkansas') Monette and Leachville. That's where the major controversy and shooting over dicamba took place in 2016."

He didn't know what the problem was and assumed it was weather-related or maybe involved an insecticide.

In 2017, "just like the past 10 years, we placed bees on our locations in Mississippi and Crittenden Counties. Production in these counties this year has been dramatically reduced.

"We began noticing lower than normal bee population the last week of June. The hives stopped building population and we could not understand what the problem might be. We looked at all of our management practices and found nothing out of the ordinary."

In retrospect, Coy says what happened was pollen had stopped coming into the beehives. "Pollen is the protein source for the hive. Without it, the queen will not lay eggs because there's no protein to feed the larvae. That has a tipping effect that negatively impacts honey production."

It takes 21 days for eggs to mature into adult bees. Therefore, "you don't really notice what's going on for a few weeks. There's a lag time and so it was deep into July before we knew there was a major problem. Another reason it took so long to get a grip on this is we have about 13,000 hives and we run them about every three weeks."

So, from middle to late July the Coys knew there was "a major problem. The hive-check rotation takes about three weeks since the hives are scattered all over the Delta. My younger brother, David, and I began going to different areas and really looking closely at the hives. We determined in areas without dicamba drift our honey production had not decreased. We dug deep into the hives and found we had a lot of pollen available in non-dicamba use areas and very little, to no, pollen stored where there were dicamba-tolerant crops."

## Research

Even without dicamba-tolerant crops, how would Coy describe this year for making honey?

"This year, the weather has been conducive for an average crop. We had too much rain in August to have an above-average crop.

"However, there are hives set up where apparently little dicamba was used because there are pigweeds in the fields and the vines also show no damage. The hives in

those areas have average to above average production.

“When you’re trying to put together the pieces of a puzzle together it can take a while.”

Around the last week of July, Richard and his brother “went to check our bee locations around Webb and Tutwiler, Miss. We run about 1,600 (hives) in that area. Chris said ‘We have some locations that have filled every box full. But, I have found an area where they haven’t made any honey since the first of July.’ He checked into it, and sure enough, where the honey production had stopped was also where the farmers had planted (dicamba-tolerant) soybeans.”

That spurred Richard to do some more research to “see if I was reading too much into the situation. Well, I found a study from Penn State University that shows where there is widespread dicamba use in an area there would be enough visible drift and volatility to damage all the vegetation. The study found it would decrease pollinator habitat by 50 percent and pollinator visits by 50 percent.”

At that point, in late July, Coy called the Arkansas Plant Board and explained what he’d found and had been seeing. “They sent out some inspectors a couple of weeks later and they took some pictures of the vegetation. They verified what I was seeing.”

## Symptomology

What was Coy observing?

“In fencerows and ditches, vegetation like wild grape, red vine and even ragweed were damaged. All that unwanted vegetation for farming is something that bees use to make honey. Those plants had curled leaves and had stopped growing prior to the blooming process.

“I went south of I-40 to an area I know there hadn’t been a lot of dicamba sprayed. There was a bunch of the (aforementioned) plants that were growing and blooming and the bees had produced a tremendous honey crop.”

What are other beekeepers saying?

“I’ve spoken with others in this region and they’d been seeing the same symptoms in their hives where there are dicamba-tolerant crops and drift complaints are the highest. Healthy hives had stopped collecting nectar and pollen and the population hadn’t grown enough to produce a good honey crop.”

## Cut-off date

What about the April 15 dicamba-spraying cutoff date urged by the task force?

“I think it’s a good idea. If you look at all the data put out by university weed scientists it looks like there isn’t an issue with dicamba and volatility until temperatures get hotter. Most of the vegetation our bees rely on isn’t really up and going by mid-April. For example, red vine doesn’t start putting on leaves until sometime in May.

“I think beekeepers would be happy to live with an April 15 cut-off.”

---

**From:** Green, Jamie
**To:** Overstreet, Anne; Baris, Reuben
**Cc:** Frizzell, Damon
**Subject:** Dicamba Control
**Date:** Wednesday, September 27, 2017 8:19:24 AM
**Attachments:** Scanned from a Xerox multifunction device.pdf

---

Hello Anne and Reuben -

I wanted to touch base with you regarding the attached control we received yesterday. We received it yesterday and it has a due date of Monday. It is from a gentleman in NE concerned because all of his seed customers are telling him they will no longer buy seed beans from him because of this year's damage from dicamba. In his letter to the administrator, he includes a couple of recommendations.

I am guessing you guys have gotten a number of these. Do you have any responses you have prepared previously that we could use? I also wasn't sure if we should be responding or if the response should come from OPP.

assigned to JOPE
due 10/2/17

**Bowman, Janet**

**From:** cmsadmin@epa.gov
**Sent:** Tuesday, September 26, 2017 12:00 PM
**To:** Robichaud, Jeffery; Bowman, Janet
**Subject:** CMS New Assignment - Dana Peters - AX-17-001-3181

Control AX-17-001-3181 has been assigned to your office on 9/26/17 12:59 PM by Dana Peters. Please go to the CMS webpage to view the details of the control.

Summary Information -
Control Number: AX-17-001-3181
Control Subject: Concern- Roundup Ready Xtend soybean Offering two solutions
From: Rob Robinson, Rob Robinson

Note: This Email was automatically generated. Please do not attempt to respond to it. You can access this control at https://cms.epa.gov/cms. Questions or comments concerning CMS should be directed to CMS Support at 202-564-4985 or CMS Information@epa.gov.

9/26/2017 - Jamie G. contacting OPP

ROB-SEE-CO

PO Box 129 | Waterloo, NE 68069 | toll free: 855-450-1822 | www.robseeco.com

September 14, 2017

Environmental Protection Agency
Scott Pruitt, Administrator
1101A
1200 Pennsylvania AVE N.W.
Washington, DC 20460

Dear Scott Pruitt,

My name is Edward Robinson and I am the CEO of a family owned seed company called Rob-See-Co. My company sells soybean seed throughout the Midwest. I am writing you to express my deep concern over Roundup Ready Xtend soybeans. My concern is twofold. First, the amount of damage I am hearing about from my soybean seed customers and sales force is alarming. Even more alarming is the number of my customers who have told me they will plant all Xtend varieties, instead of my seed, as a defensive measure against damage from neighbors who will use Xtend varieties and spray the approved dicamba products.

I do not sell Xtend varieties and do not plan to sell them. While I understand the necessity for better weed control options, I believe the unavoidable collateral damage from on-label use of Engenia and Xtendimax is unacceptable. As a result of not selling Xtend varieties, I will lose substantial sales, not due to the fact that my varieties aren't preferred by my customers, but due to the fact that my customers do not want to sue their neighbors over dicamba drift or volatility damage to their soybean fields. I find this issue incredibly anticompetitive, and something that should be considered when reviewing continued Xtendimax and Engenia label approval. As more growers use the Xtend system to control weeds, more growers with adjacent land will be forced to plant Xtend varieties to avoid injury in their fields. This will create a barrier for other weed control options to enter the market and limit grower choice.

I see two potential solutions. First is a dramatic increase in the field borders that cannot be sprayed with the approved dicamba products. I have no research to gauge the size of the borders and wonder if this approach will be effective in avoiding drift or volatility damage in neighboring fields, as damage this year seemed to spread beyond what a practical border would prevent. The other alternative is to restrict the use of the approved dicamba products to preplant only. This will ensure no damage will occur.

Thank you for your consideration of my deep concerns. I have listed my contact information below should you have any questions of me.

Sincerely,

Rob Robinson

Rob Robinson
CEO and Owner, Rob-See-Co
rrobinson@robseeco.com
402-206-6546

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2017 SEP 21 AM 10:23
OFFICE OF THE
EXECUTIVE SECRETARIAT

UNITED STATES POSTAGE
PITNEY BOWES
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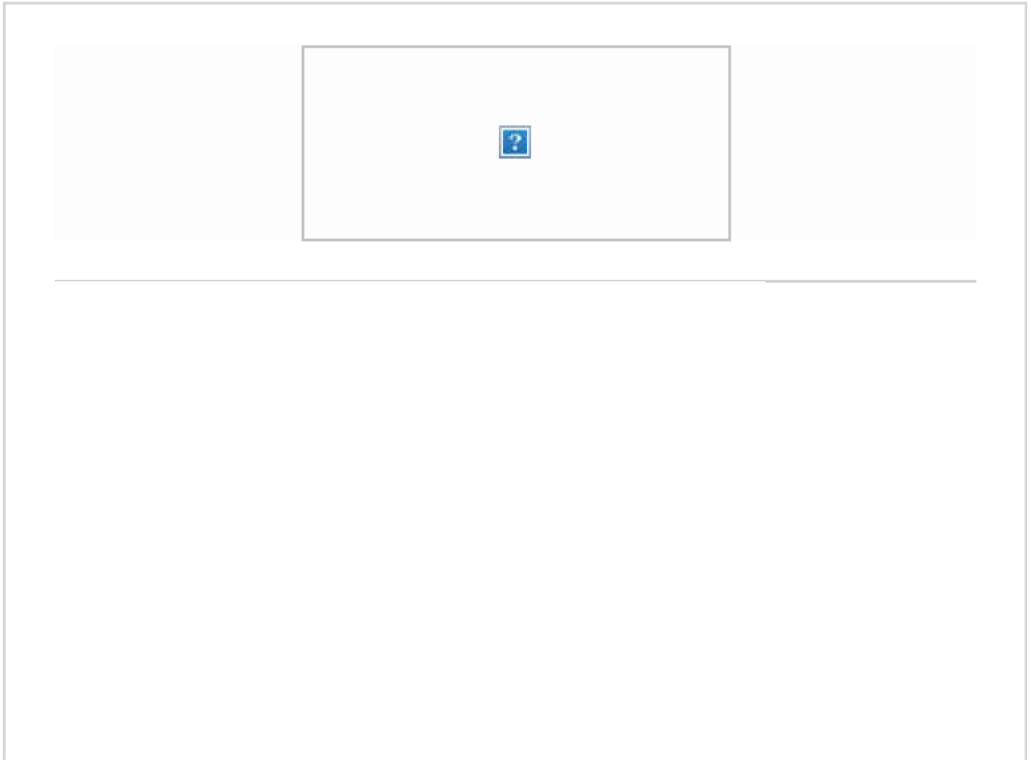
SEP 14 2017
MAILED FROM ZIPCODE 68022
SEP 21 2017
ROB-SEE-CO
Environmental Protection Agency
Scott Pruitt, Administrator
1101A
1200 Pennsylvania AVE N.W.
Washington, DC 20460
FCL 2077828

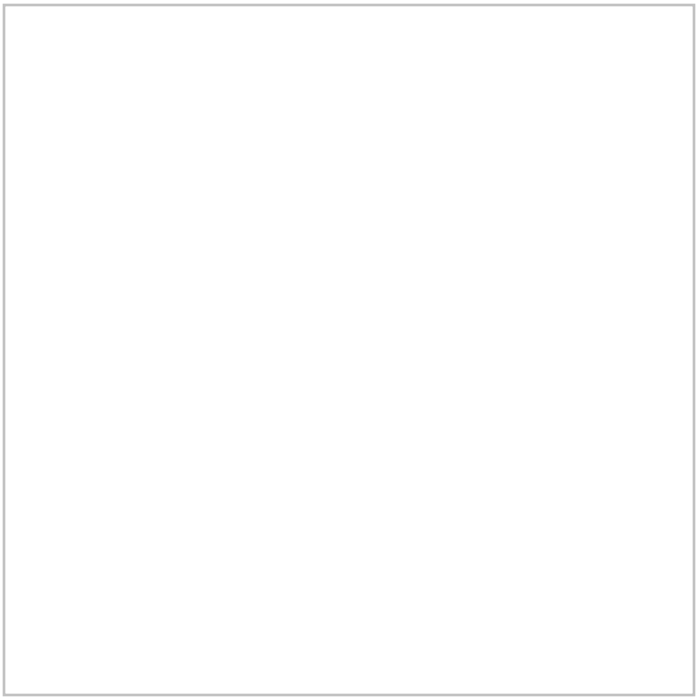
**From:** Hawkins, Caleb
**To:** Becker, Jonathan; Chism, William; Jones, Arnet; Baris, Reuben; Kenny, Daniel; Rowland, Grant; Montague, Kathryn V.; Meadows, Sarah
**Subject:** RE: FYI -- PANNA email on dicamba
**Date:** Thursday, September 21, 2017 11:40:57 AM

https://www.reuters.com/article/legal-us-usa-pesticides-epa/u-s-regulator-aiming-to-allow-controversial-herbicide-use-with-safeguards-idUSKCN1BU30R

**From:** Becker, Jonathan
**Sent:** Thursday, September 21, 2017 9:38 AM
**To:** Chism, William <Chism.Bill@epa.gov>; Hawkins, Caleb <Hawkins.Caleb@epa.gov>; Jones, Arnet <Jones.Arnet@epa.gov>; Baris, Reuben <Baris.Reuben@epa.gov>; Kenny, Daniel <Kenny.Dan@epa.gov>; Rowland, Grant <Rowland.Grant@epa.gov>; Montague, Kathryn V. <Montague.Kathryn@epa.gov>; Meadows, Sarah <Meadows.Sarah@epa.gov>
**Subject:** FYI -- PANNA email on dicamba

**From:** Pesticide Action Network Pesticide Action Network [mailto:subscribe@panna.org]
**Sent:** Wednesday, September 20, 2017 3:55 PM
**To:** Becker, Jonathan <Becker.Jonathan@epa.gov>
**Subject:** EPA: Pull Monsanto's crop-killing herbicide, now.





## Dicamba helps Monsanto, hurts farmers

Dear Friend,

Thanks to Monsanto's latest genetically engineered (GE) seeds, use of the herbicide dicamba has skyrocketed this year — and so has damage to crops growing nearby.

Farmers in 20 states have reported more than 2,200 incidents of crop damage from dicamba drift on more than 3.1 million acres of land. This has to stop.

**Tell the Environmental Protection Agency (EPA) to do its job and halt use of this harmful product, now.**

Dicamba is not a new chemical, and it has a reputation of drifting from where it's applied in the field. Scientists and farmers also know that it's particularly harmful to broadleaf plants like fruits, nuts, vegetables and non-GE soy.

And now, after being rushed to market in 2015, Monsanto's Xtend soy seeds are driving up use of this drift-prone herbicide — and ushering in a new wave of serious problems for farmers.

**Speak up to protect farmers! Urge EPA to halt the use of dicamba on soy and put an end to this devastating crop damage.**

Monsanto's Xtend seeds have been advertised as a necessary tool for farmers to combat the "superweed" epidemic. Interestingly, the corporation fails to mention two key points in its product marketing:

1. Glyphosate-resistant superweeds are the direct result of Monsanto's own RoundUp Ready crops; and
2. Scientists say weeds will also develop resistance to herbicides used on new GE seed lines, like dicamba and 2,4-D.

Put simply, engineering seeds to withstand repeated applications of herbicides just doesn't work. While the model may keep profits flowing for Monsanto, it's wreaking havoc in farmers' fields across the country.

Thank you for speaking up for farmers!

**Pesticide Action Network North America**
**Berkeley, CA | Minneapolis, MN**
**510.788.9020** | community@panna.org | www.panna.org
Facebook | Twitter

#U.S. LEGAL NEWS

SEPTEMBER 20, 2017 / 6:40 PM / 5 MONTHS AGO

# U.S. regulator aiming to allow controversial herbicide use with safeguards

Tom Polansek

WASHINGTON (Reuters) - The U.S. Environmental Protection Agency is aiming to allow farmers to spray the controversial weed-killer dicamba next year, but with additional rules for its use, an official with the agency said on Tuesday.

Reuben Baris, acting chief of the herbicide branch of the Environmental Protection Agency's (EPA) Office of Pesticide Programs, said the agency had not yet determined what steps it would take to mitigate problems associated with dicamba. The herbicide, which fights weeds resistant to another herbicide called glyphosate, was linked to widespread crop damage this summer.

The EPA has been discussing with state regulators ways to prevent such crop damage.

Use of dicamba, which is produced by BASF SE and Monsanto Co, spiked after U.S. regulators last year approved a new formulation that allowed farmers to apply it to soybean plants that were engineered to resist the chemical while it killed weeds. Previously it had been sprayed on fields prior to planting.

Farmers say the chemical caused damage by drifting away from where it was sprayed to fields of soybeans and other plants that could not tolerate it.

Baris told a meeting of state regulatory officials in Washington, D.C., that the agency was "very concerned with what has occurred and transpired in 2017."

"We're committed to taking appropriate action for the 2018 growing season with an eye towards ensuring that the technology is available, number one, to growers but that it is used responsibly," he said.

The EPA is in negotiations with Monsanto and BASF, which sell dicamba herbicides under different brands, to make changes regarding how they are used, Baris said.

State regulators previously told Reuters the EPA was considering establishing a set date after which the spraying of dicamba weed killers on growing crops would not be allowed.

Arkansas is independently weighing an April 15, 2018, deadline.

But Tony Cofer of the Alabama Department of Agriculture, who attended the meeting, said such a cut-off date would not match Baris' goal of maintaining dicamba's usefulness.

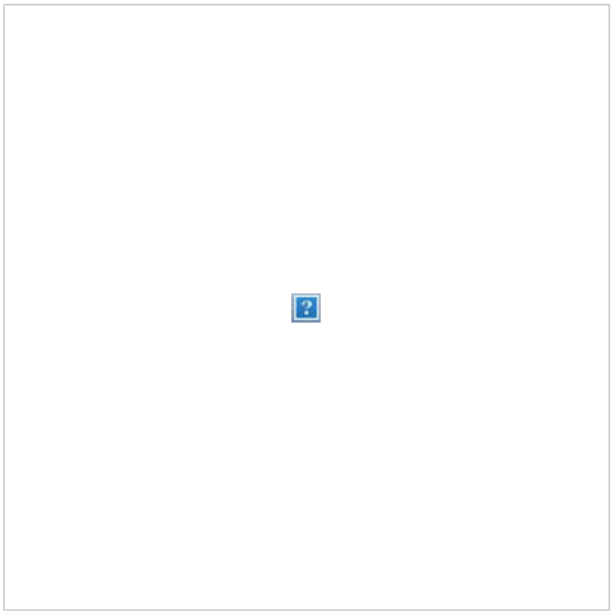
"That type of restriction would not be something they're probably considering, in all practicality, if they wanted to continue use of the product," said Cofer, director of the Pesticide Management Division at the state's agriculture department.

Monsanto has said the April 15, 2018, date would amount to a ban in Arkansas because the chemical was designed to be sprayed over the genetically engineered crops during the summer growing season.

Arkansas previously blocked sales of Monsanto's dicamba herbicide in the state.

*Our Standards:* *The Thomson Reuters Trust Principles.*

**From:** Pesticide Action Network Pesticide Action Network
**To:** Keigwin, Richard
**Subject:** EPA: Pull Monsanto's crop-killing dicamba, now.
**Date:** Thursday, September 21, 2017 12:26:51 PM



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**Facebook | Twitter**

STATE FIFRA ISSUES RESEARCH & EVALUATION GROUP (SFIREG)
JOINT MEETING MINUTES OF THE PESTICIDE OPERATIONS AND MANAGEMENT (POM) & ENVIRONMENTAL QUALITY ISSUES (EQI) COMMITTEES
September 18-19, 2017
U.S. EPA, POTOMAC YARDS, CRYSTAL CITY, VA

Called by: Timothy Drake, SC, POM Chairperson & Gretchen Paluch, IA, EQI Chairperson
Minutes by: Amy Bamber, AAPCO Executive Secretary

Monday September 18, 2017 8:30 am ET

Joint Working Committee Session

**Chlorpyrifos Tolerances**

*Discussion of uses and tolerance levels in effect, and potential measures that can be added to labels. Clarification on path forward for those working with EPA and NMFS on BE, BIOP and Bulletin Process.*
*Gary Bahr, WA, EQI*
*Gretchen Paluch, IA, EQI*
*Tim Drake, SC, POM*

Bahr began by stating that there are several chemicals undergoing biological assessments, including diazinon, chlorpyrifos, and malathion. Currently there is a December 2017 deadline for EPA to complete the assessments. EPA stated that they are not sure if they will meet this deadline.

CA, OR, and WA are still using these 3 chemicals quite a bit. Surface water monitoring is occurring, particularly in salmon and steelhead streams. The states have extensive data on the water quality in these streams.

EQI is wondering what to expect moving forward. Is EPA going to weigh in on alternatives for chlorpyrifos? Schoen-Nessa stated that for Washington corn, mint and cranberries there are not a lot of choices and they are hoping EPA will work to provide alternatives.

Singhasemamon added that chlorpyrifos is a drawn out issue; they are doing risk assessments in CA and are working with their federal partners. They had expected revocation of tolerances. Their process has included: the 2015 interim mitigation measures; going through review of risk assessments; this is a visible issue and includes public protests and concerns about bystander exposure; a recent letter discussing peer reviews; a public announcement will come out soon.

Lance Wormell, EPA/OPP/FEAD stated that they are working on submitted questions.
Yvette Hopkins, EPA's liaison to SFIREG, asked that problems or special registration questions be routed through her at this time as Marion Johnson and Anita Pease are not in Insecticides or EFED at this time.

**OPP Update**
*Yvette Hopkins, EPA/OPP/FEAD, SFIREG liaison*

Proposed Technical Amendment to Data Requirements for Antimicrobial Pesticides

On August 18, 2017, EPA issued a proposed correction pertaining to the "200 ppb level" described in the final rule, "Data Requirements for Antimicrobial Pesticides", that was promulgated on May 8, 2013 and codified under 40 CFR part 158, subpart W. The correction clarifies that the 200 ppb level established in the EPA final rule is based on total estimated daily dietary intake, and not on the amount of residue present on a single food item or commodity. The correction can be found at www.gpo.gov/fdsys/pkg/FR-2017-08-18/pdf/2017-17339.pdf

Final Biofilm Guidance for Antimicrobial Pesticides

From October 4, 2016 through January 21, 2017, EPA solicited comments from the public on two proposed test methods and associated testing guidance for evaluating antimicrobial pesticides against two biofilm bacteria, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. EPA received over 150 comments from nine entities. After considering these comments, EPA revised and finalized the guidance document and associated standard operating procedures and posted on MLB's Antimicrobial Testing Methods and Procedures webpage: www.epa.gov/pesticide-analytical-methods/antimicrobial-testing-methods-procedures-developed-epas-microbiology as well as in docket EPA-HQ-OPP-2016-0357.

Request for Nominations to the EPA Human Studies Review Board (HSRB)

EPA is soliciting nominations of people qualified in the area of human health bioethics and biostatistics to serve on the Human Studies Review Board (HSRB). More information can be found in an upcoming OPP Update on our website this fall.

Tribal Pesticide Program Council Meeting

On October 3-4 2017 the Tribal Pesticide Program Council (TPPC) will meet in Sloan, Iowa. Tentative agenda topics include:

- a discussion on the status of pesticides in Indian Country,
- updates on regional tribal activities and
- discussions regarding developing pollinator protection plans and best practices for protecting pollinators.

The TPPC is a tribal technical resource and a program and policy development dialogue group focused on pesticide issues and concerns. It is composed of authorized representatives from federally recognized tribes, Indian nations and intertribal organizations. The two-day meeting is being hosted by the Winnebago Tribe. For more information about the meeting contact Cindy Wire.

School Integrated Pest Management Publication

On August 18, 2017, EPA released *Pest Control in the School Environment: Implementing Integrated Pest Management (IPM)*. The publication is an update to its popular 1993 publication, *Pest Control in the School Environment: Adopting Integrated Pest Management (IPM).* The updated version reflects recent innovations in school IPM, provides links to new information, and has been redesigned into an easily printable format. It provides an overview of IPM and details the steps a school can follow to establish an IPM program.

The publication can be found on EPA's website at: www.epa.gov/managing-pests-schools/pest- control-school-environment.

Pesticide Electronic Application Submission Portal

EPA is continuing to update the Pesticide Submission Portal, the Web-based system for electronic submission of pesticide registration applications to EPA, with new features and functionality. This action is another step in a phased approach that will ultimately lead to EPA's ability to accept all pesticide applications electronically.

The current round of updates will be broken into three separate releases, with each release focusing on a new set of features and enhancements for the portal. The first release, PSP version
1.4 (currently available), focuses on new features such as submitting voluntary data and resubmitting 90-Day Responses, along with numerous bug fixes and user experience enhancements. The other phases of this round of updates will be released this fall.

The portal is accessed through EPA's Central Data Exchange (CDX) Network and requires user registration. Pesticide registrants currently submitting CDs or DVDs using the e-Dossier downloadable tool or their own builder tools based on EPA's guidance may use the portal and forego the courier costs of sending to EPA.

An updated user guide, frequently asked questions and other tools to help registration applicants submit electronic applications are available on the CDX Network.

Updated Guidance for Pesticide Registrants on Procedures for Notifications and Minor Amendments Now Open for Public Comment

On September 6, 2017, EPA issued a Federal Register Notice announcing proposed updates to Pesticide Registration Notice (PRN) 98-10, "Notifications, Non-notifications and Minor Formulation Amendments." This notice provides guidance to registrants submitting minor

modifications to a registration that do not require extensive EPA review and do not have the potential to cause unreasonable adverse effects to the environment.

Since the issuance of PRN 98-10, there have been various statutory and regulatory changes. For instance, certain actions previously covered by this PRN now fall within the actions scheduled under the Pesticide Registration Improvement Act (PRIA). This notice will update and clarify what kinds of changes registrants can make by 1) notification to EPA, 2) non-notification to EPA and/or 3) submitting a minor formulation amendment to EPA.

EPA believes these changes will save registrants time and help to keep submissions from being rejected, while still protecting public health and the environment.

EPA is requesting comment from affected parties, including general comments regarding the changes, information on projected cost implications, and feedback on the use of these procedures as an avenue for voluntary disclosure of inert ingredients. For instance, in some cases pesticide companies request approval of label changes to disclose the identity of inert ingredients based on third-party vendor requirements. The agency is seeking comment on whether notifications to EPA are the appropriate mechanism for such changes and also whether such disclosures should be required to include all inert ingredients or only a subset of inert ingredients.

The 30-day public comment period began on September 6, 2017, and closes on October 6, 2017. View the notice at www.regulations.gov docket number EPA-HQ-OPP-2016-0671.

Cooperative Agreement on Pesticide Safety Education

EPA is awarding the eXtension Foundation with a cooperative agreement to establish a system to distribute EPA funds to Pesticide Safety Education Programs (PSEPs) in State Cooperative Extension Services at Land Grant Universities.

PSEPs will use the funds to provide pesticide applicator training on the safe use of restricted use pesticides by applicators in agricultural, commercial and residential settings.

The cooperative agreement is funded at $1,500,000 for the first year, with up to $1,000,000 for each of the four remaining years. We expect to award up to $5,500,000 over the five years. EPA solicited proposals from eligible applicants and applications were due last December.

Pesticide Regulatory Education Program (PREP) 2018

For FY2018, the four courses will be: Compliance/Enforcement; Senior Executive; Registration/Re- evaluation; and, Structural/Non-Agricultural Pest Control Issues. The locations will be announced later.

**OECA Update**
*Liz Vizard, EPA/OC/OECA*

**Regulator in Residence**
*Emily Ryan, EPA/OPP/FEAD*

Ryan presented FEAD's development of the RIR program. After the presentation, there was discussion.
Clark offered up that when EPA gets their first set of states, it is better for EPA to use a three-year planning process (rather than one year at a time), so that the states can budget properly.
As a previous participant, Clark liked being able to find folks in various divisions, and was able to bring state specific issues directly to EPA staff. He also added that planning should occur far enough in advance to allow EPA staff to clear their schedules to meet with the RIR.
Fleeson Trossbach highlighted that the program allowed for great state and EPA exchange. She came in to the program without specific issues to address and found that was a good approach too as it allowed her to experience a typical day at EPA.
Both Fleeson Trossbach and Clark mentioned that inclusion of OECA would be a beneficial addition to the program. They also emphasized that the working committee members should try to take advantage of the program if they can combine their committee time with the RIR program.
Singhasemamon added that CA is currently doing this with EPA modelers and it is working well.
Mensch will reschedule her time with the water quality folks as well.

EPA will send out a formal RIR announcement soon.

**WC-Roles, Responsibilities, and Expectations**
*Amy Bamber, AAPCO Executive Secretary*

Please see presentation.

**PERC Update**
*Amy Bamber, Pesticide Educational Resources Collaborative Advisory Member*

Bamber presented from the PERC website showing the committees how to navigate, discussing the Advisory Board Members, open project solicitations, new resources that are available, and projects that are near completion. Topics included respiratory guidance, field posters and materials, Spanish language resources, Train the Trainer materials.

**States/Tribes/Territories on Amended Certification of Pesticide Applicator's Rule**
Liza Fleeson Trossbach, VA, ASPCRO Past-President

Please see presentation.

STATE FIFRA ISSUES RESEARCH & EVALUATION GROUP (SFIREG)
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Concurrent Afternoon Committee Sessions-POM

**Pesticide Feed Additives-Referral from Full SFIREG**
*Cary Giguere, SFIREG Chair*

Please see presentation.
Giguere made the argument that the use of an insecticide in animal feed to prevent fly larval formation in manure is not a medication, as it does not affect the animal at all. It is used as an insecticide. Giguere also asked if this use had been officially discussed between FDA and EPA.

FDA weighed in on the phone. Several things, but first he described the federal act he works under, the Federal Feed, Drug and Cosmetic Act (FFDCA). He acknowledged the issue of some pesticides overlapping between the two acts. Because of that it may appear something is amiss here. He also wanted to identify that new animal drugs are not pesticides, which may include animal feed, and he gave us the definition of new animal food. Having said that he wants to highlight that the terms drug and pesticide are defined, but there is actually no such thing as a feed additive. Regarding the question of whether a feed is medicated or not, the product must include approved new animal drugs, which would not include a pesticide. If a feed doesn't include a new animal drug, it is not a medicated feed. A pesticide is not a new animal drug. Therefore, to address the confusion regarding if this is a medicated feed:

1. A pesticide is not a feed additive, or animal drug
2. The pesticide in question in this type of feed is not exempt, because this isn't a medicated feed
3. Additionally, one thing is FDA says that in general they are ok if a pesticide is added to a feed, provided it does not interfere with the medication in the medicated feed.

Schoen Nessa clarified that FDA does not consider this pesticide to be a feed or food additive. FDA agreed.
Giguere stated that this was Vermont's interpretation as well. The Clarify manufacturer had previously stated that they didn't need a Producer Establishment designation, contradicting FDA and Vermont. Giguere also said that he believes that this is a countrywide issue.
Drake asked if this is an issue paper or if POM should take the issue. Giguere stated that it should be an issue paper for formalizing and the states ask OECA to stay involved. The registrant will have to follow up on stewarding this product with proper labeling, feeding instructions, keep out of reach of children, and proper disposal.

**Devices and Structural Fumigation. How to Regulate?**
*Cary Giguere, SFIREG Chair*

Please see ozone presentation.
Giguere asked POM to take on the subject. Perhaps development of BMP when using these devices, something to help ensure no one is hurt.

Clark had a couple of questions. There is a school district overseeing this practice. The superintendent would have to have been aware of this. They had to believe that the treatment would kill the roaches. They had to have asked about safety, hvac systems, inadvertent school visitors, etc. The principal or superintendent would have ideally discussed this with the teachers. Giguere responded that the website stated this is non-pesticide control, therefore the school didn't notify anyone; they believed it was safe and effective. The teacher had brought her concerns to the principle and school board and was told her concerns weren't warranted.
Schoen Nessa stated that ozone is a chemical. She does not want to register devices, but if you are creating a chemical that is used for pest control it should be registered and regulated.
Drake stated that this use would be a structural fumigation in SC, and the activity would be regulated. Since the gas doesn't have a label it would be an issue to control the use pattern. Drake also contrasted this to dry ice, since the device produces and applies the gas.
Lastinger said that this use would require an applicator's license in GA. They also have a rule requiring the applicator to follow the product directions, even if it isn't a pesticide. NC would require licensing as well.
Ed White, IN, suggested defining a pesticide product to include pesticide substance and pesticidal device. Then require those using either commercially to be licensed as applicators. SC's rules include devices that are required to apply a pesticide.
It is likely that more equipment/devices like this will continue to increase on the marketplace. It is an upcoming issue.
Patterson added that many potato storage facilities in ME do use ozone, and it is not regulated.
Schoen Nessa agreed that this is a good POM topic. She also wants to look at USDA plant protection regulations to see if they discuss this. There may also be labor or occupational health standards to reference.
Drake confirmed that POM would look further into the issue.

**WPS Update**
*Jackie Mosby, EPA/OPP/FEAD*

Mosby stated that in February 2017 NASDA petitioned the agency to extend the implementation and compliance date for WPS to 2018. She stated that this gives SLAs ample time to implement. On May 11, EPA committed to formally extending the implementation date. They must follow the rule making process, including scheduling with USDA and Congress. EPA is also working through the comments received during the regulatory reform comment process. Any changes to WPS will include a robust public discussion with states. The current Administrator is committed to federalism and working with states on the rule.
Clark asked what timeframe this process will take? Mosby answered it will follow the normal process, 60 or 90 day comment periods. At this point that is the process they have to follow.
Giguere asked about previous comments related to vacating the 2015 rule and re-implementing the 1998 rule and what implications that has for current program implementation? What timeframes are we expecting for this process?
Mosby didn't have more to add to timeframe. Giguere clarified, are the states being asked to postpone current inspections while this process is being decided? Mosby stated that guidance is forthcoming. Drake stated that Region 4 states were told to follow the older WPS rule while this

rule being finalized, and asked other Region 4 states for input. Cofer offered that his understanding is the states should be implementing the new rule. Until EPA announces the delay officially, states are working under the new rule. Fleeson Trossbach agreed-until the new rule is officially delayed, states are working with the new rule.
Mosby requested that states submit any comments or questions for EPA's consideration as they work through this process.
The states commented that this can create confusion for the regulated community.
Don Lott, EPA/OECA, joined the conversation. He stated that OECA is enforcing what is in place right now. Right now it is the 2015 rule.

**Measuring MP3s-PPDC Workgroup Survey**
*Liza Fleeson Trossbach, VA*

Please see presentation.
PPDC has a new approach that includes the typical metrics, but does not include scoring or rankings of state plans. EPA will use this information to tell the story of pollinator protection efforts in the pesticide programs.
Giguere emphasized that the PPDC material does not supercede the metrics and guidance developed by SFIREG, but should strengthen EPA's ability to tell the story. He also discussed outputs vs outcomes, and how those concepts have come in to this process.
There will be a survey to the states, and this presentation is the first exposure of the PPDC approach for most states.
Fleeson Trossbach also clarified that this is a workgroup product. It will then be presented to the full PPDC, then if approved to EPA. Or back to the workgroup. PPDC will be looking for state input on this approach before they recommend this to EPA.
Drake thought that this approach is much better than the rubric approach being considered previously. Giguere thanked Fleeson Trossbach for being AAPCO's liaison to PPDC and for catching the rubric approach as unacceptable to states early on so that the metric product could be addressed differently. Cofer thanked Fleeson Trossbach and Rose Kachadoorian who is a part of PPDC and put in a lot of work to assist in the redevelopment of the effort.

**Tolerances vs. Action Thresholds on Cannabis, Colorado White Paper**
*John Scott, CO*

Giguere began by describing the issue where an estimated health-based action level has been adopted by a state, but is not the same as an FQPA tolerance, and they are being used to justify condemning crops.
This is a situation that can cause conflict for states that have primacy for FIFRA.

Scott described the situation where state marijuana control agencies are asserting that no harm will come to growers if they stay under certain levels. CO has been pushed to establish action thresholds or establish pseudo-tolerances for pesticides, because growers look at other states that have done so. CO has spent a lot of time trying to educate the grower community, as well as the other involved agencies about the issue. Some growers believe they are already breaking the law

(federal) and therefore are not worried about the issue of whether a supposed health-based limit is technically correct or not. Other states' action thresholds are in conflict with FIFRA and it is getting difficult for CO as they are encountering a lot of pressure from interest groups. In CO, the marijuana enforcement division is in charge of enforcement. They frequently will hold plants until they can show that the pesticide residues previously found are below detection levels, and then they release the plants for use in edibles.

Colorado asked EPA to send a letter or communicate with FDA to establish a consistent approach for all the states to use.
Because other agencies have jurisdiction over pesticide use, in varying degrees, related to cannabis cultivation, the issue of primacy has come up. CDA sent a letter to the governor's office saying that the pesticide SLA must be in charge of pesticide enforcement or else risk their primacy.
Colorado would like EPA to back them up with a letter to the governor specifically related to the authority of CDA to be the sole regulator of pesticides in the state, due to their primacy. Cannabis does not need to mentioned in the letter, as this is an issue that could potentially arise in various commodities. Colorado also wanted FDA to weigh in because the plant extracts that are put into food are considered food by FDA.

Other states spoke up about their frustration with action levels that have been developed for use in oversight of marijuana production. None of the states that have legal cannabis agree with this approach and all of the states agree that the pesticide state lead agencies need to have primary authority over pesticide use. It has been a challenge to get state legislative and executive bodies to understand this when they are developing marijuana and hemp programs.

Concurrent Afternoon Committee Sessions-POM

**State and Federal Efforts to Utilize Pesticide Surface Water Monitoring Data in Ecological Risk and Drinking Water Exposure Assessments**
*Exploring the use of bias factors, simple imputation methods, and regression models such as USGS' SEAWAVEQ/EC for quantitation and uncertainty analysis of monitoring data.*
*Matt Bischof, Washington State University*
*Rochelle Bohaty, EPA/OPP/EFED*

Please see attached presentation.

- EPA is better able to use monitoring data for EFED's risk assessments with this model.
- WSDA did a case study using chemicals which met the criteria.
- The work will be peer reviewed and there will be stakeholder feedback.
- Interested states should visit the USGS website to find SEAWAVEQ.

**Water Quality PREP and Pesticide of Interest Tracking System (POINTS) Survey**
*Committee to review results of POINTS survey, Water Quality Prep response and status on the POINTS transition project.*
*Gretchen Paluch, EQI Chair*

*EPA/FEAD*

Please see attached presentation.

- There were 29 responses to the POINTS survey, revealing inconsistent uses of the system among the states.
- CA has developed an SOP for POINTS and will share it with SFIREG.

**Overview and Update of the List of Human Health Benchmarks**
*Presentatin of process and list of Human Health Benchmarks updated 1/1/2017*
*Jamie Strong, EPA/OW*
*EPA/HED*

Please see attached presentation.

**Overview and Discussion of Plant Back Restrictions-White Paper**
*Presentation to full SFIREG of white paper presenting technical concerns, especially the use of "cover crops" for forage and potential marking as an animal feed. Committee to discuss options for resolution.*
*Gretchen Paluch, IA, EQI Chair*

Please see attached presentation. EQI began working on this issue after the 2015 AAPCO letter to NRCS asking them for assistance in resolving the issue. The request was unsuccessful and EQI has been gathering data and developing the issue further. Should the issue be sent to full SFIREG as an Issue Paper? The committee agreed that it should.

Tuesday September 19, 2017 7:30 am ET

Resumption of EQI Breakout Session

**State Updates on Issues Related to Environmental Quality Programs**
*Each member of EQI will provide a brief update on major issues related to environmental quality topics, including water quality program topics, faced by each state.*
*EQI Members*

Washington State

- They are hosting a water quality meeting with the R10 states, including DEQs, USGS, and NOAA
- They have a joint project with Oregon for groundwater and surface water. It began because of dacthal and it's metabolite dpa detections, which are used in onions. They are including domestic and public wells in their sampling, and have had some public meetings.
- Collaborating with Oregon to get them crop mapping
- Regional groundwater-still monitoring in ID, OR considering GW monitoring

- Regional surface water-WA,OR,ID all have programs; WA is in 14 watersheds, sampling weekly
- They do get some aquatic life benchmark exceedances
- Forestry herbicides on the Olympic Peninsula is a new cooperative project with the WA DNR and timber companies.

California

- They have 2 Ag and 2 Urban monitoring projects currently
- They use monitoring prioritization, which includes the use of collected data. They find they need an ever-shifting analytical net.
- The 2012 pyrethroid regulations don't appear to have had a significant impact. So they are back at the table and reconsidering their data, trying new tools and models.
- Fipronil-they have worked with BASF and CFI. They saw label changes to incorporate modeling recommendations for ant control and structural pest control
- Reanalyzing data based on new benchmarks; this is changing how they work with neonics, and they expect to see the benchmarks go down.
- Copper antifouling paints regulation went into effect this past summer.

**Report on AAPCO Laboratory Committee Call**
*Summary of topics covered relevant to state water quality programs including up to date lab methodologies for pesticide analysis in groundwater and/or surface water monitoring. Opportunities for increased efficiencies in quality assurance to be discussed.*
*Carrie Leach, Office of the Indiana State Chemist*
*EQI Members*

Please see presentations. Leach reviewed the surveys that are available on the AAPCO website, including the 2015 turn-around survey and the 2016 instrumentation survey. She also discussed the recent lab committee calls and the upcoming Laboratory PREP.

**Dicamba**

*Tim Drake, SC, POM Chair*
*Gretchen Paluch, IA, EQI Chair*
*Reuben Baris, Acting Herbicide Branch Chief, OPP/EPA*

The chairs called for introductions around the room. The sign in sheet is attached to these minutes. On the phone were Dea Zimmerman, FEAD/EPA; Leo Reed, IN; Ples Spradley, AR; EPA Region 3; Carol Black, WSU; Andrew Thostenson, NDSU.

*Impacts to the State's Enforcement Programs*

IA-107 incidents reported; 75% appear to be off-target onto soybeans

FL-none

NC-18 cases currently, mostly on tobacco, some on soybean. In the cases with tobacco, the crop must be destroyed. Dr. York of NC believes most cases were drift rather than volatility. NC is utilizing specific auxin training for the Dicamba-tolerant (dt) technology.

AL-5 misuse cases. They have mandatory training and 24(c) labels in place for dt products. AL grows about 450,000 acres cotton and 450,000 acres soybeans.

IN-254 cases with 126 known Dicamba cases. The Indiana Pesticide Review Board determined on August 30th that all Dicamba products with a 6.5% concentration or greater should be RUP. IN assumes that approximately 1/10 cases are being reported to the state lead agency.

GA—no official complaints. Georgia Agriculture Commissioner hosted a Dicamba summit to bring together stakeholders in march 2013 to discuss the technology and concerns and make recommendations. A dicamba workgroup was formed and meetings started in October 2014. The workgroup established a network of stakeholders to discuss issues and facilitate information. The state requires "Using Pesticides Wisely" (UPW) training through 24c registrations. The UPW training is tracked through applicator certification licensing program. Non-certified applicators are issued a credential to verify completion of UPW. GDA launched a webpage to post dicamba related information in Spring 2017. http://www.agr.georgia.gov/24c.aspx The trainings started in 2015 and were hosted by UGA and GDA with 33 classroom trainings that were attended by 3,000 cotton/soybean growers. The training focuses on the use dicamba and 2,4-D drift mitigation, volatility studies. BASF, Monsanto, Dow and Dupont were also part of the programs. The training is beneficial for drift mitigation of any pesticide. UGA Extension has further increased stewardship of these products by developing and implementing one-on-one trainings with growers. 300 applicators have been trained using this format. GDA dealer outreach effort: inspectors visited dealers to provided education on the use of the new products and review the distribution of old product and dealer recommendations.

MN-similar complaint numbers to IA. They have an online survey as well, and are just beginning to review that.

WI-one reported case.

SC-3 or 4 reports with impacts to peanuts and soybeans.

DE-one case that was the applicator's fault for not washing out the spray tank.

AR-976 cases. They have trained about 1,000 applicators and have mandatory online training which includes a test requiring a 90% passing score to purchase and use product. The AR Plant Board has recommended an April 15th cutoff date for over the top use of Dicamba. This

recommendation was supported by their Dicamba task force as well. Any rule-making must go through the legislature and the governor.

ND- have received 28 complaints during the past three weeks. They also have an online survey and have received about 120 responses. They believe their caseload is a fairly conservative estimate of damage, reflecting 150,000 acres impacted. They have had very dry conditions, but August rains have helped with overall plant health. There has been extensive training to applicators.

Liza Fleeson Trossbach, VA presented current case numbers for impacted states. Her slides may be found in the attached presentations.

*EPA support for State Lead Agencies*

EPA has made laboratory resource support available. More information may be found on the Dicamba webpage of aapco.org.

EPA headquarters has instructed the regions to renegotiate state work plans for states that have been hit heavily with Dicamba caseloads.

*Training Efforts*

The chairs asked that the discussion include effectiveness of various training approaches.

GA-has had 3 years of training in place, and has trained approximately 3,000 applicators.

NC- The label is considered to have very complex label language, and therefore they have focused trainings on compliance with the label, emphasizing aspects such as buffers. Their training is online, and they have seen about 3,000 applicators come through it. The training may have had the effect of deterring use of the technology due to the complexities of label compliance.

Cofer stated that it is extremely difficult to respond appropriately to the number of complaints that many states are experiencing. Drake followed up by asking if registrants were planning to help with the training needs? Wendy Bair Johnson of BASF responded affirmatively that they have an 'On Target Application Academy' and are very willing to help states. BASF had the 'On Target Application Academy' for several years leading up to this year's launch and over 15,000 growers and applicators completed the program. BASF worked with states on training this year. Some states wanted to develop their own programs, and others worked with us on the training. We will continue to work with states on training. Spradley asked if the registrant training included volatility and Bair said that it addresses volatility. BASF will be holding a symposium with university and extension experts in October where BASF will present observations and research results and university/extension will do the same.

*While requiring training for use of the Dicamba products was seen as very important, the form of movement of the pesticide was also discussed.*

Is this physical drift or volatility? In other words, is this misuse or product failure? How do we chart a path forward, especially if it is volatility, which much of the research and anecdotal evidence suggests to be the case? Dave Scott, IN, stated that we need to know how to scientifically identify if direct particle drift vs. volatility is the issue. The labels are contradictory and current sample analysis does not allow states the ability to discern low volatile formulations from older formulations. We are being told that even though no drift gradient is seen the damage is not due to volatility. Is drift different for Dicamba than for other chemicals? Do tank mix partners play a role in the dispersal of the compound?

Bair, BASF, asserted that they want to add lessons learned from investigations into their training. She said that there have been reports that at first the damage appears to be uniformly spread over the field and then through time a gradient appears.

*Registrant reporting*

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), section (6)(a)(2) states: "If at any time after the registration of a pesticide the registrant has additional factual information regarding unreasonable adverse effects on the environment of the pesticide, the registrant shall submit such information to the Administrator."

The chairs asked EPA if they had received any 6A2 reports from the registrants. Baris replied that they have received one report each from BASF and Monsanto. He explained that the reporting may be 'aggregated' over a 30 day period.

Cofer reinforced AAPCO's position that while the registrants are actively encouraging complainants to work directly with them, the states and EPA should be informed of the number of investigations they are working on and the conclusions of the registrants' own investigations.

Baris added that 6A2 reporting is not required for misuse.

Baris also added that there had never been a 6A2 report of resistance. Resistance development is reportable under 6A2. This shows that the 6A2 reporting system is not working.

Dave Scott added that Indiana believes 1/10 reports of symptoms actually reach the Indiana State Chemist's office.

Underreporting of symptoms impacts the state's ability to full discern the problem.

*Identifying symptoms of damage in other plants*

While some states expect widespread adoption of dt technology in 2018, other states do not. In either case, identification of damage to plant species other than soybeans is an interest for EPA and state regulators.

BASF offered to follow up on symptomology, and it was suggested by Singhasemanon that UC Davis may have information as well.

Julie Spagnoli identified uses of Dicamba aside from dt systems that are valuable for many growers including preplant, pasture, corn and burn down applications.

*What happens to the seed if the use of lower volatility Dicamba is restricted or cancelled? How is EPA coordinating with USDA?*

Baris says that EPA is coordinating with USDA.

Cofer stated that the rollout of the seed was not coordinated between USDA and EPA. What can we do as states or as EPA/USDA to prevent this scenario from occurring again?

Baris agreed that the 2016 rollout was not coordinated, and offered that at the federal level they continue to learn and adapt. He said that this is also an opportunity for the registrant to steward the registration. Currently the pesticide's conditional registration is set to expire on November 9, 2018.

*What can be done to improve the 2018 season?*

Schoen-Nessa asked if EPA can require a chemical tracer in the new Dicamba formulations to assist states in identifying if misuse of older labels is occurring. Baris thought that was an interesting idea.

Cofer continued by saying that SLA's have said they need tools. The question is whether EPA will support:

- a pesticide classification change to RUP?
- A mandatory training requirement? Would that be through Extension or the registrants?
- Ability to differentiate the old and new technology analytically
- Adjust the buffers around sensitive crops?

He asked what else could we do that would have an impact for 2018?

Giguere suggested:

- Tracking use and sale of the product
- Evaluating the efficacy of current training programs

- Ensuring the correct label is available for applicators to use
- Offering up SFIREG and AAPCO's help in forming a formal workgroup of state lead agency personnel to continue monitoring and working on the issue.

Cofer responded by asserting that this simply cannot happen again. The volume of work created by this registration is unprecedented, and it is unreasonable to expect the state programs to be able to absorb this volume of enforcement cases related to one registration year after year. Thostenson and Reed agreed.

The question was asked what sort of enforcement issues did Round Up Ready technology create? Spradley stated that in AR they have had about 300 glyphosate complaints in 20 years. This is not necessarily a technology issue, but rather a product-specific issue.

Dudley Hoskins of NASDA finished up the session by saying that this is a challenging, complex issue for NASDA. They do not have a consensus within their membership at this time. But they do have 100% agreement that additional education and training must be supported, and that the SLA's have plenty to do already (prior to Dicamba becoming such a resource intensive issue for many states). The bottom line is that we need more resources for States in all areas.

The meeting adjourned at noon.

| | |
|---|---|
| **From:** | Green, Jamie |
| **To:** | Kenny, Daniel; Baris, Reuben |
| **Subject:** | FW: Record number of pesticide misuse claims by Iowa farmers due to dicamba drift problems |
| **Date:** | Wednesday, September 13, 2017 10:30:06 AM |

FYI

**From:** Ridnour, Lacey
**Sent:** Wednesday, September 13, 2017 9:25 AM
**To:** Green, Jamie <Green.Jamie@epa.gov>
**Subject:** Record number of pesticide misuse claims by Iowa farmers due to dicamba drift problems

https://geneticliteracyproject.org/2017/09/13/record-number-pesticide-misuse-claims-iowa-farmers-due-dicamba-drift-problems/

Lacey Ridnour
Iowa & Tribal Circuit Rider Project Officer
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P (913) 551-7986

# Record number of pesticide misuse claims by Iowa farmers due to dicamba drift problems

geneticliteracyproject.org/2017/09/13/record-number-pesticide-misuse-claims-iowa-farmers-due-dicamba-drift-problems/

Nationally, 2,242 farmers say dicamba has damaged an estimated 3.1 million acres, a University of Missouri report shows.

Iowa ag leaders are investigating a record 258 crop damage reports from pesticide misuse this year. About 100 complaints on 150,000 acres are tied to dicamba.

Monsanto and other ag giants like DuPont and BASF have developed seeds that are genetically modified so they can be sprayed with dicamba, killing weeds but leaving the crop unharmed.

At issue is whether the new dicamba products stay where they're sprayed — or move to neighboring fields, where they can damage non-resistant crops, fruits and vegetables, trees and flowers.

Monsanto claims the problems primarily come from farm application errors.

...

Some university weed scientists disagree.

"The big debate is whether or not the stuff is volatilizing," or turning from liquid to vapor, enabling it to easily move, potentially over a few days, said Robert Hartzler, an Iowa State University weed scientist.

...

The U.S. Environmental Protection Agency is talking with academic researchers, state farm regulators, and Monsanto and other manufacturers to determine whether new restrictions should be placed on the chemical's use.

**The GLP aggregated and excerpted this article to reflect the diversity of news, opinion, and analysis. Read full, original post:** Iowa farmers make record number of pesticide misuse claims

# Iowa farmers make record number of pesticide misuse claims

**Donnelle Eller, deller@dmreg.com** Published 6:39 p.m. CT Sept. 11, 2017 | **Updated 11:24 a.m. CT Sept. 12, 2017**


*(Photo: Zach Boyden-Holmes/The Register)*

About three-fourths of Shane Susie's 80-acre soybean field was damaged after getting hit with dicamba that drifted over his crops from neighboring fields.

The herbicide also savaged his family's trees, flowers and vegetable patch.

"We're not eating anything out of it this year," said the 30-year-old who farms near Kingsley in northwest Iowa.

He estimates his soybean damage losses at $15,000. With drought worries and low corn and soybean prices, "it will be a tough year." he said. "It makes a challenging year more challenging."

Susie and other Midwest farmers have been drawn into a national debate swirling around whether new dicamba versions are safe for growers to use.

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## Volatility vs. applicator error

Fullscreen

**Photos: Controversial herbicide is damaging Iowa crops**

Monsanto claims the problems primarily come from farm application errors.

"We did 1,200-some odd tests in connection with registration of our product with EPA," said Scott Partridge, Monsanto's vice president of global strategy. "They confirmed to us what the label says — if it's followed ... there will be no off-target movement of dicamba by wind or volatization."

Some university weed scientists disagree.

"The big debate is whether or not the stuff is volatilizing," or turning from liquid to vapor, enabling it to easily move, potentially over a few days, said Robert Hartzler, an Iowa State University weed scientist.

"New formulations were supposed to have taken care of the volatility problem," he said, "but all the research suggests that they've reduced the volatility, but not to a level that's safe" after plants have emerged from the ground.

The U.S. Environmental Protection Agency is talking with academic researchers, state farm regulators, and Monsanto and other manufacturers to determine whether new restrictions should be placed on the chemical's use.

"The underlying causes of the various damage incidents are not yet clear, as ongoing investigations have yet to be concluded," the EPA told the Register.

Monsanto said it's cooperating with the EPA's review and expects a decision soon.

Last week, the company challenged an Arkansas task force recommendation to ban the use of dicamba-related products after April 15 next year.

In July, the state issued a four-month prohibition on dicamba use. Arkansas farmers have logged 963 dicamba-related complaints this year.



**Bob Hartzler, a weed specialist at Iowa State University, stands in a soybean field near ISU on Monday, Sept. 11, 2017.** *(Photo: Zach Boyden-Holmes/The Register)*

Hartzler said he and other weed scientists support EPA restrictions on dicamba product-use after plants have emerged from the ground, a time that can vary depending on the state.

"If it is volatilizing, it’s nearly impossible to use, in my opinion, post-emergence," he said.

Hartzler said Monsanto and BASF are fighting restrictions because they would "greatly reduce the value" of their chemical and seed systems, which required "a huge investment" to develop over several years.

"The seed is where they make the majority of their money," Hartzler said. "So if the chemical is restricted and it no longer controls waterhemp or Palmer amaranth, farmers would not see the need to pay additional money" for that technology.

Iowa and U.S. farmers want more weapons in their battle against weeds that can't be killed with glyphosate, the active ingredient in Monsanto's popular Roundup Ready products.

Several Southern states are struggling with glyphosate-resistant Palmer amaranth, a rapidly growing, fast-adapting "super weed" that can quickly overrun cotton and soybean fields.

Palmer amaranth is creeping across Iowa, moving into about half of its counties. So far, the weed can be killed with glyphosate, but weed scientists say it's only a matter of time until it adapts to the the widely used chemical.

The Iowa Department of Agriculture has asked farmers in the state to check fields this harvest for Palmer amaranth, which can grow more than 7 feet tall.

**Bob Hartzler, a weed specialist at Iowa State University, hold a soybean plant that has been affected by dicamba near ISU on Monday, Sept. 11, 2017.** *(Photo: Zach Boyden-Holmes/The Register)*

## Who will cover damage?

Partridge said about 75 percent of the 1,000 U.S. crop damage reports Monsanto has investigated are due to "failure to follow the label."

Monsanto continues to look into the other 25 percent to determine what role weather might have played, he said.

Partridge believes better education can reduce complaints and points to Georgia as an example. It required that chemical applicators become certified and has experienced no reports of drift damage.

With Monsanto expecting customer demand to double, he warned that Arkansas growers could see twice the damage if the state continues its ban in 2018. That could result in farmers using an older, more volatile version of the herbicide, he said.

Clark Porter, who farms near Waterloo, said he anticipates more farmers will look at using dicamba-tolerant seeds to reduce their damage risk.

Porter said two of his fields received dicamba damage — one when he sprayed using a tank contaminated with a dicamba product and another he believes was vapor drift. One field should see little reduction in yields; the other — just a few acres — will have losses, he said.

Depending on when it occurs, dicamba damage may have no impact or climb up to 40 percent in yield reduction, Hartzler said, based on damage reported in Iowa.

Pat Swanson, who farms near Ottumwa, said her family experienced no problems when they had a contractor spray 220 acres of soybeans.

"We were happy with the results," said Swanson, a Pioneer seed dealer. "We had no problems with drift."

The Iowa Soybean Association said it's working with farmers, researchers, manufacturers and others to find answers, so growers "can continue to have access to these important products and they can be assured that their own and their neighbors' crops won't be affected."

Susie, a Beck's Hybrids seed dealer, worries that his losses won't get covered, given the ongoing debate about whether the responsibility for the damage lies with dicamba makers or those applying their products.

Insurance adjusters have determined their clients followed label instructions when spraying the dicamba that damaged his fields. His only other option is to file a lawsuit against the applicators or join a class action suit against dicamba makers.

"I think it's a great product, but I'm not sure there was enough research done" to ensure it remains stable once it's applied, he said.

He agrees with Porter that farmers might feel forced to buy dicamba-tolerant seeds next year "to protect themselves."

"It's not what we should have to do. We shouldn't be fearful about getting damaged," Susie said.

Read or Share this story: http://dmreg.co/2w2NaKf

**From:** Bradley, Kevin
**To:** Baris, Reuben
**Subject:** Re: call this week?
**Date:** Monday, September 11, 2017 10:15:58 PM
**Attachments:** A68295E2-4431-4EF5-944A-3488169A97FC[70].png
5939E0CA-ECB1-4FAB-9D4D-0C2C4E8C81AE[70].png
image002.png
Volatility Data for EPA Review.pdf

Reuben, attached is a pdf of slides from several university weed scientists that have done some independent volatility testing of the new dicamba formulations this summer; Jason Norsworthy, Larry Steckel, Tom Mueller, and myself. I realize you pretty much already have the slides from Mueller's presentation. If you have any questions on any of this please let me know. In case the file is too large to go through email, you can download it here instead:
https://www.dropbox.com/s/xlfpzo8i8qbtdmd/Volatility%20Data%20for%20EPA%20Review.pdf?dl=0

Kevin Bradley, PhD
Professor, Division of Plant Sciences
State Extension Weed Scientist
University of Missouri

Weed Science Website: http://weedscience.missouri.edu
Weed ID Website: http://weedid.missouri.edu

Follow us on:

**From:** "Baris, Reuben" <Baris.Reuben@epa.gov>
**Date:** Friday, September 1, 2017 at 7:30 PM
**To:** Kevin Bradley <bradleyke@missouri.edu>
**Subject:** Re: call this week?

Hi Kevin,
It was been a crazy week for both of us. I'm sorry we kept missing each other. We are interested in the volatility data. While GLP would be ideal we are interested in any data that you or your colleagues are willing/able to share. The other pieces of information we are trying to nail down are non-target damage estimates that includes both non-DY soy and any other sensitive crop, plant etc. I can explain the rationale more for that when we are able to chat on the phone. And then what other investigations are going on in the field that you are hearing. Are Monsanto and BASF out in the field still? How are the various CheckOff groups involved in the issues at hand? There are still a lot of things to discuss. I

hope we can find some time next week to chat.
Hope you are able to enjoy the long weekend.
Reuben

Sent from my iPhone

On Sep 1, 2017, at 4:35 PM, Bradley, Kevin <bradleyke@missouri.edu> wrote:

> Reuben, doesn't seem like we can catch each other on the phone. I just wanted to let you know our committee can get you some data and at least for my own part, there aren't any restrictions on what we can and can't show you….we can share everything we have. I assume we are talking about volatility but not even sure what kind of data you were asking for on the phone voice message. You are free to call me anytime on my cell, 573-999-1278.
>
> Kevin Bradley, PhD
> Professor, Division of Plant Sciences
> State Extension Weed Scientist
> University of Missouri
>
> Weed Science Website: http://weedscience.missouri.edu
> Weed ID Website: http://weedid.missouri.edu
>
> Follow us on:
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> <A68295E2-4431-4EF5-944A-3488169A97FC[57].png> <5939E0CA-ECB1-4FAB-9D4D-0C2C4E8C81AE[57].png>
>
> ---
>
> **From:** "Baris, Reuben" <Baris.Reuben@epa.gov>
> **Date:** Friday, August 25, 2017 at 8:29 AM
> **To:** Kevin Bradley <bradleyke@missouri.edu>
> **Subject:** RE: call this week?
>
> Hi Kevin,
> There was a call with the State Lead Agencies (SLAs) who have primacy with the enforcement for pesticide use. The intent of the call was to discuss labeling and work together to find some solutions for the 2018 season. The invite for the call went out through AAPCO/SFIREG, and was extended to the EPA regional points of contact as well as HQ OECA. It ended up going out to a much broader audience and I apologize that it didn't make it to you. We had some discussion about volatility which I think would have benefited from your perspective and research. I think Dr. Norsworthy represented the current state of research fairly well. If you're available today, I'd like to discuss the

outcome and next steps with you more. I have a few sporadic meetings throughout the day, but for the most part I am available. Please give me a call at your convenience.

Reuben Baris | Acting Chief | Herbicide Branch
U.S. Environmental Protection Agency, Office of Pesticide Programs | (703) 305-7356

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**From:** Bradley, Kevin [mailto:bradleyke@missouri.edu]
**Sent:** Friday, August 25, 2017 8:30 AM
**To:** Baris, Reuben <Baris.Reuben@epa.gov>
**Subject:** call this week?

Reuben, was there some kind of EPA call this week, like on Tuesday or Wednesday? If it is none of my business no problem but apparently other university weed scientists were on it and they are asking me how come I wasn't on it/didn't know about it if I am the contact person for this WSSA committee that is to interact with you all. People are asking me questions and I don't know anything about it.

Kevin Bradley

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**From:** "Baris, Reuben" <Baris.Reuben@epa.gov>
**Date:** Friday, August 18, 2017 at 3:18 PM
**To:** Kevin Bradley <bradleyke@missouri.edu>
**Subject:** RE: WSSA committee

Hi Kevin,
Thanks for pulling this together. I think this is along the lines of what some are talking about. Do you (or your colleagues) have a sense of how this correlates with the incidents that are being reported?

Reuben Baris | Acting Chief | Herbicide Branch
U.S. Environmental Protection Agency, Office of Pesticide Programs | (703) 305-7356

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**From:** Bradley, Kevin [mailto:bradleyke@missouri.edu]
**Sent:** Friday, August 18, 2017 12:01 PM
**To:** Baris, Reuben <Baris.Reuben@epa.gov>
**Subject:** Re: WSSA committee

Reuben, this is what we have come up with at this point in time. Is this what you had in mind?

**The following species sensitivity rankings are based on published literature**

**and/or studies:**

**Extremely Sensitive:**
Grapes
Lima Bean
Southern Pea
Snap Bean
Soybean
Tobacco
Peach
Elderberry
Dogwood
Oaks
Viburnum

**Very Sensitive:**
Cotton
Pepper
Pumpkin
Tomato
Watermelon

**Moderately Sensitive:**
Cantaloupe
Cucumber
Squash
Apple
Maple
Elm
Redbud
Rose
Dogwoods

**Low Sensitivity:**
Peanut
Broccoli
Cabbage
Kale
Mustard
Turnip
Walnut

Pecan
Raspberry
Strawberry
Sweetgum
Crabapple
Hydrangea

**Species which appear to be sensitive based on observations from the field but no published data:**
Ginkgo
Paulinao
Frindge
Sycamores
Cypress
Boxelder
Birch
Catalpa
Honeylocus
Spruce
Poplar

Kevin Bradley, PhD
Associate Professor,
Division of Plant Sciences
University of Missouri

Weed Science Website: http://weedscience.missouri.edu
Weed ID Website: http://weedid.missouri.edu

Follow us on:

<image001.png> <image003.png>

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**From:** "Baris, Reuben" <Baris.Reuben@epa.gov>
**Date:** Tuesday, August 15, 2017 at 12:36 PM
**To:** Kevin Bradley <bradleyke@missouri.edu>
**Subject:** RE: WSSA committee

Hi Kevin,
Thanks for the quick response. If you don't mind holding off on scheduling the call, I think that will allow us to better formulate and organize our thoughts around a larger teleconference. In the meantime, there is one item that I think the committee would

be able to provide quick feedback on, and that is  a list of sensitive plants. Either stemming what has been formally/informally reported in terms of complaint or incidents or your observations from the field.  We have been so focused on soybeans that we have not discussed (in as granular a focus) all the other sensitive crops, fruits, vegetables, ornamentals, and trees (etc.). The idea being that this would potentially feed into training and stewardship.
Thank you again for your continued engagement. It certainly is extremely helpful to know we have a wealth of knowledge and experience just a short call away.
Sincerely,
Reuben

Reuben Baris | Acting Chief | Herbicide Branch
U.S. Environmental Protection Agency, Office of Pesticide Programs | (703) 305-7356

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**From:** Bradley, Kevin [mailto:bradleyke@missouri.edu]
**Sent:** Tuesday, August 15, 2017 1:21 PM
**To:** Baris, Reuben <Baris.Reuben@epa.gov>
**Subject:** Re: WSSA committee

Can you propose a time, or several times, that you are available next week and we can schedule a call then?  Or do you just want to wait until you know for sure you need something?

Kevin

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**From:** "Baris, Reuben" <Baris.Reuben@epa.gov>
**Date:** Tuesday, August 15, 2017 at 10:04 AM
**To:** Kevin Bradley <bradleyke@missouri.edu>
**Subject:** RE: WSSA committee

Hi Kevin,
Sorry for the delay in getting back to you regarding the WSSA committee. We are still in negotiations with the Registrants on label changes. So I'm not exactly sure what's needed in terms of help at this very moment. But in the next few days or early next week we will certainly need feedback from you and your colleagues on the registration structure. That is to say once we have a better handle on how these products will be structured for the 2018 growing season. I think a conference call in the next week would be helpful to provide WSSA's feedback to the agency.

Thank you.
Reuben

Reuben Baris | Acting Chief | Herbicide Branch
U.S. Environmental Protection Agency, Office of Pesticide Programs | (703) 305-7356

**From:** Bradley, Kevin [mailto:bradleyke@missouri.edu]
**Sent:** Thursday, August 10, 2017 7:56 PM
**To:** Baris, Reuben <Baris.Reuben@epa.gov>
**Cc:** McFarland Janis USGR <janis.mcfarland@syngenta.com>; Mike Barrett <mbarrett@uky.edu>
**Subject:** WSSA committee

Reuben,

As per our phone conversation the other day, I wanted to let you know that the WSSA has formed a special committee to be used as a resource by you (EPA) pertaining to off target movement of dicamba. This committee is comprised of 9 university academics as well as two individuals from ag co-operatives that are closely associated with spraying these products across large acreages in the Midwest and mid-south. Now that we have the committee formed, I wanted to reach out to you directly and ask how we might be able to help? What information can we provide? Would you like for me to arrange a conference call between you and the committee? If you tell me what information you are looking to obtain, I can work with the committee to get that to you. If you are looking for opinions and thoughts about a variety of topics related to all this, a call might be better at least initially. Thanks.

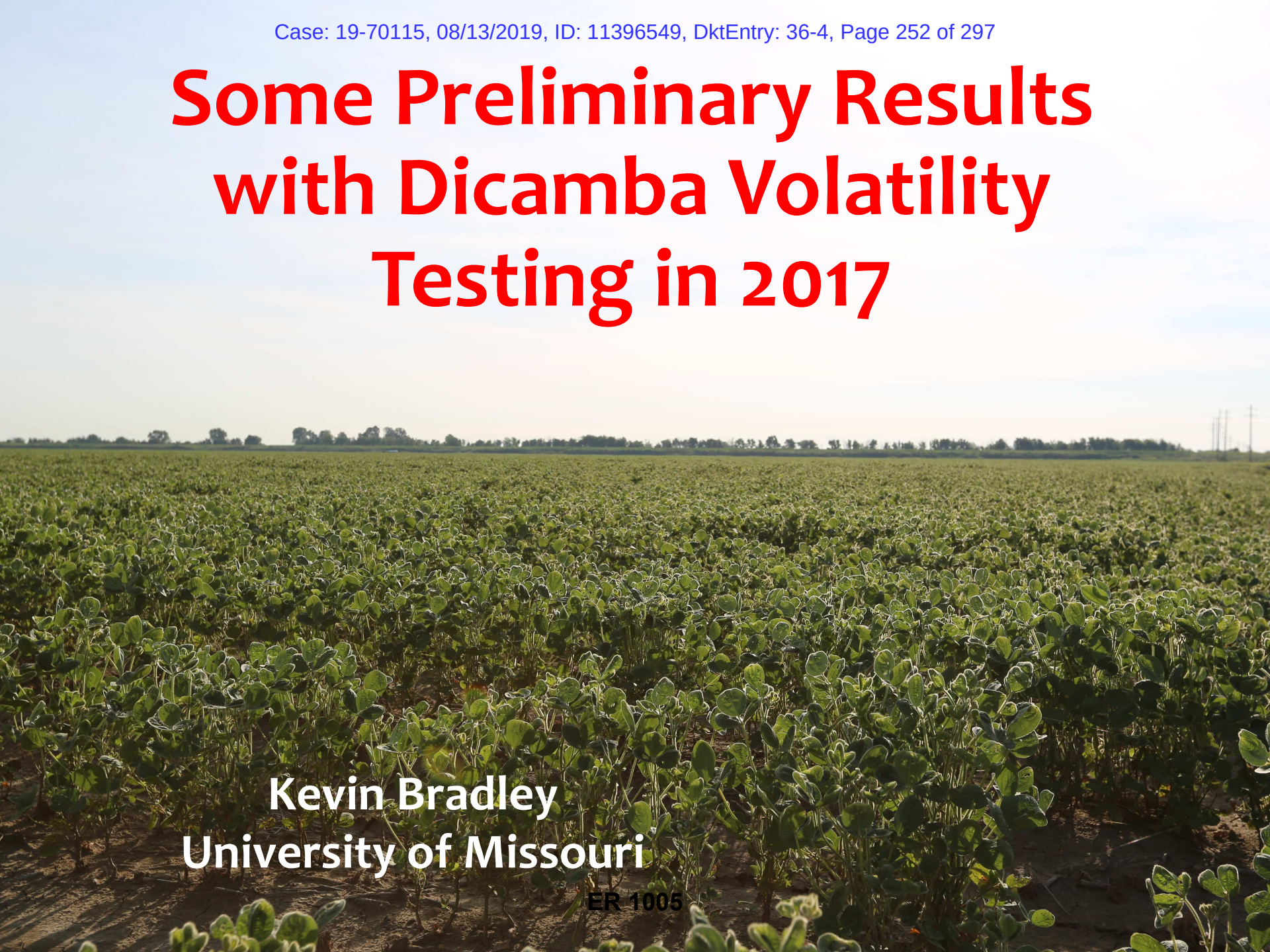
Kevin Bradley

<image001.png>

<image002.png>

<image003.png>

# Some Preliminary Results with Dicamba Volatility Testing in 2017



Kevin Bradley
University of Missouri

ER 1005

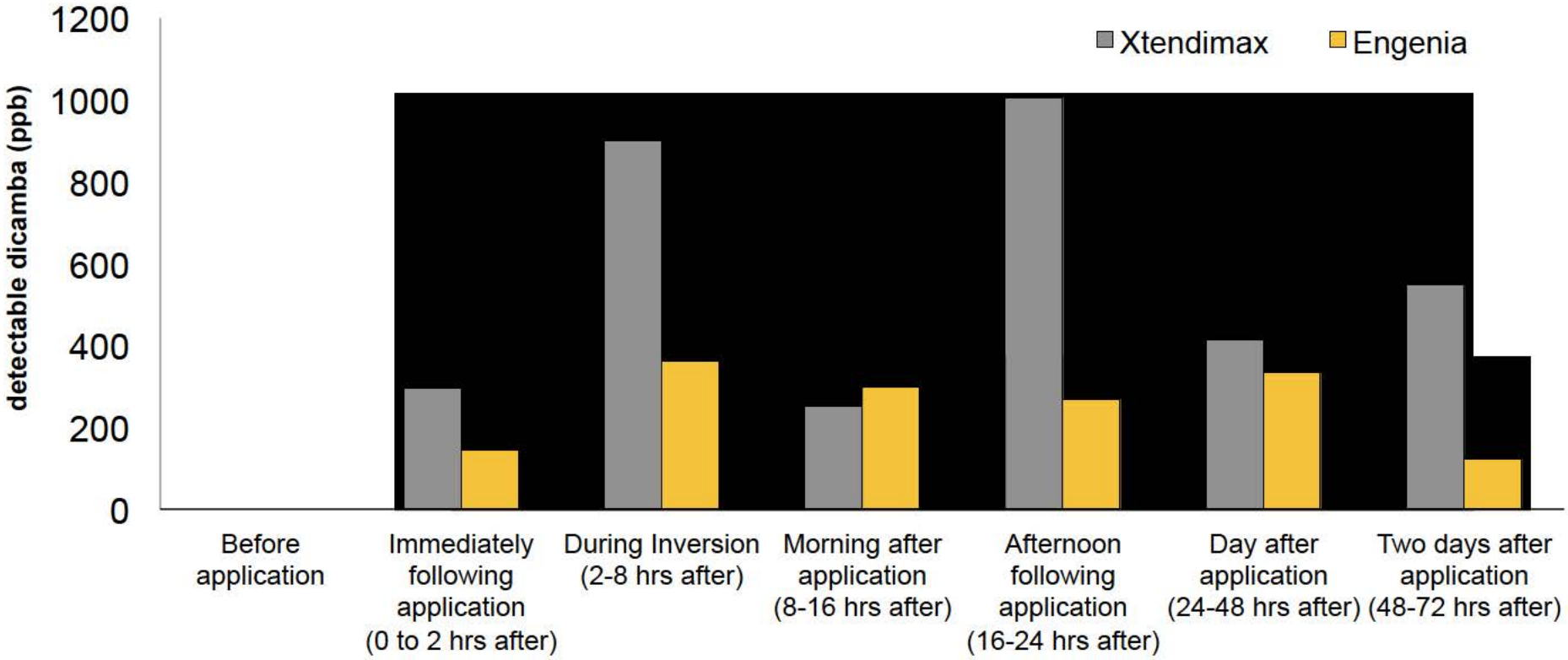
# Our Efforts to Understand the Role of Formulations & Temperature Inversions in the Off-site Movement of Dicamba

2 separate experiments running in June, July, August of 2017:

- **Experiment 1 (3 runs):** Engenia, and Xtendimax (+Roundup PwrMax) sprayed in 20 x 100 ft plots in geographically separate areas of Bradford research center. Air samples taken and indicator plants placed at regular intervals after treatment

- **Experiment 2 (6 runs):** Xtendimax sprayed in 20 x 100 ft plot in mid-afternoon, and then in a geographically separate 20 x 100 ft plot into an inversion during the evening/night. Air samples taken and indicator plants placed at regular intervals after treatment.

# Some Preliminary Air Sampling Results with Engenia and XtendiMax




*combined results from 2 experiments

ER 1007

# Soybean "Indicator Plant" Response following Application of Xtendimax


*Photos taken 21 days after application

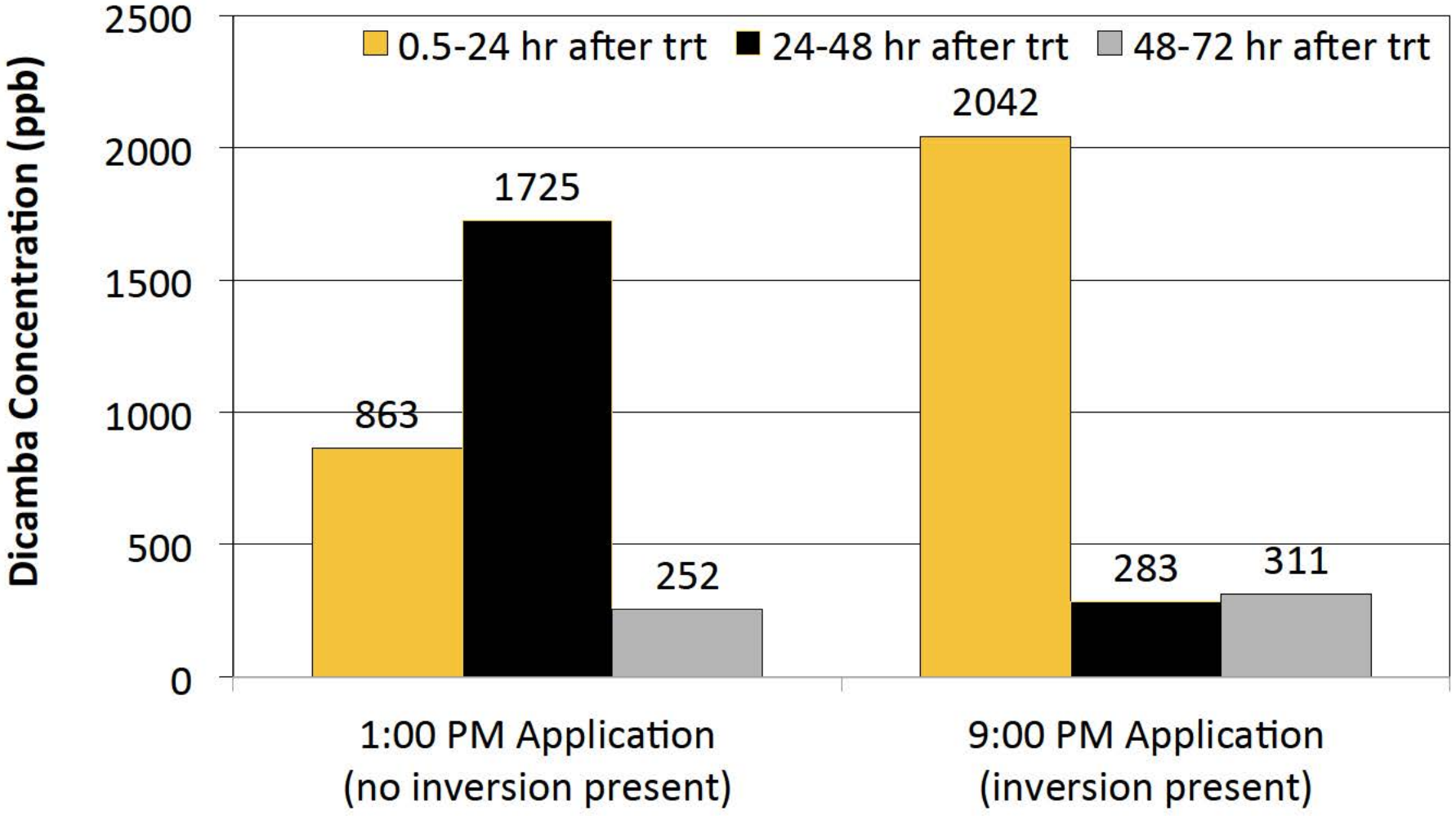
ER 1008

# Soybean "Indicator Plant" Response following Application of Engenia


*Photos taken 21 days after application

ER 1009

# Influence of Application Time of Day and Inversion Presence on Dicamba Air Concentrations following an XtendiMax Treatment



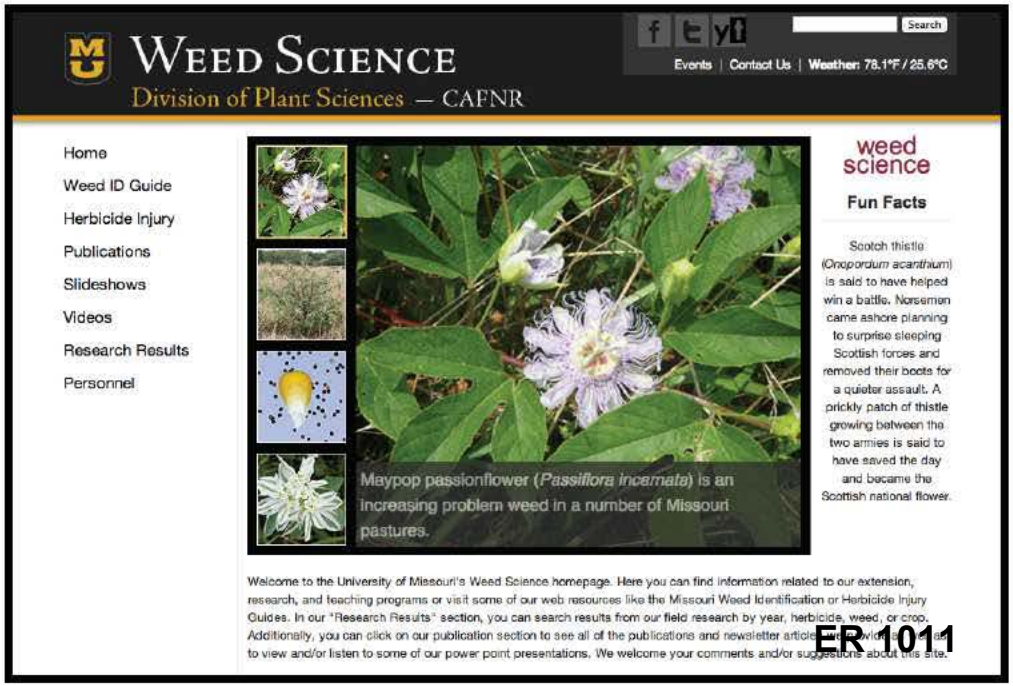

ER 1010

*results from 1 experiment conducted 7/11-7/15

# Mizzou weed science

**Email: bradleyke@missouri.edu**

Website: weedscience.missouri.edu




App: ID Weeds (free download)

id weeds

Facebook: Mizzou Weed Science

facebook

Twitter: @ShowMeWeeds

twitter

# Effect of adding Roundup PowerMax to Engenia on vapor losses under field conditions

Thomas C Mueller
University of Tennessee
July, 2017


# Methods

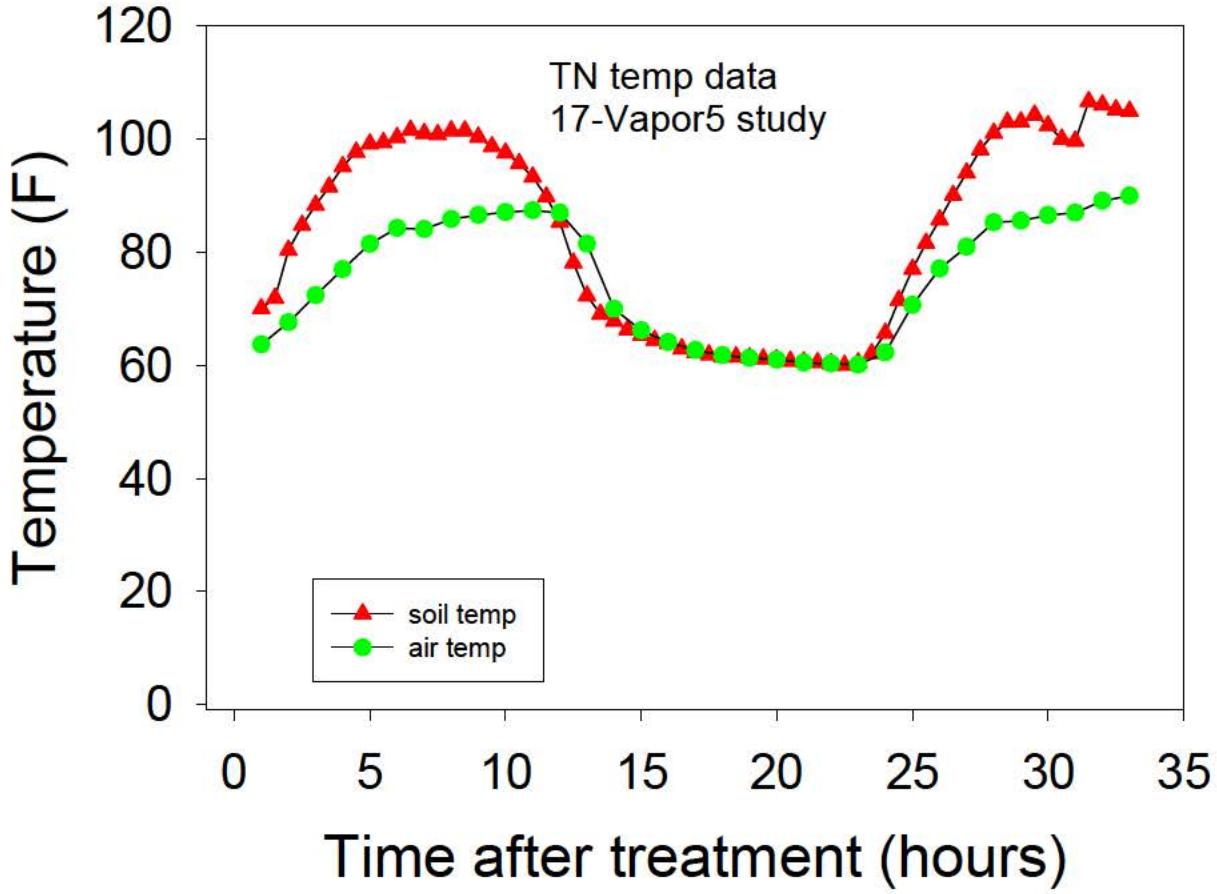
- Field plots established using farmer-scale equipment (30 foot boom, TTI nozzles) following label rates and instructions (late June 2017)
- Plot size = 200*200 ft (~ 1 acre per each treatment)
- High Volume air samplers used to collect dicamba vapors from within the treated area
- Samples collected at 4 different intervals at various hours after treatment (HAT), with 4 samplers in each treated plot
- 0-6 HAT (morning of application)
- 6-12 HAT (afternoon of application)
- 12-24 HAT (overnight)
- 24-36 (day after initial application)

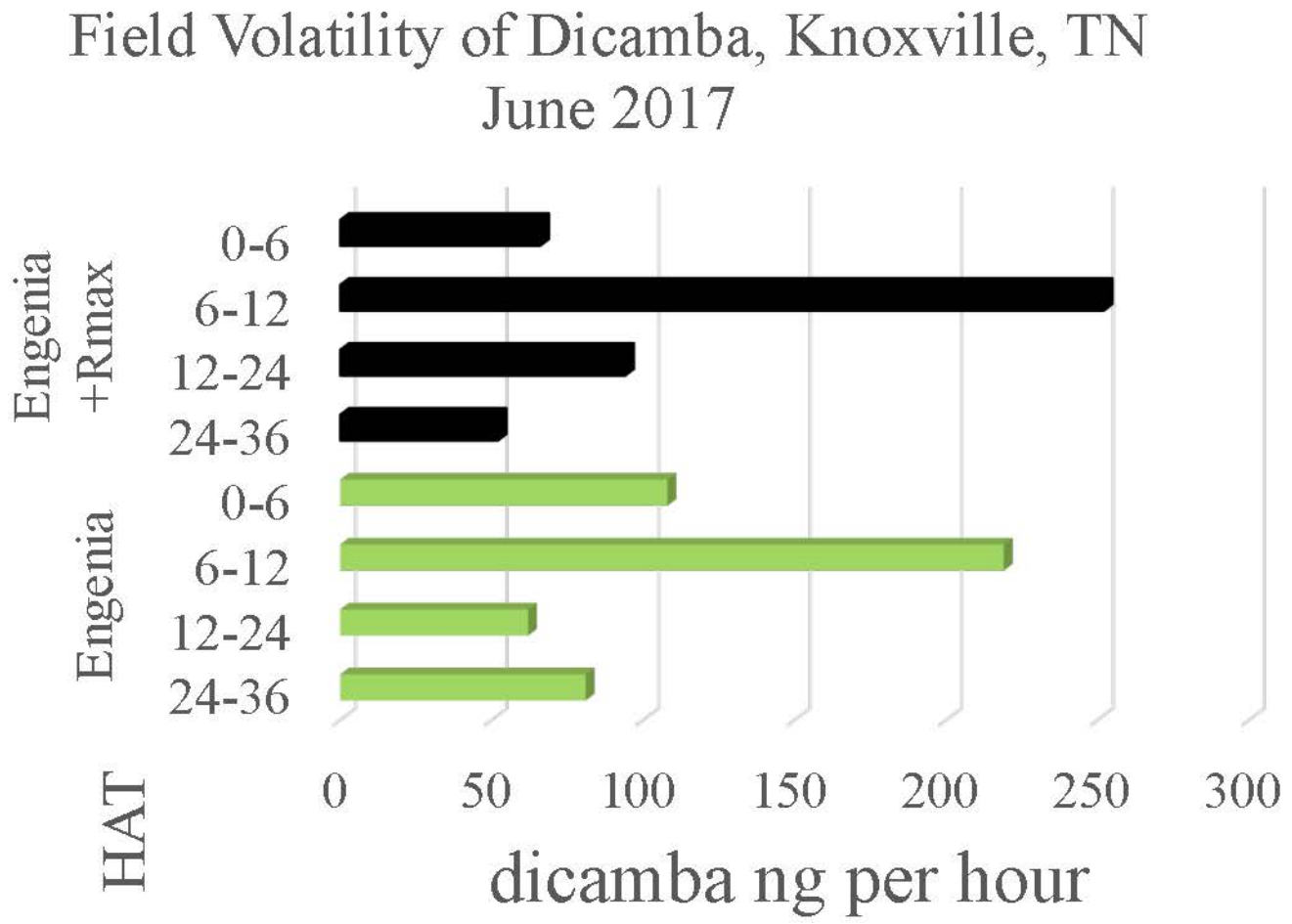
# Methods

- Herbicide treatments included:
- Engenia alone at 12.8 fl oz/acre
- Engenia at same rate + Rmax at 32 fl oz/acre
- Untreated control

- Applications were made early in the AM of first day (0 HAT)
- Surface condition of plots was small soybeans (V2-3) planted in a high residue, long-term no-till environment
- Soil was a medium textured silt loam (pH 6.2, OM = 1.3)
- No rainfall occurred during the sampling period

# temperature




Field Volatility of Dicamba, Knoxville, TN
June 2017
Engenia +Rmax
0-6
6-12
12-24
24-36
Engenia
0-6
6-12
12-24
24-36
HAT
0
50
100
150
200
250
300
dicamba ng per hour

# Observations

- All samples had detected concentrations of dicamba
- No apparent effect of adding Rmax on dicamba volatility from Engenia
- Greatest dicamba concentrations at 6-12 and 12-24 HAT sampling intervals
- Most dicamba loss to atmosphere per hour was in the first afternoon after spraying (6-12 HAT)

TENNESSEE SOYBEAN PROMOTION BOARD

# Field Drift Evaluation of Xtendimax and Engenia

Larry Steckel
University of Tennessee
August, 2017


# Initial Setup

- Trial was conducted in a 40 acre field of dicamba-sensitive soybeans in Sharon, Tennessee.
  - Soybean row spacing was 7.5”
  - Soybeans were at the V5-V6 growth stage at the time of application.
  - Both treatments tested on 2 acres within the 40 acre field.

- Treatments included:
  1. 22 fl. oz. Xtendimax + 32 fl. oz. Roundup Powermax + 0.5% Intact
  2. 12.8 fl. oz. Engenia + 32 fl. oz. Roundup Powermax

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XTENDIMAX™ With VaporGrip™ Technology

Engenia™ Herbicide

# Application

- Treatments were put out *simultaneously* with two Bowman Mudmasters
  - 25 foot boom, 20 inch nozzle spacing
  - Boom Height: 24" above the canopy
  - 9 mph ground speed
  - 15 GPA using the TeeJet 844E Sprayer Control system on both sprayers
  - TTI 04 nozzles
- 

| Date | Time at Application | Temperature | Relative Humidity | Wind Speed | Prevailing Wind Direction |
|---|---|---|---|---|---|
| July 27, 2017 | 10:45 am | 84.2 °F | 84% | 6 mph | SW |

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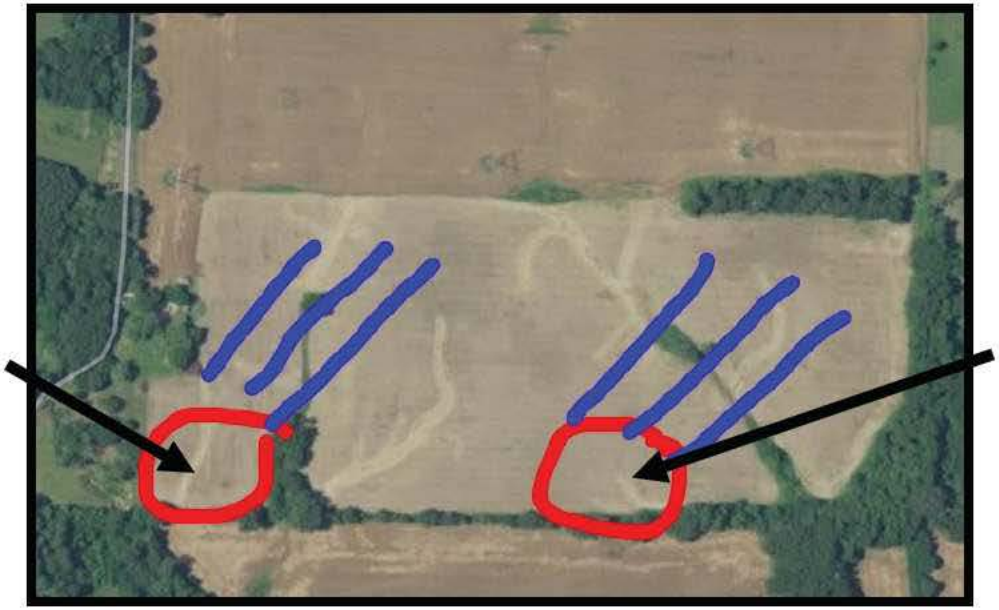
# Initial Setup

22 fl. oz.
Xtendimax
+ 32 fl. oz.
Roundup
Powermax
+ 0.5%
Intact



12.8 fl. oz.
Engenia
+ 32 fl. oz.
Roundup
Powermax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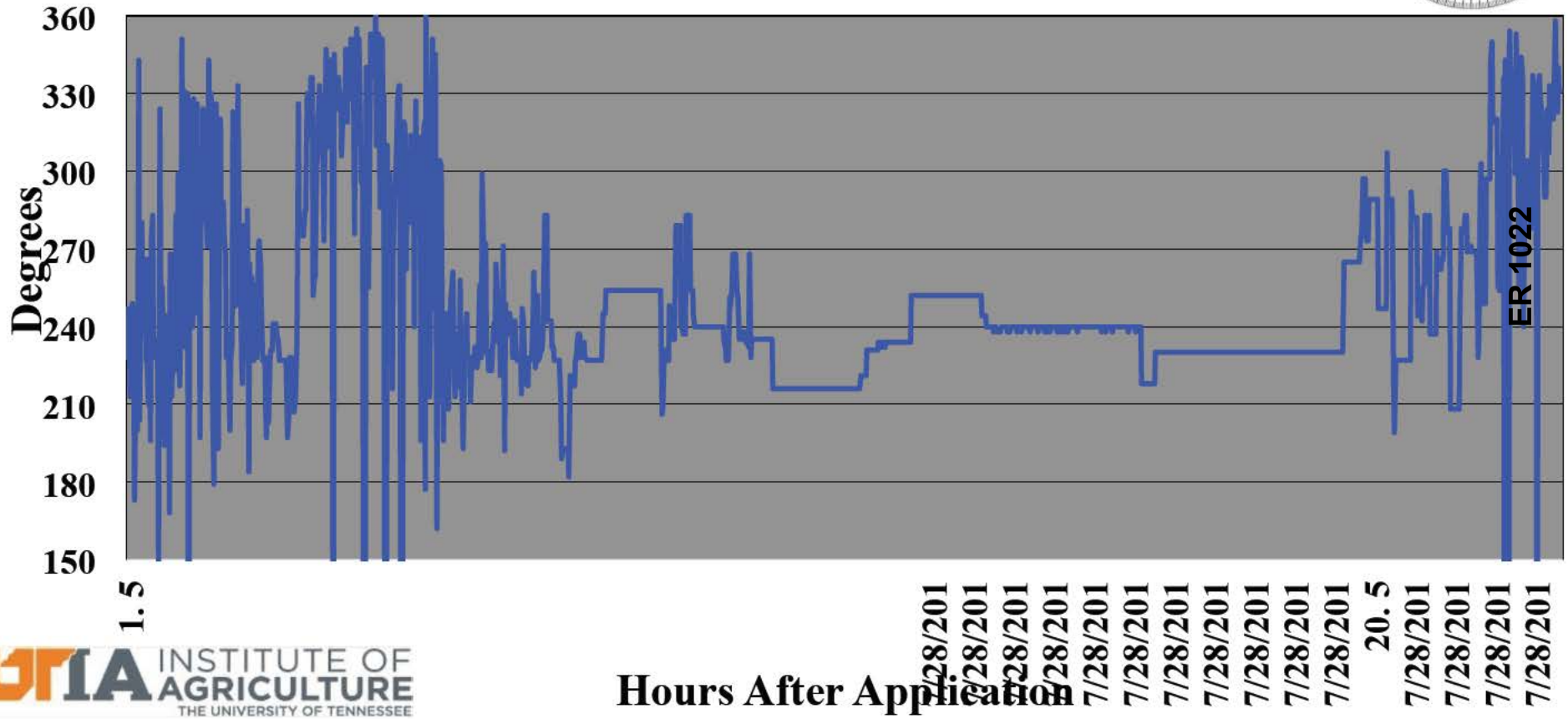
THE UNIVERSITY OF TENNESSEE

# Wind Direction After Applicati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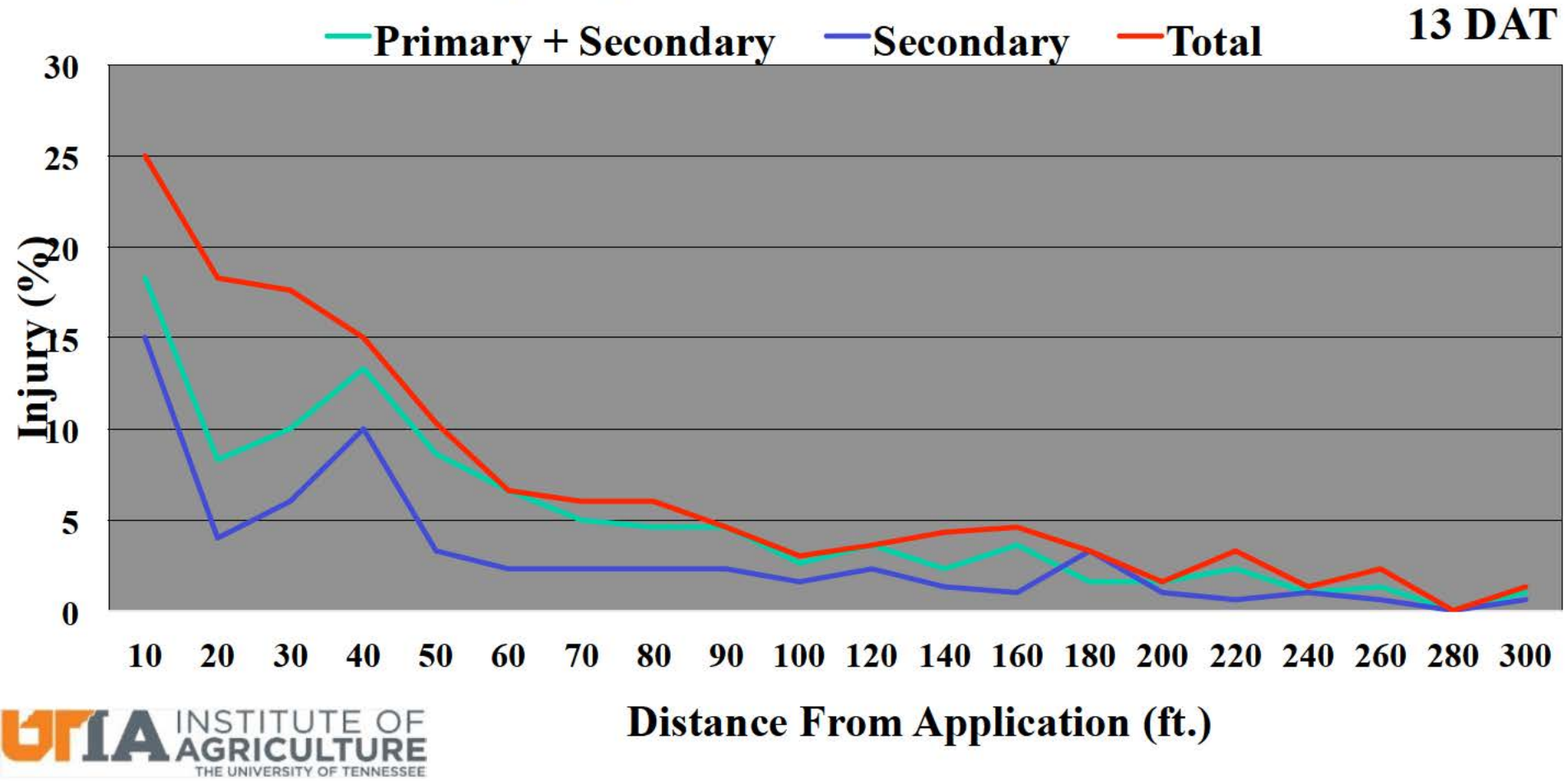
THE UNIVERSITY OF TENNESSEE

# 22 fl. oz. Xtendimax + 32 fl. oz. Roundup Injury + 0.5 % Intact

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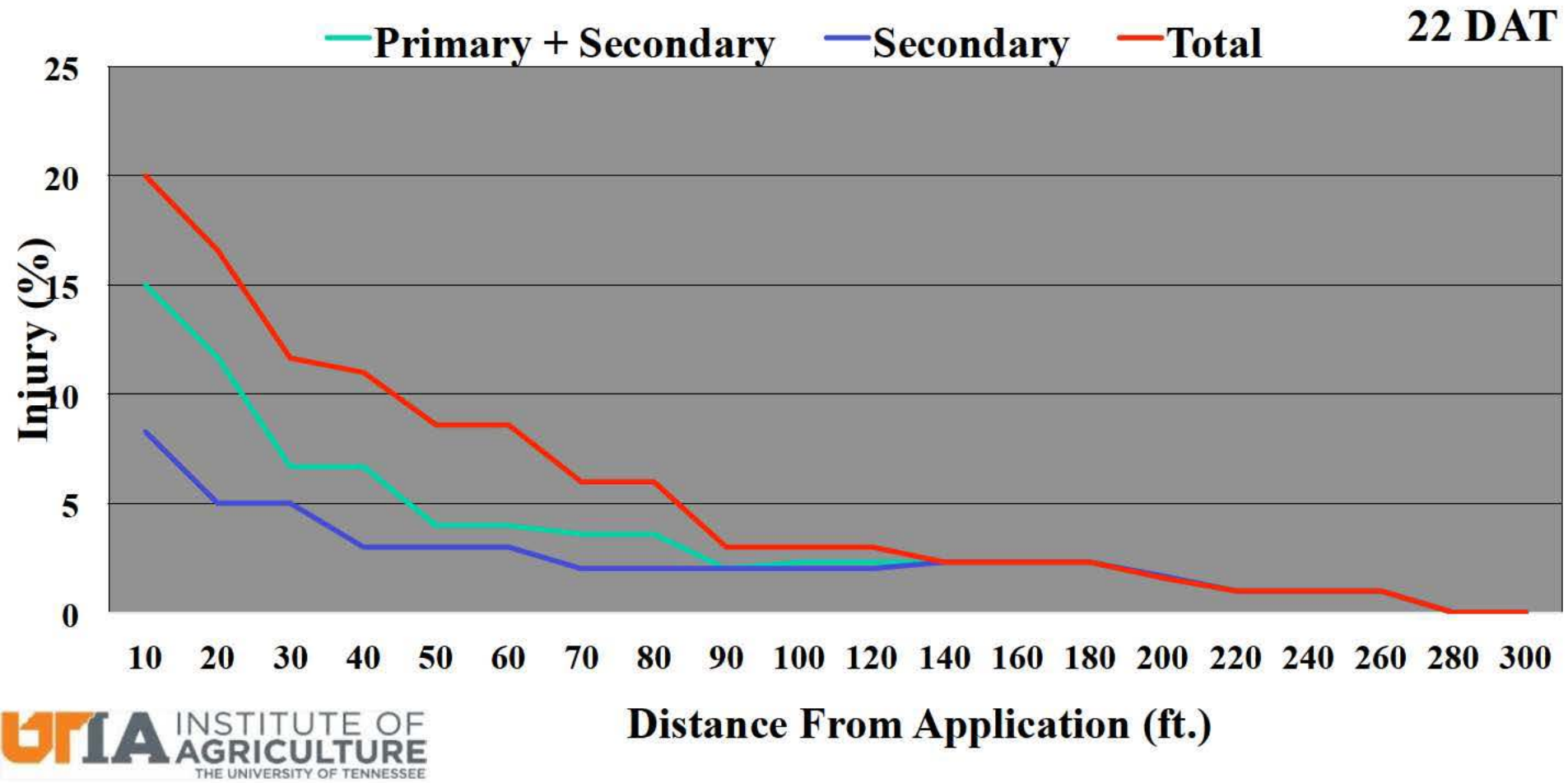
THE UNIVERSITY OF TENNESSEE

# 22 fl. oz. Xtendimax + 32 fl. oz. Roundup Injury + 0.5 % Intact

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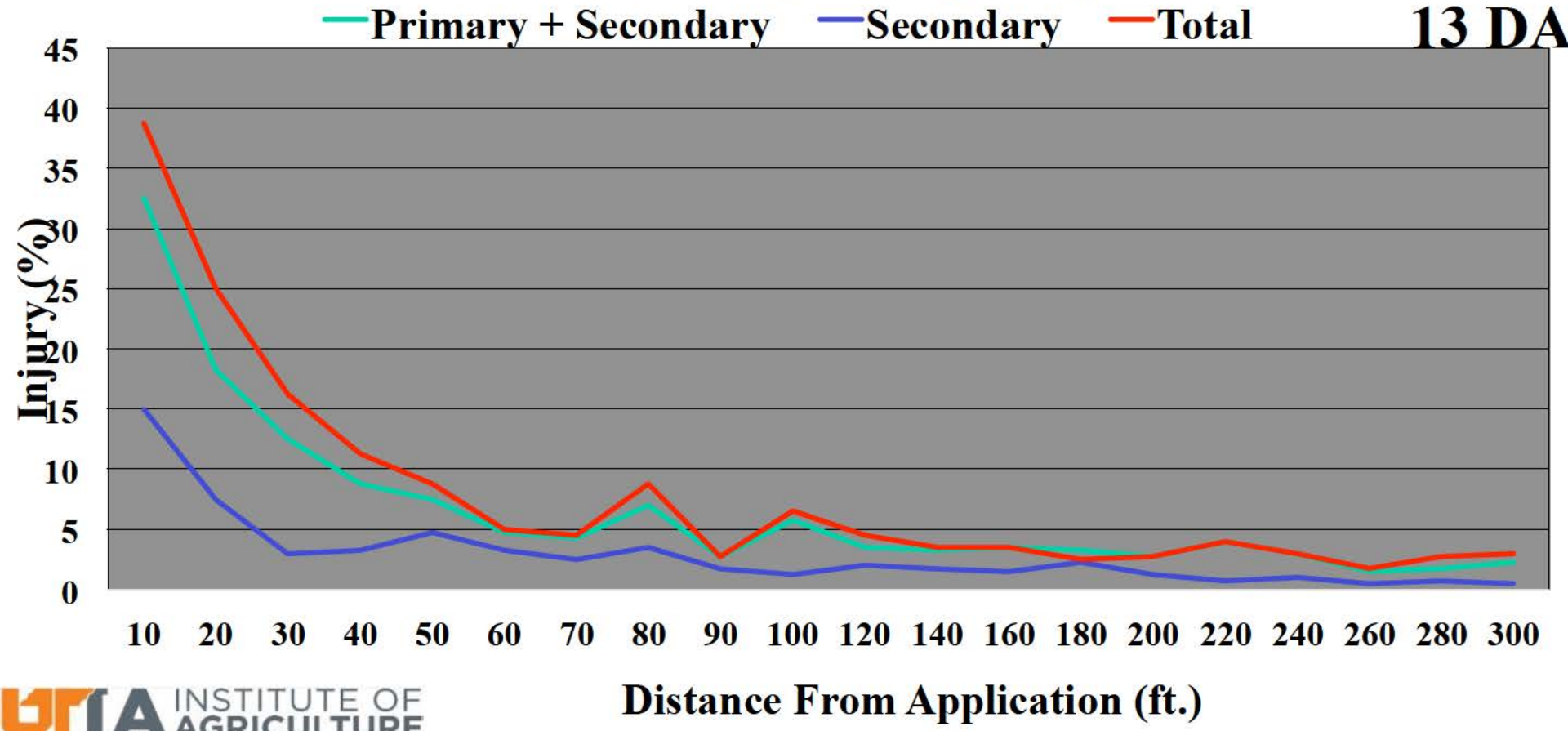
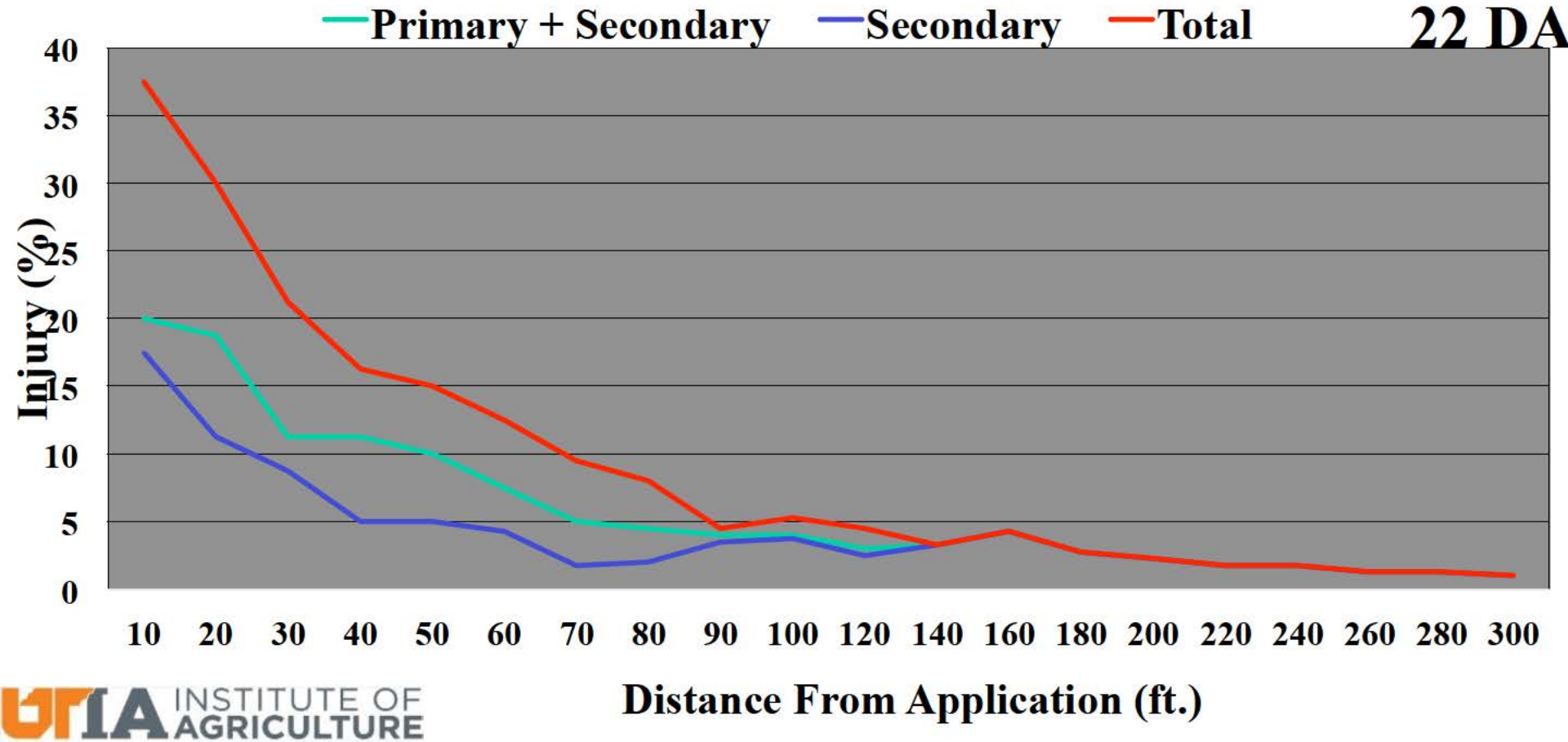
# 12.8 fl. oz. Engenia + 32 fl. oz. Roundup Injury




INSTITUTE OF AGRICULTURE
THE UNIVERSITY OF TENNESSEE

# 12.8 fl. oz. Engenia + 32 fl. oz. Roundup Injury

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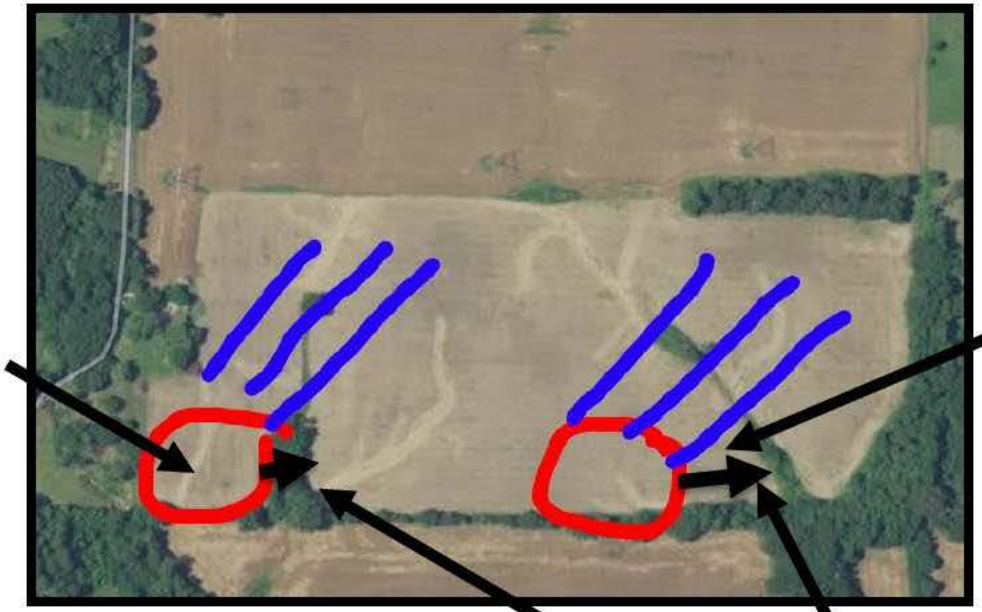
THE UNIVERSITY OF TENNESSEE

# Drift Symptomology showed up in a Direction wind was not blowing at Application Time

22 fl. oz. Xtendimax + 32 fl. oz. Roundup Powermax + 0.5% Intact



12.8 fl. oz. Engenia + 32 fl. oz. Roundup Powermax


Wind changed from the SW at application time to W about 2 hours after application and symptomology could be seen to E

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# Observations

- Xtendimax caused at least 5% visual soybean injury 160’ and Engenia 120’ down wind at application time
- Wind shifted about 2 hours after application from SW at application to W
- Engenia moved E 2 hours after application about 120’ *Xtendimax was buffered by thick brush line on east side of its’ treated area and little eastward movement was notable

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TENNESSEE SOYBEAN PROMOTION BOARD

# Dicamba Volatility

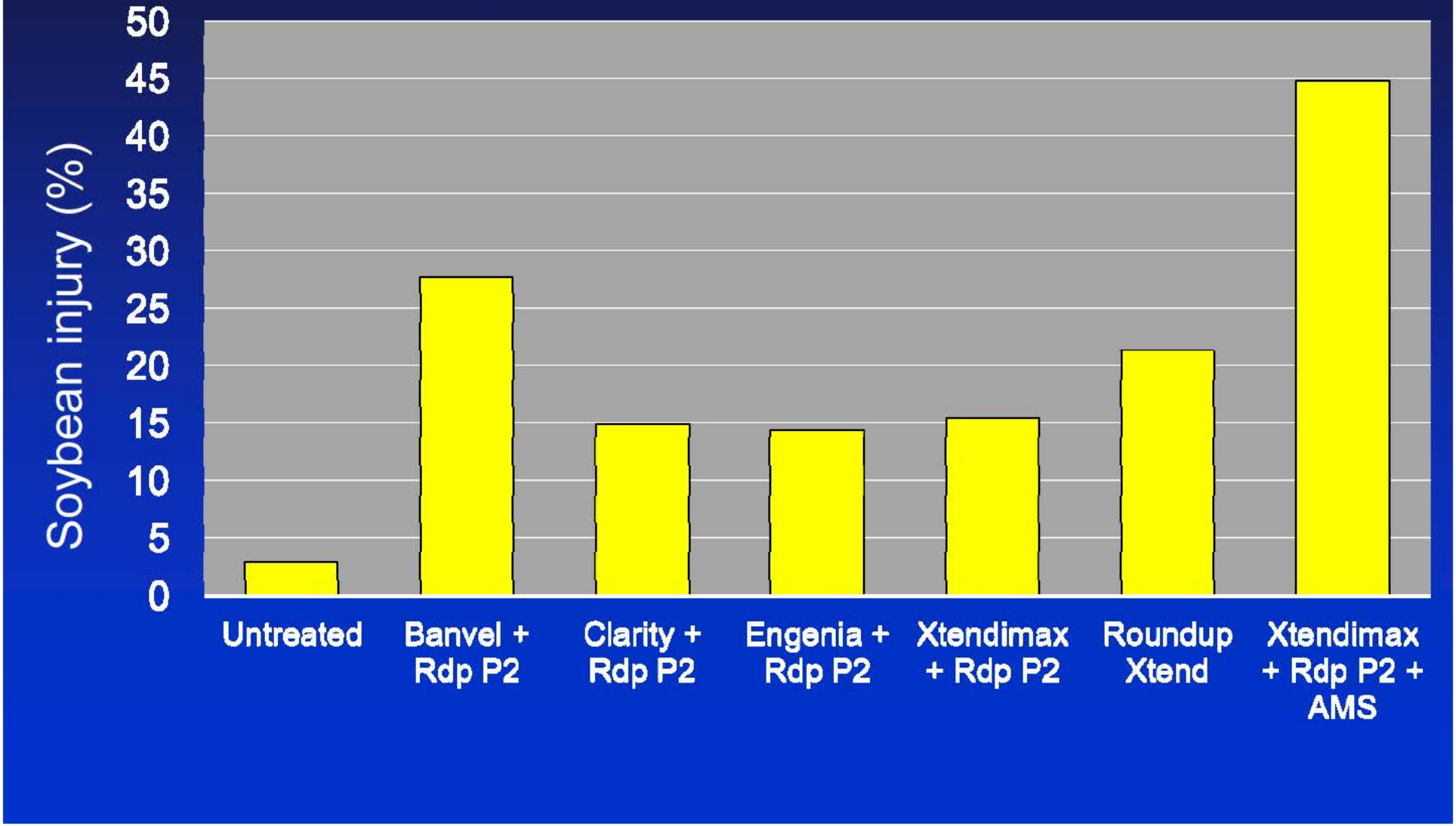
Jason K. Norsworthy

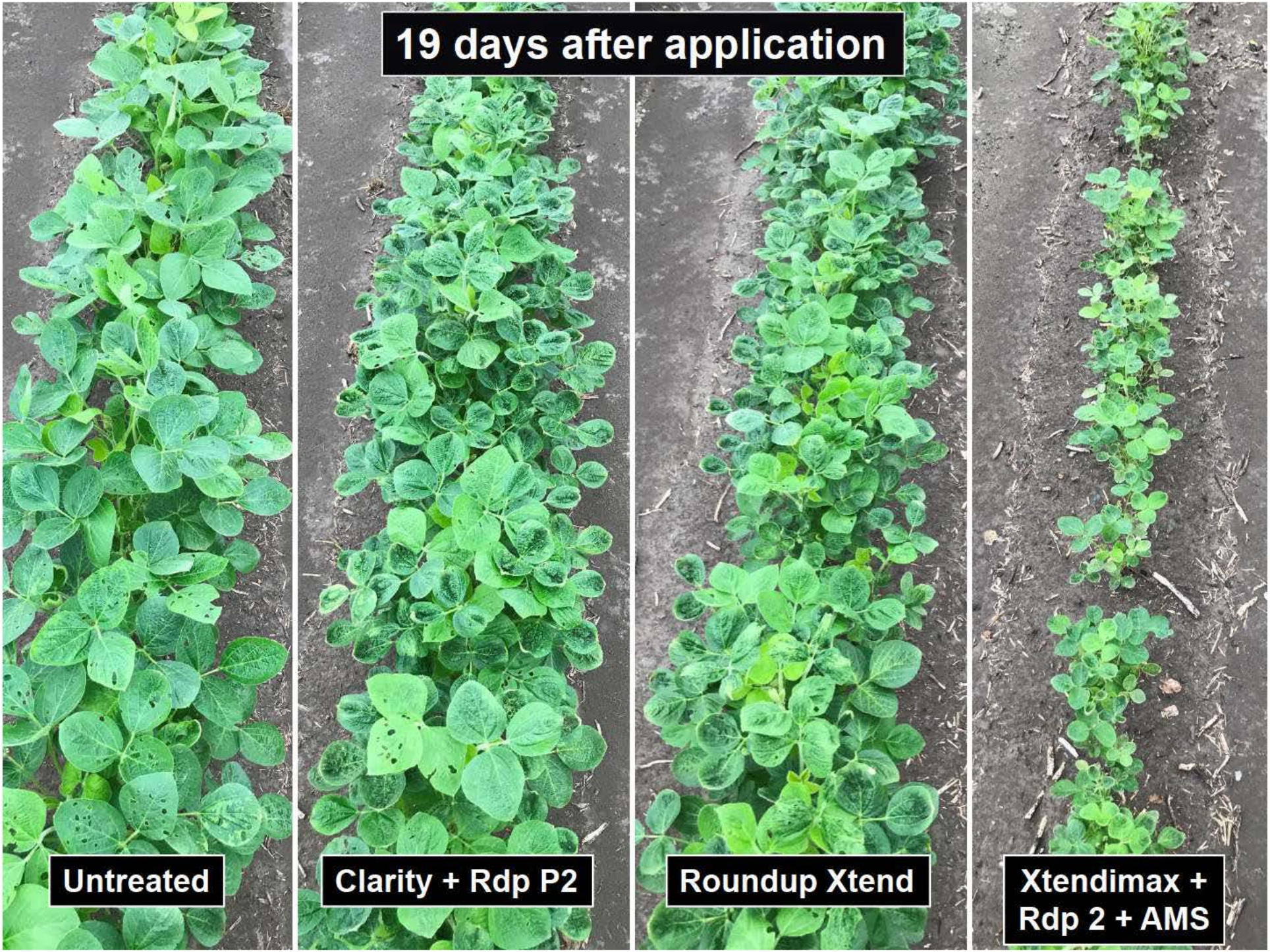
Professor and Endowed Chair of Weed Science

UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE

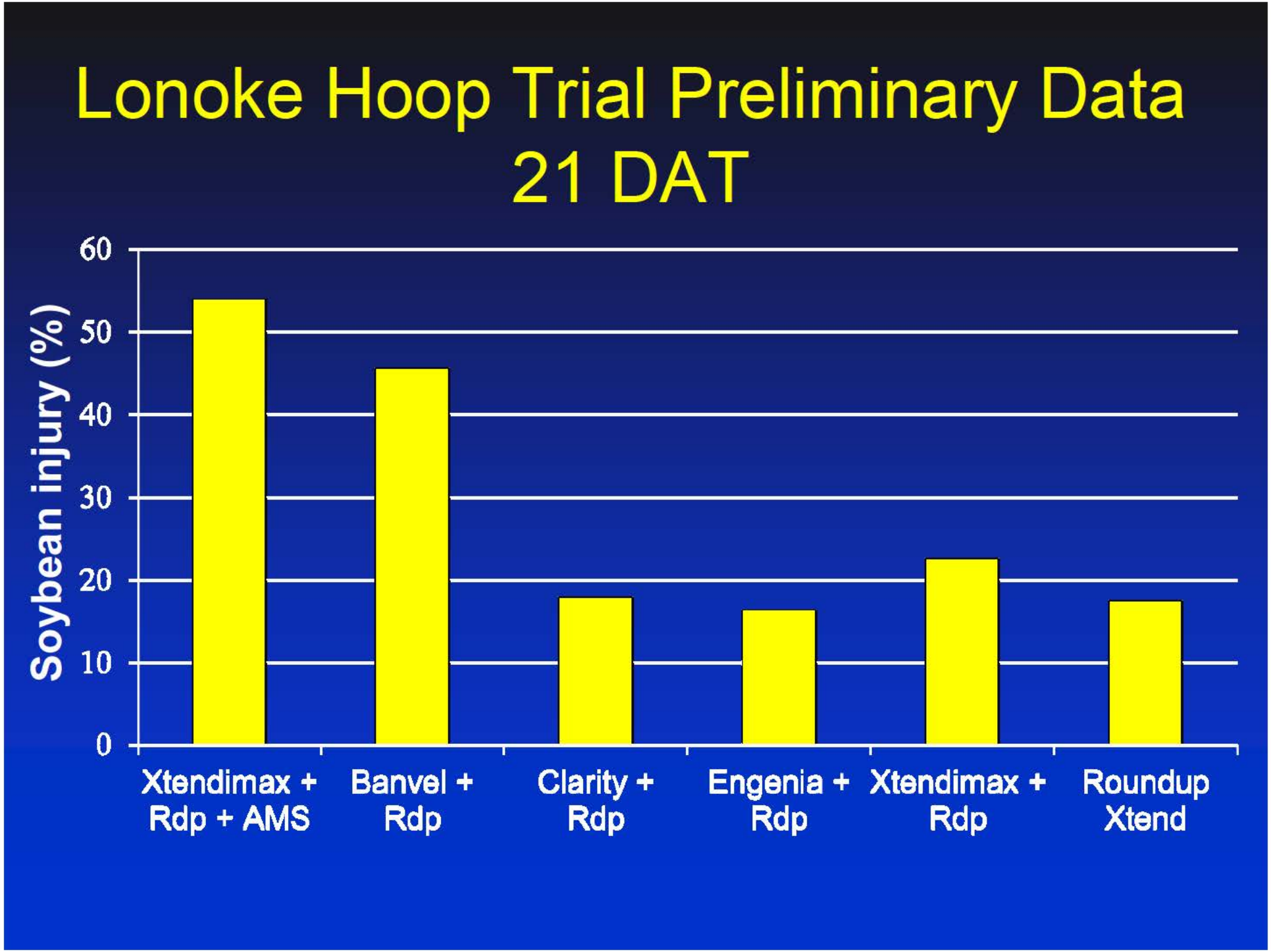
UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE

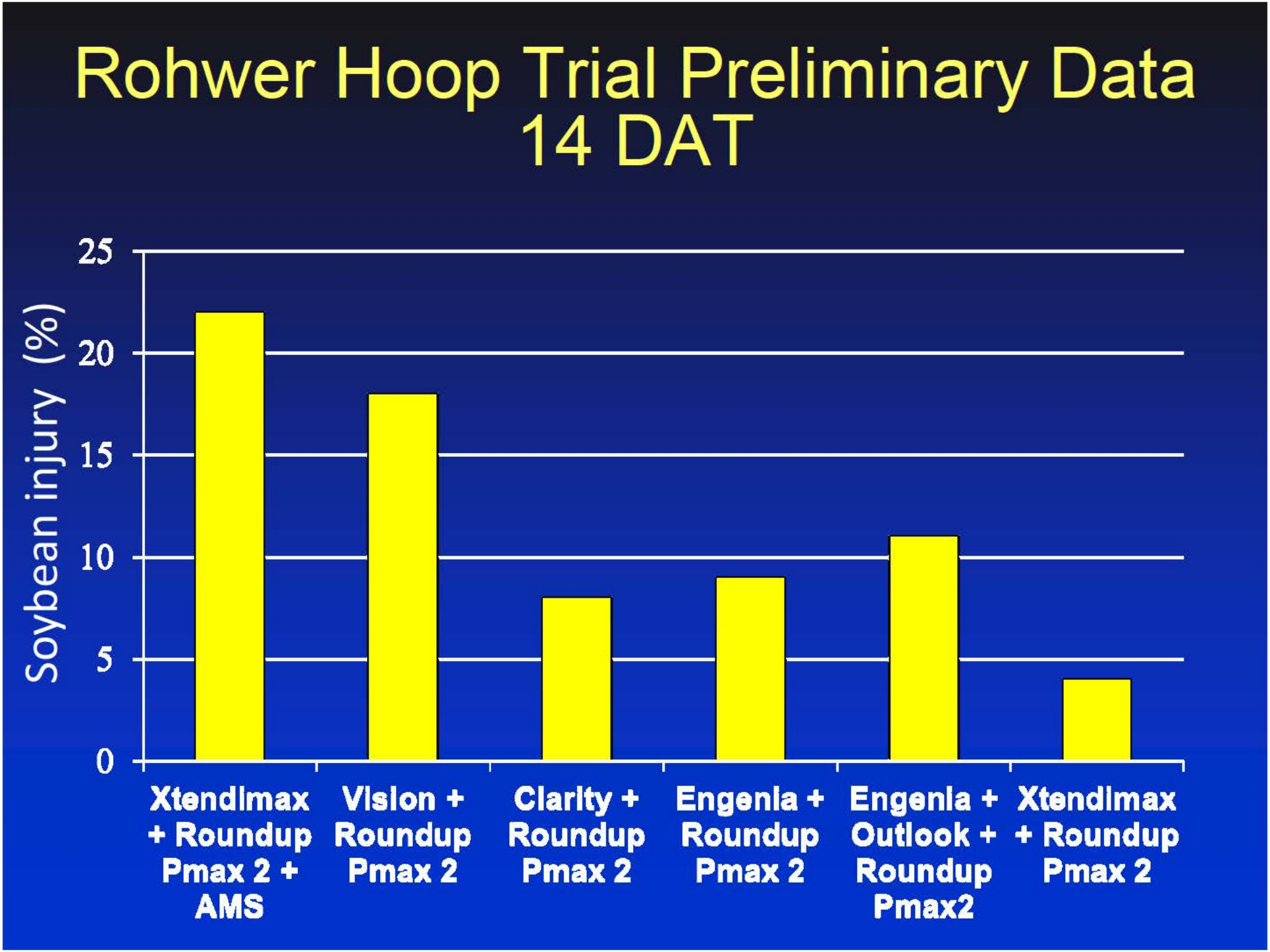
# Keiser Hoop Trial Preliminary Data
# 12 days after application



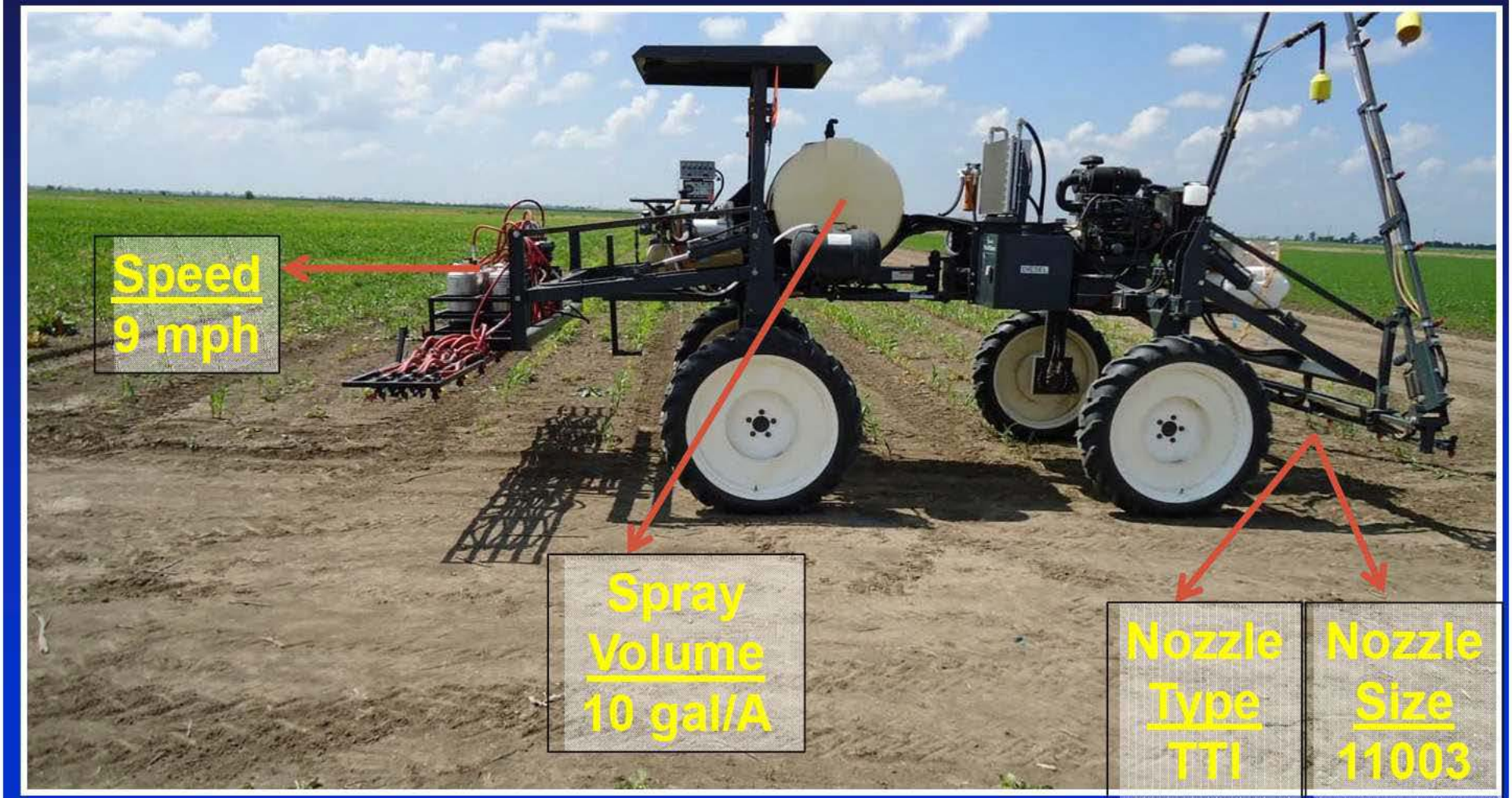

19 days after application
Untreated
Clarity + Rdp P2
Roundup Xtend
Xtendimax + Rdp 2 + AMS

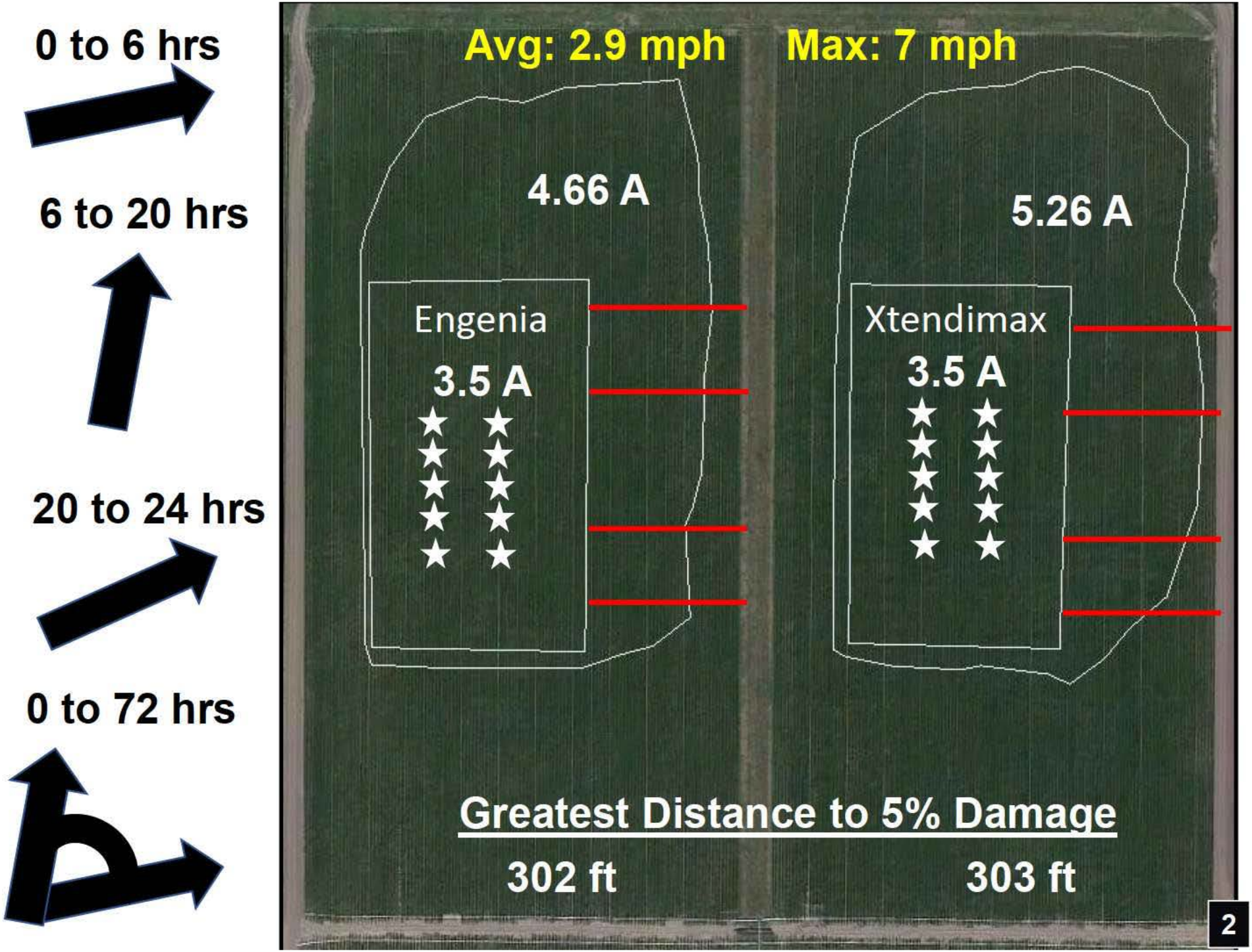

19 days after application
Xtendimax + Rdp P2
Engenia + Rdp P2
Roundup Xtend
Banvel + Rdp P2


Lonoke Hoop Trial Preliminary Data
21 DAT
Soybean injury (%)
60
50
40
30
20
10
0
Xtendimax + Rdp + AMS
Banvel + Rdp
Clarity + Rdp
Engenia + Rdp
Xtendimax + Rdp
Roundup Xtend

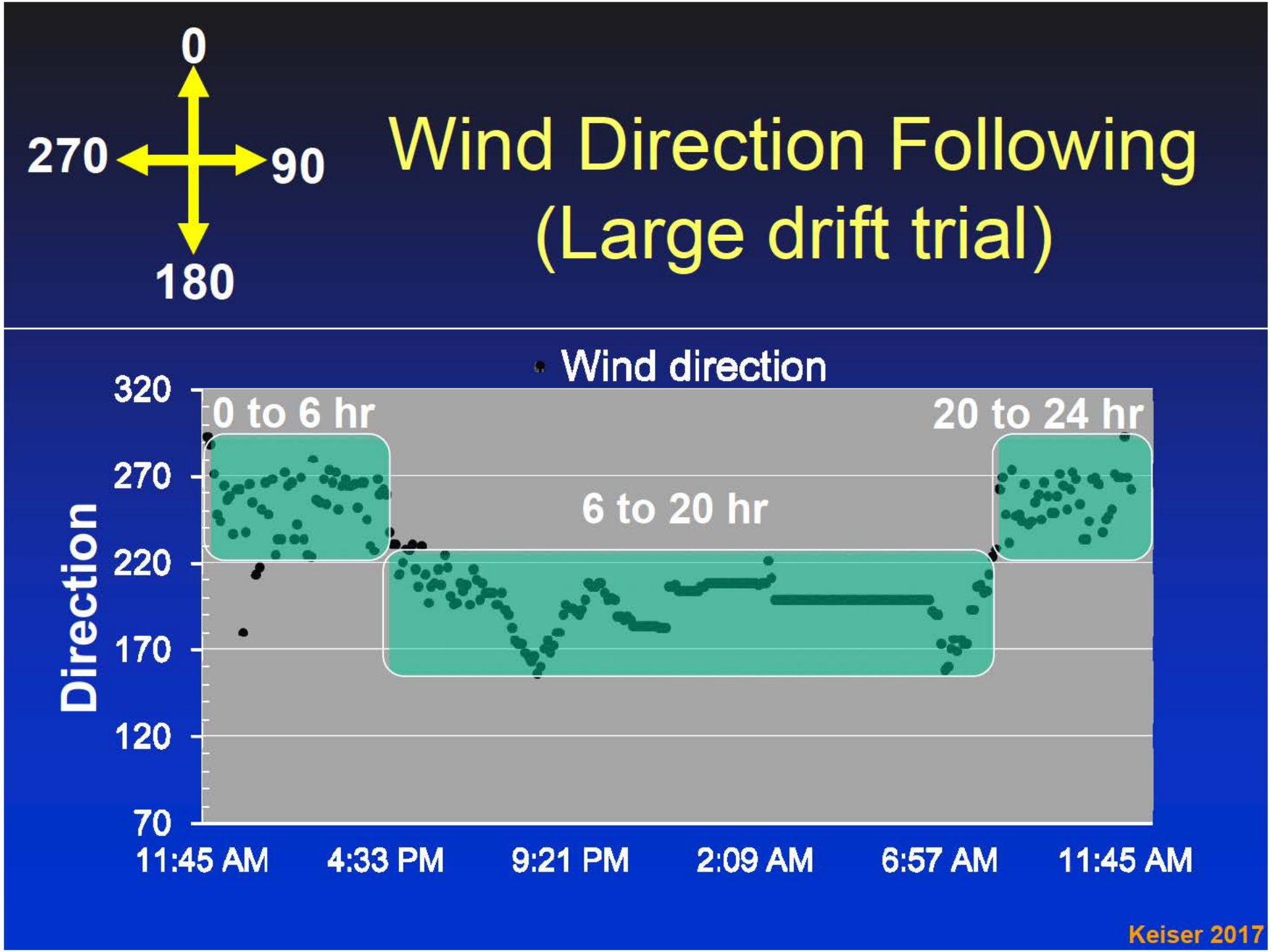

Rohwer Hoop Trial Preliminary Data
14 DAT
Soybean injury (%)
25
20
15
10
5
0
Xtendimax + Roundup Pmax 2 + AMS
Vision + Roundup Pmax 2
Clarity + Roundup Pmax 2
Engenia + Roundup Pmax 2
Engenia + Outlook + Roundup Pmax2
Xtendimax + Roundup Pmax 2

# Application Parameters

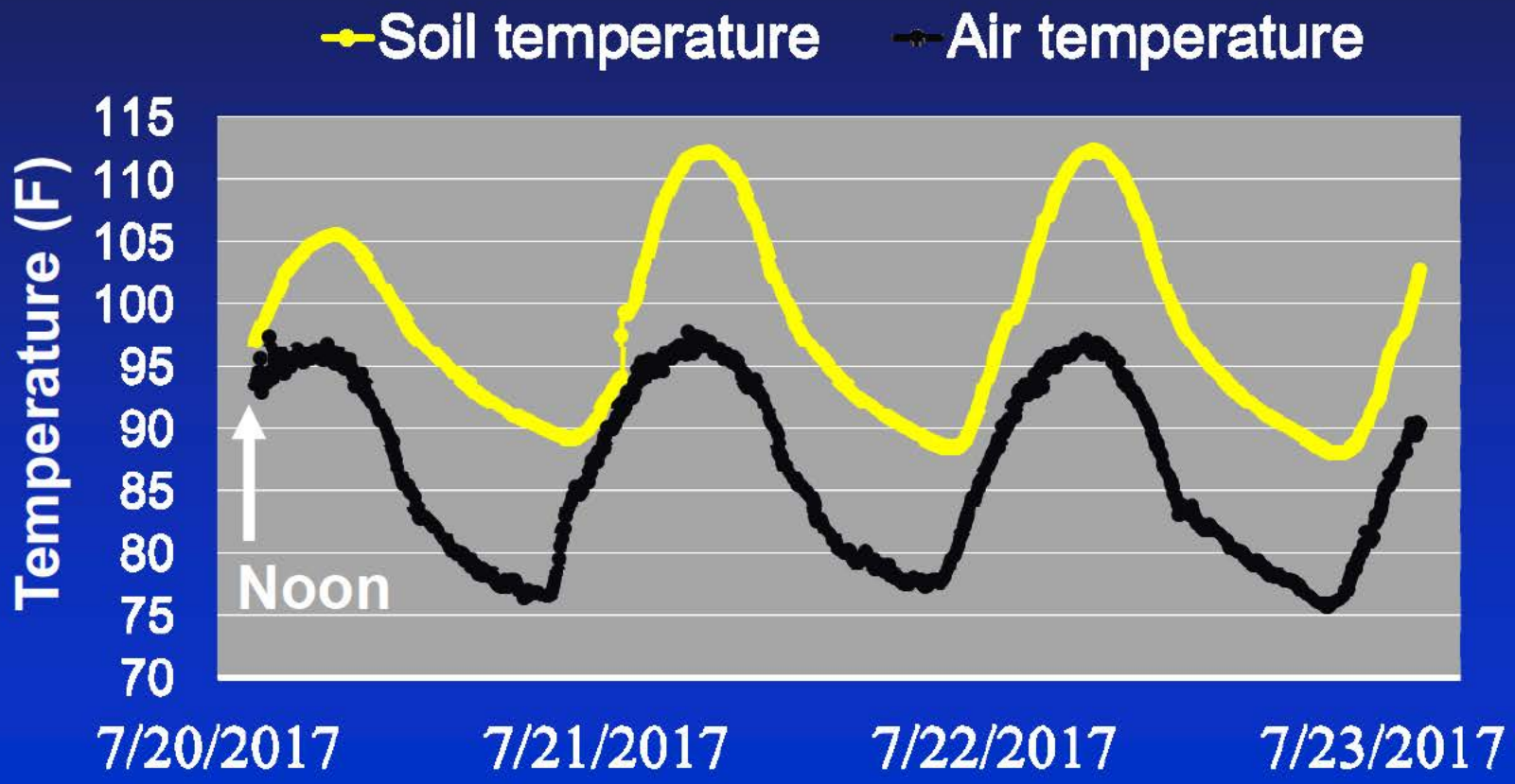



0 to 6 hrs
6 to 20 hrs
20 to 24 hrs
0 to 72 hrs
Avg: 2.9 mph
Max: 7 mph
4.66 A
5.26 A
Engenia
3.5 A
Xtendimax
3.5 A
Greatest Distance to 5% Damage
302 ft
303 ft
2

ER 1036

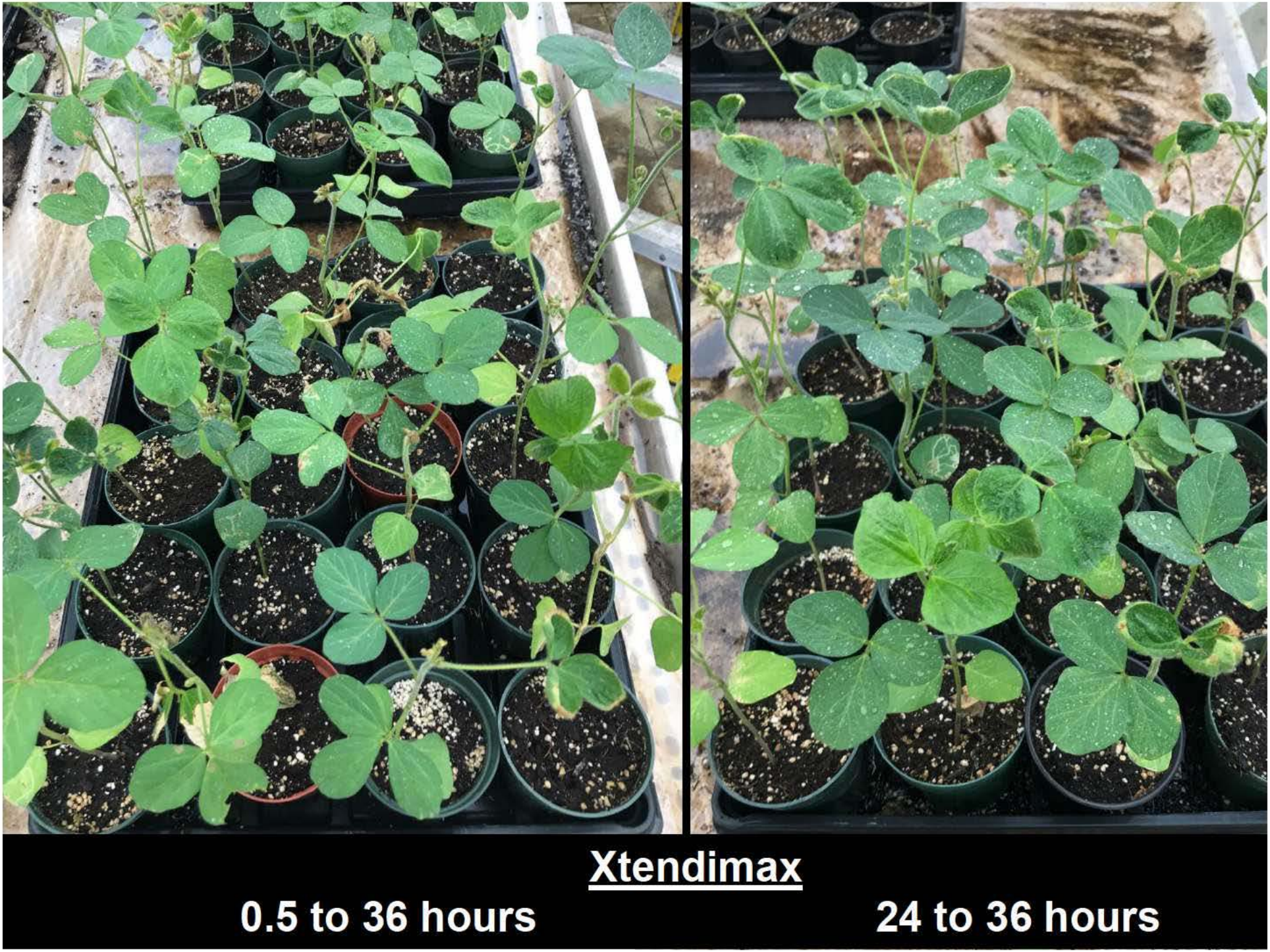

0
270
90
180
Wind Direction Following
(Large drift trial)
Wind direction
0 to 6 hr
6 to 20 hr
20 to 24 hr
Direction
320
270
220
170
120
70
11:45 AM
4:33 PM
9:21 PM
2:09 AM
6:57 AM
11:45 AM
Keiser 2017

# Temperature Following Application (Large drift trial)

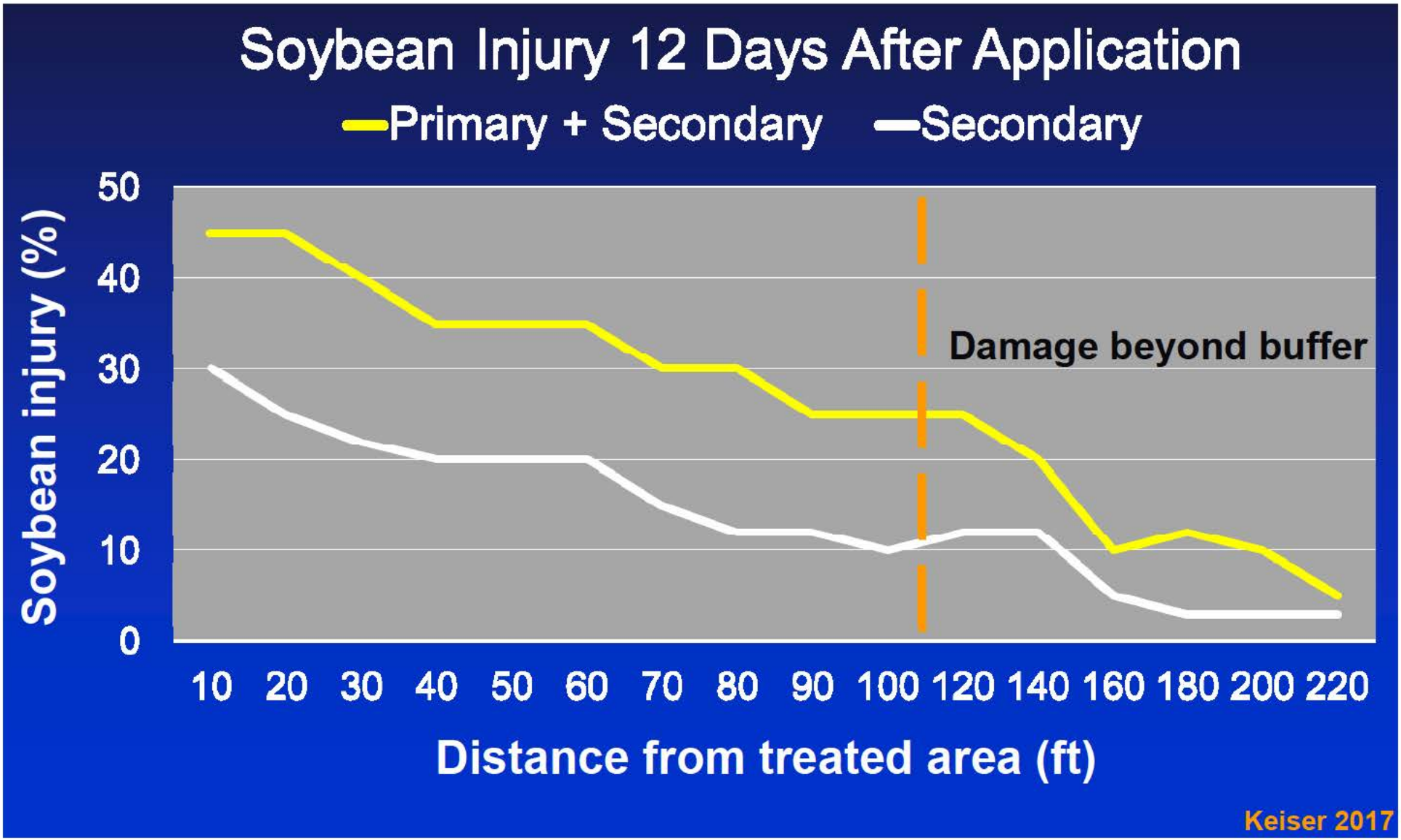



Keiser 2017

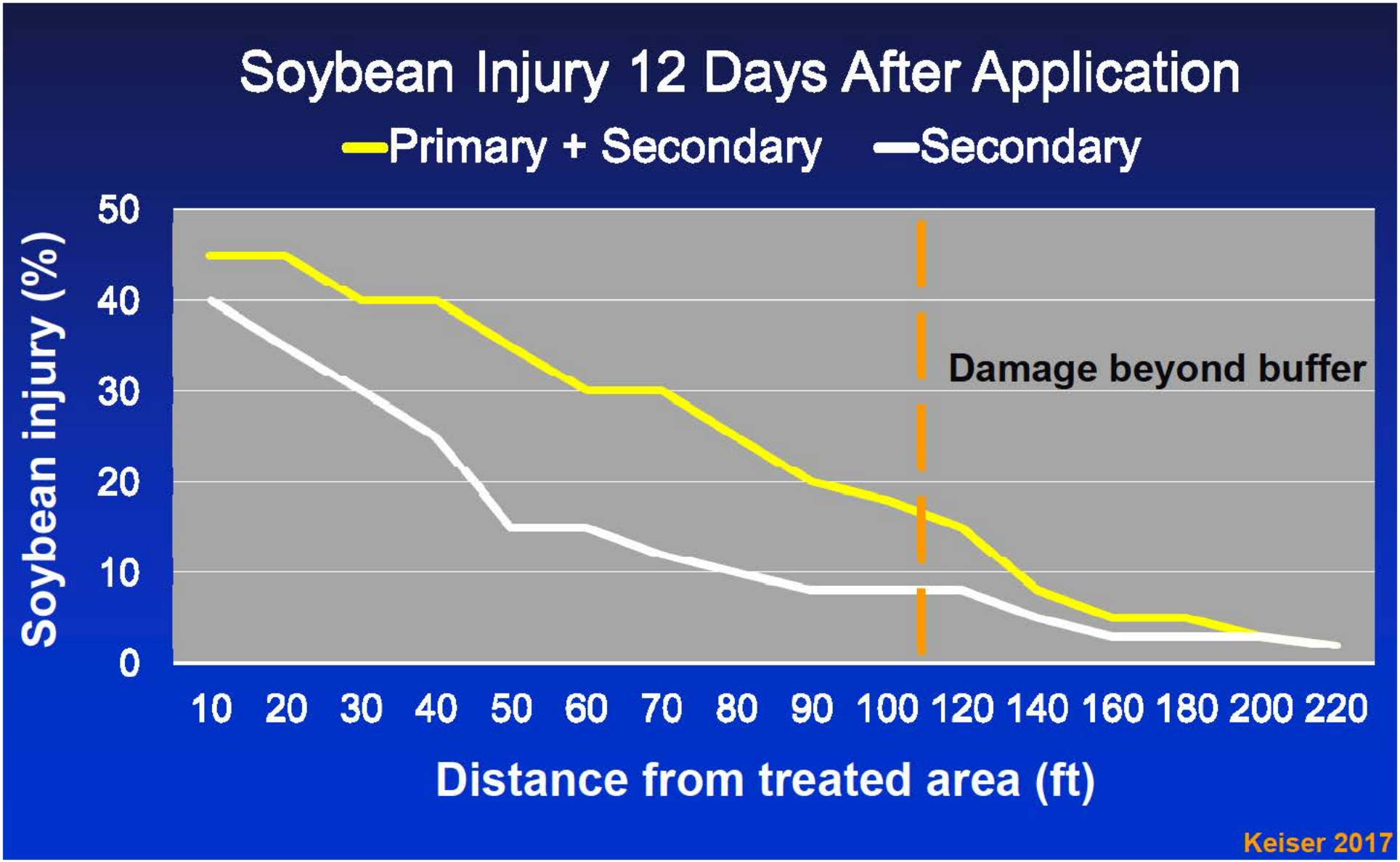

Soybean from greenhouse


Xtendimax
0.5 to 36 hours
24 to 36 hours

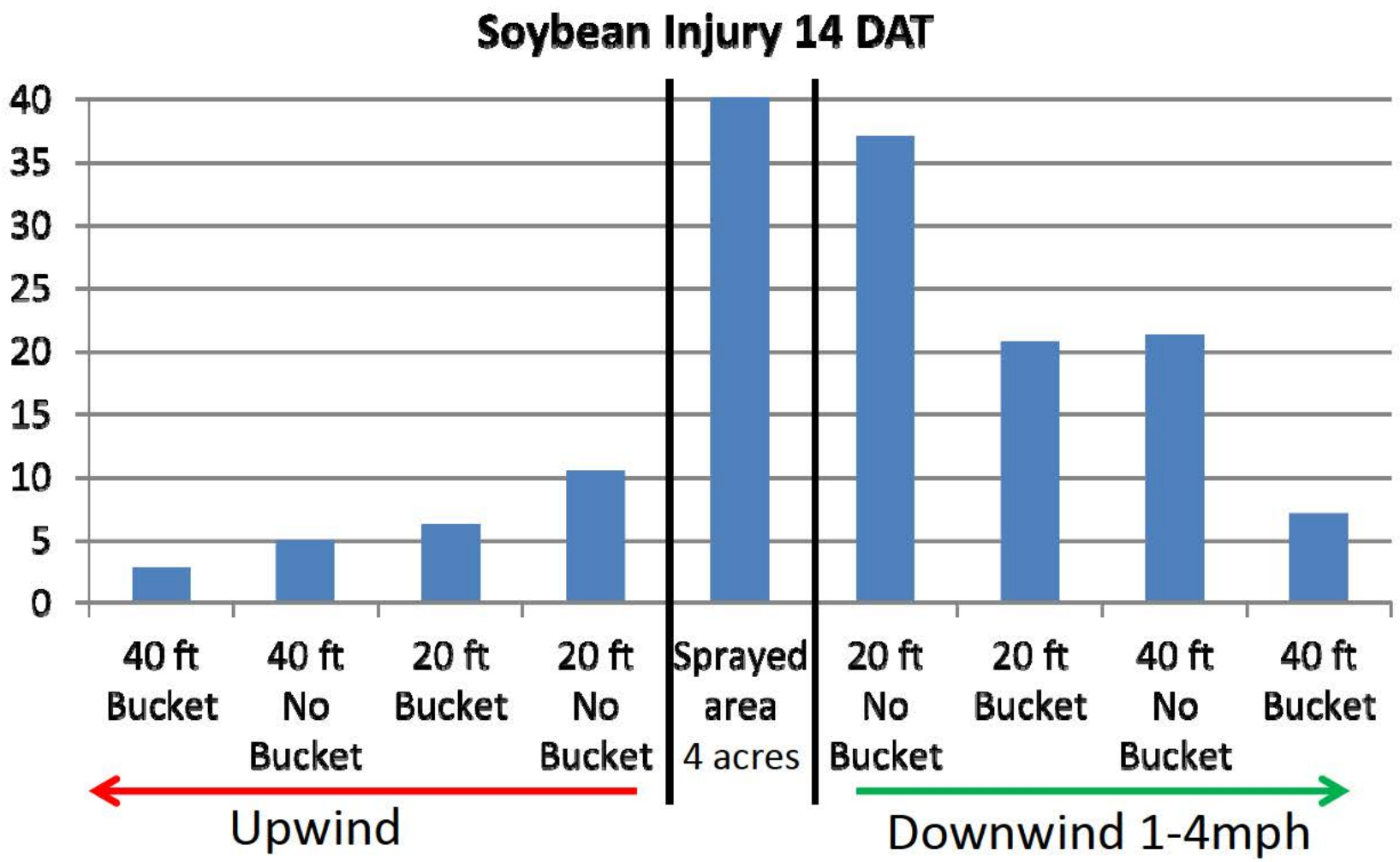
# Xtendimax Movement – North Transect



# Engenia Movement – North Transect



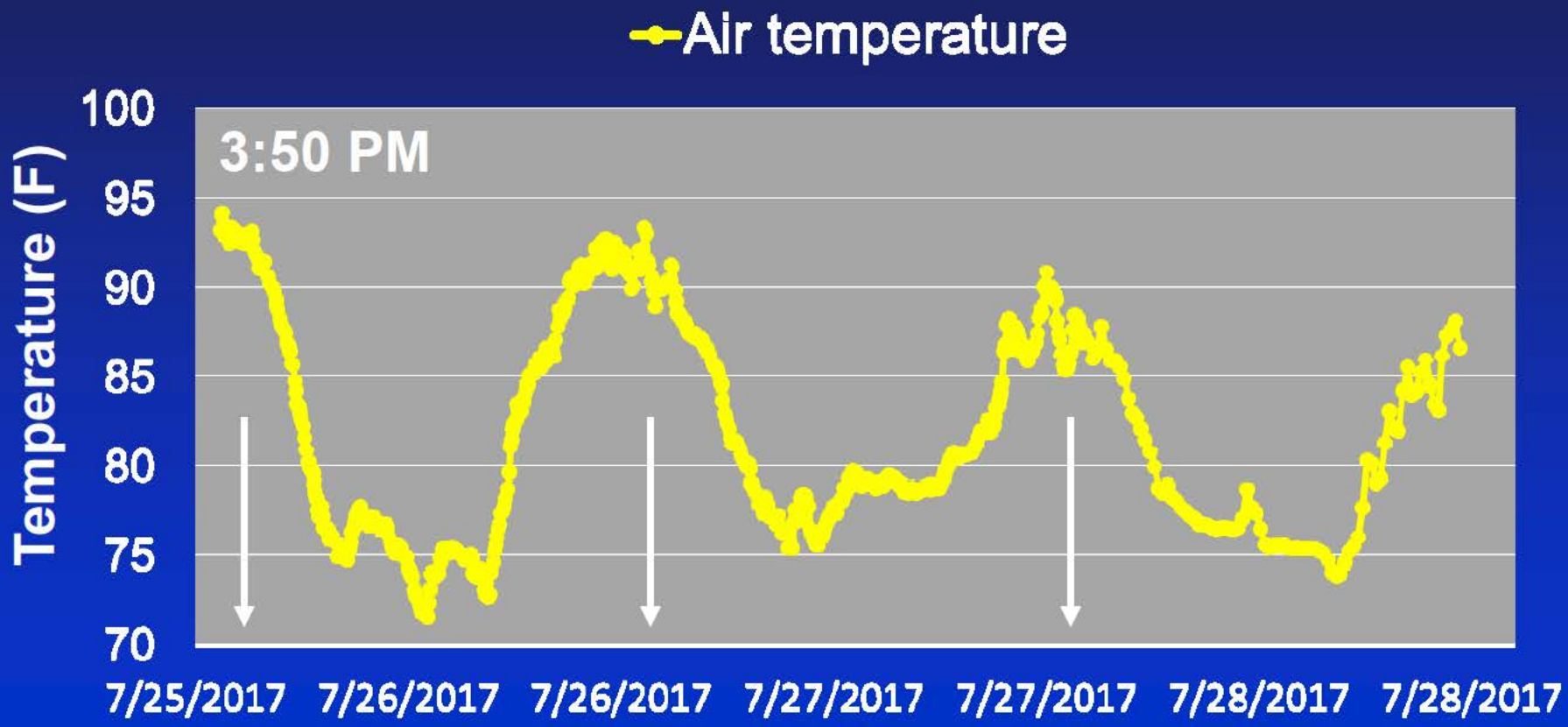
# 20 Acre Drift Study Rohwer Xtendimax 22 oz



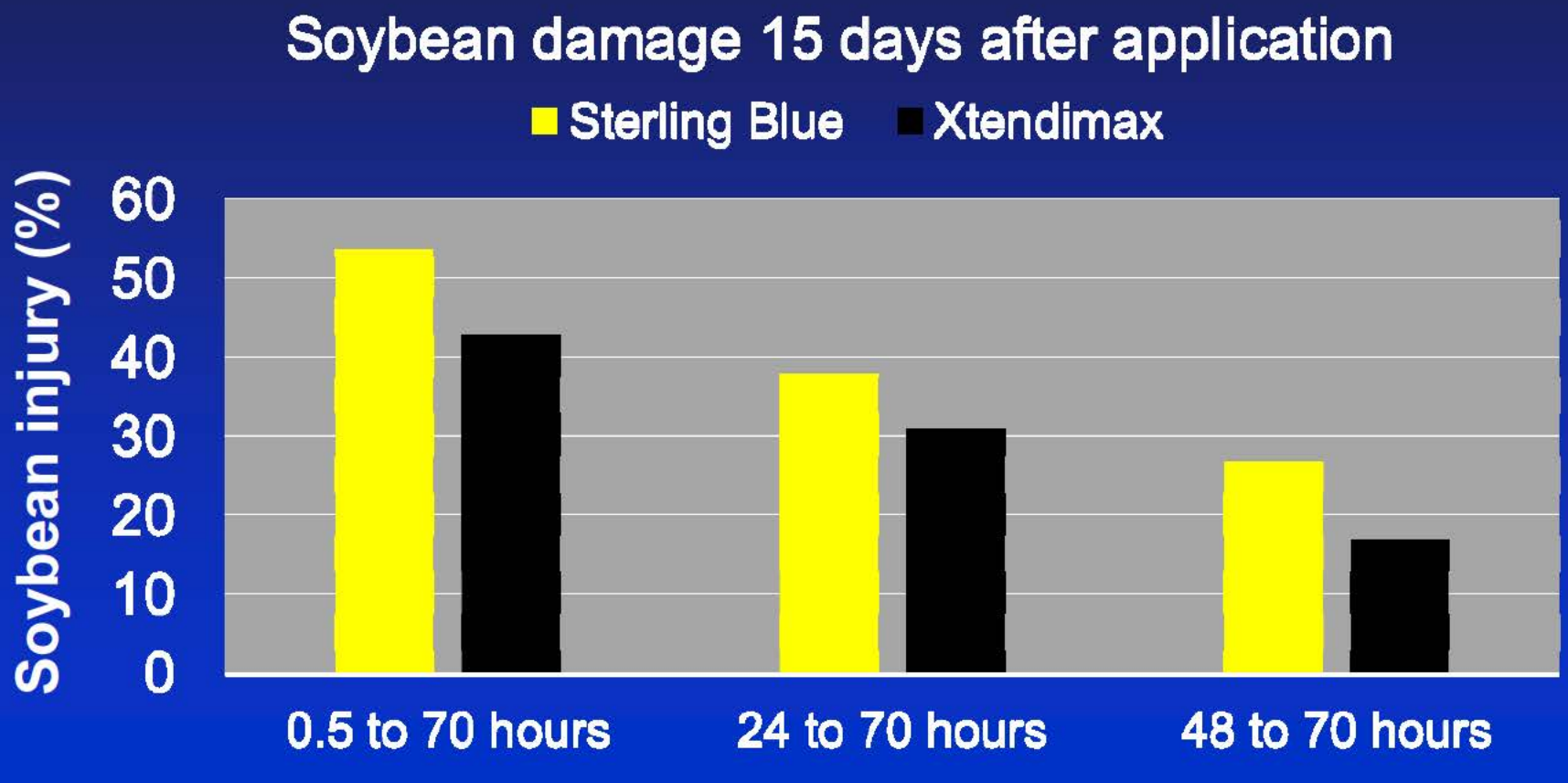

3


Farmington Volatility Trial #1
July 25, 2017 (3:50 PM)
Xtendimax
1.5 Acres
Sterling Blue
1.5 Acres

# Temperature Following Application (Farmington – Trial #1)



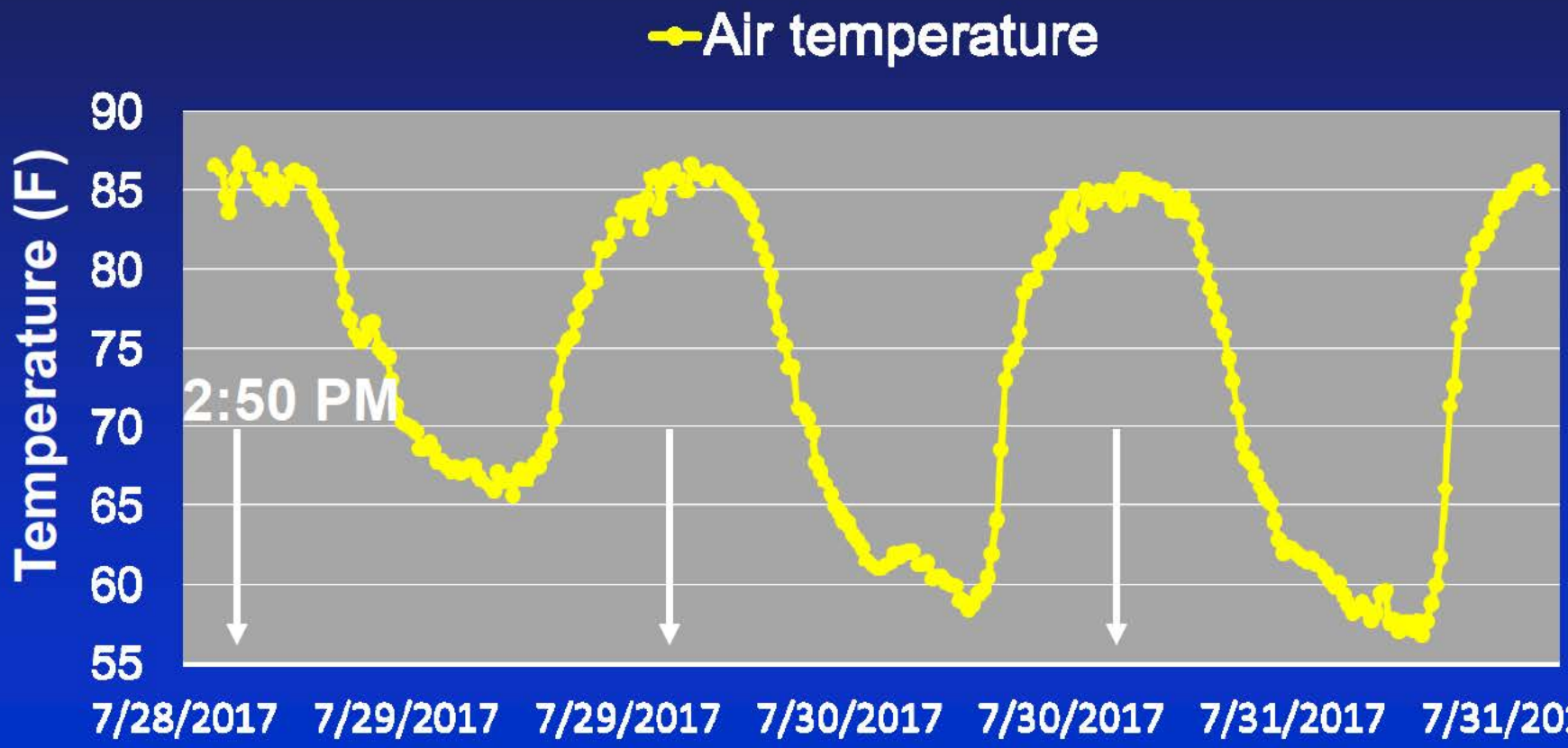
# Secondary Damage to Soybean (Farmington Trial #1)




4

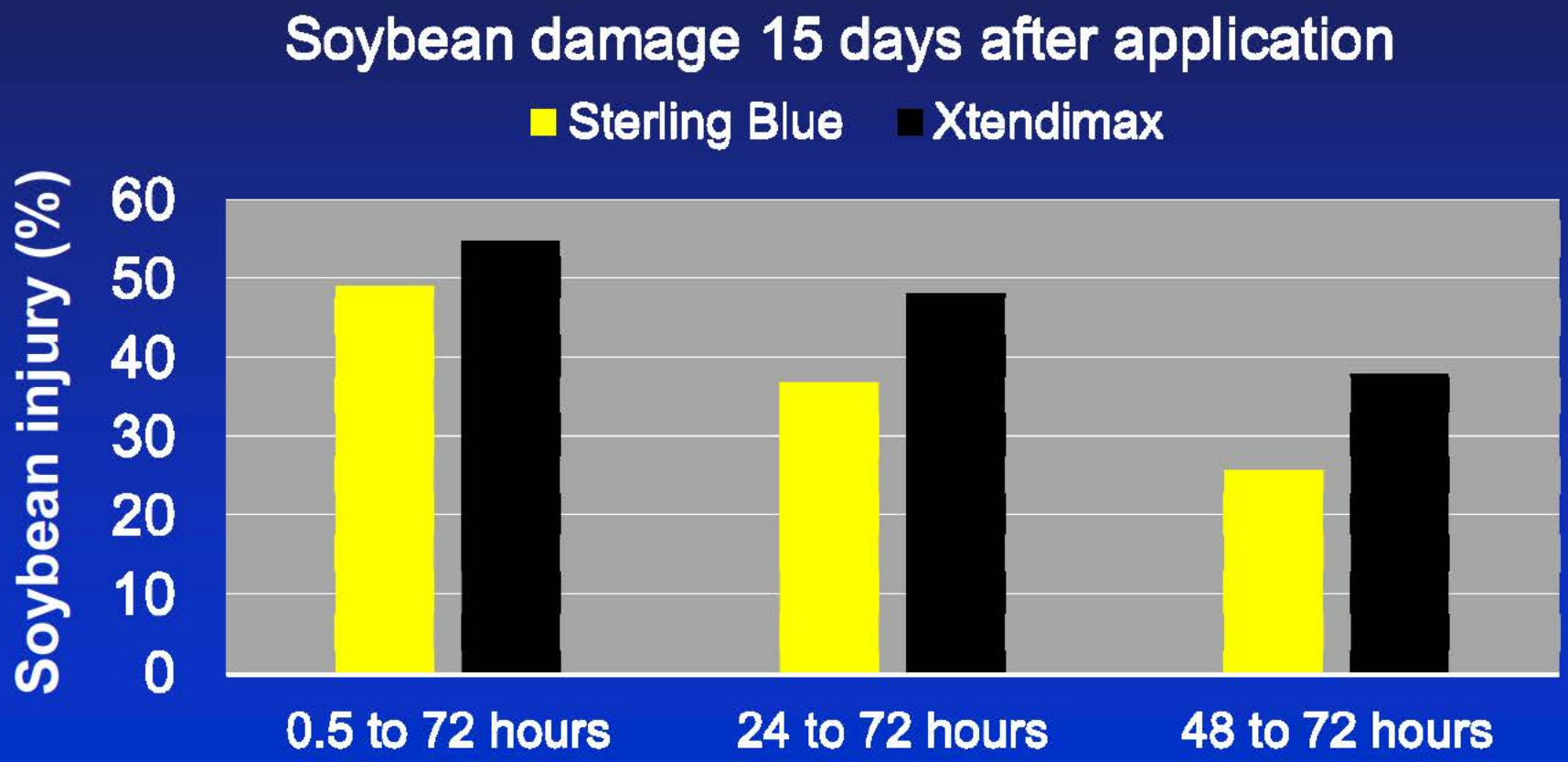

Farmington Volatility Trial #2
July 28, 2017 (2:50 PM)
Sterling Blue
1.5 Acres
Xtendimax
1.5 Acres

# Temperature Following Application (Farmington – Trial #2)




Farmington 2017, Trial #2

# Secondary Damage to Soybean (Farmington Trial #2)

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