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April 21, 2021

Via E-mail and Hand Delivery

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RE: Comments to Proposed 2021 Dicamba Rule

Gentlemen:

I represent Freedom To Farm, Inc., a network of farmers and a food production system that are at risk from dicamba (the "At Risk Parties"). Dicamba damages their crops and feed source.

The At Risk Parties object to your proposed 2021 dicamba rule published for comment on March 24, 2021 (the "**Proposed 2021 Dicamba Rule**"). This proposed rule has arisen from your deliberations on a petition for rule making submitted by Huntington Tyler Hydrick and heard by you on March 3, 2021 (the "Hydrick Petition"). See **Exhibit** 1.

The At Risk Parties object to the Proposed 2021 Dicamba Rule on the basis that 1) it has not been promulgated in compliance with the Arkansas Administrative Procedures Act, 2) it is not supported by, and is contrary to, scientific and other technical information that has been presented in your dicamba rule making and which is of record, and 3) it ignores the facts surrounding dicamba usage and damage experienced in Arkansas each year since 2017.

The Law.

The Arkansas Pesticide Use and Application Act (Ark. Code Ann. §§ 20-20-201 *et seq.*) provides that it is essential to the public health and welfare that pesticides be used properly to prevent unreasonable adverse effects on humans and the environment. (Ark. Code Ann. § 20-20-202(b)). In issuing regulations, the Plant Board shall consider pertinent research findings and recommendations of other agencies of this state, the United States Government, or other reliable sources. (Ark. Code Ann. § 20-20-206(a)(2).) The Arkansas Administrative Procedures Act at Ark. Code Ann. § 25-15-204(b)(1) provides that an agency's rule must be based on the best reasonably obtainable scientific, technical, economic, or other evidence and information available concerning the need for, consequence of and alternatives to the rule. Ark. Code Ann. § 25-15-204 also prescribes the process for an agency to issue rules.

Pursuant to the Arkansas Administrative Procedures Act, specifically Ark. Code Ann. § 25-15-204(a)(2)(D), we request that you issue the required statement of your reasons for adopting the Proposed 2021 Dicamba Rule, and we repeat this request for each of the specific comments discussed below. We request that you deliver these required responses to us no later than April 29, 2021.

The Proposed 2021 Dicamba Rule Is Fatally Flawed—It Is Not What The Plant Board Approved.

The Proposed 2021 Dicamba Rule is not what the Plant Board approved on March 3, 2021.

The Hydrick Petition was based on the EPA's October 2020 approval of labeling for use of new formulations of reduced volatility dicamba products for in-season use only and specifically requested "the implementation of a full, federally approved label for all reduced volatility dicamba formulation in the State of Arkansas without additional restrictions." See **Exhibit 1**, page 3, item IIIa. The Plant Board approved the following Motion made by Sam Stuckey and seconded by Barry Walls (the "Stuckey Motion"):

> "Accept the Hydrick Petition for full federal label for dicamba use over the top of dicamba tolerant crops."

Chairman Fuller repeated the Stuckey Motion before the vote. (March 3, 2021 meeting, time marks 1:43:35, 1:51:45, and 2:07:17. See **Exhibit 2**.) Thus, the Stuckey Motion was limited to relaxing the current Plant Board dicamba rule only for in-season/over the top use of dicamba products.

However, the proposed rule submitted to and approved by the Governor for the promulgation process, published for comment and to be the subject of a public hearing was far broader than the Stuckey Motion, to wit:

> "**All** pesticides containing dicamba shall be used in compliance with their respective federal labels." (emphasis added).

Thus, the proposed rule submitted for public comment also includes lifting the Plant Board's restrictions on dicamba "burn down" products, and not just the restrictions on "in season" products. We address further below how this simple all-inclusive statement will create regulatory and environmental havoc in Arkansas. But first, we address this fundamental flaw in this proceeding - that what is now being presented as the Proposed 2021 Dicamba Rule is not what the Plant Board proposed and approved for public notice and comment.

The Hydrick Petition requested "the implementation of a full, federally approved label for **all reduced volatility** dicamba formulation in the state of Arkansas without additional restrictions." (emphasis added) See **Exhibit 1**, page 3, item IIIa. The Stuckey Motion was to adopt the Hydrick Petition, and Board Member Stuckey spoke only of "over the top" products. The Hydrick Petition and the Stuckey Motion describe one and the same class of dicamba products—the reduced volatility, a/k/a over the top or a/k/a in-season products.

An entirely separate class of dicamba is referred to as a "burn down" product. The burn down dicamba products were clearly not part of either the Hydrick Petition or the Stuckey Motion. There are important, material differences between the burn down products and the in-season/over the top products. These differences are clearly reflected in the current dicamba regulations. Drafting the Proposed 2021 Dicamba Rule to include "**all pesticides** containing dicamba" is a material and dangerous departure from the current dicamba rules, is not part of the Stuckey Motion, and thus was not approved by the vote of the Plant Board on March 3, 2021.

Consequently, the rule actually proposed in the Stuckey Motion and approved by the Plant Board on March 3, 2021, has not yet been presented to the Governor for approval. Likewise, the rule proposed and approved by the Plant Board on March 3, 2021 for public notice and comment, has not yet been presented to the Legislative Council (or the Joint Budget Committee) or the Secretary of State as required by Arkansas Code Ann. § 25-15-204(e)(1)(A).

The Plant Board action taken on March 3, 2021 to adopt the Proposed 2021 Dicamba Rule is still sitting at the Plant Board, and it has not moved through the regulatory requirements for publication, that in turn start the 30-day comment period, which is the prerequisite for public hearing and further deliberations. Instead, the rule approved by the Governor and published for notice and comment is materially different because it allows the use of all dicamba products

according to their federal labels, including "burn down" products—not just the "in season" products that were the subject of the Hydrick petition, the Stuckey Motion and the Plant Board's action.

This is not a situation where the public comments and public hearing might lead to changes in the proposed rule that are a "logical outgrowth" of the initial draft. This is much different. Here, something materially different from what the Plant Board approved was put forward as the Plant Board's action (before receiving any comments from the public).

The proposed rule presented to the Governor and published for comment is not the rule that the Plant Board approved on March 3, 2021. This situation is not covered by the "substantial compliance standard" of Ark. Code Ann. § 25-15-204(h), which alludes to procedure, because this situation involves a radically material change to the substance of what the Plant Board actually approved.

Therefore, the current proceedings on the published Proposed 2021 Dicamba Rule have not met the prerequisites for publication and public comment, and are, therefore, fatally flawed and should be halted.

Pursuant to Ark. Code Ann. § 25-15-204(a)(2)(D), we request that you issue the required statement of your reasons for why and how this rule-making action should proceed further at this time in light of the comment above about the material discrepancy between the Plant Board's approval of the Stuckey Motion addressing in-season dicamba products only, and the far broader proposed rule that was presented to the Governor's Office and published for comment for "**all pesticides** containing dicamba." (emphasis added).

Lack of Proper Notice.

Ark. Code Ann. § 25-15-204(a)(1)(B) provides that the 30 days' notice shall include a statement of the terms or substance of the intended action or a description of the subjects and issues involved. The notice apparently intended for the Proposed 2021 Dicamba Rule (the "March 24 Notice") provides simply "The proposed changes will be to consider changes for use of dicamba in the State of Arkansas." See **Exhibit 3a**, page 1. Given the history and complexity of the dicamba saga, this general statement falls far short of the statutory requirement for a statement of the terms or substance of the intended action. There is not even a hint of what kind of changes are in issue or who might be affected.

The legal shortcomings of the March 24 Notice are further highlighted when compared to the notice the Plant Board published on March 6, 2021 (the "March 6 Notice") for actions taken in its meeting on December 2, 2020, one of which was "to establish cutoff dates for late season permits for dicamba applications east of the Mississippi River levee that will comply with the Federal Insecticide, Fungicide, and Rodenticide Act." The March 6 Notice is included in **Exhibit 3a** at pages 2-5. The March 6 Notice clearly describes where or who may be affected and the specific issue of dicamba cutoff dates. The March 24 Notice did not provide any such information.

In addition to the lack of statutory detail, the March 24 Notice fails to make any mention of whether and how the March 24 Notice relates to or is impacted by the preceding March 6 Notice, as both deal with changes to the dicamba rules. The comment period for the March 6 Notice was still open when the March 24 Notice was filed. With the lack of any information on the kind of changes involved, the March 24 Notice does not offer any information as to whether it is or is not a continuation of the March 6 Notice, if it is subject to or supersedes the March 6 Notice.

The March 24 Notice had no terms, no substance and no mention of whether and how the subject of the March 6 Notice is involved with the March 24 Notice. Therefore, the current proceedings lack proper legal notice and should be halted.

The Hydrick Petition Does Not Meet the Statutory Standard For Rule Making.

In its meeting on December 2, 2020, the Plant Board addressed dicamba and its dicamba rules in considerable detail. The dicamba discussion included the following:

1. a presentation from BASF, a manufacturer of dicamba products;
2. a presentation from Dan Scheiman, Audubon Arkansas; and
3. a presentation from Dr. Jason Norsworthy, University of Arkansas. See **Exhibit 3b**.

Correspondence from Rachel Hurley, Bayer U.S. Crop Science, also a manufacturer of dicamba products, dated November 30, 2020, was also available to the Plant Board members.

On December 2, 2020, after consideration of this information the Plant Board voted in that meeting 13 to 1, with 1 abstaining, to keep the current dicamba rules, with the new federal label dates to apply east of the Mississippi River levee. It was confirmed at that time that said vote was a rule making action, and that action has been the subject of public notice. (the "December 2020 Rule") (December 2, 2020 meeting, time marks 5:24:58, 5:38:11, 5:40:19, and 5:44:34. See **Exhibit 3c**.) The December 2020 rule is the subject of the March 6 Notice discussed above and included in **Exhibit 3a**.

Subsequently, on or about January 31, 2021, Mr. Hydrick filed the Hydrick Petition. The Hydrick Petition did not include any information, data, studies or attachments other than the text of the Hydrick Petition itself. The Plant Board heard the Hydrick Petition on March 3, 2021. No information was submitted in support of the Hydrick Petition, other than the Hydrick Petition itself and an oral presentation with slides by Mr. Hydrick.

Mr. Hydrick's observations and opinions are certainly worthy of consideration. But Mr. Hydrick did not provide any new scientific, technical, economic or other evidence that addressed…

dicamba volatility,
Arkansas temperatures,
cut-off dates or,
how the new dicamba products are supposed to work.

Mr. Hydrick argued, without any supporting evidence, that dicamba damage does not cause yield loss. That unsupported argument ignores logic and volumes of research that documents dicamba damage and yield loss. See **Exhibit 4** for such research and **Exhibit 13** below discussing the $400 million Dicamba Settlement. If dicamba damage did not cause yield loss, the Plant Board would not be having this discussion.

The Hydrick Petition did not provide evidence that meets the requirements of Ark. Code Ann. § 25-15-204(b)(1) to support a rule change. No such evidence was presented with the Hydrick Petition that changed, refuted or rebutted any of the scientific, technical or other information presented at the Plant Board meeting of December 2, 2020, or in earlier dicamba rule makings.

Nevertheless, at that meeting on March 3, 2021, the Plant Board approved the Stuckey Motion:

> Accept the Hydrick Petition for full federal label for dicamba use over the top for dicamba tolerant crops. See **Exhibit 2**.

As with the Hydrick Petition, the Stuckey Motion is not supported by any scientific, technical, economic or other evidence or information as required for rule making by Ark. Code Ann. § 25-15-204(b)(1). Moreover, as discussed further below, the Stuckey Motion is contrary to specific discussions and information presented in the Plant Board meeting on December 2, 2020, and that was accepted by and formed the basis for the Plant Board's December 2020 Rule. Therefore, the Proposed 2021 Dicamba Rule should be rejected.

Pursuant to Ark. Code Ann. § 25-15-204(a)(2)(D), we request that you issue the required statement explaining why you adopted the Hydrick Petition and thereby initiated rule-making to revoke your December 2020 Rule.

Burn Down Products.

Current Arkansas dicamba rules reflect years of experience with two distinct classes of dicamba, one commonly referred to as "burn down" and the other as "in-season use" (a/k/a over the top and a/k/a reduced volatility), and the different restrictions on their use in Arkansas. See Arkansas Rules on Pesticide Use (referred to herein as "ARPU") XIII. B. The Proposed 2021 Dicamba Rule would replace detailed Arkansas dicamba rules with the single all-inclusive statement that "all pesticides containing dicamba shall be used in compliance with their respective federal labels."

As the Plant Board has previously determined, the federal labels for dicamba products do not adequately protect Arkansas due to climate, geography and other factors specific to this state. The federal labels for dicamba burn down products allow these products to be applied by airplane and they have no cut-off dates. Current ARPU XIII. B.3. provides a cut-off date of April 15 for aerial application of dicamba burn down products in Arkansas. Based on the experience of the

attempted 2017 in-season roll out, known temperatures and known volatility, applying dicamba aerially during the growing season would result in extensive dicamba damage.

The At Risk Parties object to any changes to the current burn down dicamba rules in Arkansas. The Hydrick Petition was for "reduced volatility dicamba" and did not request any changes to the rules for dicamba burn down products.

Pursuant to Ark. Code Ann. § 25-15-204(a)(2)(D), we request that you issue the required statement of your reasons for adopting Proposed 2021 Dicamba Rule, thereby allowing burn down dicamba products to be applied by airplane with no cut-off dates, which is currently clearly prohibited under current ARPU XIII. B.3.

Cut-off Date.

Dicamba has been in commercial use since the mid-1960s. It is known to be volatile. The volatility of dicamba is known to increase as the air temperature increases. The volatilization significantly increases at near 80 degrees F. In fact, the label for Banvel, a burn down dicamba product, at page 7, provides "do not apply … adjacent to sensitive crops when the temperature on the day of application is expected to exceed 85 degrees F as drift is more likely to occur." See **Exhibit 5**, page2.

Dr. Jason Norsworthy has made repeated presentations to the Plant Board explaining that due to its chemical properties dicamba starts to volatilize at 76 degrees F, and that volatility increases "exponentially" over 80 degrees F. Arkansas proponents of dicamba have seen fit to disparage Dr. Norsworthy and attempt to portray his research as an outlier. They are wrong, because Dr. Norsworthy's research is consistent with other research. See **Exhibit 6**, page 3 for EPA information that reports **dicamba volatilizes for days after its application** and the following pages of **Exhibit 6** for various published research addressing the increased dicamba volatility above 80 degrees F. The last article in **Exhibit 6** includes temperature/volatility charts Dr. Norsworthy presented to the Plant Board on December 2, 2020, demonstrating the relationship between temperature and volatilization of dicamba.

Even manufacturers of dicamba products admit that temperature is critical. In the Plant Board meeting on December 2, 2020, Plant Board member Scott Milburn asked BASF representative Dr. Dan Westberg about temperature. Dr. Westberg responded: So temperature certainly has an effect on volatility; and , matter of fact, it is a key driver." (Dec. 2. 2020 meeting, time mark 54:40.) See **Exhibit 7**.

As to the "new" 2021 in-season dicamba label approved by EPA and in effect for the first time in 2021, the states of Illinois and Indiana have established a cut-off date of June 20 (not the federal label June 30 cut-off date for soybeans), and Illinois has an added temperature cut-off of 85 degrees F. These cut-off rules are tailored to the weather and other conditions in those states and clearly reflect the arrival and impact of the hot summer everyone knows occurs, and that increases dicamba volatility. See **Exhibit 8**.

Arkansas has its own hot summer conditions. The charts at **Exhibit 9** show that Northeast Arkansas regularly achieves 85 degrees F before the end of May. Pages 5 and 6 of **Exhibit 9** are temperature charts Dr. Norsworthy presented to the Plant Board on December 2, 2020. Based on this information, approval of the use of in-season dicamba after May 25 would be contrary to the requirements of the Arkansas Pesticide Use and Application Act and the Arkansas Administrative Procedures Act.

The EPA Assessment of Dicamba Use On Dicamba Tolerant (DT) Cotton And Soybean, dated October 26, 2020 (the "EPA Assessment"), at pages 318-323 goes into considerable detail about temperature impacts on dicamba volatility in the various states, with much of the discussion on 75 degrees F and 80 degrees F. EPA concluded that "1. Temperature reductions have been demonstrated to reduce the volatility of dicamba.... 4.... At 75 degrees F... concerns for wide-area exposure are greatly reduced." See **Exhibit 10**, page 10. The Hydrick Petition did not include any information that changed, refuted or rebutted the evidence shown in **Exhibits 5-10** about the relationship between temperature and dicamba volatility, or the statement of Dr. Westberg that temperature is a key driver.

Dr. Norsworthy pointed out the lack of large-scale studies of the new dicamba products in Arkansas. (Dec 2, 2020 meeting, time marks 2:44:40, 2:48:40, 2:52:55, 3:27:52, and 3:31:36. See **Exhibit 11** .) It is not prudent to allow an unproven dicamba product to be used repeatedly on hundreds of thousands of Arkansas acres into the hot summer months. This type of experimentation occurred in 2017 and resulted in widespread crop damage, an emergency stop action, and the Plant Board's current dicamba rules. The At Risk Parties object to changing the current dicamba cut-off dates in Arkansas.

Pursuant to Ark. Code Ann. § 25-15-204(a)(2)(D), we request that you issue the required statement of your reasons for adopting the Proposed 2021 Dicamba Rule and thereby revoking the May 25 cut-off date under current ARPU XIII. B. 1.

Buffer.

Current ARPU XIII. B. 2. provides a 1-mile buffer in all directions from University and USDA research stations, certified organic and commercially grown specialty crops for the use of in-season dicamba products. That rule also provides a "1/2-mile buffer zone in all directions from non-dicamba tolerant crops." In spite of these very clear buffers, the University of Arkansas research stations in Lee, Mississippi and Desha counties have sustained dicamba damage in 2018, 2019 and 2020. See **Exhibit 12**. Note that in all of these events the source of the dicamba damage could not be determined, and the Rohwer report states that the nearest dicamba was 2 miles from the station. So, clearly, even a 1-mile buffer is not sufficient to protect crops that do not tolerate dicamba.

Arkansas' experience of the 1-mile dicamba buffer being inadequate is consistent with information in the EPA Assessment. See **Exhibit 10**, page 5 where it is reported that "the spread of distances from the suspected application site to the incident ranged from the treated field edge (0 feet) to 8,089 feet." **EPA reports dicamba off-target movement of over 1.5 miles!** That, and

the repeated multi-site damages to the University of Arkansas research stations, that are supposed to be protected by a 1-mile buffer, clearly show that dicamba movement beyond a mile happens often enough that it should be addressed in the Arkansas rules.

The Hydrick Petition did not include any information that addresses buffer zones or how to otherwise mitigate the extent of dicamba movement documented in **Exhibits 10 and 12**. Yet the Proposed 2021 Dicamba Rule revokes the 1-mile buffer and the even more inadequate ½ buffer for other sensitive crops. The At Risk Parties object to removing the existing Arkansas dicamba buffers.

Pursuant to Ark. Code Ann. § 25-15-204(a)(2)(D), in light of EPA reporting off-target dicamba movement of 8,089 feet, and the University of Arkansas research stations being repeatedly damaged in spite of a 1-mile buffer, we request that you issue the required statement of your reasons for adopting Proposed 2021 Dicamba Rule and thereby removing dicamba buffer zones in current ARPU. XIII. B.

VRA and Glyphosate

The in-season dicamba products entered the market in 2017 and were promoted to be "less volatile." Since first being used in 2017, the in-season dicamba products have caused considerable damage and widely discussed controversy. Mr. Hydrick and others try to dismiss or downplay dicamba damage. But the Plant Board must take into account the fact that the in-season dicamba products have caused serious damage to Arkansas crops. See **Exhibit 4**. Also, the in-season dicamba products are the subject of a $400 million litigation settlement entered June 2020 in a multi-district litigation lawsuit in St. Louis. In RE: Dicamba Herbicide Litigation, 1:18-md-2820-SNLJ (E.D. Mo). See **Exhibit 13**. That lawsuit already includes 92 Arkansas farmers seeking recovery for dicamba damages. Persons claiming dicamba damage, including additional Arkansas farmers, have until May 28, 2021, to file their claims in that settlement. There is a separate settlement fund for non-soybean claims. (The "Dicamba Settlement").

In October 2020, the EPA approved labeling for another iteration of the in-season dicamba products that are promoted as containing volatility reducing agents (VRA)— these products purport to only reduce volatility, not eliminate it. The 2021 season will be the first year on the market—the first large scale test of these VRA dicamba products. Dr. Norsworthy pointed out the lack of large-scale tests of the VRA products in Arkansas, as does the EPA Assessment at **Exhibit 10**. (Dec 2, 2020 meeting, time marks 2:48:40, 2:52:55, and 3:31:36. See **Exhibit 10**, page 3 and **Exhibit 11**.)

In addition to the lack of testing in Arkansas, it is essential to recognize that the VRA is not intended to reduce the volatility of dicamba alone; instead, it is intended to reduce the volatility of the even more volatile dicamba/glyphosate mixture. The in-season dicamba products are volatile. Adding glyphosate to the dicamba increases that volatility. To address that added volatility, current Arkansas Rule XIII. B. 2. b. prohibits mixing glyphosate with dicamba.

The new VRA is intended to reduce the increased volatility of the glyphosate/dicamba mixture back down to the volatility of dicamba alone, but not reduce the baseline volatility of dicamba, i.e., dicamba without the addition of glyphosate. BASF confirmed and clarified this at the Plant Board meeting on December 2, 2020. See **Exhibit 14** for the transcripts of exchanges with Plant Board members Marty Eaton, Reynold Meyer and Dr. Nathan Slaton and BASF representatives Dr. Dan Westberg and Dr. Jeff Birk, where Dr. Westberg explains that the VRAs only "bring back to parity" at **Exhibit 14**, page 5.

Notably, Dr. Norsworthy reported in that same December 2, 2020, meeting that his 2019 blind test of the BASF VRA (Sentris) showed that Sentris only reduced the volatility of the dicamba/glyphosate mixture to the volatility level of dicamba alone. Dr. Norsworthy's slide showing that result is included at **Exhibit 14**, page 9. Dr. Norsworthy further stated that "we don't have the data to answer" whether VRAs added to glyphosate/dicamba mixes can have lower volatility than dicamba alone. (Dec. 2, 2020 meeting, time mark 2:48:40. See **Exhibit 11**, page5.) Consequently, the VRA products do nothing to address the baseline volatility of dicamba. In other words, even if the VRA products work as intended, all they do is keep Arkansas at the same level of dicamba volatility—"bring back to parity" (Westberg at **Exhibit 14**, page 5)—that exists under current Arkansas rules that prohibit the dicamba/glyphosate mixture. The Proposed 2021 Dicamba rule would extend that exposure to that volatility to July 30.

EPA points out the lack of largescale tests and the limited testing of the VRAs. The October 26, 2020 EPA Assessment provides…

> "EPA concluded that it is more likely that there is vapor phase exposure associated with these [wide-area] distances, especially on large landscape scales beyond the 10-to-20-acre field scale used for distance to effects studies. Therefore, EPA cannot definitively exclude the potential impact of vapor phase drift in the wide area zone based on an evaluation of available large field off-field movement studies. Moreover, EPA cannot identify any single volatility control measure (e. g. volatility reducing agent, VRA) that is certain to prevent dicamba from transforming into its acid, that results in offsite volatilization."

See **Exhibit10**, p. 19.

The Hydrick Petition does not provide the Plant Board with any information on how the VRA products are supposed to work or any information that counters the VRA purpose and limits shown in **Exhibits 10** (at page 19) and **14**.

The At Risk Parties object to allowing dicamba to be mixed with glyphosate in Arkansas.

Pursuant to Ark. Code Ann. § 25-15-204(a)(2)(D), we request that you issue the required statement of your reasons for adopting the Proposed 2021 Dicamba Rule, thereby maintaining 2020 dicamba volatility levels through July 30, as opposed to the current cut-off date of May 25.

Pursuant to Ark. Code Ann. § 25-15-204(a)(2)(D), in light of EPA reporting that its 10- to 20-acre field studies cannot be relied on to assess or regulate landscape scale use and impact, and that it "cannot identify a single volatility control measure (e.g., volatility reducing agent, VRA) that is certain to prevent dicamba from transforming into its acid," we request that you issue the required statement of your reasons for adopting Proposed 2021 Dicamba Rule and thereby allowing application of the "new" VRA in-season dicamba products across hundreds of thousands of Arkansas acres into the heat of the summer until July 30.

EPA Actions and Documents.

In June 2020, the United States Court of Appeals for the Ninth Circuit vacated the labels that allowed the use of in-season dicamba products in 2019 and 2020. *Nat'l Fam. Farm Coal. v. U.S. Evit. Prot. Agency*, 960 F. 3d 1120 (9th Cir. 2020). The stated reasons for vacating those labels included the following:

1. EPA substantially understated the risks to non-dicamba tolerant (DT) plants by over the top (OTT) application of dicamba herbicides (*Id.* at 1136.);

2. The record clearly showed that dicamba damage complaints understated the amount of dicamba damage (*Id.* at 1137-1138);

3. EPA entirely failed to acknowledge risks it was statutorily required to consider, including:
    a. Substantial non-compliance with the label (*Id.* at 1140);
    b. Economic cost that is virtually certain (*Id.* at 1142-43); and
    c. Social costs--the record contains extensive evidence that OTT application of dicamba herbicides has torn apart the social fabric of many farming communities. (*Id.* at 1143).

Remarkably, in a document dated March 10, 2021, EPA official, Michal Feedhoff, Acting Assistant Administrator, Office of Chemical Safety and Pollution Prevention, acknowledged that Federal Court of Appeals ruling and its findings. In Freedhoff's own words:

> *2018 Dicamba Registration Decision*: In 2018, OCSPP senior leadership directed career staff to: (1) rely on a limited data set of plant effects endpoints; (2) discount specific studies (some with more robust data) used in assessing potential risks and benefits; and (3) discount scientific information on negative impacts. This interference contributed to a court's vacating registration based on these and other deficiencies, which in turn impacted growers' ability to use this product."

See **Exhibit 15**.

It should be noted that the EPA administration that approved the 2019-2020 labels that were vacated is the same EPA administration that issued the October 2020 5-year approval of the

"new" VRA dicamba in-season products. Given the circumstances described by Michal Freedhoff above, it remains to be seen to what extent the new 5-year VRA product labels will stay in effect.

Federal Label vs. State Rules.

The EPA's material failures on the 2019-2020 dicamba labels described in the U.S Court of Appeals Case highlight the role and need for the states' responsibilities for regulating the application of pesticides in their respective jurisdictions. The national cut-off dates put an exclamation mark on that point. 2021 will be the first market year for the new VRA dicamba products. The base chemical is still dicamba, and the volatility of dicamba still increases with higher temperatures. Yet, EPA has set national cut-off dates that give the Gulf of Mexico the same cut-off dates as the Canadian border, and EPA set different cut-off dates for soybeans and cotton.

EPA understands the variability of temperatures across the United States. The Plant Board's duty is to understand the purpose and the limits of EPA's national cut-off dates. That duty starts with the following question: Should the Arkansas dicamba cut-off date be the same as that of the Canadian border?

The EPA Assessment at **Exhibit 10**, page 1 calls the June 30 and July 30 cut off dates "mandatory" and "hard cut off." In other words, after clearly recognizing dicamba volatility above 75 degrees F, the federal label cut off dates are back stops.

The EPA Assessment at **Exhibit 10**, page 1, discussing Appendix I, provides that the "mandatory" cut off dates reduce the probability of dicamba application on days more favorable for dicamba volatilization, which the EPA Assessment identifies as over 75 degrees F. See **Exhibit 10**, pages 7-11 for that temperature discussion. Arkansas temperature records clearly show how early in the spring Arkansas temperatures regularly exceed 75 degrees F.

The EPA Assessment at **Exhibit 10**, page 11 concludes the following:

> "...cut off dates provide a margin of extra safety when considering their impact on avoiding application conditions favorable to off field dicamba volatile movement."

The federal cut off dates are the hard cut off, the back stop, for any state rules that for whatever reason have not taken into account all the known information about dicamba volatility above 75 degrees F and still allow application above that temperature.

Fortunately, the governing federal law and the state law expect the states to set restrictions as appropriate for each state, which has always been the case, even for Arkansas. So, the Plant Board should not expect Arkansas to be bound by, or guided by, the national label late summer cut-off dates and inadequate buffers for these new VRA dicamba products. The Plant Board cannot simply point to the federal label and say the EPA declares July 30 as a safe dicamba cut-off date. EPA clearly did not do that.

If the Plant Board adopts the federal label for the VRA dicamba products, then the Plant Board is misusing EPA's stated purpose of the national cut-off dates (reduce the probability of a dicamba application when volatility is likely and as an extra margin of safety—safety that should have been addressed by the states with an appropriate cut-off date). Merely pointing to the national cut-off date ignores common facts and common sense. Merely pointing to the national cut-off date would be shirking its responsibilities to the public health and welfare under the Arkansas Pesticide Use and Application Act, to set a cut-off date for Arkansas that prevents unreasonable adverse effects on humans and the environment in Arkansas. Ark. Code Ann. § 20-20-202(b).

Legal Standard for Arkansas Rule Making.

As stated at the beginning of these comments, the Arkansas Pesticide Use and Application Act provides that it is essential to the public health and welfare that pesticides be used properly to prevent unreasonable adverse effects on humans and the environment. The Arkansas Administrative Procedures Act requires that rules are to be based on the best reasonably obtainable scientific, technical, economic or other evidence or information.

To their credit, some Plant Board members have pointed out the need for more research and certainty about the VRA, and that the Plant Board is also responsible for protecting those who are at risk from dicamba. Soybeans are very sensitive to dicamba. Arkansas plants approximately 2.7 million acres of soybeans yearly. Reports on the market share of dicamba tolerant soybeans vary from ½ to 2/3 of soybean acres, some of which is known to be defensive planting. Even if dicamba tolerant soybeans make up 2/3 of Arkansas soybeans, at least 900,000 acres of Arkansas soybeans are at risk from dicamba. That non dicamba acreage includes non-GMO soybeans and food grade soybeans. Other crops at risk from dicamba in Eastern Arkansas include approximately 5,000 acres of sweet potatoes and over 4,000 acres of certified organic crops. These crops were in production in Arkansas before in-season dicamba was introduced in 2017. When dicamba volatilizes and moves across the landscape it is a pesticide trespass, a trespass that causes unreasonable adverse effects on those vulnerable crops.

Some Plant Board members have repeatedly mentioned concerns about Arkansas having the most restrictive dicamba rules. Whether or not Arkansas has the most restrictive rules in the country is not the legal standard. The proper legal standard is what prevents unreasonable adverse effects on humans and the environment in Arkansas, considering Arkansas conditions and Arkansas circumstances.

Some Plant Board members have repeatedly mentioned wanting to give farmers a chance to use a new product and do the right thing. That is not the proper standard for rule making. The rule must be based on scientific and technical information about the volatility and adverse effects of dicamba. Dicamba can volatilize days after application. Consequently, the applicator has no control of dicamba after it is applied. So even a proper application of dicamba remains volatile, especially in the hot summer months, and volatilization does not leave a drift trail to the responsible party. The fact that so many have not been doing the right thing led some Plant Board members to insist on higher penalties—something with teeth—for egregious violations. The Arkansas

Legislature delivered by giving the Plant Board authority to issue fines up to $25,000 for egregious violations.

Some Plant Board members contend that dicamba complaints are going down, when in fact they are at best steady, with 200 complaints in 2018, 210 in 2019 and 217 in 2020. The Plant Board should be more concerned with the fact that the source of these dicamba events has not been determined.

The University of Arkansas research stations conduct a wide range of important research. Those stations are public assets. They are subject to public awareness. They should get public protection, and public enforcement of that public protection. Where is the outrage about repeated dicamba damage to these public assets even when a 1-mile buffer is in place?

This situation begs the question: How does that dicamba damage occur at the research stations?

You should also consider that if research stations at known locations with a 1-mile buffer are hit, how often are the crops of individual Arkansas farmers with a smaller buffer and less protection hit?

The extent of dicamba movement evidenced by the repeated damage to the research stations warrants its own study.

The new VRA dicamba products have not been sufficiently tested for Arkansas. And, at best, BASF confirms that the new VRA dicamba products are intended to "bring back to parity" a volatility level that is no better than what would be achieved by following the Arkansas rules now in place that prohibit mixing dicamba with glyphosate. See **Exhibit 14**.

Some Plant Board members have mentioned wanting to make a risk assessment decision with the best information available and then assuming that risk through later cut-off dates. No Plant Board member wishing to extend the cut-off date of dicamba will be at any risk from that extension. However, a later cut-off date will increase the risk to members of the public with non-dicamba crops. The Plant Board's decisions should be based on the public interest, not the interests of Plant Board members.

"The mission of the Arkansas State Plant Board is to protect and serve the citizens and agricultural and business communities by providing information and unbiased enforcement of laws and regulations." (Plant Board web site.)

The Plant Board members take the following oath of office: "I, _____, do solemnly swear (or affirm) that I will support the Constitution of the United States and the Constitution of the State of Arkansas, and that I will faithfully discharge the duties of the office of the Arkansas State Plant Board, upon which I am now about to enter." Arkansas Constitution, Article 19, § 20.

Reject the Proposed 2021 Dicamba Rule.

The Proposed 2021 Dicamba Rule has not been promulgated in compliance with the Arkansas Administrative Procedures Act, and, therefore, it should be rejected. The Proposed 2021 Dicamba Rule ignores established science, facts, Arkansas experiences and common sense, particularly as such factors apply to burn down products, cut-off dates, buffers, untested VRAs and questionable EPA actions.

We object to the Proposed 2021 Dicamba Rule and request a public hearing on the matter.

We request that you deliver your required responses above under Ark. Code Ann. § 20-15-204(a)(2)(D) to us no later than April 29, 2021.

Sincerely,

DOVER DIXON HORNE PLLC

Cal McCastlain

JCM/rkj
Enclosures *(Exhibits 1-15)*

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 1

Before the Arkansas State Plant Board

Request for Rule Making

IN THE MATTER OF

Huntington Tyler Hydrick — Petitioner

and

The Arkansas State Plant Board — Respondent

PETITION FOR RULEMAKING AND AMENDMENT TO CURRENT RULES

Come Now the undersigned Petitioners that do herby submit, pursuant to Arkansas Code Annotated 25-15-204 (d), this Petition for Rulemaking and state as follows:

I Introduction

a. As a licensed Arkansas crop consultant (AR License #480), certified crop advisor (CCA #499886), President of the Arkansas Agricultural Consultant's Association, consultant at Hydrick's Crop Consulting Inc., owner of Ag Assistants, LLC, and weed science Master's Degree holder from Mississippi State University, I respectfully request that the Arkansas State Pia nt Board initiate the administrative rule-making process to allow Arkansas growers to apply reduced-volatility dicamba products with no further restriction than those approved by the United States Environmental Protection Agency (EPA).

b. Hydrick's Crop Consulting Inc. and Ag Assistants, LLC operate in five northeastern Arkansas counties, one southeastern Missouri county, and one western TN county on the west side of the Mississippi River. Across my Arkansas territory, these two businesses are responsible for tens of thousands of soybean and cotton acres. Of those acres, roughly 90% of soybeans are Xtend or XtendFlex, 5% are Libertylink or Enlist, and 5% conventional soybeans. Of the cotton acres, approximately 90% are XtendFlex, 5% Enlist, and 5% GT/LL. Our growers understand the best path for financial and stewardship success is through the Xtend system. I recommend that most of my growers plant Xtend/XtendFlex cotton and soybean due to its higher yield and excellent weed control.

c. Based on my professional experience, questioning colleagues, peer-reviewed scientific journal articles, and the documentation of the University of Arkansas, Palmer amaranth is one of the most troublesome weeds in Arkansas. Palmer amaranth is widely recognized in Arkansas as having multiple resistance to acetolactate synthase inhibitors (Group 2), ESPS synthase inhibitors (Group 9), protoporphyrinogen oxidase inhibitors (Group 14), very long chain fatty acid inhibitors (Group 15), and microtubule inhibitors (Group 23). Due to its prolific seed production, a plant that germinates between March and June may produce in greater than 200,000 seeds per plant. One that emerges in June may grow between 0.18 and 0.2 cm per

growing degree day. Under favorable conditions around 86 degrees, Palmer amaranth can germinate within a single day, compared to other *Amaranthus* species that may take days to germinate. When populations reach approximately 2- to 3 plants per meter of row, 64 and 68% yield reductions have been reported in scientific literature. One of the pillars of herbicide resistance management is the use of multiple modes of action.

d. As the literature and concerned growers of Arkansas have long reported, Palmer amaranth has resulted in significant financial losses because of limited weed control options in Arkansas crops; leading to overall yield reductions.

e. In an effort to help growers control Palmer amaranth and other problematic weeds nationwide, Monsanto (merged to Bayer Crop Science) developed the dicamba-tolerant herbicide systems Xtend and XtendFlex, which have been widely adopted by all states.

f. All states, other than Arkansas, have adhered to the federal label with no need for additional restrictions to the federally accepted labels.

g. Enhanced restrictions on dicamba herbicides have forced farmers to grow their dicamba-tolerant crops with little chance to make a dicamba application that would improve weed control and herbicide resistance management programs.

h. Volatility is described as the transition of a liquid to a gas. The main goal of the new dicamba formulations was to reduce this change of state. Although they do not eliminate volatility, reduction in volatility has been shown across other states, as the products claim they will. It should be noted that dicamba is not the only herbicide to volatilize.

i. Physical drift is the movement of a liquid from a target to a non-target area, usually caused by wind. Physical drift is a concern of not just dicamba, but every pesticide used.

j. The movement of pesticides in a temperature inversion is one that is known, but not perfectly understood and should not be confused with volatility. These two phenomena are similar in their appearance when an inversion disperses over a wide area. Inversions, like volatility and physical drift, are not only linked to the herbicide dicamba.

k. The EPA has restricted the use of dicamba after June 30 and July 30 in soybean and cotton, respectively. This is vastly different than the May 25 cutoff imposed by the Arkansas State Plant Board. It should be noted that soybeans are typically planted from late March to mid-June in Arkansas and cotton is typically planted from late March to early June. Many farmers rely on the use of residual herbicides to keep hard-to-control weeds at reducing the need for POST herbicides, as recommended by the University of Arkansas weed scientists and most weed scientists across the nation. In several cases, farmers do not have the ability to spray dicamba before the May 25 cutoff in Arkansas. In the previous three growing seasons, wet weather has prevented planting and spraying resulting in disastrous situations ranging from seemingly insurmountable weed pressure and even replanting large acreage. These situations, in combination with a May 25 cutoff, force growers to rely on old technology that Palmer amaranth is either becoming overly subjected or resistant to.

l. It should be understood that farmers never intend to harm their own, neighbors', or homeowners' property EVER. Some herbicides, like dicamba, have very distinct damage that may show up on unintended vegetation; however, this damage in most cases is nothing more than superficial due to the significantly less than lethal rate that has dispersed over the distance traveled. These rates are typically so small that it is impossible to replicate the amount in small-plot research. In almost all cases, the injured plants will return to normal growth habits that never hinder their ability to reproductively produce at a level that is not different than if the injury had never occurred. Lastly, in a few cases, these herbicide injury symptoms can be mimicked by other plant stress enhancers (see holcus leaf spot in corn compared to paraquat injury).

m. Buffer zones have been placed on dicamba products labeled for over-the-top use in dicamba crops by the EPA. These buffer zones are in place to protect non-target areas from damage that would be considered lethal or excessively damaging. Currently, the EPA-approved restrictions require a 240 ft downwind buffer as well as the use of pH buffer. Documentation has shown these dicamba products can reduce the pH of the final solution to a less than acceptable level that can result in increased off target movement. The use of pH buffers raises the pH to acceptable levels that keep products where they are intended. The Arkansas State Plant Board has further restricted buffer zones to within half of a mile of non-DT crops and homes, as well as, a one-mile restriction from any university or USDA research facility. These restrictions are 11 and 22 times more restrictive than the federal label, respectively.

n. In 2021, my growers are expected to plant a majority of XtendFlex soybeans and cotton. With the addition of glufosinate to the XtendFlex soybean system, we have the ability to rotate between two effective modes of action within one cropping season. With a May 25 cutoff, this puts an insurmountable pressure on glufosinate. It is possible that cotton and soybean acres are sprayed with glufosinate in consecutive years since they are a common rotational crop, and even more so within corn systems. This strategy puts pressure on the Libertylink system to maintain an unattainable level of control year after year. Once widespread glufosinate resistance in confirmed, there will be no other POST control methods available outside of dicamba and 2,4-D in soybeans and cotton.

o. It is paramount the Arkansas State Plant Board understand the need for dicamba in Arkansas agriculture and why farmers should be allowed to abide by federal label restrictions without additional restrictions. These restrictions have placed heavy financial burdens on farmers and possibly even more so on other herbicide technologies.

II. Argument

a. Xtend/XtendFlex technologies should lead the state in planted acres. Assuming this, we can project that dicamba is intended to be applied zero to two times per field. With the 2020 restrictions, several farmers who need time to even make one application could possibly not have that. It is only fair that Arkansas growers paying a premium for the seed technology receive a premium herbicide to control the State's most troublesome pest.

b. I, Huntington Tyler Hydrick, am opposed to any further restrictions on over-the-top applications of dicamba. Anything short of a June 30 cutoff in soybeans and a July 30 cutoff in cotton is detrimental to a grower's weed control system and profits.

c. Since release in 2017, we have been able to observe reduced complaints where applications were made within the rules and observe surrounding states each year. Arkansas growers have attended necessary trainings to make quality applications that limit off-target movement. As a consultant, I recommend the labeled use rates and insert specific label restrictions in the comments of the report. This has lowered our risk of off-target movement.

d. It comes without argument that dicamba has been placed on its own pedestal within the Arkansas State Plant Board. Inspectors are pulling weeds from fields to be tested for damage, unlike any other pesticide on the market. Dicamba is one of the few pesticides in Arkansas with mountains of enhanced restrictions. Dicamba is the only herbicide to have its own task force created to regulate it within the Arkansas State Plant Board. Dicamba is the only pesticide within the Arkansas State Plant Board that comes with a $25,000 fine for chemical trespass per incidence. Farmers and consultants alike see the damage caused by glyphosate in rice. Literature has shown that paraquat injury on rice can affect yield, and possibly even seed germination where seed rice is grown for the following year. I feel, as do many others, that dicamba has received an unfair and biased ruling within the Arkansas State Plant Board.

e. One such argument for the ban on dicamba has come from members outside of the Agricultural community. Let me be frank in saying, I have never seen a tree, bird, or bee colony killed by dicamba. Behind the Mississippi River levee in Tennessee, we have successfully applied dicamba since 2017 with zero tree fatalities. This argument lacks teeth and should not be considered by the Arkansas State Plant Board. These peoples are only here to see the destruction of Arkansas agriculture and those who take pride in their work in the field.

III. Action Requested of the Arkansas State Plant Board

a. I request the following as part of the rule-making process:
   i. The implementation of a full, federally-approved label for all reduced volatility dicamba formulation in the state of Arkansas without additional restrictions.

b. I request the rule making process be initiated on the point outlined in Section III a. I also request the process be expedited and that I am provided the opportunity to participate in the discussion related to the rule-making process.

Submitted on this 31 day of January, 2021.

Huntington Tyler Hydrick

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 2

in the Dicamba day, '96, '97, '95, right in there. But I was not -- don't remember those. Sam's holding his hand up there --

MR. STUCKEY: Yes.

CHAIRMAN FULLER: -- I think he may have something to say. (Inaudible) the floor, Mr. Stuckey.

MR. STUCKEY: Yes, Mr. Chairman. Yes. Thank you, Mr. Chairman.

I'd like to make a motion to accept Mr. Hydrick's petition into rule making for the full federal label for -- label Dicamba use over the top of (inaudible) crops.

CHAIRMAN FULLER: (Inaudible) crops. Okay. Sam made the -- and anybody that wanted to continue discussion? I think we probably discussed out, but -- seeing none, I'll ask for a second to Sam's motion --

MR. WALLS: Second. Barry Walls. Second.

CHAIRMAN FULLER: Barry Walls, second to Sam's motion. Okay. I've got a motion by Sam and a second by Barry Walls to accept Tyler's petition for full federal label over the top of Dicamba tolerant crops, is I think what the -- what the official motion should be.

1 to explain that to us before we vote.
2 MR. HESS: Okay.
3 CHAIRMAN FULLER: The motion, as I
4 understand it, is to -- for Arkansas to adopt
5 the federal label for over the top application
6 of Dicamba products regardless of crop.
7 So, on soybeans, I think that's June 30th.
8 And, on cotton, that's July 30th. And two
9 products that have growth date restrictions for
10 soybeans, one product doesn't, I -- I'm almost
11 positive those same two products -- I know
12 Tavium has a growth restriction for cotton.
13 I'm not sure about the XtendiMax on cotton. I
14 think it does, but I'm not sure. But the
15 Engenia does not. It would just be the date.
16 It doesn't have a growth stage.
17 But, anyway, it would be federal label for
18 over the top application of crops in the State
19 of Arkansas for Dicamba. All other regulations
20 would still apply.
21 Our buffer zones, just for clarification
22 for around our university experiment stations
23 or whatever, I mean, would be full federal
24 label. So, whatever was protected under
25 federal label would be protected, but no buffer

1 So I'm going to go ahead call for the vote
2 and start the roll call vote, unless somebody
3 has a procedural question on what'll actually
4 happen to this if we do it.
5 And I think we've about hashed it out
6 what's going to actually happen when it goes
7 through or if it fails. You know, we'll --
8 MR. STUCKEY: I'll call for the vote just
9 like it is.
10 CHAIRMAN FULLER: Okay. Thank you, Sam.
11 All right. We're fixing to vote on the
12 motion to adopt federal State of Arkansas for
13 over the top crops.
14 We got -- the motion was made by Sam
15 Stuckey, seconded by Barry Walls. We'll do a
16 roll call and we'll start with Mr. Bruce
17 Alford.
18 And for those that's not voted before or
19 whatever like this procedure, yes vote is for
20 the motion, no vote is opposed to the motion.
21 Mr. Bruce?
22 MR. ALFORD: No.
23 CHAIRMAN FULLER: Mr. Bruce Alford votes
24 no. Thank you for that.
25 Mr. Tommy Anderson?

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 3a

on

Legal Notices 1201

Legal Notice
Arkansas State Plant Board

The Arkansas State Plant Board is proposing changes to the Arkansas Rules on Pesticide Use and Classification. The proposed changes will be to consider changes for the use of dicamba in the State of Arkansas. The proposed rule change may be viewed on the webpage at www.agriculture.arkansas.gov/plant-industries/rules-and-regulations/proposed-rules.

Written comments will be accepted beginning March 24 through April 22, 2021. Comments may be submitted online at www.agriculture.arkansas.gov.

/s/Wade Hodge
Wade Hodge, Chief Council
Arkansas Department of Agriculture

75396413f

Legal Notice

Arkansas State Plant Board

The Arkansas State Plant Board is proposing adoption of the following:

- Arkansas State Plant Board Rules Regarding the Adoption of the National Institute of Standards and Technology (NIST) Handbooks. Ark. Code Ann. § 4-18-303 provides that NIST "shall be the primary state standard for weights and measures". The Bureau of Standards is charged with the duty to enforce weights and measures standards in the state, and this rule informs those subject to regulation what the standards are.

  Comments may be mailed to the Arkansas Department of Agriculture,
  ATTN: Nikhil Soman, 1 Natural Resources Drive, Little Rock, AR 72205, or emailed to
  nikhil.soman@agriculture.arkanas.gov

- Arkansas Regulations on Pesticide Use. To establish cutoff dates for late season permits for dicamba applications east of the Mississippi River levee that will comply with the Federal Insecticide, Fungicide, and Rodenticide Act.

  Comments may be mailed to the Arkansas Department of Agriculture,
  ATTN: Susie Nichols, 1 Natural Resources Drive, Little Rock, AR 72205, or emailed to
  susie.nichols@agriculture.arkansas.gov

- Arkansas Pesticide Use and Application Act. The Environmental Protection Agency now requires that restricted use pesticide applicators must be at least 18 years old.

  Comments may be mailed to the Arkansas Department of Agriculture,
  ATTN: Susie Nichols, 1 Natural Resources Drive, Little Rock, AR 72205, or emailed to
  susie.nichols@agriculture.arkansas.gov

Comments will be accepted beginning March 6, 2021, until the close of business April 4, 2021.

The proposed rule changes may be viewed on the web page at www.agriculture.arkansas.gov

Wade Hodge, Chief Council
Arkansas Department of Agriculture

Asa Hutchinson
Governor

ARKANSAS DEPARTMENT OF AGRICULTURE

1 Natural Resources Drive, Little Rock, AR 72205
agriculture.arkansas.gov
(501) 225-1598

Wes Ward
Secretary of Agriculture

March 3, 2021

TO: Editor Arkansas Democrat-Gazette

FROM: Scott Bray, Director
Arkansas State Plant Board

SUBJECT: Legal Notice

Please publish the enclosed legal notice in the March 6 - 8, 2021 issues of the Arkansas Democrat-Gazette. Please bill us in the usual manner.

SB:ll

Enclosures

CC: Wade Hodge, Attorney, Arkansas Department of Agriculture
Megan Perkins, Governor's Office
Caleb Stanton, Governor's Office
Arkansas State Library
U of A Library, Fayetteville

ARKANSAS REGISTER

Proposed Rule Cover Sheet

Secretary of State
John Thurston
500 Woodlane Street, Suite 026
Little Rock, Arkansas 72201-1094
(501) 682-5070
www.sos.arkansas.gov

Name of Department Arkansas Department of Agriculture

Agency or Division Name Arkansas State Plant Board

Other Subdivision or Department, If Applicable

Previous Agency Name, If Applicable

Contact Person Scott Bray

Contact E-mail scott.bray@agriculture.arkansas.gov

Contact Phone 501-225-1598

Name of Rule Arkansas State Plant Board Regarding the Adoption of the National Institute of Standards and Technology (NIST) Handbooks

Newspaper Name Arkansas Democrat-Gazette

Date of Publishing March 6 - 8, 2021

Final Date for Public Comment April 4, 2021

Location and Time of Public Meeting TBD

Legal Notices 1201

Feel free to contact Tracy Turner if you have any questions or concerns.

The Department of Human Services, Division of Developmental Disabilities Services, is in compliance with Title VI and VII of the Civil Rights Act and to operated, managed and delivered services without regard to age, religion, disability, political affiliation, veteran status, sex, race, color, or national origin

75325749

Bids/Requests 1210

Legal Notice
Arkansas State Plant Board

The Arkansas State Plant Board is proposing adoption of the following:

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ATTN: Susie Nichols, 1 Natural Resources Drive, Little Rock, AR 72205, or emailed to susie.nichols@agriculture.ar-

Bids/Requests 1210

kansas.gov

Comments will be accepted beginning March 6, 2021, until the close of business April 4, 2021

The proposed rule changes may be viewed on the web page at www.agriculture.arkansas.gov

/s/Wade Hodges
Wade Hodges, Chief Counsel
Arkansas Department of Agriculture

75388028

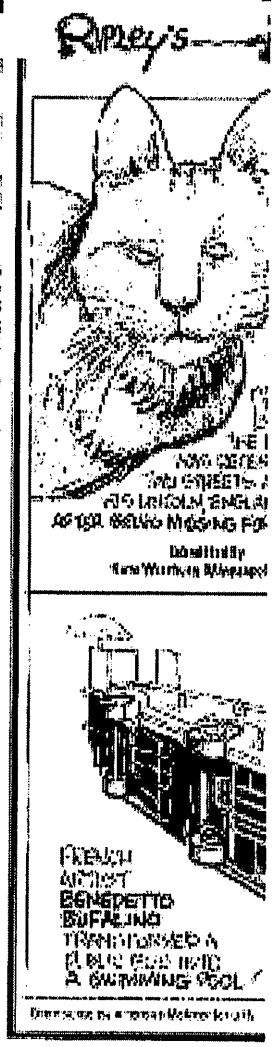

EXHIBIT 3a-Page 5

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 3b

Asa Hutchinson
Governor

ARKANSAS DEPARTMENT OF AGRICULTURE

1 Natural Resources Drive, Little Rock, AR 72205
agriculture.arkansas.gov
(501) 225-1598

Wes Ward
Secretary of Agriculture

AGENDA

442nd State Plant Board Meeting via Zoom

December 2, 2020

9:30 a.m.

1. **Opening Comments and Introductions**.

2. **Minutes** of the September 2, 2020 quarterly Board meeting are ready for approval.

3. **Examination Results**. The Pest Control examinations given September 14, October 12 and November 9, 2020 are ready for Board action.

4. **Presentation from BASF**

5. **Presentation from Dr. Dan Scheiman, Audubon Arkansas**

   Break

6. **Presentation from Dr. Jason Norsworthy, University of Arkansas**

   Short break or lunch break if needed

7. **Standing Committee Reports.** Standing Committees may have information or recommendations for the Board's consideration.

   Bureau of Standards Committee met November 10, 2020
   Pest Control Committee met November 20, 2020
   Pesticide Committee met November 20, 2020

8. **Other Business**. Chairman Fuller may wish to cover other business.

9. **Date for the next Quarterly Board Meeting**. Set date for the next quarterly Board meeting in March 2021.

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 3c

CHAIRMAN FULLER: I got 13 yeses and one no, so the motion carries.

MR. BRAGG: Yes, sir. And one -- one recusal.

CHAIRMAN FULLER: And one recusal.

All right. Thank y'all for that.

Do we have other business today? Are we ready to set the date for the next meeting?

MR. EATON: Hey, Terry.

CHAIRMAN FULLER: Marty.

MR. EATON: Can we not -- can we not -- someone make a motion to -- to have another date? I mean, we voted -- this vote here, it was May 25th, whichever way you voted. Right?

CHAIRMAN FULLER: The only thing on this date that was changing was behind the levee, yes --

MR. EATON: Yeah.

CHAIRMAN FULLER: -- basically.

MR. EATON: Yeah. I mean, the -- before we shut this thing down, can I not make a --

CHAIRMAN FULLER: We -- we can if you -- we're in other business, so if you'd like to make a motion, you can have the floor.

MR. EATON: Okay. I would like to make a

in the tank.

MR. BRAY: Yeah, that -- it won't change. That's already in place, so it's not addressing that at all. Okay.

CHAIRMAN FULLER: Yes, sir. That's already in place, so it's not addressing it.

Okay. I guess we might need a clarification from Wade. Do we have to go through the rule making for the Mississippi River change that we already adopted --

MR. HODGE: Yes.

CHAIRMAN FULLER: -- (inaudible) --

MR. HODGE: Yes. You -- you'll absolutely have to go through rule making for that because that is a change to your rule.

CHAIRMAN FULLER: Okay. And that would be -- the only thing that's in the rule making now is that. Okay.

MR. HODGE: Yeah, currently. Now, if this current motion --

CHAIRMAN FULLER: All right.

MR. HODGE: -- passes, then that would require rule making as well.

CHAIRMAN FULLER: Then that -- then we'll have the date in the mix, but right as of now

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 4

Integrated Pest Management
University of Missouri

2020 Mizzou Weed Science Virtual Field Day Video 10: Off-target Dicamba and 2,4-D Movement and Yield of Injured Soybean

Mandy D. Bish
University of Missouri
(573) 882-9878
bishm@missouri.edu

PUBLISHED: AUGUST 17, 2020

Dr. Bradley discusses synthetic auxins and yield loss in this final video of the 2020 virtual field day. As he explains in the video, dicamba off-target movement continued to be an issue in 2020, and there were also instances of 2,4-D off-target movement due to physical drift.

Dr. Bradley also addresses the most common question regarding injury to soybean: *how does injury affect yield?*He summarizes research on dicamba and 2,4-D drift and soybean yield.

Thanks for tuning into this video series. If you have any questions, please let us know. You can find all 10 episodes on our YouTube Channel. Keep connected with us on Facebook and Instagram at Mizzou Weed Science and on Twitter @ShowMeWeeds.

REVISED: August 17, 2020

EXHIBIT 4-Page 1

Dicamba Injury Study

Reproductive Stage Soybeans More Sensitive to Dicamba

7/12/2019 | 12:36 PM CDT

By Matt Wilde , Progressive Farmer Crops Editor

Kevin Bradley, University of Missouri weed specialist, informs farmers and agronomists about the latest studies on dicamba and weeds during the university's Pest Management Field Day on July 9 at the Bradford Research Center in Columbia, Missouri. (DTN photo by Matthew Wilde)

COLUMBIA, Mo. (DTN) -- University of Missouri (Mizzou) research has shown that soybeans entering the reproductive phase are most vulnerable to injury from dicamba.

That reproductive time is now across the major production areas, according to the latest U.S. Department of Agriculture (USDA) Crop Progress and condition reports. Dicamba applications are ongoing in many states due to a late planting season and rule changes.

Weed scientists urge farmers and chemical applicators to communicate and follow label instructions to mitigate possible production losses associated with dicamba drift. The herbicide and weed management were dominant topics Tuesday at Mizzou's Pest Management Field Day at the Bradford Research Center in Columbia, Missouri.

"When (soybean) plants start to flower, they are most susceptible to yield loss (from dicamba)," said Mandy Bish, University of Missouri Extension weed specialist. "There's still a lot of dicamba being sprayed.

"Neighbors need to communicate with each other to find out what's planted where and come up with a game plan," she continued. "Applicators must follow the buffer and wind speed rules and even shut down spraying earlier than the label requires. Two hours before sunset may not be sufficient during weather that favors temperature inversions."

Studies show non-dicamba-tolerant soybeans in the R1 to R3 reproductive stage -- beginning flowering to beginning pod set -- sustain the greatest yield loss from drift. Multiple exposures exacerbate losses, research indicated.

University of Missouri testing last year showed soybeans injured by dicamba in the V3 stage produced 1 bushel per acre (bpa) more than non-injured beans after a single drift event. Injured soybeans in the R1 and R3 stages yielded 11 bpa and 7 bpa less, respectively, after a single drift event than non-injured soybeans. Injured soybeans in stage R5 only suffered a 2 bpa loss compared to non-injured soybeans. If soybeans sustained drift injury during the R1 and R3 stages, yields were half as much compared to non-injured soybeans.

"There's a difference getting drifted on once compared to many times," said Kevin Bradley, a Mizzou weed specialist. Tests show production losses escalate in soybeans sensitive to dicamba if drift injury occurs multiple times.

LATE START

Soybean planting occurred well into June or even July in some cases. Only 7% of Iowa's soybean crop was in bloom as of Sunday, July 7, according to USDA. That's 10 days behind the five-year average.

Six percent of Missouri's soybean crop is in bloom, according to the latest crop progress and condition report. Illinois is even less at 2%. Soybean progress is below average in most states.

Dicamba labels allow over-the-top soybean applications prior to beginning bloom (R1) or no more than 45 days after planting, or whichever comes first, for XtendiMax, Engenia and FeXapan. Tavium in-crop applications are allowed through V4 or 45 days after planting, whichever comes first.

Some states, like Iowa, follow federal label rules dealing with application timing. States with earlier dicamba application cut-off dates extended the time to spray due to the lack of suitable spraying days and delayed planting. For example, Illinois extended its June 30 cutoff date to July 15 for June-planted soybeans. Oklahoma filed a special local needs label to allow for in-crop dicamba use for 90 days after planting cotton and 60 days after seeding soybeans.

"If soybeans are flowering or in a later stage, people need to understand the yield loss due to injury can be much greater," Bradley said.

Dicamba injury symptoms tend to take at least 10 to 14 days to appear. DTN previously reported dicamba off-target injury complaints have started coming in to state agencies.

"It is important to note that not all dicamba injury results in yield loss," Bish said.

OTHER FIELD DAY HIGHLIGHTS:

Bradley said early studies indicate new 2,4-D choline formulations are not as volatile as reformulated dicamba products.

Bradley expects more herbicide options and flexibility for farmers in the future, including additional soybean traits with three-way tolerance.

A new University of Missouri study reveals farmers need to consider their cereal rye cover crop seeding rate in order to achieve the most effective weed control. Research shows seeding rates of at least 50 pounds of cereal rye per acre are required to suppress waterhemp, and preferably even higher.

When planting into green cover crops, research indicates farmers should wait to apply residual herbicide until cover crops start to deteriorate after burndown and soybeans

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reach to the V2 to V3 stage to be the most effective.

Dicamba-injured soybeans do not attract more insects, so there is not a greater increase in yield loss, research indicated.

University of Missouri entomologist Kevin Rice said Japanese beetle populations won't increase this year due to extensive rainfall and flooding, but injury thresholds could be reduced due to short plants.

Stink bugs may cause more problems this year since they like later-planted soybeans and late-maturing pods, Rice said.

Matthew Wilde can be reached at matt.wilde@dtn.com

Follow him on Twitter @progressivwilde

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Matt Wilde

About the Author

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UNIVERSITY OF MINNESOTA EXTENSION

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Extension is expanding its **online education** and resources to adapt to COVID-19 restrictions.

Soybean yield response to dicamba exposure

Due to non-Xtend soybeans' sensitivity to dicamba, injury symptoms aren't reliable indicators of yield loss.

Figure 1: Xtendimax drift onto non dicamba-tolerant soybean. Photo: Liz Stahl.

Slight dicamba injury doesn't always result in significant yield loss, according to published research. However, yield losses from dicamba exposure can be dramatic.

The level of yield loss depends on several factors. These include:

- Soybean growth stage at the time of exposure.
- Exposure dose.
- Growing conditions for the remainder of the growing season.

Soybean growth stage

Research suggests that if minor exposure occurs during early vegetative development, yield loss is less likely compared to when soybean has entered reproductive development.

About the study

University of Nebraska researchers applied six **micro-rates of dicamba to non-tolerant soybeans** <https://cropwatch.unl.edu/2018/research-impact-dicamba-drift-non-dicamba-tolerant-soybeans> that ranged from 1/10 (equivalent to 3 tablespoons per acre) to 1/1000 of the labeled rate. These rates were applied at three different soybean stages:

1. Early vegetative (V2)
2. Late vegetative/early flowering (V7/R1)
3. Full flowering (R2)

Results

Researchers found non-tolerant soybeans were most sensitive to dicamba exposure in the V7/R1 stage. Soybeans exposed to 1/10 of the labeled Engenia rate at this stage yielded an average of only three bushels per acre (Table 1).

Early vegetative soybeans (V2) were least sensitive to dicamba exposure in this study. Yield loss at the 1/10 rate was still significant at 59 percent, but much less than soybeans exposed at V7/R1.

Soybeans exposed at full flowering had higher yields than those of V7/R1, but less than those exposed at V2.

Table 1: Losses of non-tolerant soybean exposed to dicamba

Shows average yield and percent yield losses after researchers applied 1/10 of the labeled Engenia rate at different growth stages. Source: University of Nebraska.

Table 1

Growth stage at application	Average yield	Average yield loss
Check (no dicamba)	59 bushels per acre	0%
Early vegetative (V2)	24 bushels per acre	59%
Late vegetative/early flowering (V7/R1)	3 bushels per acre	95%
Full flowering (R2)	19 bushels per acre	68%

Dicamba exposure dose

Similar to injury symptoms, the impact on yield increases with the level of dicamba exposure.

Research: Nebraska

Findings from the **Nebraska study** <https://cropwatch.unl.edu/2018/research-impact-dicamba-drift-non-dicamba-tolerant-soybeans> include:

- Even very small concentrations of dicamba (1/1000 of the labeled rate) at V2 reduced yields by an average of three bushels per acre.
- As the exposure increased to 1/10 of the labeled rate, yield losses approached 60 percent (Figure 2).

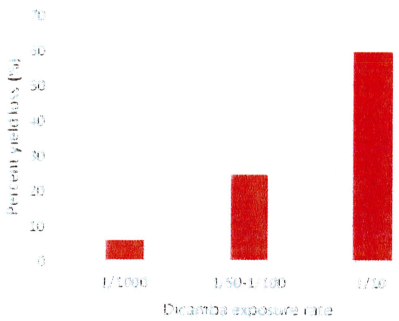

Figure 2: Percent yield loss of non-tolerant soybean at V2 to varying micro-rates of dicamba. Source: University of Nebraska.

Research: Purdue

Similar research at Purdue in 2009 and 2010 studied eight dicamba rates ranging from 1/10,000 to 1/25 of the labeled rate.

They found dicamba reduced yields of non-tolerant soybeans by 10 percent with exposures as low as 1/1064 to 1/510 of the labeled rate. Keep in mind, a 1/1000 rate is equivalent to 1/10 of one teaspoon per acre.

These studies looked at single exposures of dicamba at different rates and soybean growth stages. To date, no data describe yield effects on soybean exposed more than once.

Environmental effects

Drought conditions during reproductive growth stages can influence yield.

In the Purdue study, one of the site-years received only 2.75 inches of rain from July through September. The drought stress amplified dicamba exposure's impact on yield. Even at an extremely low rate of 1/3333 of the labeled rate, yields were reduced by 10 percent.

Sources

Hager, A. (2017). **The dicamba dilemma in Illinois: Facts and speculations** <http://bulletin.ipm.illinois.edu/?p=3942> .

Ikley, J. & Johnson, B. (2017). **Response of Roundup Ready soybean yield to dicamba exposure** <https://ag.purdue.edu/btny/weedscience/Documents/Response%20of%20Roundup%20Ready%20Soybean%20Yield%20to%20Dicamba%20 .

Knezevik, S. (2018). **Research on the impact of dicamba micro-rates on non-tolerant soybean** <https://cropwatch.unl.edu/2018/research-impact-dicamba-drift-non-dicamba-tolerant-soybeans> .

Jeffrey Gunsolus, Extension weed scientist

Reviewed in 2018

1 October 2018

Response of Non–Dicamba-Resistant Soybean to Dicamba As Influenced by Growth Stage and Herbicide Rate

Spencer McCown, Tom Barber, Jason K. Norsworthy

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Weed Technology, 32(5):513-519 (2018). https://doi.org/10.1017/wet.2018.64

Abstract

Introduction of the Roundup Ready® Xtend system (Monsanto Co., St. Louis, MO) provides an alternative weed management option for growers, but of concern is the risk of dicamba injury to sensitive crops, particularly soybean from off-target movement and tank contamination. Experiments were conducted to determine the response of soybean to low rates of dicamba over a wide range of application timings. Two glufosinate-resistant varieties (HBK 4950LL–indeterminate and HALO 5.45LL–determinate) commonly grown in Arkansas were chosen for these studies. Two rates of dicamba, 2.18 and 8.75 g ae ha^{-1} (1/256 × and 1/ 64 × of the POST labeled rate for dicamba-resistant soybean), were applied at two vegetative (V4, V6) and six reproductive (R1 to R6) growth stages. Compared to the nontreated control, dicamba applied during late vegetative and early reproductive growth of soybean caused leaf injury, plant height reduction, and seed yield loss for both soybean cultivars. Averaged across dicamba rates applied at R1, soybean seed yield was reduced 14% for the HBK 4950LL cultivar and 19% for the HALO 5.45LL cultivar. Averaged over rates, dicamba applied at R1 to the HALO 5.45LL and HBK 4950LL soybean resulted in 48% and 43% visible injury 4 wk after treatment, respectively. Grain yield was similar to that of the nontreated control when dicamba was applied at the later reproductive stages averaged across rates.

Nomenclature: Glufosinate; dicamba; soybean, *Glycine max* (L.) Merr

Citation Download Citation

Spencer McCown, Tom Barber, and Jason K. Norsworthy "Response of Non–Dicamba-Resistant Soybean to Dicamba As Influenced by Growth Stage and Herbicide Rate," *Weed Technology* 32(5), 513-519, (1 October 2018). https://doi.org/10.1017/wet.2018.64

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FarmProgress

Mindy Ward

DOING THE WORK: Kevin Bradley, MU Extension weed specialist, has been studying issues surrounding dicamba at University of Missouri research centers around the state.

10 things university research teaches us about dicamba

Weed scientist says spraying other herbicides before and after dicamba drift increases injury to soybeans.

Mindy Ward | Dec 23, 2019

University of Missouri Extension weed scientist Kevin Bradley bolded and underlined the word "university" because he's "mad at the industry, the companies" who have not contributed to identifying and solving issues surrounding dicamba.

"The things that we have learned about dicamba since it came out have come from concerned university scientists, not just here, but all over," Bradley told a group of 300 crop consultants, chemical and seed representatives, and industry professionals during the MU Crop Conference in Columbia, Mo.

"A lot of you don't get that," he added. "You just listen to what your local rep says, and you just go with it." He challenged them to probe deeper and visit with university experts when they need more information.

He offered 10 ideas from years of research from across the nation regarding dicamba use for 2020 and beyond:

1. Herbicide applications can hurt. When farmers use other herbicide applications days before or after a dicamba drift event, injury severity increases on non-Xtend soybeans. Researchers at Purdue University found injury to soybeans is worse when Liberty or Roundup was applied — either one to three days before a drift event, or one to three days after a drift event — than without an application. Why? The research attributes it to the fact that an application of a product was made that had an adjuvant. "If dicamba is sitting on leaf," Bradley added, "then you just made it so that dicamba goes into that soybean plant."

2. Water helps. Irrigation or rainfall likely reduces aerial movement of dicamba. If you make an application of dicamba, rainfall it is a good thing, Bradley said. Pretty soon after, it will reduce the likelihood of volatility. So the sooner after application that you can get a rainfall or irrigation without messing up your uptake on the weeds, the better it is.

3. Lifting from leaves. University of Tennessee, University of Minnesota and Purdue University researchers found dicamba volatility is greater coming off leaves. They looked at more surfaces, but overall found volatility was greater from leaves than soil.

4. Dewy day effect. Where dew is present, dicamba volatility increases. If there is dew on a leaf and Xtendimax, Fexapan or Engenia is applied, Bradley says, it increases the likelihood it will volatilize.

5. Soil pH problems. Dicamba volatility is greater if applied to soils with lower pH.

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YIELD LOSS IS REAL: Data from university trials prove that yield loss occurs from dicamba drift. One symptom of damage is leaf cupping shown here.

6. Tank interference. Dicamba volatility is greater if applied with glyphosate or in a low spray tank pH. "Glyphosate does lower spray tank pH for sure," Bradley said. "But regardless of whether you have glyphosate or not, if your spray tank is low, it's going to be more volatile coming out of that tank."

7. Yield loss exists. "There's yield loss with dicamba. Period," Bradley said. "I still have people trying to fight me on this one, but just about every university that has had a weed scientist in it for the past 30-plus years has shown this over and over and over." Non-Xtend soybeans are extremely sensitive to dicamba and will experience yield loss depending on dose and stage of growth at the time of applications.

8. **High temp troubles.** Higher temperatures increase the likelihood of dicamba volatility. Bradley said this university data is why states such as Illinois have a cutoff for dicamba application dates and a temperature cutoff at 85 degrees F.

9. **Inversion impact.** Temperature inversions play a major role in dicamba movement. MU has been out in the front on this research, starting six years ago showing how temperature inversions work and what role they play in increasing drift and off-target movement of herbicide spray droplets. MU has proven that inversions interact with dicamba vapor movement, Bradley said.

10. **Long-lasting instability.** The new dicamba products can experience volatility as much as 72 hours after initial application, Bradley says. While he's been warning of it for years, recently his findings were published in the Journal of Environmental Quality. "We did 20-some studies to be able to say that if you make an application, I can still detect dicamba in the air, in that field, for 72 hours after that application made," he said. He said it could be longer, but they did not test just how long after six days.

Extended volatility was a huge finding for the industry and one, Bradley contends, companies still are not going to say is correct. "That is fine," he said, "but there's the peer review process and blind review and publishing and everything else. There's a bunch of scientists that say it is good work, and it is real."

Source URL: https://www.farmprogress.com/crops/10-things-university-research-teaches-us-about-dicamba

ARKANSAS STATE PLANT BOARD

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COMMENT LETTER

APRIL 22, 2021

EXHIBIT 5

5/37

BANVEL® + 2,4-D

For use on Conservation Reserve Program Land, Fallow Systems (Between Crop Applications), General Farmstead, Sorghum, Grass (Hay or Silage), Pastures, Rangeland, Sugarcane, and Wheat

Active Ingredients:*

Dimethylamine salt of dicamba (3,6-dichloro-o-anisic acid)	12.4%
Dimethylamine salt of 2,4-dichlorophenoxyacetic acid**	35.7%
Inert Ingredients:	51.9%
Total	100.0%

* This product contains 10.3% 3,6 dichloro-o-anisic acid (dicamba) or 1 pound per gallon (120 grams per liter) and 29.6% 2,4-D or 2.87 pounds per gallon (344 grams per liter).
** Isomer specific by AOAC method 978.05, 15th Edition.

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DANGER / PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

FIRST AID	
IF IN EYES:	Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
IF SWALLOWED:	Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.
IF ON SKIN OR CLOTHING:	Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
IF INHALED:	Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible.
NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate gastric lavage.	
HOT LINE NUMBER	
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. FOR 24-HOUR EMERGENCY MEDICAL ASSISTANCE: Call PROSAR at 1-866-303-6952 or 1-651-632-8946 if calling from outside the U.S. FOR CHEMICAL EMERGENCY: Spill, leak, fire, exposure, or accident call CHEMTREC at 1-800-434-9300 or 1-703-527-3887 if calling from outside of the U.S.	

EPA Reg. Number: 66330-287
EPA Est. No. 68323-TX-1
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Manufactured For:
Arysta LifeScience North America Corporation
15401 Weston Parkway, Suite 150
Cary, NC 27513

ACCEPTED
with COMMENTS
In EPA Letter Dated:
10 FEB 2009
Under the Federal Insecticide, Fungicide, and Rodenticide Act as amended, for the pesticide registered under EPA Reg. No.
66330-287

Filename: Banvel + 2,4-D (287-100907)(DCI Clean).doc

Do not apply under circumstances where spray drift may occur to food, forage, or other plantings that might be damaged or crops thereof rendered unfit for sale, use or consumption. Susceptible crops include, but are not limited to, cotton, okra, flowers, grapes (in growing stage), fruit trees (foliage), soybeans (vegetative stage) ornamentals, sunflowers, tomatoes; beans, and other vegetables, or tobacco. Small amounts of spray drift that may not be visible may injure susceptible broadleaf plants.

Other State and Local Requirements

Applicators must follow all state and local pesticide drift requirements regarding application of 2,4-D herbicides. Where states have more stringent regulations, they must be observed.

Equipment

All aerial and ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates.

Aerial application requirements: The boom length must not exceed 75% of the wingspan or 90% of the rotor blade diameter. Release spray at the lowest height consistent with efficacy and flight safety. Do not release spray at a height greater than 10 feet above the crop canopy unless a greater height is required for aircraft safety. This requirement does not apply to forestry or rights-of-way applications.

Ground application requirements: Do not apply witha nozzle height greater than 4 feet above the crop canopy.

SENSITIVE CROP PRECAUTIONS

Banvel + 2,4-D may cause injury to cotton, okra, flowers, grapes (in growing stage), fruit trees (foliage), soybeans (vegetative stage) ornamentals, sunflowers, tomatoes, beans, and other vegetables, or tobacco. These plants are most sensitive to Banvel + 2,4-D during their development or growing stage. FOLLOW THE PRECAUTIONS LISTED BELOW WHEN USING BANVEL + 2,4-D.

- Do not treat areas where either possible downward movement into the soil or surface washing may cause contact of Banvel + 2,4-D with roots of desirable plants such as trees and shrubs.
- Agriculturally approved drift-reducing additives may be used.
- Do not apply Banvel + 2,4-D adjacent to sensitive crops when the temperature on the day of application is expected to exceed 85°F as drift is more likely to occur.

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COMMENT LETTER

APRIL 22, 2021

EXHIBIT 6

Registration Decision for the Continuation of Uses of Dicamba on Dicamba Tolerant Cotton and Soybean

Approved by: _____

Michael Goodis, Director
Registration Division
Office of Pesticide Programs

October 31, 2018

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Days after Planting Spray Prohibition:
Dicamba OTT applications to large weeds provide incomplete control and speed the development of dicamba-resistant weeds by creating an in-field seedbank born from weeds that have bounced back from a dicamba application. Repeated sub-lethal doses to herbicides are known to promote the development of resistance. For this reason, EPA recommends that dicamba OTT uses be used for early season applications rather than late season rescue treatments. Alternative herbicide tools other than dicamba are available to assist with late season weed control. This decision document adds a prohibition on OTT spraying of dicamba 60 days or later after planting cotton and 45 days or later after planting soybeans. Because the majority of dicamba OTT spraying already occurs within these timeframes, the additional burden on growers is expected to be minimal. For those applications that would have occurred outside these timeframes, when plant coverage is significant and the ability of dicamba to reach the soil is reduced, EPA expects to further minimize the potential for off-site movement.

Sunrise/Sunset Timing Restriction:
A revised time-of-day restriction now requires applicators to limit OTT applications of dicamba to at least one hour after sunrise and two hours before sunset. This revision is intended to reduce the possibility of applications being made at times of day when temperature inversions often occur. Inversions can contribute to off-target damage from pesticides by suspending pesticide particles in the air and enabling them to migrate long distances before returning to the ground. All labels with OTT dicamba uses already include advisory language on avoiding inversions and language prohibiting applications between sunset and sunrise. The revised restriction reduces the daily allowed application window by three hours, and is expected to lower the potential for off-target movement of dicamba from physical spray drift but not from volatility. This is because physical spray drift occurs during or shortly after an application is made, while volatility is a secondary transport mechanism that can occur, in the case of dicamba, for days after an application. The new timing restriction will mitigate the scenario of any immediately volatilized dicamba particles entering an inversion during an application but will not lower the possibility of volatilized dicamba particles entering any future inversions occurring over a field after an OTT dicamba application concludes.

Equipment Clean-out Requirements:
Poor hygiene practices for maintaining pesticide application equipment used to spray dicamba has the potential to result in cross-contamination. Because even trace amounts of dicamba can cause crop injury, residues that are accidentally left in application equipment can carry over to subsequent applications to non-dicamba tolerant crops. Equipment clean-out instructions are already on dicamba OTT labels. By adding new advisory language on the subject of application equipment hygiene, however, the Agency intends to raise awareness of this issue among applicators by reiterating the risks of even trace amounts left in the equipment and by offering additional techniques to ensure all parts of application equipment are cleaned, thereby reducing the potential for any dicamba incidents caused by improper cleaning of application equipment.

Endangered Species Buffer:
As mentioned, the list of new label statements in this dicamba decision includes an Endangered Species Protection Requirement of an omnidirectional infield buffer of 110 feet downwind and 57 feet in the other directions. The previously approved label contains a 110-foot downwind buffer for 0.5 pound active ingredient per acre (220 feet for 1 pound active ingredient per acre

Farm Progress

SYMPTOMS: Dicamba herbicide drift injury to non-dicamba resistant soybean varieties in Iowa in 2020 is more widespread than in the past three years.

Dicamba: What does the research say?

Iowa State's Bob Hartzler reviews recent studies investigating factors that influence off-target drift of dicamba herbicide.

Rod Swoboda | Jul 03, 2020

Nearly 20 years ago Iowa State University Extension weed management specialist Bob Hartzler summarized research from the University of Minnesota investigating factors that influence volatilization of dicamba.

The Minnesota research by R. Behrens and W. E. Lueschen is titled "Dicamba volatility" and was published by Weed Science in 1979. The article written by Hartzler was prompted by an increase in off-target injury to soybeans.

This year Iowa is again experiencing widespread damage to soybeans from off-target dicamba movement. ISU Extension field agronomists have reported that this injury is more widespread in 2020 than in the previous three years following registration of over-the-top applications of dicamba to dicamba-tolerant soybean varieties.

In response to these problems, Hartzler has summarized some of the recent research investigating factors that influence off-target movement of dicamba. Not surprising, the recent research mirrors the earlier research. The following is Hartzler's summary report. For his full version complete with graphs and charts to illustrate the latest research results, visit Dicamba: What does the research say?

University of Tennessee research

Mueller, T.C. and L.E. Steckel. 2019. Dicamba volatility in humidones as affected by temperature and herbicide treatment. Weed. Technol. 33:541-546.

Mueller and Steckel at the University of Tennessee evaluated dicamba losses due to volatilization as affected by temperature and tank-mixing with Roundup PowerMax.

Xtendimax with Vapor Grip Technology was applied to soil contained in trays, and then placed inside humidors maintained at different temperatures. As would be expected, dicamba volatilization increased as temperatures increased. Tank-mixing dicamba with glyphosate increased dicamba concentrations in the air by 2.9 to 9.3 times across the temperature ranges evaluated compared to dicamba alone. The addition of Roundup PowerMax (or other glyphosate formulations) to dicamba reduces the pH of the spray solution, and this change in pH has been shown in other research to increase volatilization losses.

University of Missouri research

Bish, M.D., S.T. Farrell, R.N. Lerch, and K.W. Bradley. 2019. Dicamba losses to air after applications to soybean under stable and nonstable atmospheric conditions. J. Env. Q. 48:1675-1682.

Bish et al. measured dicamba concentrations in the air above a soybean canopy sprayed with dicamba. High volume air samplers were positioned 6 inches above the canopy 30 minutes following the application of dicamba (Engenia plus Xtendimax with Vapor Grip Technology). Applications were made during the daytime and evening, the evening applications occurred during stable environmental conditions (low wind speeds). Applications were made according to label restrictions; a drift retardant was included but not glyphosate.

No differences were determined between the two dicamba formulations. Dicamba concentrations in the air above the soybean canopy during the first 8 hours after application was approximately five times greater than at later sampling dates. However, dicamba was still detected three days following the application.

Time of application influenced dicamba presence in the air above the soybean canopy. Evenings were characterized by low wind speeds. Under these conditions higher dicamba concentrations were detected in the air than when dicamba was applied during periods with higher wind speeds. The authors stated the low wind speeds during evening applications could prevent dispersion of dicamba in the atmosphere, resulting in the higher concentrations in the first eight hours after application.

University of Missouri research

Oseland, E., M. Bish, L. Steckel, and K. Bradley. 2020. Identification of environmental factors that influence the likelihood of off-target movement of dicamba. Pest Management. Sci. 76.

In this study, weed scientists at the University of Missouri evaluated factors that influenced whether commercial applications of dicamba on soybean were successful at preventing off-target movement and injury to adjacent crops. They evaluated 135 applications, 45% of the applications were classified as "successful." Applications that had problems with off-target injury had a mean application temperature 3 degrees warmer than successful ones.

Impact of wind speed on application success was less clear. Maximum wind speed on the day of application was inversely related with the chance of success. With most pesticides the primary concern with drift is the movement of spray droplets with wind. They suggested that higher winds could disperse dicamba, reducing the amount of dicamba contacting sensitive plants in the area.

Bradley's group documented higher concentrations of dicamba in the atmosphere when the product was applied during calm conditions (Bish et al. 2019). The likelihood of a successful application decreased with increasing winds the day following application.

The researchers found that the likelihood of an unsuccessful application (off-target injury) increased as the soil pH decreased. They conducted trials with pH-adjusted soil to evaluate volatilization of dicamba off the soil surface. Plastic hoop structures were erected over susceptible soybean. Dicamba was applied to soil contained in 20-inch by 11-inch flats, following application the flats were placed within the hoops for 72 hours to allow volatilization from the soil surface.

Dicamba volatilization increased as pH decreased. It's important to note that it's the pH of the soil surface that will determine vapor loss; pH values from routine soil tests may not be valid for evaluating soil pH influence on volatility. Fields under no-till production or that have surface applications of N likely have a surface pH more acidic than pH provided by a soil test. Other research has shown greater volatilization losses when the pH of the carrier solution is decreased.

Several dicamba formulations were evaluated, and while there were significant differences in vapor loss among formulations, all resulted in measurable soybean injury. All formulations had greatest losses when applied to a soil with a 4.3 pH.

Recent Weed Technology report

Soltani, N. et al. 2020. Off-target movement assessment of dicamba in North America. Weed Technol. 34:318-330.

A recent paper in Weed Technology evaluated off-target movement of dicamba applied to dicamba-resistant (DR) soybean to adjacent susceptible soybean. A combination of dicamba (Xtendimax plus Vapor Grip Technology) plus glyphosate was applied to a block of dicamba resistant soybeans

planted within a field of susceptible soybeans. All applications were made according to label restrictions (sprayer set up, environmental conditions).

To distinguish particle drift from vapor drift (secondary movement) tarps were placed over plants at regular intervals downwind during application. Dicamba symptoms on plants under tarps was attributed to vapor drift since the tarps would intercept spray droplets leaving the treated area during application. Soybean plants were rated at 21 to 28 days after application, and a model was developed to estimate the distance vapor drift would cause 1% and 10% injury.

As experience has shown, the risk of off-target movement is hard to predict. The distance where 10% injury was observed was more than 10 times greater in Arkansas than the other locations. This is likely due to higher temperatures at and following application. At the other locations, secondary movement causing 10% injury ranged from zero feet in Ontario to 16 feet in Wisconsin.

Secondary movement resulted in soybean injury that occurred at all but one location, and the authors concluded that high temperatures associated with low air movement increases the likelihood and magnitude of secondary movement resulting in crop injury.

Hartzler concludes, "All of the aforementioned research supports that secondary movement [volatilization] is a significant contributor to dicamba movement from treated areas. Combining this volatility with the extreme sensitivity of non-resistant soybean varieties makes it essentially impossible to use current formulations of dicamba in a landscape where both resistant and susceptible soybeans are grown without significant crop injury."

Source URL: https://www.farmprogress.com/herbicide/dicamba-what-does-research-say

FarmProgress

Mindy Ward

DOING THE WORK: Kevin Bradley, MU Extension weed specialist, has been studying issues surrounding dicamba at University of Missouri research centers around the state.

10 things university research teaches us about dicamba

Weed scientist says spraying other herbicides before and after dicamba drift increases injury to soybeans.

Mindy Ward | Dec 26, 2019

University of Missouri Extension weed scientist Kevin Bradley bolded and underlined the word "university" because he's "mad at the industry, the companies" who have not contributed to identifying and solving issues surrounding dicamba.

"The things that we have learned about dicamba since it came out have come from concerned university scientists, not just here, but all over," Bradley told a group of 300 crop consultants, chemical and seed representatives, and industry professionals during the MU Crop Conference in Columbia, Mo.

"A lot of you don't get that," he added. "You just listen to what your local rep says, and you just go with it." He challenged them to probe deeper and visit with university experts when they need more information.

He offered 10 ideas from years of research from across the nation regarding dicamba use for 2020 and beyond:

1. Herbicide applications can hurt. When farmers use other herbicide applications days before or after a dicamba drift event, injury severity increases on non-Xtend soybeans. Researchers at Purdue University found injury to soybeans is worse when Liberty or Roundup was applied — either one to three days before a drift event, or one to three days after a drift event — than without an application. Why? The research attributes it to the fact that an application of a product was made that had an adjuvant. "If dicamba is sitting on leaf," Bradley added, "then you just made it so that dicamba goes into that soybean plant."

2. Water helps. Irrigation or rainfall likely reduces aerial movement of dicamba. If you make an application of dicamba, rainfall it is a good thing, Bradley said. Pretty soon after, it will reduce the likelihood of volatility. So the sooner after application that you can get a rainfall or irrigation without messing up your uptake on the weeds, the better it is.

3. Lifting from leaves. University of Tennessee, University of Minnesota and Purdue University researchers found dicamba volatility is greater coming off leaves. They looked at more surfaces, but overall found volatility was greater from leaves than soil.

4. Dewy day effect. Where dew is present, dicamba volatility increases. If there is dew on a leaf and XtendiMax, Fexapan or Engenia is applied, Bradley says, it increases the likelihood it will volatilize.

5. Soil pH problems. Dicamba volatility is greater if applied to soils with lower pH.

YIELD LOSS IS REAL: Data from university trials prove that yield loss occurs from dicamba drift. One symptom of damage is leaf cupping shown here.

6. Tank interference. Dicamba volatility is greater if applied with glyphosate or in a low spray tank pH. "Glyphosate does lower spray tank pH for sure," Bradley said. "But regardless of whether you have glyphosate or not, if your spray tank is low, it's going to be more volatile coming out of that tank."

7. Yield loss exists. "There's yield loss with dicamba. Period," Bradley said. "I still have people trying to fight me on this one, but just about every university that has had a weed scientist in it for the past 30-plus years has shown this over and over and over." Non-Xtend soybeans are extremely sensitive to dicamba and will experience yield loss depending on dose and stage of growth at the time of applications.

8. High temp troubles. Higher temperatures increase the likelihood of dicamba volatility. Bradley said this university data is why states such as Illinois have a cutoff for dicamba application dates and a temperature cutoff at 85 degrees F.

9. Inversion impact. Temperature inversions play a major role in dicamba movement. MU has been out in the front on this research, starting six years ago showing how temperature inversions work and what role they play in increasing drift and off-target movement of herbicide spray droplets. MU has proven that inversions interact with dicamba vapor movement, Bradley said.

10. Long-lasting instability. The new dicamba products can experience volatility as much as 72 hours after initial application, Bradley says. While he's been warning of it for years, recently his findings were published in the Journal of Environmental Quality. "We did 20-some studies to be able to say that if you make an application, I can still detect dicamba in the air, in that field, for 72 hours after that application made," he said. He said it could be longer, but they did not test just how long after six days.

Extended volatility was a huge finding for the industry and one, Bradley contends, companies still are not going to say is correct. "That is fine," he said, "but there's the peer review process and blind review and publishing and everything else. There's a bunch of scientists that say it is good work, and it is real."

Source URL: https://www.farmprogress.com/crops/10-things-university-research-teaches-us-about-dicamba

EXHIBIT 6-Page12

Weed Technology

www.cambridge.org/wet

Dicamba volatility in humidomes as affected by temperature and herbicide treatment

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Research Article

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Abstract

This research examined dicamba measurements following an application to soil inside a humidome. The dicamba formulations examined were the diglycolamine (DGA) and diglycolamine plus VaporGrip® (DGA+VG), both applied with glyphosate. Post-application dicamba measurements were related to ambient temperature, with more dicamba detected as the temperature increased. There also appeared to be a minimum temperature of ~15 C at which dicamba decreased to low levels. The addition of glyphosate to dicamba formulations decreased the spray mixture pH and increased the observed dicamba air concentrations. Adding glyphosate to DGA+VG increased detectable dicamba air concentrations by 2.9 to 9.3 times across the temperature ranges examined. Particle drift would not be expected to be a factor in the research, as applications were made remotely before treated soil was transported into the greenhouse. The most probable reason for the increased detection of dicamba at higher temperatures and with mixtures of glyphosate is via volatility.

Introduction

Weed management was notably changed with the introduction of glyphosate-resistant (GR) crops to the United States (Corbett et al. 2004; Burke et al. 2005; Culpepper 2006; Norsworthy et al. 2012). Reliance on glyphosate caused a shift in the weed spectrum through extreme selection pressure, and GR biotypes of key weed species have become common (VanGessel 2001; Culpepper 2006; Steckel 2007; Norsworthy et al. 2012). These pests are not only the most common but are also the most troublesome weed species in the United States (Van Wychen 2016). A recent response to this biological resistance was the introduction of dicamba-resistant crops (Bish and Bradley 2017; Werle et al. 2018) that allow for the POST application of dicamba on soybean [*Glycine max* (L.) Merr.] and cotton (*Gossypium hirsutum* L.). New formulations of dicamba (3,6 dichloro-2-methoxybenzoic acid) have been registered for use in these dicamba-resistant crops. Monsanto introduced a diglycolamine (DGA) salt of dicamba that includes an acetic acid/acetate pH modifier, referred to in this manuscript as DGA+VG (Hemminghaus et al. 2017; MacInnes 2017). BASF also introduced *N,N*-Bis-(3-aminopropyl) methylamine salt for use in dicamba-resistant crops (Werle et al. 2018).

Dicamba injury to sensitive non-target broadleaf vegetation has been extensively reported in recent years (Bish and Bradley 2017; Hager 2017). The reports from these off-target dicamba injury cases have been attributed to a number of elements. Some of the possible factors are the use of nonlabeled nozzles that produce small droplets that stay suspended for several minutes after application, spraying into temperature inversions where small- or medium-sized droplets may remain suspended in cooler air near the surface of the earth, or the possibility that spray droplets deposited on soil in the target field but later moved via wind or water while on the soil (Anonymous 2018a, 2018b). These reports of off-target dicamba injury to broadleaf plants could also be due to volatility (Bish and Bradley 2017; Hager 2017).

Numerous researchers have reported volatility of different dicamba salts (Behrens and Lueschen 1979; Busey et al. 2003; Sciumbato et al. 2004; Strachan et al. 2010; Johnson et al. 2012; Penner and Michael 2014; Bish and Bradley 2017; Egan and Mortensen 2012). The seminal paper on dicamba volatility was written by Behrens and Lueschen (1979), who reported that "soybean drift injury from dicamba has been attributed to spray particle drift rather than vapor drift because the commercial dimethylamine (DMA) salt formulation of dicamba is considered to be low in volatility." This statement is similar to those of some agrochemical company representatives in recent years about the newer formulations of dicamba. MacInnes (2017) reported that volatility is usually a small contributor to potential off-target movement of the DGA salt of dicamba. Moreover, he reported that the VaporGrip® technology (DGA+VG) reduces the volatility potential of the DGA salt of dicamba even further and that spray drift and tank contamination are the main contributors to potential off-target damage. Behrens and Lueschen (1979) also stressed the importance of air temperature and the sprayed surface affecting dicamba and relied mainly on a bioassay of soybean. This soybean bioassay was recently used by others to

Table 1. Descriptive and summary aspects of runs conducted to examine dicamba concentrations following application.

Runs	Start date, 2017	Average temperature	Average relative humidity	Applied dicamba dose	Applied dicamba dose	DGA[a] + Gly[b]	(DGA + VG)[c] + Gly	(DGA + VG)
		C	%	kg ae ha^{-1} ± SE	ng		pH of spray solution	
1	Sept 21	34.1	49.2	0.41 ± 0.09	7,964,000	4.8	5.0	
2	Sept 26	30.8	66.8	0.48 ± 0.05	9,323,700	4.7	4.7	
3	Oct 3	24.9	79.7	0.44 ± 0.02	8,502,000		5.1	5.8
4	Oct 11	29.1	47.2	0.39 ± 0.03	7,761,000	4.8	5.0	5.8
5	Oct 17	21.5	66.8	0.42 ± 0.07	8,158,200	5.0	5.4	7.1
6	Oct 31	17.9	62.7	0.43 ± 0.04	8,656,000	4.8	5.2	5.8
7	Nov 8	14.1	77.5	0.50 ± 0.08	9,853,000	5.0	5.3	6.3
8	Nov 15	14.6	60.6	0.50 ± 0.09	9,852,000	4.9	5.2	5.8
All				0.446	8,758,000			

[a] DGA indicates that diglycolamine salt formulation of dicamba was used.
[b] Gly denotes glyphosate was applied as the formulated product, which in this test was a potassium salt containing additional surfactants.
[c] DGA+VG denotes the DGA formulation of dicamba with "VaporGrip®" added, which is acetic acid/acetate included as a pH modifier.

measure dicamba movement under field conditions. Egan and Mortensen (2012) reported that the DGA formulation substantially reduced dicamba vapor drift in comparison with the DMA formulation and that temperature was positively correlated with DMA dicamba vapor drift. Others have also employed plant bioassays as indicators of dicamba activity (Egan and Mortensen 2012; Penner and Michael 2014; Sciumbato et al. 2004). Although the sensitivity of these bioassays is adequate, a quantitative assessment via air sampling followed by chemical extraction and analysis may yield more direct indications of herbicide behavior (Mueller et al. 2013; Mueller 2015; Ouse et al. 2018). This research aimed to examine the effect of temperature, dicamba formulation, and glyphosate addition on dicamba concentrations. In this report, the authors use the term concentration to refer to relative amounts of dicamba measured in the air volume and or in the chemical extracts.

The humidome research in this report was conducted at different dates during autumn, thus at different ambient temperatures to examine the effect of temperature on dicamba behavior. Additionally, studies were conducted to elucidate any effect pH changes in the spray solution might have on dicamba concentrations. Preliminary reports show that dicamba volatility could be reduced by increasing spray pH, thus favoring the dicamba salt moiety (Hemminghaus et al. 2017; MacInnes 2017). Our hypothesis was that dicamba volatility would be greater at higher temperatures and also at lower spray solution pH, perhaps as a result of the addition of glyphosate.

Materials and Methods

This research was conducted in the fall of 2017 and used methods from previous research by Mueller et al. (2013) and Gavlick et al. (2016). Expendable supplies included plastic trays to hold the sprayed material, clear plastic vented humidity domes, soil, and the aforementioned sampling media. Plastic trays 28 by 54 by 6 cm in depth (https://www.greenhousemegastore.com) were individually covered by an 18-cm-tall vented humidity dome that was specifically sized to be attached directly to these trays. To facilitate sample collection, a 10-cm-diam hole was cut using a hole saw into the vented dome, and two small holes (2 cm diam) were also cut to allow for air entrance on the opposite side of the vented dome. A Sequatchie loam soil that had no previous herbicide use was utilized (34% sand, 48% silt, 18% clay, 1.3% organic matter, pH 6.2, and cation exchange capacity 11 mEq g^{-1}).

This research utilized air samplers previously demonstrated to be effective in collecting dicamba from the atmosphere (Mueller et al. 2013). The air sampler and associated sample collection hardware are available from Hi-Q Environmental Products Co. (San Diego, CA, USA; https://www.hi-q.net/). Key components of the air samplers included the air sampler main unit equipped with digital readouts for both cumulative air flow and time interval sampling, a microfiber filter paper holder, and a PolyUrethane Filter (PUF) sampling module (Hi-Q products, San Diego, CA). The sampling media used was a 10-cm-diam HEPA-type high-purity binderless 99.99% efficiency borosilicate glass fiber filter paper and an 8-cm-long polyurethane vapor collection substrate. Additional parts included glass cartridges with stainless-steel screens for the PUF head sampler and the associated single Teflon end caps with silicone O-rings.

The herbicide mixtures were applied to screened (2 mm size), air-dried soil with each tray filled half-full. The same volume and weight of soil (~4 kg) was used in each tray. Soil and trays were used a single time and then discarded. The same air flow (55 L min^{-1}) was used through all experiments. The humidomes were located in the same area for all experiments. All herbicide applications were made using commercially available formulations (Table 1). There were three DGA herbicide treatments: the DGA formulation of dicamba plus glyphosate (DGA+Gly) and the DGA formulation including pH modifier (VaporGrip®) with or without glyphosate (Table 1). The dicamba salt in DGA and DGA+VG is identical (Anonymous 2018b). To examine the effect of adding glyphosate, the commercial formulation of Roundup PowerMax (a potassium salt of glyphosate) (Monsanto, St Louis, MO) was used. Figures and tables use the abbreviation "Gly" to denote these formulated glyphosate applications.

Herbicide applications were made at 0.5 kg ae ha^{-1} of dicamba. The dosage of glyphosate was 1.0 kg ae ha^{-1}. No additional surfactants or adjuvants were added. Herbicide mixtures were prepared in 1.0-L bottles and applied using a spray volume of 190 L ha^{-1} using a flat-fan nozzle operated 50 cm above the target application site. Treatments were made with a CO_2-pressurized backpack sprayer in this research. Spray solution pH was measured for each spray bottle (Table 1). Later research showed no effect of CO_2 pressure on spray pH using this water source (data not shown). McCormick (1990) showed that pressurizing water using CO_2 decreased spray pH, but our results conflict with this observation, perhaps because the commercial formulations used in this research provided different pH modifiers or because a different water source was used.

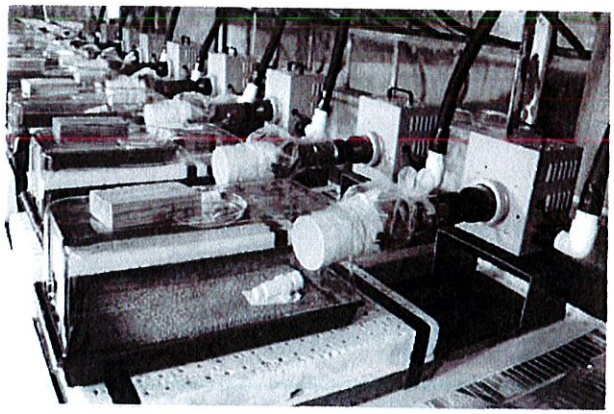

Figure 1. Humidome setup for research showing soil in tray, HOBO temperature, and relative humidity sensor, sampling connections, and air sampler.

To validate herbicide doses applied to each tray, a 12.5-cm diam qualitative filter paper was placed in the front of each tray prior to herbicide application. The herbicides were applied as previously described. After application, the filter paper was removed and placed into a 250-ml LDPE Nalgene bottle and stored at −20 C until chemical analysis. The herbicides were applied to the trays outside of the greenhouse and away from where the air samplers were to be operated. The humidomes were inside the greenhouse, which has no cooling pads or intake fans. This physical separation avoids the confounding factors of potential aerosol droplets possibly being pulled into the air samplers at a later time. Herbicide applications were made at approximately 0700 on the day of application (Table 1). The trays were in a double-stack tray configuration, with two identical trays nested one inside the other. The top tray contained the dry soil, and the lower tray rested directly on the concrete surface outside the greenhouse. After spraying, only the top tray was transported into the greenhouse, where the air samplers were connected to each unit. The bottom trays were discarded. Trays were left undisturbed for 10 min after herbicide application, after which they were placed on plastic greenhouse carts with minimum soil disturbance and moved into the greenhouse. The treated trays were brought into the greenhouse through a double-door system, and care was taken so as not to allow any spray drift particles to enter into the greenhouse. Preliminary research including nontreated control plants indicated that no dicamba spray particles were entering the greenhouse, and systematic efforts to eliminate spray droplets from the greenhouse were made. All dicamba concentrations in samples from nontreated soil plus trays were below the limit of detection (data not shown).

Where the filter paper had been on the treated surface, a temperature/relative humidity data logger was placed into each tray and was located directly under the sampling port (Figure 1). The temperature samplers (HOBO model PRO V2, Onset Company, Bourne, MA) were set to operate at 30-min intervals. These units were re-set prior to each experiment. Previous calibrations of the HOBO units showed acceptable accuracy and agreement among the samplers (±0.1% when tested at 20 C, 30 C, and 40 C).

Each tray was covered with a clear plastic dome and attached to a single air-sampling unit (Figure 1). Air samplers were equipped with a microfiber filter paper in front of a PUF sampling medium as previously described. Each air-sampling unit was re-zeroed for cumulative flow and elapsed time. The samplers operated at 55 L min^{-1}, the lowest flow rate that was stable given the electronic sensors that these samplers utilize. A concern was that this air flow would cause turbulence that could move soil particles. To verify that air speed was not excessive, air flows inside an assembled humidome were measured using an anemometer (Fisherbrand 06-662-73; https://www.traceable.com), which had a dynamic flow rate down to 0.05 m s^{-1}. The highest flow rate was measured immediately in front of an inlet hole on the inlet side of the humidome, and a maximum air speed of 0.09 m s^{-1} was detected. This is less than the minimum speed of 1.34 m s^{-1} to make a labeled application under field conditions (Anonymous 2018b). Measurements inside the humidome were less than 0.05 m s^{-1} and indicated that turbulence sufficient to forcibly move soil particles into the air would not be expected. Also, if soil particles were swept aloft by excessive air flows, this same phenomenon would occur at night and in the daytime, yet the dicamba measurements showed a strong diurnal pattern, suggesting a different primary mechanism for dicamba movement.

Sampling intervals for all experiments were 12 h. The exact amount of time was recorded for each sampler and used to calculate the dicamba collected per unit of time. The samplers automatically measured the cumulative flow. Each air sampler was connected to the respective treated tray plus cover using a 10-cm-diam PVC plastic pipe that was affixed to the sampling apparatus. A polyethylene plastic bag with one end cut off was placed on both ends of the plastic pipe, and rubber bands or wire ties were used to seal this connection (Figure 1). Preliminary research showed minimum air leakage and adequate sample collection with these methods. Each sampler had an exhaust port attached to a flexible hose that was vented outside of the greenhouse. The elevation of the treated tray plus vent cover matched that of the sampling apparatus. As no dicamba was detected in the PUF sampling medium, dicamba was not expected to return into the greenhouse from the vent tubes.

There were eight runs of the test with two replications per run of each treatment in a randomized complete block design. The blocking was done on table location. All units were in a single greenhouse on a single set of long tables (Figure 1). The temperature in the greenhouse was not directly modulated. Thus, some temperatures were approximately 40 C, whereas other experiments were conducted at less than 20 C. This approach was used to more closely reflect field conditions in which dicamba would be applied.

These research methods generated three types of samples. First, samples were collected on 12.5-cm-diam qualitative filter papers to verify herbicide application. Second, microfiber filter papers as the primary sample collection medium were used in air samplers. Third, PUF samples were utilized for the secondary sample collection media. Sampling media were placed directly into a small container upon collection at respective intervals and stored in a −20 C freezer until later chemical analysis. As the research progressed, it was observed that all dicamba measurements were noted on the microfiber filter paper only, and the PUF sampling media did not contain any dicamba. To facilitate ease of sample collection, the PUF sampling media were only collected at the end of each experiment, stored at −20 C, and later extracted.

The microfiber filter papers were extracted with 40 ml of methanol for 1.5 h on a reciprocating shaker operated at 80 cycles min^{-1}. Concentrations were corrected for dilution and recovery (80%, preliminary data). PUF sampling media were sectioned into four long, narrow sections using an 8-cm box cutter knife cleaned with methanol between individual samples. The four sections were placed into a single 1,000-ml bottle, and 400 ml of methanol

were added and the bottle shaken as previously described. An aliquot of each extraction was passed through a 0.45-μm filter directly into a LC MS vial for later chemical analysis. The samples collected at the time of dicamba application were extracted by shaking in methanol for 1 h, filtration, and then analysis by LC using a diode array detector (Agilent model G1315B; Agilent Technologies, Santa Clara, CA; https://www. Agilent.com) operated at 230 nm.

Dicamba concentrations were determined using an external standard technique of analytical standards of dicamba acid (Chemservice, Westchester, PA; https://www.Chemservice.com) dissolved in methanol. An Agilent Liquid Chromatograph (1100 series) in line with an Agilent single-quad 6120 mass spectrometer (Agilent.com) was used for analysis. A Luna 3-μm particle size, 25 cm by 4.6 mm C-18 100 A column (Phenomenex, Torrance, CA; http://www.phenomenex.com) at 35 C was used to separate components of interest from the matrix. The mobile phase at 0.7 ml min^{-1} used a gradient program of acetonitrile and water, and both mobile-phase components were fortified with 0.1% formic acid. Initial conditions were 50% acetonitrile/50% water, followed by a linear gradient to 95% acetonitrile at 4 min, held constant at 95% acetonitrile for 9 min, and then returned to original conditions for equilibration prior to the next injection. The parameters for this MS system were drying-gas flow 12.0 L min^{-1}, nebulizer pressure at 35 bar, drying-gas temperature at 250 C, vaporizer temperature at 200 C, capillary at 2,500 V, corona at 0 V, charging at 1,200 V, and single-ion monitoring at 219.0 from 4.0 to 7.0 min. The retention time of dicamba acid in the system was 5.0 min, with an apparent limit of detection of 0.1 ppb. Once samples were extracted, they were stored in a dark freezer at −20 C and were analyzed within 3 d. Inside the greenhouse, nontreated control sampling media were included to confirm a lack of dicamba contamination. Within each LC MS analytical sequence, numerous solvent blanks were included to verify that dicamba carryover from previous injections was not present.

Descriptive aspects and summary results of the experiments are given in Table 1. There were duplicate samplers at each measurement interval in all experiments. The observed dicamba values were sorted into five temperature ranks from 15 C to 30 C in increments of 5 C (<15 C; 15 to 19.9 C; 20 to 24.9 C; 25 to 30 C, >30 C). The three herbicide treatments were then examined within that temperature range to determine formulation treatment differences. Although there was variation within the 12-h time interval, an average value would provide some indication of the relationship to dicamba concentrations. Showing the minimum and maximum temperature was considered, and these data presentations were misleading. Each experiment was conducted such that the temperature inside a particular humidome was independent from others, but conditions were largely affected by the temperature inside the greenhouse and the amount of sunshine at that time. Temperatures at night tended to be more consistent, as there was less variability in temperature. Also, the temperatures inside the humidomes increased on sunny days but would not increase as much on cloudy days. Relative humidity was also examined, and no clear patterns were apparent in the analysis. This is not to say that humidity does not play a specific role in dicamba volatility, and this is an important area of future investigations. Future research efforts will explore how to relate the observed environmental observations to dicamba concentrations.

Data were analyzed using the GLMMIX procedure of SAS (ver. 9.4; SAS Institute; Cary, NC). Main effects and interactions were tested using the appropriate expected mean square values as recommended by McIntosh (1983). Each run was considered an environment sampled at random from a population of environments as suggested by Carmer et al. (1989). Considering runs (environments) a random effect permits inferences about treatments to be made over a range of environments (Carmer et al. 1989; Blouin et al. 2011). With this model construction, all runs were pooled together as suggested by Carmer et al. (1989). Environments and replication (nested within environments), and all interactions containing these effects, were declared random effects in the model. Herbicide treatments were considered fixed. Type III statistics were used to test the fixed effects, and least square means were separated using Fisher's protected LSD at $P = 0.05$.

Data were sorted as described above by herbicide treatment, and the dicamba concentration was regressed against the observed mean temperature for that humidome and that sampling interval. Data were fit to a three-parameter logistical model (Equation 1) as suggested by Thornley and Johnson (1990). The three parameters were A, B, and X_0, where A is the estimate of asymptote or total dicamba detected, X_0 is the inflection point or where the curve goes from increasing at an increasing rate to increasing at a decreasing rate, B is the estimate of the duration of change. Data regressions were accomplished using SigmaPlot 14 (SYSTAT Software; Chicago, IL).

$$Y = A/(1 + \exp[-(\text{temp} - X_0)/B]) \quad [1]$$

Results and Discussion

The observed temperature was warmer for the first two runs, with the average temperature being >30 C (Table 1). Temperatures declined as later runs were conducted, which reflects the seasonality of this region. No supplemental heat was added to the greenhouse during this research. The last two runs, which were conducted in November, had an average temperature <15 C. This explains why there were more data points at low temperatures compared with higher ones.

The target dose for each experiment was 0.5 kg ae ha^{-1}. Averaged over all runs, the measured dose was 0.48 kg ae ha^{-1} (Table 1). This variation within each experiment was deemed acceptable and provided a good foundation for the subsequent chemical collection, sampling, and analysis.

The experiment had three herbicide regimes, all using a DGA salt of dicamba. The DGA+Gly treatment was considered to be a "standard treatment" showing the highest level of dicamba volatility, based on previous field studies.

Dicamba is a weak acid, and the molecular state (whether protonated or deprotonated) may have a substantial impact on the volatility (MacInnes 2017). The pH of each spray solution was measured (Table 1). The pH of DGA+Gly treatments was always ≤5.0 and ranged from 4.7 to 5.0 (Table 1). The pH of the DGA+VG mixture was lower when the treatment included glyphosate (~6.0 compared to <5.0) (Table 1). These data clearly showed that adding glyphosate lowered the solution pH. The DGA+VG label states that dicamba has the potential to volatilize in lower-pH spray mixtures (Anonymous 2018b). Therefore, the authors suggest that the addition of glyphosate to the DGA+VG spray solution lowered the pH and probably helps to explain why this treatment had higher dicamba volatility (Table 2).

As ambient temperature increased, dicamba concentrations also increased (Table 2, Figure 2). Temperatures below 15 C had <5% dicamba concentrations compared to temperatures >30 C. This direct relationship continued through each temperature range

Table 2. Dicamba concentrations from humidomes as affected by temperature and herbicide mixtures.

Temperature rank	Herbicide	Number of observations	Mean dicamba amount	Dicamba concentration standard error	Mean separation[d]
C		n	ng		
>30	DGA[a]+Gly[b]	14	17,284	1,780	A
>30	DGA+VG[c]+Gly	22	13,016	2,480	B
>30	DGA+VG	8	4,527	2,110	C
25–30	DGA+Gly	5	5,683	1,260	NS
25–30	DGA+VG+Gly	8	3,697	1,350	NS
25–30	DGA+VG	0	No data		
20–25	DGA+Gly	12	2,694	567	A
20–25	DGA+VG+Gly	15	2,979	577	A
20–25	DGA+VG	9	882	644	B
15–20	DGA+Gly	13	1,158	132	A
15–20	DGA+VG+Gly	14	767	130	B
15–20	DGA+VG	13	156	140	C
<15	DGA+Gly	18	708	128	A
<15	DGA+VG+Gly	18	361	128	B
<15	DGA+VG	19	39	131	C

[a] DGA indicates that the diglycolamine salt formulation was used.
[b] Gly denotes glyphosate formulated product, which in this test was a potassium salt containing additional surfactants.
[c] DGA+VG denotes the DGA formulation with "VaporGrip" added, which is acetic acid/acetate included as a pH modifier.
[d] Values that share a letter within a temperature rank are not different at the 5% significance level.

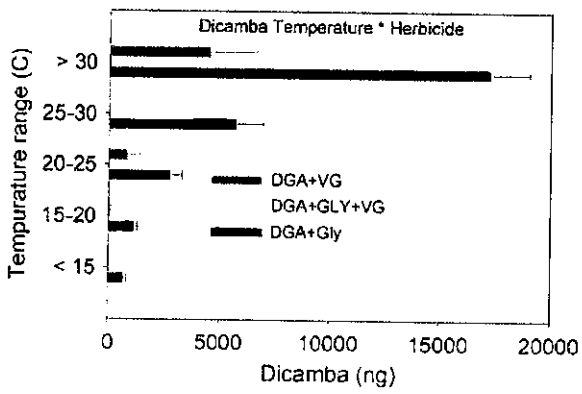

Figure 2. Dicamba measurements in 12-h intervals from within humidomes as affected by herbicide treatments and temperature grouping. Data shown represent mean ± standard error. Actual values and mean separation are given in Table 2.

(Table 2). Within each 5 C range, the order of measured dicamba was DGA+VG < DGA+VG+Gly < DGA+Gly, with statistical differences in three of five temperature ranks (Table 2). Observations from 20 C to 30 C followed the same general trend, with dicamba concentrations being intermediate between the lower and higher temperatures. One peculiarity of the dataset was the lack of observations from 25 to 30 C for the DGA+VG treatment. As the temperature was not controlled in this research, those particular treatments were not present in any of the studies as a consequence of greenhouse space and humidome number constraints. With observations directly above and below the 25 to 30 C range, our results still imply a consistent trend over the observed temperature range.

These data show that the addition of the VG to the DGA formulation reduced dicamba volatility (Table 2, Figure 2). The addition of glyphosate to the DGA+VG increased dicamba concentrations at each temperature range tested, from 2.9 to 9.3 times

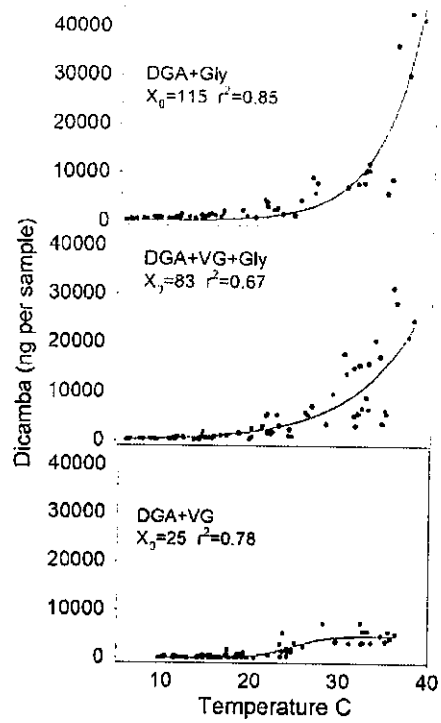

Figure 3. Dicamba measurements in 12-h intervals regressed against average temperature within the humidome for three herbicide regimes. Data points represent individual measurements. Regression equation is fit to a three-parameter sigmoidal model, $Y = A/(1 + \exp[-(\text{time} - X_0)/B])$, and parameter X_0 is a calculated value where 50% of the observed dicamba would be measured. Goodness of fit of the model to data is shown by r^2 value.

that of DGA+VG alone. It should be noted that the dicamba concentrations below 15 C were low (708, 361, and 39 ng compared with 17,284, 13,016, and 4,527 ng for the >30 C), part of the reason for the larger relative increase. The DGA formulation in this study always contained glyphosate and consistently had the greatest dicamba measurements.

Regression analysis showed that X_0 (the inflection point) was 25 for the DGA+VG, 83 for the DGA+VG+Gly, and 115 for the DGA+Gly treatment (Figure 3). The reason for this parameter estimate to increase with the treatments that contained glyphosate is that the magnitude of dicamba detected as temperature increased with those treatments was much greater and never reached an inflection point. Therefore, the inflection point was estimated to be beyond the temperatures measured. By stretching out the temperature range over 3-fold to reach the inflection point, this parameter estimate would suggest that adding glyphosate to DGA+VG increased dicamba volatility by a factor of 3.3 times (83/25 = 3.3) averaged across all temperatures in this study. Moreover, a 4.6-fold increase in dicamba was detected with the DGA+Gly treatment compared with the DGA+VG treatment. Asymptote values would mirror this, where parameter A from glyphosate-containing treatments was far beyond the data range. The authors are not aware of a mechanism that would involve glyphosate increasing soil particles moving dicamba. As such, the most plausible explanation for the increased detection of dicamba was that glyphosate lowered the solution pH thereby resulting in more dicamba being in acid form, which is known to increase volatility (Anonymous 2018b).

Based on these data, it would appear that dicamba volatility would nearly cease at 15 C and lower (Figure 3). Greater dicamba

detections at higher temperatures are consistent with previous findings (Behrens and Lueschen 1979; Egan and Mortensen 2012). These results would also agree with field observations of dicamba off-target injury by scientists in 2017, where applications made during warmer temperatures in late June and July correlated with more off-target dicamba movement complaints (Hager 2017). These results would also be consistent with the dicamba DMA salt label, which states, "do not spray Banvel adjacent to sensitive crops when the temperature of the day of application is expected to exceed 29 C as drift is more likely to occur" (Anonymous 2018c).

The dicamba concentrations detected in this research were not due to aerosol particles directly from the spraying operation, as the applications were made outside of the greenhouse. The dicamba on soil particles could be part of the dicamba that was detected, and the kinetic energy of the system as the temperature increased could have encouraged small soil particles to move upward into the air stream and then into the samplers. However, the addition of glyphosate greatly increased the dicamba detection in this study. This result would point to increased volatilization, as glyphosate added to DGA+VG consistently lowered the solution pH. It would also be in agreement with the registrant label of the DGA+VG f ormulation that lower pH can increase volatility (Anonymous 2018b). The new 2018 DGA+VG label now has added directions to add a pH modifier if spray solution pH is below 5.0 (Anonymous 2018b). Our research would agree with the solution pH recommendation on the new registrants' label.

Data generated from this research provide insight into factors that are most influential in dicamba movement following a spray application. Temperature appears to be a major contributor of dicamba volatility, with greater dicamba detections at higher temperatures. The addition of glyphosate and the resulting decrease in spray mixture pH increased dicamba concentrations compared with the DGA+VG formulated product alone. DGA+VG showed lower dicamba compared with the DGA+Gly treatment, although detectable dicamba residues were noted in every sample. The most probable reason for the increased detection of dicamba at higher temperatures and with mixtures of glyphosate is via volatility.

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References

Anonymous (2018a) Engenia label. http://www.cdms.net/ldat/ldDG8028.pdf. Accessed: February 24, 2019

Anonymous (2018b) XtendiMax label. http://www.cdms.net/ldat/ldDF9006.pdf. Accessed: February 24, 2019

Anonymous (2018c) Banvel label. http://www.cdms.net/ldat/ld279008.pdf. Accessed: February 24, 2019

Behrens R, Lueschen WE (1979) Dicamba volatility. Weed Sci 27:486–493

Bish MD, Bradley KW (2017) Survey of Missouri pesticide applicator practices, knowledge, and perceptions. Weed Technol 31:165–177

Blouin DC, Webster EP, Bond JA (2011) On the analysis of combined experiments. Weed Technol 25:165–169

Burke IC, Troxle SC, Askew SD, Wilcut JW, Smith WD (2005) Weed management systems in glyphosate-resistant cotton. Weed Technol 19:422–429

Busey P, Broschat TK, Johnston DL (2003) Injury to landscape and vegetable plants by volatile turf herbicides. Horttechnol 13:650–652

Carmer SG, Nyquist WE, Walker WM (1989) Least significant differences in combined analyses of experiments with two- or three-factor treatment designs. Agron J 81:655–672

Corbett JL, Askew SD, Thomas WE, Wilcut JW (2004) Weed efficacy evaluations for bromoxynil, glufosinate, glyphosate, pyrithiobac, and sulfosate. Weed Technol 18:443–453

Culpepper AS (2006) Glyphosate-induced weed shifts. Weed Technol 20: 277–281

Egan JF, Mortensen DA (2012) Quantifying vapor drift of dicamba herbicides applied to soybean. Environ Toxicol Chem 31:1023–1031

Gavlick WK, Wright DR, MacInnes A, Hemminghaus JW, Webb JK, Yermolenka VI, Su W (2016) A method to determine the relative volatility of auxin herbicide formulations. Pages 24–32 *in* GossGR, ed, Pesticide Formulation and Delivery Systems, Vol 35, Pesticide Formulations, Adjuvants, and Spray Characterization in 2014. West Conshohocken, PA: ASTM International

Hager A (2017) Observations of Midwest weed extension scientists. Page 98 *in* Proceedings of the 72nd Annual Meeting of the North Central Weed Science Society. St. Louis, MO: North Central Weed Science Society

Hemminghaus JW, MacInnes A, Zhang J, inventors; Monsanto Technology LLC, assignee (2017) Low volatility herbicidal compositions. US Patent 9, 743, 664 B2

Johnson VA, Fisher LR, Jordan DL, Edmisten KE, Stewart AM, York AC (2012) Cotton, peanut, and soybean response to sublethal rates of dicamba, glufosinate, and 2, 4-D. Weed Technol 26:195–206

MacInnes A (2017) VaporGrip• technology: how it works and its benefits. Abstracts of the Weed Science Society of America 45:160. Westminster, CO: Weed Science Society of America

McCormick RW (1990) Effects of CO_2, N_2, air and nitrogen salts on spray solution pH. Weed Technol 4:910–912

McIntosh MS (1983) Analysis of combinted experiments. Agron J 75:163–155.

Mueller TC (2015) Methods to measure herbicide volatility. Weed Sci 63: 116–120

Mueller TC, Wright DR, Remund KM (2013) Effect of formulation and application time of day on detecting dicamba in the air under field conditions. Weed Sci 61: 586–593

Norsworthy JK, Ward SM, Shaw DR, Llewellyn RS, Nichols RL, Webster TM, Bradley KW, Frisvold G, Powles SB, Burgos NR, Witt WW, Barrett M (2012) Reducing the risks of herbicide resistance: best management practices and recommendations. Weed Sci 60 (Special Issue I):31–62

Ouse DG, Gifford J M, Schleier J, Simpson DD, Tank HH, Jennings CJ, Annangudi SP, Valverde-Garcia P, Masters RA (2018) A new approach to quantify herbicide volatility. Weed Technol 32:691–697

Penner D, Michael J (2014) Bioassay for evaluating herbicide volatility from soil and plants. Pages 36–43 *in* Sesa C, ed., Pesticide Formulation and Delivery Systems, Vol 33: Sustainability: Contributions from Formulation Technology. ASTM International.

Sciumbato AS, Chandler JM, Senseman SA, Bovey RW, Smith KL (2004) Determining exposure to auxin-like herbicides. II. Practical application to quantify volatility. Weed Technol 18:1135–1142

Steckel LE (2007) The dioecious Amaranthus spp.: here to stay. Weed Technol 21:567–570.

Strachan SD, Casini MS, Heldreth KM, Scocas JA, Nissen SJ, Bukun B, Lindenmayer RB, Shaner DL, Westra P, Brunk G (2010) Vapor movement of synthetic auxin herbicides: Aminocyclopyrachlor, aminocyclopyrachlor-methyl ester, dicamba, and aminopyralid. Weed Sci 58:103–108

Thornley JHM, Johnson JR (1990) Plant and Crop Modeling: A Mathematical Approach to Plant and Crop Physiology. New York: Academic. Page 78

VanGessel MJ (2001) Glyphosate-resistant horseweed from Delaware. Weed Sci 49:703–705

Van Wychen L (2016) 2015 baseline survey of the most common and troublesome weeds in the United States and Canada. Weed Science Society of America National Survey Data Set http://wssa.net/wp-content/uploads/2015_Weed_Survey_Final.xlsx. Accessed: February 1, 2019

Werle R, Oliverira MC, Jhala AJ, Procotor CA, Rees J, Klein R (2018) Survey of Nebraska farmer's adoption of dicamba-resistant soybean technology and dicamba off-target movement. Weed Technol 32:754–761

RapidTables

Celsius to Fahrenheit Chart

Celsius (°C) to Fahrenheit (°F) chart.

Celsius to Fahrenheit conversion table

Celsius (°C)	Fahrenheit (°F)
-50 °C	-58.0 °F
-40 °C	-40.0 °F
-30 °C	-22.0 °F
-20 °C	-4.0 °F
-10 °C	14.0 °F
-9 °C	15.8 °F
-8 °C	17.6 °F
-7 °C	19.4 °F
-6 °C	21.2 °F
-5 °C	23.0 °F
-4 °C	24.8 °F
-3 °C	26.6 °F
-2 °C	28.4 °F
-1 °C	30.2 °F
0 °C	32.0 °F
1 °C	33.8 °F
2 °C	35.6 °F
3 °C	37.4 °F
4 °C	39.2 °F
5 °C	41.0 °F
6 °C	42.8 °F
7 °C	44.6 °F
8 °C	46.4 °F
9 °C	48.2 °F
10 °C	50.0 °F
20 °C	68.0 °F
30 °C	86.0 °F
40 °C	104.0 °F
50 °C	122.0 °F
60 °C	140.0 °F
70 °C	158.0 °F
80 °C	176.0 °F
90 °C	194.0 °F
100 °C	212.0 °F
200 °C	392.0 °F

TEMPERATURE CONVERSION

- Celsius to Kelvin
- Celsius to Fahrenheit
- Fahrenheit to Celsius
- Fahrenheit to Kelvin
- Kelvin to Celsius
- Kelvin to Fahrenheit

RAPID TABLES

- Recommend Site
- Send Feedback
- About

300 °C	572.0 °F
400 °C	752.0 °F
500 °C	932.0 °F
600 °C	1112.0 °F
700 °C	1292.0 °F
800 °C	1472.0 °F
900 °C	1652.0 °F
1000 °C	1832.0 °F

Celsius to Fahrenheit formula ▶

See also

- Celsius to Fahrenheit converter
- Fahrenheit to Celsius converter
- Celsius to Kelvin converter
- Celsius to Rankine converter
- Electric conversion
- Power conversion

Write how to improve this page

Your message ...

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 7

1 panelists that would like to ask a question
2 before we come back to you, as you've already
3 asked one time.
4 Do we have any other plant board members
5 that would like to ask a question?
6 MR. MILBURN: This is Scott. I was
7 curious, are the results consistent across a
8 wide temperature range?
9 CHAIRMAN FULLER: Thank you for that, Mr.
10 Scott.
11 MR. WESTBURG: So temperature certainly
12 has an effect on the volatility; and, matter of
13 fact, it's a key driver. It's one of the
14 reasons why we do some of these studies at
15 elevated temperatures so that, you know, it's a
16 worse case scenario.
17 I think that was clearly shown in the data
18 that I provided by Tom Mueller, that they're in
19 that night cycle, that 12-hour period of, you
20 know, evening to perhaps early morning. You
21 can see that the volatility there is
22 essentially zero.
23 Those numbers, keep in mind, were across
24 the whole 12-hour period and so the amount of
25 volatility you see there is essentially zero.

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 8

New Requirements for Applying Dicamba on Soybeans in 2021

University of Illinois Extension
Pesticide Safety Education Program

Engenia by BASF
XtendiMax with Vapor Grip Technology by Bayer
FeXapan plus Vapor Grip Technology by Corteva
Tavium by Syngenta

Requires an approved pH-buffering agent, also known as a volatility reducing agent, be tank mixed with dicamba products prior to all applications

Additional Recordkeeping items

Must consult the FieldWatch sensitive crop registry before application
www.fieldwatch.com

Prohibits applications when the wind is blowing toward an adjacent residential area

Requires a down-wind buffer of 240 feet and 310 feet in areas where listed endangered species are located

Do not apply after June 20, 2021

Prohibits applications when the wind is blowing toward any Illinois Nature Preserves Commission site* that is adjacent to the proposed field of application

Temperature restriction of 85 degrees Fahrenheit

The intent of these additional restrictions is to reduce the potential for off-target movement of these products, thereby reducing the po-tential for possible adverse impacts to dicamba-sensitive crops/areas. Please follow all the specified instructions on the manufacturer's label. For more information–https://www2.illinois.gov/Pages/news-item.aspx?ReleaseID=22533
*www.dnr.illinois.gov/conservation/Pages/Chemical-Drift-Awareness-Areas.aspx

Illinois Extension
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

College of Agricultural, Consumer and Environmental Sciences
University of Illinois, U.S. Department of Agriculture, Local Extension Councils Cooperating.
University of Illinois Extension provides equal opportunities in programs and employment.

EXHIBIT 8-Page1

KeyCite Yellow Flag - Negative Treatment
Proposed Regulation

West's Illinois Administrative Code
Title 8. Agriculture and Animals
Chapter I. Illinois Department of Agriculture
Subchapter I. Pesticide Control
Part 250. Illinois Pesticide Act (Refs & Annos)

8 Ill. Adm. Code 250.230

250.230 Use of Pesticides Containing Dicamba on Soybeans

Currentness

Emergency action effective Feb. 05, 2021.

In addition to the requirements of the federally-approved labels, all use on soybeans of pesticides containing dicamba shall comply with the following requirements:

a) Temperature Restriction

A pesticide containing dicamba shall not be applied on soybeans if the air temperature at the field at the time of application is over 85 degrees Fahrenheit or if the National Weather Service's forecasted high temperature for the nearest available location for the day of application exceeds 85 degrees Fahrenheit. Local National Weather Service forecasts are available at https://www.weather.gov.

b) Cut-off Date Restriction

Application on soybeans of a pesticide containing dicamba shall not be made after June 20 of each year.

c) Before applying a pesticide containing dicamba on soybeans, the applicator shall consult the FieldWatch sensitive crop registry (https://www.fieldwatch.com) and comply with all associated recordkeeping and label requirements.

d) Application on soybeans of a pesticide containing dicamba shall not be made if the wind is blowing toward:

1) Any Illinois Nature Preserves Commission site that is adjacent to the field of application; or

2) An adjacent residential area.

e) Any violation of the requirements of this Section shall be considered a use contrary to label directions (precautionary statements, sites, rates, restricted use requirements) and shall be assessed the associated point value of 3 (see Section 24.1(4)(E)(1) of the Illinois Pesticide Act [415 ILCS 60]) for purposes of determining the appropriate administrative action or penalty authorized by Section 24.1 of the Act.

Credits

(Source: Added by emergency rulemaking at 45 Ill. Reg. 2071, effective February 5, 2021, for a maximum of 150 days)

Current through rules published in the Illinois Register Volume 45, Issue 11, March 12, 2021. Some sections may be more current, see credits for details.

8 ILAC § 250.230, 8 IL ADC 250.230

End of Document

2021 Dicamba

FREQUENTLY ASKED QUESTIONS

Updated: January 21, 2021

On October 27, 2020, the U.S. Environmental Protection Agency (EPA) announced that registrations for **Engenia, Xtendimax, FeXapan,** and **Tavium** herbicides were extended through 2025.

The following frequently asked questions (FAQs) have been developed by the Office of Indiana State Chemist (OISC) to address many of the issues that have been raised regarding legal use of agricultural dicamba-containing products in Indiana. Updates to these FAQs are posted at https://www.oisc.purdue.edu/pesticide/dicamba.html.

1. Are there any Indiana restrictions on the purchase and use of "older formulation" dicamba products (NOT Engenia, Fexapan, Xtendimax, or Tavium)?

Yes, all agricultural herbicides containing at least 6.5% dicamba were classified as **State Restricted Use Pesticides (RUPs)** in Indiana, effective 2018. These older dicamba products must be sold, distributed, tracked, applied, and recorded the same as every other RUP in Indiana. These older formulations are **NOT** labeled for over-the-top post emergence use on soybeans.

2. Are there any Indiana state-specific restrictions on the use of dicamba herbicides in 2021?

Yes, just like in 2020, Indiana is pursuing a **June 20th** application cut-off date for the 2021 use season. But unlike 2020, the application cut-off date would now apply to all RUP dicamba herbicide products formulated with at least 6.5% dicamba. The purpose of the cut-off date is to address the unacceptably high number of off-target movement incidents and resulting adverse effects associated with later season dicamba applications. OISC has collected data since 2017 that suggests off-target incidents can be reduced by over half by observing the June 20th application cutoff-date This same data reflects that late season use of <u>any</u> agricultural dicamba herbicide can be overly problematic.

3. Will there be any changes to how OISC responds to complaints of off-target movement of dicamba herbicides in 2021?

Starting in 2019 OISC initiated a dicamba response procedure that allowed complainants to request a full compliance investigation or an investigation to document dicamba exposure only. The procedural change was intended to preserve OISC resources that had been overwhelmed by dicamba complaints and to provide a response option that had been requested by some of the complainants in 2017 and 2018. Based on the documented success of these changes in 2019 and 2020, OISC will continue to provide these options in 2021. In addition, OISC will extend these investigation response options to off-target movement complaints for all herbicides, not just dicamba.

4. Do mixers, loaders, handlers, and spray equipment cleaners of the soybean dicamba herbicides (Engenia, Fexapan, Xtendimax, Tavium) need to be certified applicators?

Yes, anyone who is responsible for any part of the use and application process, which includes mixing, loading, application, or cleaning dicamba application equipment, must become a certified and licensed private applicator or a commercial applicator (Category 1). Workers are not required to be certified and licensed if they are involved in nothing more than transportation of unopened dicamba containers, transportation of "hot loads" that were mixed by a certified and licensed applicator, or unloading of a pre-mixed "hot load" directly from the transportation vehicle into a spray rig.

5. Do I need to be "dicamba trained" again in 2021 to use the soybean dicamba herbicides?

Yes, the 2020 label requirements for the soybean herbicides accepted by EPA again include the annual training requirement for all applicators, handlers, loaders, mixers, and spray equipment handlers. This mandatory annual dicamba training is in addition to the requirement to be a licensed commercial applicator or private applicator.

6. Who will provide the mandatory annual dicamba training?

Annual dicamba training in Indiana is now provided almost exclusively by the soybean dicamba product registrants *(BASF, Bayer, Corteva, Syngenta).* This registrant training may be in person or virtual group training or may be self-directed online training. OISC recommends that you contact your dicamba supplier or visit registrant websites for details. OISC will also accept dicamba training that has been accepted by any other state pesticide regulatory agency.

7. Have the soybean dicamba herbicide record keeping requirements changed for 2021?

Yes, in 2021, the applicator records must also include the identity of and a receipt for the label-required **pH buffering adjuvant/volatility reduction adjuvant** and **drift reduction adjuvant** mixed in every tank mix of the soybean dicamba herbicides. If you use the record keeping form developed by Purdue Pesticide Programs in PPP-119, you will satisfy the 2021 dicamba record keeping requirements for Indiana.

8. The labels for the soybean products require that I keep a record of when I checked DriftWatch for the presence of nearby sensitive crops or sites. Can I also use that site to check for the presence nearby non-DT soybeans?

Yes, effective January 1, 2019, a new FieldWatch feature called CropCheck has allow growers to map row crops like soybeans, cotton, and corn that may be sensitive to some nearby pesticide applications. Access CropCheck through www.driftwatch.org. Note that checking CropCheck for nearby non-DT row crops does not eliminate the requirement for the applicator to ensure those neighboring crops are dicamba-tolerant before application.

9. The dicamba soybean labels require, "If wind direction shifts such that the wind is blowing toward neighboring sensitive crops or residential areas, STOP the application." What documentation will OISC require as evidence that the applicator has met this requirement?

The label requires record keeping of wind direction at the start and finish of the application. However, the applicator must also constantly monitor wind speed and direction throughout the entire application and include a notation in the application records documenting the time-period that the application was stopped due to a change in wind speed or direction. Otherwise, the assumption will be that the application was continuous, without stopping, as required.

10. Application records must include start and stop times. If the wind direction shifts toward neighboring sensitive crops or residential areas, and the applicator stops the application, but doesn't pick up the application until the following day, is that a separate application or the same one?

Yes, stopping an application and resuming it on a following day will be considered a separate application. Accurate records must be maintained. Each time the certified applicator starts or stops an application it needs to be recorded, regardless of which applicator is performing the application or which day.

11. Are there any application timing restrictions on the use of soybean dicamba products?

Yes, these products may not be applied at night or during the period two hours before sunset through one hour after sunrise. In addition, the 2021 labels prohibit application after the R1 growth stage of the soybeans and after June 30th. However, additional state restrictions in both Indiana and Illinois will set the application cut-off date in 2021 at **June 20th.** So the more restrictive June 20th cut-off date will apply in Indiana.

12. Are there still prohibitions against spraying when wind is blowing toward sensitive crops, plants, and residential areas?

Yes, the 2021 labels still prohibit application when the wind is blowing toward adjacent sensitive crops, plants, and residential areas.

13. What does the term "adjacent" mean on these labels?

While the various dicamba soybean product labels for 2021 have eliminated the use of the term "neighboring" and have settled on the term "adjacent" for describing sensitive sites to be protected, neither the EPA nor the product registrants have defined the limits of what they mean by the term "adjacent". Therefore, in Indiana the term "adjacent" shall mean any protected crop or site that exists, partially or in whole, within 240' of the edge of the target soybean field. EPA's improved risk assessments in 2020 and increased levels of drift protection applied to the 2021 labels suggest that significant downwind drift past 240' should not be a concern. However, applicators should be advised that this improved risk assessment and safety margin does not eliminate applicator regulatory liability under the Indiana state drift rule for off-target adverse effects resulting from drift past 240'. Both label restrictions and the state drift rule will be considered by OISC when investigating off-target movement complaints.

14. Do sensitive crops include adjacent organic crops?

Yes, although certified organic crops are not specifically listed on the labels as an example of a sensitive crop, the fact remains that any pesticide residues in these crops, whether causing a visible adverse effect or not, might make these crops unfit for sale, use, or consumption as organic. Therefore, certified organics are sensitive crops.

15. Are the 2021 buffer requirements for dicamba soybean products the same as on previous labels?

No. There are several significant changes. First, the standard 110' downwind buffer from last year has been increased to 240'. The applicator must always maintain a 240' downwind buffer between the last treated row and the nearest downwind field/area edge (in the direction the wind is blowing). In addition, for dicamba soybean applications in counties with protected endangered species (**Greene, Harrison, Lagrange, Lake, Porter, Posey),** a 57' buffer is required on every side of the target soybean field plus a 310' downwind buffer. Applicators must check the EPA website https://www.epa.gov/endangered-species/bulletins-live-two-view-bulletins for restrictions prior to application.

16. Is a buffer required on just one side of a dicamba-treated soybean field when the application does not occur in one of the Endangered Species Act counties?

Sometimes yes, but oftentimes buffers are required on several sides of the target field. Applicators should remember that buffers will often be required on two or more downwind sides of a target field. If wind direction is not constant and non-target fields and sites are not positioned completely perpendicular to one another, two or more sides of the target soybean field may require a buffer. A 45-degree wind direction would require a buffer on at least two downwind sides.

17. Are downwind buffers required next to in-field grass/vegetative waterways?

No, downwind dicamba buffers would not be required next to these in-field areas. U.S. EPA and OISC have concluded that grass waterways should be treated the same as Conservation Reserve Program (CRP) areas. Both CRP and grass waterways include voluntary conservation agricultural areas that could be used for cropland production. Therefore, buffers are not required to protect these voluntary conservation practice areas.

18. The dicamba labels prohibit application during a temperature inversion. How can I determine if a temperature inversion exists in or near my target field prior to application?

Just like other weather measurements, there is no one official method to determine if temperature inversion conditions exist in a field. However, temperature inversion indicators can include nights with limited cloud cover and light-to-no wind, ground fog, smoke not rising, dust hanging over a road, or the presence of dew or frost. Just like other weather data documentation, a time, date, and GPS-stamped photograph taken in the field from your smartphone can serve to supplement and support your determination that an inversion did not exist. In addition, tools to help you identify the likelihood of a temperature inversion can include smoke generators in the

target field, phone apps, and the Inversion Tester by Spoton ®. (*Reference to any specific equipment or brand does not suggest product endorsement by OISC*).

19. Weather apps are now available to help an applicator predict and measure weather. Are these apps certified or official-enough for my weather measurements?

It is important that you understand that these apps rely on weather data collected at weather stations that may or may not be close to your target application field. Most of these apps use computer software to estimate the weather conditions at your location. Therefore, there will be some margin of error or inaccuracy. While not perfect, these weather-predicting apps are usually better than an applicator's guess or estimate made without measuring equipment used at boom height in the target field at the times of application. Research on the in-field reliability of weather apps is available at https://vimeo.com/309554246/b04fd38bf2 or on the OISC Dicamba Update website page under Ground Truthing Weather Apps for Wind Speed and Temperature Inversions.

20. I have a spray injection system that allows me to keep my dicamba and my other on-sprayer herbicides and adjuvants in separate tanks. The point of injection for each tank is at the spray boom. Can I use the same spray system for dicamba and other herbicides or adjuvants if those other products are not on the list of label-approved tank mixes?

No, you cannot use the injection spray system to circumvent the tank mix restrictions. The labels of these products require that the entire spray system, including tanks, pumps, booms, lines, screens, and nozzles be cleaned according to label directions, both before and after application. Therefore, since it is impossible to clean the spray booms before or after injection of these dicamba products, this type of application is prohibited. Even very small amounts of dicamba left in spraying systems have caused significant cross contamination and non-target impact issues.

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 9

Daily High Temperatures for
Jonesboro, Ark.—April 1, 2020-July 31, 2020
Data from U.S. Dept. of Commerce, NOAA

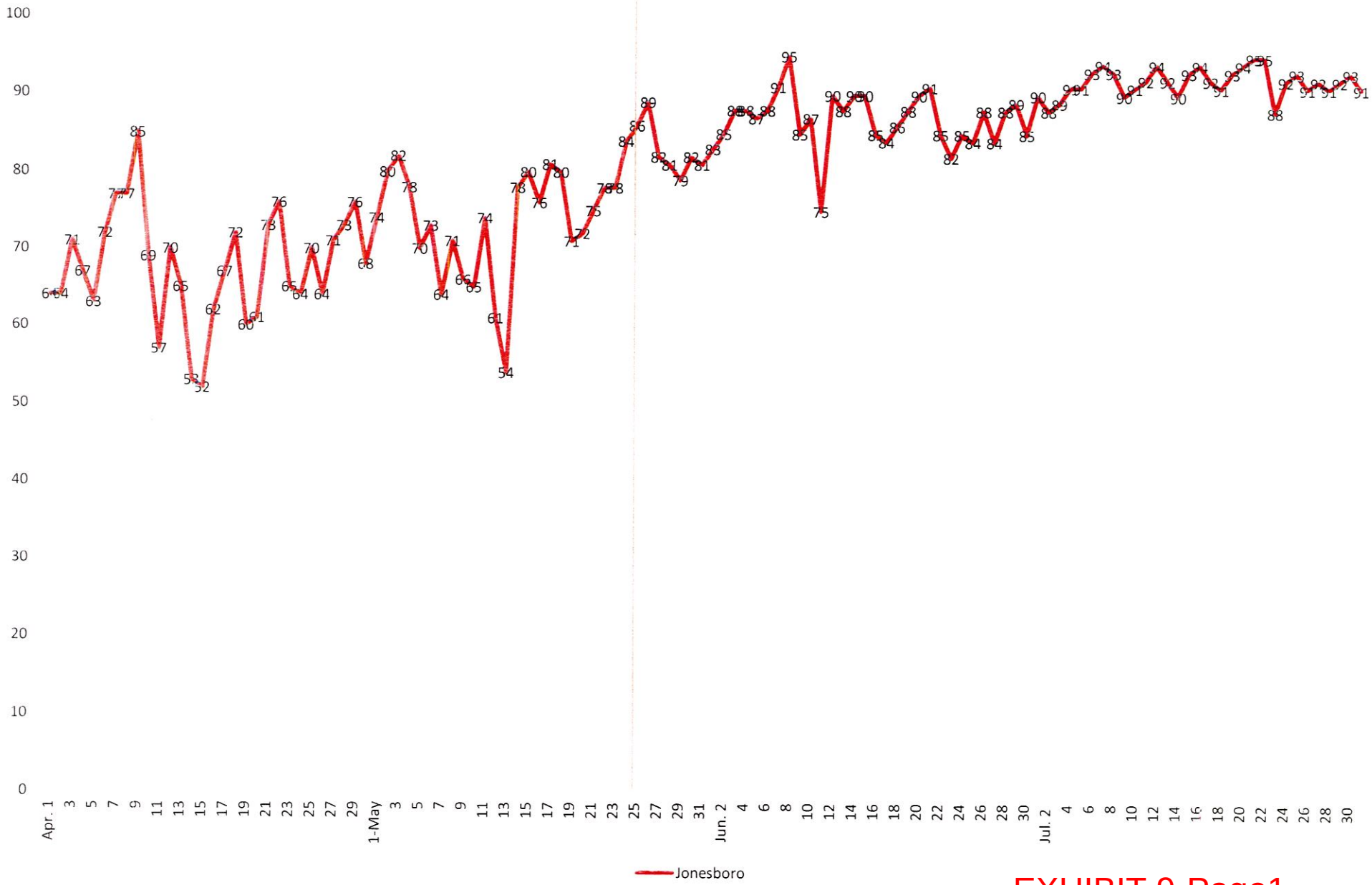

EXHIBIT 9-Page1

Daily High Temperatures for
Jonesboro, Ark.—April 1, 2019-July 31, 2019
Data from U.S. Dept. of Commerce, NOAA

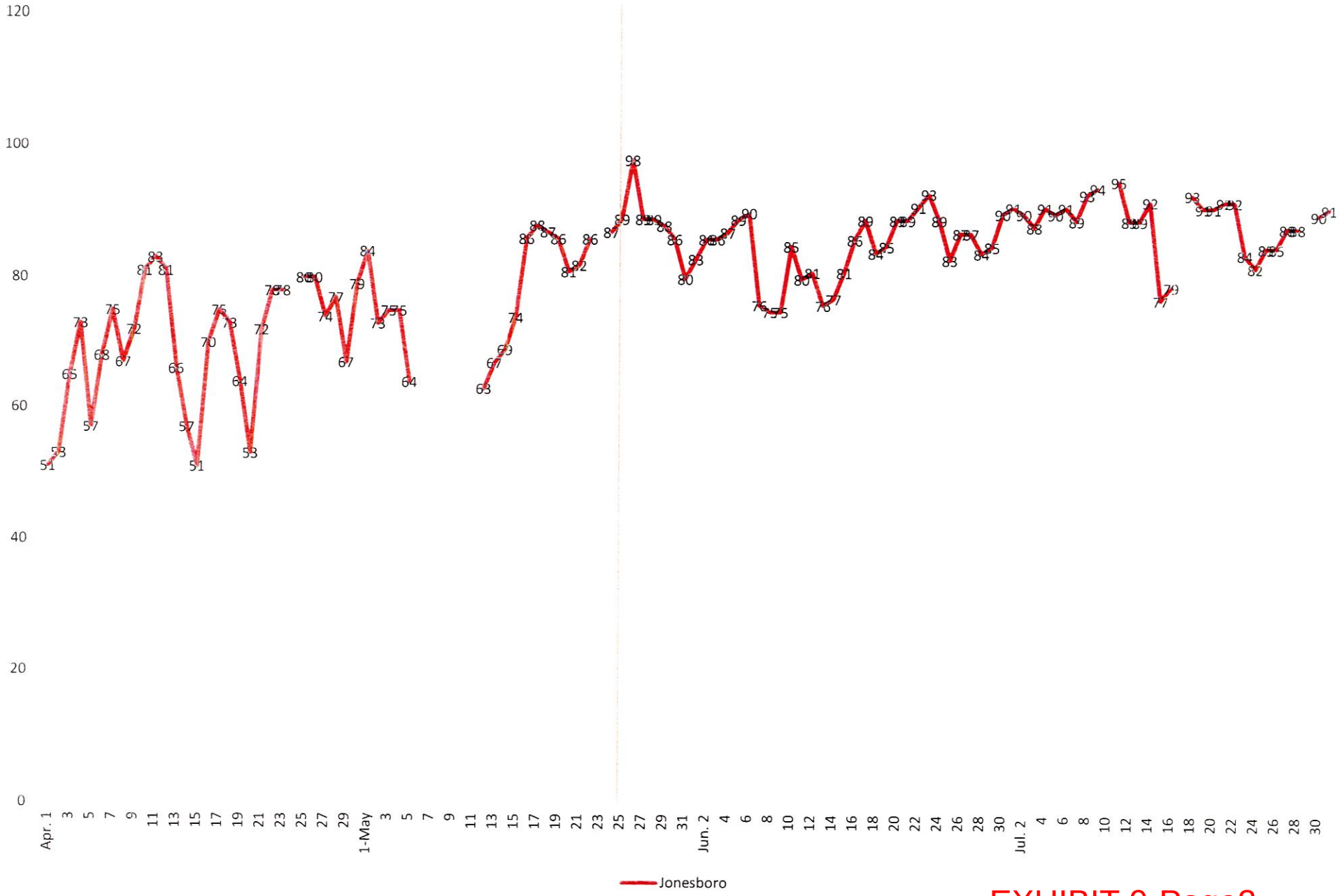

EXHIBIT 9-Page2

Daily High Temperatures for
Marianna, Ark.—April 1, 2020-July 31, 2020
Data from U.S. Dept. of Commerce, NOAA

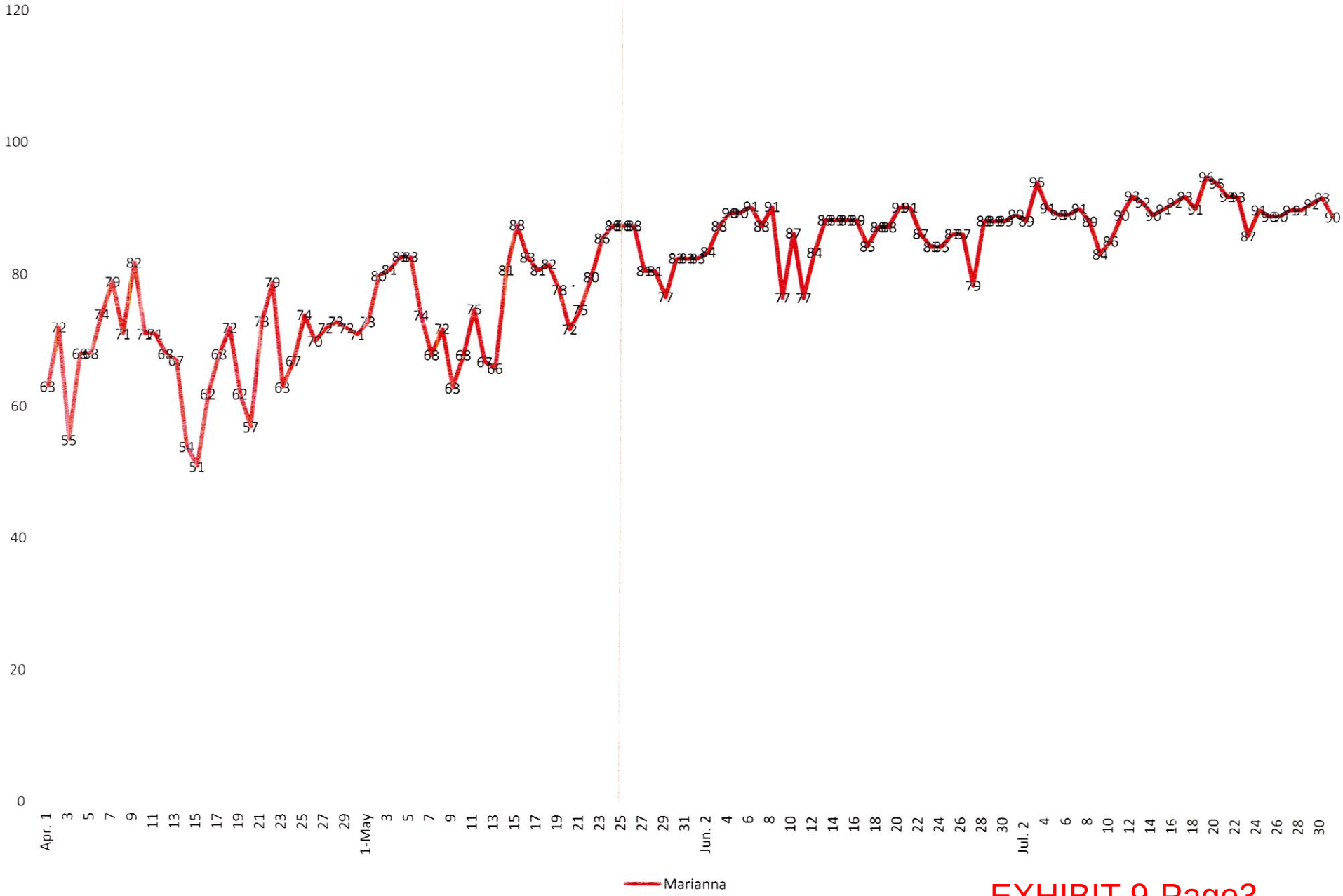

EXHIBIT 9-Page3

Daily High Temperatures for
Marianna, Ark.—April 1, 2019-July 31, 2019

Data from U.S. Climate Data (usclimatedata.com)

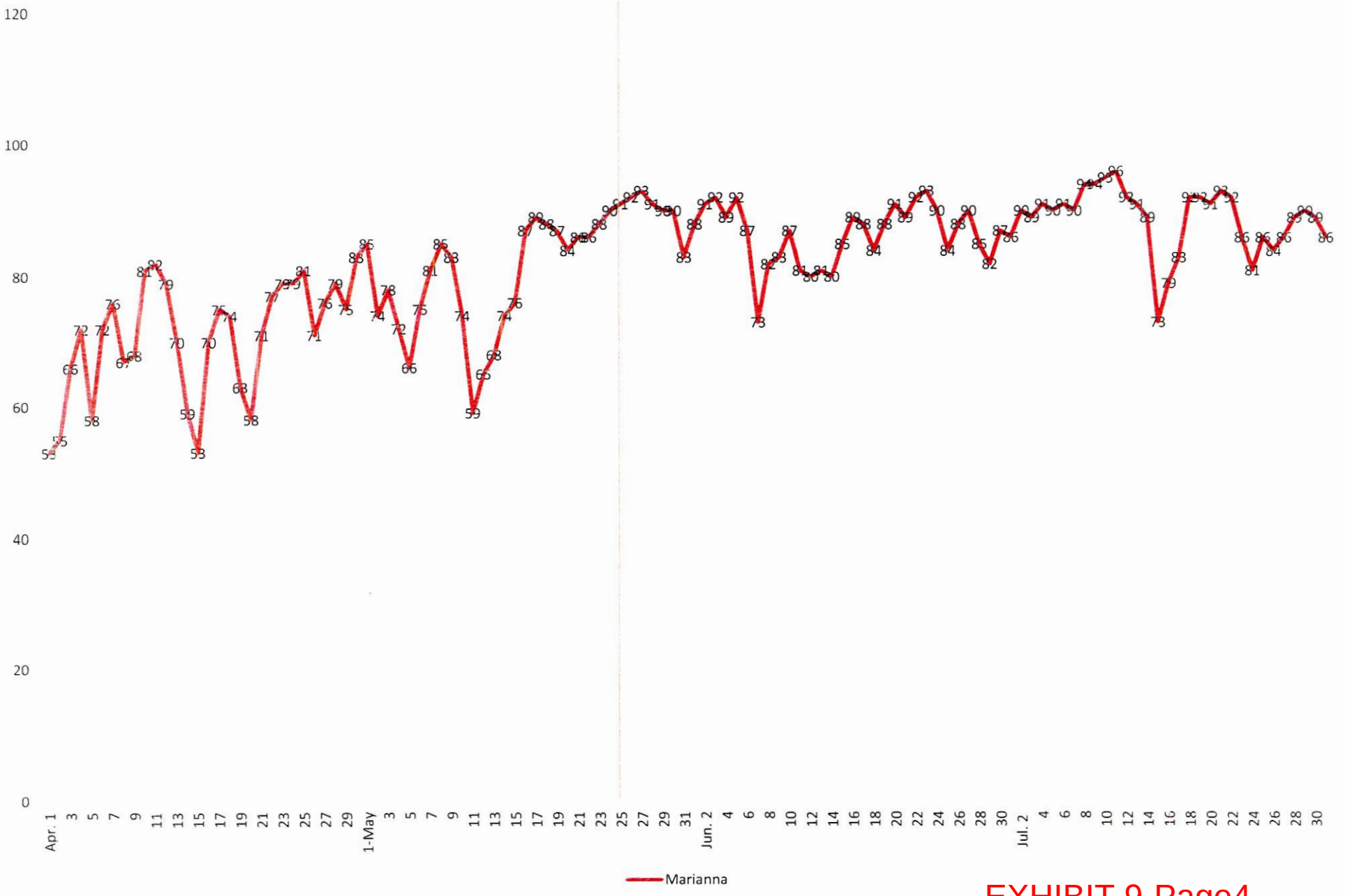

EXHIBIT 9-Page4

Daily maximum air temperature at Keiser (May 26 – July 30)

- 0 of 66 days <80 F high
- 4 of 66 days <85 F high
- 28 of 66 days <90 F high

EXHIBIT 9-Page5

Dr. Hardke (weather station

Daily maximum air temperature at Marianna (May 26 – July 30)

- 5 of 66 days <80 F high
- 14 of 66 days <85 F high
- 31 of 66 days <90 F high

EXHIBIT 9-Page6

wunderground

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 10

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

PC Codes: 100094, 128931
DP Barcodes: 459792, 459793, 459794
Date: October 26, 2020

MEMORANDUM

SUBJECT: **Dicamba DGA and BAPMA salts** – 2020 Ecological Assessment of Dicamba Use on Dicamba-Tolerant (DT) Cotton and Soybean Including Effects Determinations for Federally Listed Threatened and Endangered Species

TO: Margaret Hathaway, Senior Regulatory Specialist
Emily Schmid, Product Manager Team 25
Daniel Kenny, Branch Chief
Herbicide Branch
Registration Division (7505P)

FROM: Michael Wagman, Senior Scientist, Environmental Risk Branch 2 — MICHAEL WAGMAN Digitally signed by MICHAEL WAGMAN Date: 2020.10.26 20:05:19 -04'00'
Frank T. Farruggia, Senior Scientist, Environmental Risk Branch 1 — 2020.10.26 20:00:48 -04'00'
Ed Odenkirchen, Senior Advisor, Immediate Office — EDWARD ODENKIRCHEN Digitally signed by EDWARD ODENKIRCHEN Date: 2020.10.26 20:12:56 -04'00'
Jennifer Connolly, Senior Scientist, Environmental Information Support Branch — JENNIFER CONNOLLY Digitally signed by JENNIFER CONNOLLY Date: 2020.10.26 20:19:43 -04'00'
Environmental Fate and Effects Division (7507P)

THRU: Monica Wait, RAPL — Digitally signed by MARK CORBIN Date: 2020.10.26 20:33:40 -04'00'
Mark Corbin, Branch Chief — Digitally signed by MARK CORBIN Date: 2020.10.26 20:32:27 -04'00'
Michael Lowit, Senior Scientist, Environmental Risk Branch 6 — 2020.10.26 20:24:45 -04'00'
Environmental Risk Branch 6
Environmental Fate and Effects Division (7507P)

The Environmental Fate and Effects Division (EFED) has completed a Section 3 new use ecological risk assessment, including effects determinations for Federally listed threatened and endangered species, for over-the-top product registrations for use on dicamba-tolerant soybeans and dicamba-tolerant cotton.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

PC Codes: 100094, 128931
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2020 Ecological Assessment of Dicamba Use on Dicamba-Tolerant (DT) Cotton and Soybean Including Effects Determinations for Federally Listed Threatened and Endangered Species

October 26, 2020

Prepared by:
OFFICE OF PESTICIDE PROGRAMS

U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460

taxa is greater than 90% when using the distances to plants to establish the efficacy of the in-field setbacks.

- The option to use an approved hooded sprayer technology on DT soybean crops along with an in-field downwind spray drift setback can also address spray drift. Field studies conducted on bare soil and soybean crops indicated that the use of a particular hooded sprayer (RedBall 642E) addressed potential spray drift exposures. Based on analysis in **Appendix O**, the 240 foot in-field spray drift setback can be reduced to 110 feet and still be protective of non-listed plant species. It should be noted that these trials did not evaluate the use of other sprayers (alternative hooded broadcast, hooded in-row and layby sprayers) nor did they evaluate the use of a hooded sprayer over cotton crops. As a result, the reductions in buffer distance permitted when using hooded sprayers is limited to soybean crops and this one currently approved technology. Alternative hooded sprayer technologies need to be tested under the EPA approved protocol to determine whether they can be approved for use. These approvals will be updated on the product websites. See **Section 1.7**.
- EPA evaluated the label statements that include the use of drift reduction agents. Most of the field studies (88%) EPA used to establish distance to effects for spray drift included the use of a drift reducing agent (DRA). Field studies demonstrate results are variable with the use of DRAs Based on the evaluated data, EPA concluded that a DRA does not need to be mandatory on the label. See **Appendix F**.
- EPA evaluated the mandatory label requirements to include volatility reduction agents (VRA) to address the issue of exposure to volatile emissions up to 160 feet from point of application. EPA determined that the inclusion of approved VRAs (without consideration of any additional restrictions) prevents damage from volatile exposures off the treated field with a high degree (89%) of certainty. See **Appendix F**.
- An evaluation of incident data, coupled with laboratory and field-based volatility data, shows that avoiding application when air temperatures are favorable to volatility would decrease the conditions that may have led to some dicamba-related non-target plant incidents. The imposition of the mandatory application cut-off dates (June 30th soybean, July 30th cotton) on the product labels reduces the probability of dicamba application on days more favorable for dicamba volatilization. See **Appendix I**.
- The mandatory runoff control measures on the labels reduce the risks to non-listed plants. See **Appendix G**.

EPA considers reduction in growth, survival and reproduction as regulatory endpoints. In this assessment, EPA evaluated a large number of studies from the registrants, academia, and weed scientists to determine the appropriate in-field setbacks to address the potential for off-field movement. In doing so, EPA determined the distance to effect for non-target organisms. In this evaluation, EPA conservatively selected 10% visual signs of injury (VSI) as a protective threshold which is expected to be protective against 5% reductions in plant height and yield with a high degree of certainty and to reasonably avoid the occurrence of off-field effects to non-target plants. Because other factors are important to the ultimate plant growth and yield relationship to observations of VSI, the (10% VSI) is not predictive of significant yield loss or growth impairment in non-target plants.

With respect to plants, the typical measurement endpoints based on laboratory studies report the measurement of survival, height and weight effects. However, for this assessment the best available data provides additional measurements specific to plant reproduction (yield) and visual signs of injury (VSI). EPA selected the measurement of VSI as an endpoint for two reasons: 1) to allow EPA to utilize the broadest range of available field effects data across a variety geographic areas, meteorological

application (spray drift) as well as exposure to vapor phase dicamba that volatilizes from the treated field under favorable environmental conditions over more protracted time periods (vapor drift). After review of the available distance to effect studies conducted by the dicamba registrants and academic researchers, EPA determined that spray drift would be the dominant exposure route for the near-field zone. These same field studies also indicate that dicamba vapor drift may occur at the near-field zone. As noted previously, these studies did not take into account the control measures on the labels EPA is now assessing.

A review of the available field studies and use of EPA's spray drift modelling and vapor phase dispersion tools provide a high level of confidence in describing the distance to effects (without consideration of the mandatory control measures) in the near-field zone out to between 300 to 400 feet from the field edge, depending upon the nature of the exposure route (spray droplet drift vs vapor phase transport). These same tools allowed EPA to measure the efficacy of the mandatory control measures.

EPA also assessed the wide area zone of impact - the area where plant responses characteristic of dicamba exposure have been reported in incident reports at distances exceeding those observed in available field studies and suggested by available modelling tools. The Agency used available field studies (from both academic and registrant-submitted sources) that document situations where dicamba-consistent signs of plant symptomology were observed, unrelated to the field study applications of the herbicide. The largest body of evidence for such wide area effects came from reports submitted by the registrants in response to EPA's request to provide information under FIFRA Section 6(a)(2). These reports contained information on approximately 5600 off-target incidents (reported at various distances) for the years 2017 through 2019. The reports contain information that shows incidents that have occurred beyond the distances from treated fields, including the setback restrictions contained on earlier labeling for these products, intended to address spray drift and vapor drift routes of exposure.

Based EPA's spray drift analysis, the mandatory control measures address spray droplet fines that were associated with wide-area incidents (those occurring at distances of hundreds of feet from a known dicamba use site). EPA has concluded that it is more likely that there is vapor phase exposure associated with these distances, especially on large landscape scales beyond the 10 to 20-acre field scale used for distance to effects field studies. Therefore, EPA cannot definitively exclude the potential impact of vapor phase drift in the wide area zone based on an evaluation of the available large field off-field movement studies. Moreover, EPA cannot identify any single volatility control measure (e.g., volatility reducing agent, VRA) that is certain to prevent dicamba from transforming into its acid, that results in offsite volatilization. In scientific studies and open literature VRAs are often referred to as "pH buffering agents" or "pH buffers" or "buffering agents".

1.1.1. Mode Of Action

Dicamba is a benzoic acid herbicide similar in structure and mode of action to phenoxy herbicides. Like the phenoxy herbicides, dicamba mimics auxins, a type of plant hormone and causes abnormal cell growth by affecting cell division. Dicamba acts systemically in plants after it is absorbed through leaves and roots. It is easily transported throughout the plant and accumulates in new leaves.

Consistent with the previous assessments on dicamba products for use on DT-crops, EPA bridged the environmental fate and effects data used in this assessment across the dicamba acid and all of the

Table 1.22 summarizes the crop type with reported damage from the same 5600 incidents reported in the 6(a)2 submissions. Soybeans are the dominant crop associated with incident reports.

Table 1.22 Summary of the number of 6(a)2 incidents by crop type

Crop Type	Number of Incidents
Soybeans	5458
Peaches	32
Cotton	28
Unspecified	25
Tobacco	21
Alfalfa	10
Tomatoes	8
Vegetables	6
Garden	4
Grapes	4
Peanuts	4
Oak Trees	3
Sunflowers	3
Blackberries	2
Canola	2
Hemp	2
Peas	2
Pinto Beans	2
Pumpkins	2
Potato	2
Apple Trees	1
Aronia Berries	1
Corn	1
Flax	1
Fruit Trees	1

Out of the nearly 5600 FIFRA section 6(a)2 incidents reported, a subset included sufficient information to allow EPA to establish a distance from a suspected dicamba use site to the affected plants. A total of 493 incidents provided this information. The spread of distances from suspected application site to incident ranged from the treated field edge (0 feet) to 8,089 feet. In order to evaluate volatility that would not be prevented by the in-field omnidirectional 57-foot volatility setback, EPA selected all incidents that occurred 50 feet or beyond the reported dicamba source site. This distance approximates the 57-foot omnidirectional volatility setback label requirement at the time of dicamba applications. . Two-hundred and seventy-nine (279) out of 493 incidents occurred beyond this distance. EPA performed an additional sorting of incidents at a distance of 110ft and beyond the dicamba application site. This sorting was to evaluate incidents that occurred beyond the limits of expected spray drift. The 110-ft distance corresponds to the in-field downwind 110-ft spray drift setback in place on product labels at the time of incident reporting. The analysis revealed that 124 incidents occurred at distances equal to or greater than 110 feet from a suspected dicamba source.

5. Analysis of Incident Data Relative to Select Temperature Thresholds

EPA quantified the effect of temperature thresholds evaluated in the above steps on the frequency of incidents that might have been avoided, if the thresholds were considered as "spray or no spray" criteria. In order to consider incidents for this evaluation EPA established the following data criteria for inclusion of an incident in the analysis:

1. A reported incident must have a reported application date for the incident
2. The incident must have reported latitude and longitude coordinates
3. The incident must have a reported distance from spray to affected site

These criteria enabled EPA to establish proximity of an incident to the alleged source site of dicamba and use the associated application data to compare with geographically maximum temperature data on the reported day of application.

Within two FIFRA 6(a)(2) submissions, "Bayer Off Target Movement (OTM) Inquiries" and "BASF Off-Target Reports", EPA searched the ~5600 incidents reported as occurring in 2017, 2018, and 2019 for those that reported dicamba application location, date, and the distance from that application to the reported incident .Out of the nearly 5600 6(a)2 incidents reported, a subset included sufficient information to allow EPA to establish a distance from a suspected dicamba use site to the affected plants. A total of incidents 493 provided this information. The extreme spread of distances from suspected application site to incident ranged from the treated field edge (0 feet) to 8,089 feet. EPA selected all incidents that occurred 50 feet or beyond the reported dicamba source site. Fifty feet was selected as this approximated the outer limit of the 57-foot omnidirectional buffer that was on the labels to mitigate volatile emissions. Two-hundred and seventy-nine (279) incidents occurred beyond the assigned volatility buffer distance.

EPA identified the nearest weather reporting station with temperature and humidity data for the day before, the day of, and the day after the incident (Weather Underground) for each of the 279 incidents. EPA then extracted from the weather records at each station the maximum temperatures for the day before, the day of, and the day after the incident's reported date of application. In situations where a dicamba application was reported in the incident data as spanning multiple days, EPA gathered temperature data for the day before the first phase of application through the day following the final phase of the application. EPA selected the maximum air temperature on the day(s) of application or days of application and evaluated those reported temperatures relative to four selected temperatures: 70, 75, 80 and 85°F.

EPA then recorded the number and percentage of incidents reported with site application maximum temperatures $\leq$ and > X °F. The results of that analysis are included in **Table I.2**.

Table I.2. Incident Number and Percentages Associated with Maximum Daily Temperature Categories (N=279)

Temperature °F	Number of Incidents	Percentage of Incidents (rounded to whole number)
≤70	6	2
>70	273	98
≤75	18	6
>75	261	94
≤80	50	18
>80	229	82

The results in **Table I.2** can be used to inform the percentage of applications that likely would not have occurred if the label prohibited dicamba application of dicamba when temperatures were above 70, 75, 80 °F). As shown, 98%, 94%, and 82% of the applications leading to a reported incident 50 feet or greater from the application site would likely have been prevented with a labelled temperature cut-off of 70, 75, and 80°F, respectively.

5.1. The uncertainties and assumptions associated with this step in the analysis include:

1. Assignment of a dicamba application event to each incident in the analysis may not address the closest source of dicamba and other contributions to dicamba exposure may not be limited to the assigned site of herbicide use.
2. Volatility may not be the only source of dicamba exposure and so temperature at time of application my not always be an important discriminator for the dicamba exposure related to the incident
3. Other meteorological factors such as wind speed, direction, and the formation of temperature inversion conditions can play a role in the extent to which volatilized dicamba is transported and distributed in vertical strata of the near-ground atmosphere.

6. Comparison of Selected Temperature Thresholds to the Meteorological Record of Geographically Representative Data

EPA evaluated how cut-off dates of June 30th for soybean and July 30th for cotton performed relative to the proportion (or probability) of days where possible dicamba application could occur on those crops would potentially occur on days at or above selected temperature thresholds.

The previous steps in this analysis suggested that dicamba volatile emissions and correspondingly dicamba air concentrations associated with observable plant effects can occur off the treated field at temperatures above 75 °F. Moreover, a majority of dicamba incidents in the incident analysis occurred at application temperatures above 75 °F. Therefore, EPA used the temperature levels of 75 and 80 °F to conduct this phase of the analysis.

EPA consulted the Biological and Economic Analysis Division (BEAD, personal communication Bill Chism, Johnathan Becker, and Kelly Tindall) for information on state-specific crop planting dates for soybean and cotton, which were used as the beginning dates of the application window. The closing dates of the application window were the soybean and cotton labeled cutoffs for application, June 30th and July 30th, respectively.

For each of the 34 states labeled for product(s) use, EPA identified a geographically representative Pesticide in Water Calculator (PWC) crop scenario and attendant meteorological data files that has been developed for EPA routine ecological risk assessment modelling.

From each meteorological data file, EPA extracted 35 years (1980-2014) of the scenario's daily maximum temperatures within the windows described by each state/crop planting date and the crop specific cut-off date. EPA then calculated the proportion of total days equal to or greater than as well as less than 75, and 80°F. These proportions represent the probability of a dicamba application falling or not falling upon a date where temperature would be favorable, to varying degrees, for off field movement of dicamba in air and concentrations associated with observable plant effects. **Tables I.3** and **I.4** present the results of this analysis for soybean and cotton.

The analysis shows that the probability of application on a random day when the maximum temperature would occur under favorable temperature varies among different states. The conclusions regarding cut-off date performance can be divided into 1) the potential near field reductions in volatile emissions associated with observed off the field plant responses for field studies, and 2) mitigation performance for concerns for wide area volatile exposure potential including incidents at distance.

Conclusions for cut-off date avoidance of daily temperature conditions suggestive of a potential for near-field plant effects as observed in the available field studies can be reached using the 80 °F exceedance probabilities, the temperature point where available air modelling shows that field flux levels have been lowered to the extent that distances to EAAC levels have been brought back close to the field margin. The soybean cut-off of June 30th results in variable state success probabilities from a low of 12% in Texas to a high of 89% in Minnesota. Interstate variability of success probabilities is evident for the cotton cut-off date of July 30th, ranging from a low of 8% in Florida to a high of 66% in Virginia. These probabilities demonstrate that the soybean and cotton cut-off dates have the ability to provide potential reduction in the probability of random dicamba applications on days when temperatures are unfavorable for reducing dicamba flux emissions and off field transport.

Conclusions for cut-off avoidance of daily temperature conditions suggestive of a potential for wide area exposures can be reached using the 75 °F exceedance probabilities, the temperature point where available air modelling shows EAAC levels departing from the treatment field margin. For soybean the probability of avoiding an application within cut-off windows at the 75 °F level or higher ranges from a low of 3.2% in Texas to a high of 72% in Minnesota. Similar ranges in the probability of avoiding 75 °F days of application are seen with cotton with a low of 0.3% in Florida and a high of almost 36% in Virginia. These ranges in probabilities represent the potential for avoiding an application within the dicamba application window where temperature would not exceed temperatures modeled to result in dicamba EAAC levels beyond the margins of the field. This conclusion is further supported by the high probability of incident avoidance (94%) at the 75 °F level.

Table I.3. Proportion of Days Where Soybean Dicamba Application Could Occur Below and Above Select Temperature Levels.

State	Date Window		75 Degree		80 Degree	
	Start	End	% of days <75F	% of days >=75F	% of days <80F	% of days >=80F
ALABAMA	17-May	30-Jun	5.3%	94.7%	33.0%	67.0%
ARKANSAS	19-Apr	30-Jun	20.0%	80.0%	47.9%	52.1%
DELAWARE*	31-May	30-Jun	N/A	N/A	N/A	N/A
GEORGIA	10-May	30-Jun	11.0%	89.0%	45.6%	54.4%
ILLINOIS	10-May	30-Jun	43.5%	56.5%	75.9%	24.1%
INDIANA	10-May	30-Jun	43.9%	56.1%	75.8%	24.2%
IOWA	10-May	30-Jun	53.6%	46.4%	79.3%	20.7%
KANSAS	10-May	30-Jun	22.9%	77.1%	40.5%	59.5%
KENTUCKY	10-May	30-Jun	36.4%	63.6%	73.4%	26.6%
LOUISIANA	5-Apr	30-Jun	29.7%	70.3%	58.7%	41.3%
MARYLAND	7-Jun	30-Jun	21.7%	78.3%	53.9%	46.1%
MICHIGAN	17-May	30-Jun	62.6%	37.4%	78.9%	21.1%
MINNESOTA	10-May	30-Jun	71.9%	28.1%	89.2%	10.8%
MISSISSIPPI	12-Apr	30-Jun	17.4%	82.6%	44.7%	55.3%
MISSOURI	10-May	30-Jun	30.2%	69.8%	63.9%	36.1%
NEBRASKA	10-May	30-Jun	40.4%	59.6%	58.9%	41.1%
NEW JERSEY	7-Jun	30-Jun	31.1%	68.9%	61.8%	38.2%
NEW YORK	14-Jun	30-Jun	69.6%	30.4%	86.3%	13.7%
NORTH CAROLINA	3-May	30-Jun	30.3%	69.7%	65.2%	34.8%
NORTH DAKOTA	17-May	30-Jun	62.2%	37.8%	79.4%	20.6%
OHIO	10-May	30-Jun	53.3%	46.7%	80.2%	19.8%
OKLAHOMA	24-May	30-Jun	5.1%	94.9%	18.7%	81.3%
PENNSYLVANIA	24-May	30-Jun	53.8%	46.2%	79.7%	20.3%
SOUTH CAROLINA	17-May	30-Jun	8.8%	91.2%	45.5%	54.5%
SOUTH DAKOTA	17-May	30-Jun	46.7%	53.3%	66.0%	34.0%
TENNESSEE	10-May	30-Jun	25.8%	74.2%	64.2%	35.8%
TEXAS	17-May	30-Jun	3.2%	96.8%	12.3%	87.7%
VIRGINIA	10-May	30-Jun	39.9%	60.1%	69.4%	30.6%
WEST VIRGINIA	17-May	30-Jun	49.0%	51.0%	77.1%	22.9%
WISCONSIN	17-May	30-Jun	58.3%	41.7%	81.1%	18.9%

*No Delaware state crop scenario, Maryland likely representative.

Table I.4. Proportion of Days Where Cotton Dicamba Application Could Occur Below and Above Select Temperature Levels

State	Date Window		75 Degree		80 Degree	
	Start	End	% of days <75F	% of days >=75F	% of days <80F	% of days >=80F
ALABAMA	21-Apr	30-Jul	12.2%	87.8%	38.5%	61.5%
ARIZONA	10-Mar	30-Jul	20.3%	79.7%	29.9%	70.1%
ARKANSAS	21-Apr	30-Jul	13.7%	86.3%	36.1%	63.9%
FLORIDA	5-May	30-Jul	0.3%	99.7%	7.5%	92.5%
GEORGIA	21-Apr	30-Jul	13.4%	86.6%	44.2%	55.8%
KANSAS	5-May	30-Jul	16.9%	83.1%	31.0%	69.0%
LOUISIANA	21-Apr	30-Jul	12.7%	87.3%	36.1%	63.9%
MISSISSIPPI	21-Apr	30-Jul	8.9%	91.1%	29.9%	70.1%
MISSOURI	21-Apr	30-Jul	31.1%	68.9%	55.6%	44.4%
NEW MEXICO	7-Apr	30-Jul	19.4%	80.6%	29.7%	70.3%
NORTH CAROLINA	5-May	30-Jul	19.9%	80.1%	54.6%	45.4%
OKLAHOMA	21-Apr	30-Jul	10.1%	89.9%	23.0%	77.0%
SOUTH CAROLINA	28-Apr	30-Jul	12.2%	87.8%	43.2%	56.8%
TENNESSEE	28-Apr	30-Jul	24.4%	75.6%	58.1%	41.9%
TEXAS*	24-Mar	30-Jul	9.0%	91.0%	20.3%	79.7%
VIRGINIA	28-Apr	30-Jul	35.8%	64.2%	65.8%	34.2%

7. Conclusions

The overall conclusions reached from the analysis of how cut-off dates on the labels address dicamba volatility include the following

1. Temperature reductions have been demonstrated to reduce the volatility of dicamba
2. Volatility reductions with ambient temperature changes can be related to changes in field-level volatile flux rate of dicamba.
3. Changes in ambient temperature and field flux rate can be used to model the relative changes in distances where dicamba air concentrations associated observed plant effects are reached off field
4. A calculated change in field study temperature conditions at time of application down to a temperature of 80°F results in significant reduction in emissions such that the distances to plant effect associated air concentrations re brought in closure to the field, thereby mitigating some concern for near-field non-target plant effects. At 75°F these distances are brought to the very edge of the field, suggesting that concerns for wide-area exposure are greatly reduced.
5. Cut-off dates (June 30th for soybean and July 30th for cotton) when evaluated for the temperatures of 80 and 75°F, show interstate variability in their potential for limiting the potential for random application of dicamba to the crops on days that would exceed near-field

or wide area concern temperature thresholds. In all states the range based on 80^0 F was between ~12-89% for soybean and 8-66% for cotton, leading to the conclusion that cut-off dates provide a margin of extra safety when considering their impact on avoiding application conditions favorable to off field dicamba volatile movement.

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 11

1 Palm Amaranth or you have soybeans that are
2 approaching canopy formation or even cotton,
3 you're going to have greater risk for
4 volatilization of the herbicide itself. That
5 being Dicamba.
6 We also noticed that, in our research,
7 that extremely low rates of AMS that may
8 contaminate a sprayer are not sufficient to
9 caused increased volatilization of Dicamba.
10 There was some speculation a few years ago
11 that the off-target movement of Dicamba that we
12 were observing is partly attributed to the
13 contamination of sprayers with residues of AMS;
14 but our research would indicate that that is
15 not the case.
16 We've also conducted some large-scale
17 research as well as small-scale looking at the
18 use of a rope wick for controlling Palmer
19 Amaranth and soybeans.
20 And what we've observed in these trials is
21 that the use of a rope wick can sometimes
22 slightly reduce volatilization over that of the
23 spray.
24 However, overall, it's a very, very minor
25 reduction in volatility when it -- if it does

1 occur. And we've looked at other techniques
2 today such as the use of a volatility reducing
3 agents as well as even lower temperatures
4 that's going to have stronger impact on
5 reducing volatilization of the herbicide.
6 Some of our other research, what we have
7 noticed is that, when looking at potassium
8 borate and potassium acetate, in comparing
9 these on a molar basis, we have seen that
10 potassium borate appears to be a better
11 scavenger of ions, based on lower volatility
12 when used in combination with Dicamba and
13 Glyphosate.
14 This is not to say that potassium acetate
15 is not an effective material in reducing
16 volatility. It's just to say that, again, on a
17 molar basis, potassium borate is more
18 effective.
19 We've also conducted some work this past
20 summer where we've been able to observe that
21 mixing potassium borate with Dicamba plus
22 Glufosinate has a strong impact on the
23 reduction of the Dicamba volatilization.
24 We have not, at this point, had an
25 opportunity to look at establishing whether

1 we're able to get the volatilization to a level
2 comparable or less than Dicamba alone.
3 But we do know that borate is effect in
4 reducing it, even in the presence of
5 Glufosinate.
6 So, with that, I want to turn -- and, as I
7 begin to close, I want to just put forth some
8 questions. And some of these questions are
9 result of questions that arose at the pesticide
10 committee meeting. I've had others that have
11 asked me these questions.
12 And one question is how low should Dicamba
13 volatility be to not cause landscape damage.
14 And, really, it's difficult, if not impossible,
15 to know an exact value for that because it's
16 really a function of the amount of acres that
17 we treat.
18 One thing we've seen in the research today
19 is that, with these volatility reducing agents,
20 we can definitely lower the volatility of
21 Dicamba. And I think that's going to be
22 positive from the standpoint of reducing the
23 risk of off-target movement.
24 But, as we spray more and more and more
25 acres, it becomes a mass loading within the

1 air; and, hence you have greater exposure or
2 sensitivity of those plants, too, those Dicamba
3 molecules that are in the air.
4 We do know that, as temperature increased,
5 the risk for damage is going to likewise
6 increase as well as the fact, if you have more
7 days between a rainfall event, there's
8 potential that you could have more duration of
9 exposure. And, in doing so, there is going to
10 be greater risk associated with that. So it's
11 a very difficult question to answer.
12 I've had some ask me, is there any
13 analytical traceability that can be used to
14 confirm the use of a volatility reducing agent;
15 because, I know moving forward, that where we
16 do spray Engenia, where we spray XtendiMAX,
17 you're going to have to have a label volatility
18 reducing agent within the tank.
19 If you do not add that to the tank, is
20 there some way that the Arkansas State Plant
21 Board, the chemistry lab, come back in and
22 actually test that.
23 And I think there probably is. I don't --
24 there hasn't been any research that I'm aware
25 of, at this point, to go in and to test for

these volatility reducing agents. But, moving forward, there probably needs to be some research to try to answer this question, how do we go about testing the traceability of these VRAs.

Another question that has risen is, can these volatility reducing agents, when added to Glyphosate plus Dicamba, can we really achieve a lower volatility than what we get with Dicamba alone.

And I'm optimistic and hopeful that that can be achieved. I'm not sure, again, that right now we have the data in order to answer that question. Actually, I know we don't have the data to answer that.

But I think the goal is to try to be able to apply Glyphosate plus Dicamba and to achieve a lower volatility than what we get with Dicamba alone through use of these VRAs.

Another question that has risen -- and this is actually -- arose with some colleagues and some conversation I know that occurred among colleagues in a meeting that occurred here recently where we were discussing the use of VRAs.

1 And, at this point, I don't think it's
2 well understood what effect that the VRA rate
3 has on the volatility of Dicamba over a range
4 of temperatures.
5 And what I mean by that is we do know
6 that, as temperature increases, that
7 volatilization is likewise going to increase.
8 But what extent is the volatility reducing
9 agent bringing down that response with or
10 without Glyphosate.
11 And I want to -- as I close here, I want
12 to illustrate that with a slide from the Dr.
13 Mueller and Steckle published in 2019. And I
14 think I may have shared some of this data with
15 the board previously.
16 And what they're doing is they're
17 measuring Dicamba in humidomes as a function of
18 temperature. And what I did is I converted
19 this from Celsius over to Fahrenheit.
20 And the top curve is Diglycolamine
21 Dicamba. So this would be something like
22 clarity plus Glyphosate. And what you notice
23 is, as temperature increases, volatilization
24 likewise increases.
25 And what we have seen in the data, and

1 this is a wealth of data out there for this, is
2 around 80 degrees Fahrenheit, you really begin
3 to see this exponential rise in the increase in
4 the volatility of Dicamba as a function of
5 temperature.
6 What we notice is that, when we place
7 VaporGrips, a VG, this would be VaporGrip that
8 was XtendiMAX. When we add that to Glyphosate,
9 we still see a similar trend here. But,
10 overall, the response is not a great as what we
11 saw when we did not have VaporGrip in with
12 Glyphosate.
13 Again, around 80 degrees, we begin to bend
14 and really have some upward increase,
15 substantial increase in Dicamba detection.
16 I think the goal is -- should be, in terms
17 of moving forward. And when we take a look at
18 VaporGrip, we take a look at Centrus, we take a
19 look, for instance, even at potassium borate is
20 it's really trying to understand, as we
21 increase the rate of VaporGrip Xtra or Centrus,
22 can we flatten this curve such that, once we
23 start getting into these 80s, these upper 80s
24 here, that that curve does not move upwards in
25 a way that we have a significant detection of

1 Dicamba, such Dicamba detection that we're
2 going to begin to see damage outside of the
3 treated area.
4 I really think that should be the goal
5 moving forward.
6 So, with that, my final thoughts, I think
7 the volatility reducing agents are definitely
8 going to lower the volatility of Dicamba. I
9 believe that's a function, again, of the rate
10 that we're going to use.
11 The volatility reducing agent definitely
12 has -- the rate that we use is going to have a
13 strong impact. If you use a lower rate, it's
14 not going to be as impactful as if you use a
15 higher rate. I'm very confident of that.
16 I think the effectiveness also could
17 possibly differ among the volatility reducing
18 agents that are out there. Some are probably
19 going to be slightly more effective than
20 others.
21 There's, really, I think, a need for some
22 large-scale field trials of testing and
23 comparing these volatility reducing agents at
24 this point.
25 We have one tunnel trial with Centrus and

1 we have a tunnel trial with the VaporGrip Xtra.
2 But there has been no large-scale testing that
3 I'm aware of within Arkansas where we've gone
4 out and we've really tested these and compared
5 these back to the stand-alone products.
6 If we're going to want to use these with
7 Glyphosate, I would really like to see these
8 where we have Glyphosate plus the volatility
9 reducing agent plus Dicamba out there and we
10 compare that back to Dicamba alone to
11 understand to what extent we're able to reduce
12 volatility.
13 And then, thirdly here, what is considered
14 acceptable. I guess, what I mean, consider it
15 acceptable there is what is considered
16 acceptable in terms of a level of damage.
17 Any time we apply pesticides, herbicides,
18 we understand that there is some risk
19 associated with those. There's always risk
20 associated with those; and what is considered
21 an acceptable level of risk associated with
22 Dicamba 2,4-D. Even Quinclorac (inaudible) in
23 the past, you know, there have been guidelines
24 that have been put in place to help manage this
25 to ensure that we don't have greater than and

1 unacceptable level of damage associated with
2 these applications.
3 And I'm very confident, again. I think,
4 moving forward, there is -- the future looks
5 bright as we begin to use some of these VRAs if
6 we can minimize the atmospheric (inaudible).
7 And then, lastly, the point that I really
8 have made here previously is that it's all
9 about taking Dicamba such as Engenia,
10 XtendiMAX, and tank mixing it with Glyphosate
11 or Glufosinate and then using those VRAs to
12 drive down that volatility.
13 That's going to help improve weed control,
14 definitely. Putting Glyphosate in the tank is
15 going to help. Glufosinate, you know, is
16 probably going to help us. I know that
17 (inaudible) says they've got a wealth of data
18 that supports a Glufosinate plus XtendiMAX, is
19 going to result in improved weed control.
20 So, with that, I think that's where we're
21 wanting to head. The question is, can we get
22 there without causing substantial damage
23 outside of the treating fields.
24 With that, I'm going to conclude my
25 presentation. I'm going to open the floor to

that a 2022 option on that?

Or, I mean -- because, at the beginning, I kind of got the feeling you were, maybe it was just me, that you were kind of excited about this might be a breakthrough, that this is significant, this is a significant game changer type thing.

And then I kind of get the feeling you moved back away from that a little bit here, you know, at the end of the presentation in the Q and A.

So I just curious what your thoughts are. Is this enough -- is this strong enough, is there enough research now, do these product blends and the acidity that we keep talking about, is there enough there to make us question where we're at?

DR. NORSWORTHY: So, Mr. Bragg, I -- I think -- where I've been and where I will continue to be on this, and I said it in the conclusion and I'm going to reiterate and stay here, and that is that I do think the volatility reducing agents, that being Centrus, as well VaporGrip Xtra.

Now, granted I've had very, very limited

1 exposure to those, but I do think that they are
2 going to reduce volatilization.
3 Now, are they going to reduce
4 volatilization to the point in which we do not
5 see large scale damage or see major issues, I
6 don't have the answer to that.
7 You know, one thing that was -- one
8 comment -- I think this was Dr. Burke made the
9 -- this on the regulatory of BASF. When we
10 were talking about the fact these new
11 regulations, you know, 240 foot buffers --
12 these buffers depend on whether endangered
13 species are in the field and what you're
14 spraying, et cetera.
15 But talking about buffers and talking
16 about off-target movement, one thing is for
17 certain. When you go and you spray a one-acre
18 plot or you spray a two-foot square underneath
19 a low-tunnel trial, the volatilization coming
20 off of that and how that behaves at the
21 landscape level is completely different than
22 when you spray hundreds and hundreds of fields.
23 I had a conversation with the EPA back
24 this past January where we talked about this.
25 And that 250 -- 40 foot buffer is based on the

1 small five-acre, let's say, 20-acre trials and
2 also modeling that's being done by the EPA.
3 Mr. Bragg, when the EPA actually models
4 the off-target movement of a pesticide, they
5 model that from 80 acres.
6 So the conversation that I had with the
7 EPA and the question that I have is, I continue
8 to have is, if I take 100,000 acres; and, in
9 that 100,000 acres, I spray 50 percent of that
10 with a low volatile form of Dicamba that is
11 extremely low in volatility, can anyone model
12 and tell me what is the risk for damage on the
13 50 percent of the acres inside of that 100,000
14 that does not have the trait associated with
15 it.
16 And the EPA's response is, no, we can't
17 model that, we do not model that, we don't have
18 the capability of modeling that. So I am
19 extremely excited about the reduction in
20 volatility with the VRAs.
21 The other point to make here is, while at
22 times -- I think volatility is a major
23 component of the issues that we have dealt with
24 in the past. But I also believe, if you go
25 take a look at the data there at Keiser, I'm

1 not convinced that all of that material that
2 we're detecting is volatilization.
3 And I come back and I gave the Glyphosate
4 example. Where you're spraying Glyphosate and
5 we're finding Glyphosate frequently in the air
6 associated with those applications, that tells
7 me that there's something other than volatility
8 occurring.
9 So I think there's a volatilization
10 component. I think there's a suspended spray
11 particle component associated with this.
12 And, while I am excited about the fact
13 that I think we're moving in the right
14 direction with the VRAs, can I sit here today
15 and tell you with a high degree of confidence
16 that this is going to work, no, I can't.
17 And, again, I come back to the fact that
18 there really hasn't been -- there hasn't been
19 much research even looking at the use of these
20 outside of a couple of low-tunnel trials here
21 in the mid south.
22 MR. BRAGG: Thank you.
23 CHAIRMAN FULLER: Thank you, Mr. Bragg and
24 Dr. Norsworthy. You done, Russ? It appears
25 that you are.

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 12

U of A Research Stations
Dicamba Complaints

2018		
CF 18-156	Keiser	Dicamba symptoms in all soybean fields Could not establish drift pattern
CF 18-165	Keiser	Dicamba symptoms in all soybean fields Could not establish drift pattern
2019		
CF 19-0228	Marianna	an apparent application of Dicamba; Source could not be determined
2020		
CF 20-211	Marianna	"symptoms of cupping were uniformed from corner to corner across all soybean fields. Symptoms present source is unknown."
CF 20-339	Rowher	Dicamba symptoms on station's soybeans Could not find source within the mile radius to affected soybeans. Identified Dicamba applications two (2) South and three (3) miles North

F:\DDH Client Files\Freedom to Farm - 36299\Exhibit U of A Damage.docx

Narrative

CF 18-165

CF 18-156

06/15/18 I photo documented all the soybean and cotton fields at the University of Arkansas Extension Center in Keiser, AR. I found symptoms consistent with 2,4-D (stretching, epinasty appearance) in all cotton fields. I found symptoms consistent with Dicamba (cupping, curling) in all soybean fields.

I surveyed the areas surrounding the University of Arkansas Extension Center. I could not establish a drift pattern.

11-5-18

Exhibit 4

Narrative

CF 18-165

CF 18-156

06/15/18 I photo documented all the soybean and cotton fields at the University of Arkansas Extension Center in Keiser, AR. I found symptoms consistent with 2,4-D (stretching, epinasty appearance) in all cotton fields. I found symptoms consistent with Dicamba (cupping, curling) in all soybean fields.

I surveyed the areas surrounding the University of Arkansas Extension Center. I could not establish a drift pattern.

11-5-18

Exhibit 4

Form DP 9

CHECKLIST
OF
REPORT

Case File# 19-0228

Name of Requester Claude Kennedy

	Included	Needed	Not Applicable
1. Information from caller (Form DP-1)	☑	☐	☐
2. Request for Investigation (Form DP-2)	☑	☐	☐
3. Report of Investigation (Form DP-3)	☑	☐	
4. Narrative	☑	☐	
5. Attachments			
a. Map(s)	☑	☐	☐
b. Labels	☐	☐	☐
c. Statements	☐	☐	☐
d. Photos	☑	☐	☐
e. Residue Analysis	☐	☐	☐
f. Records-			
1. Dealers	☐	☐	☐
a. Notice of Inspection	☐	☐	☐
2. Applicators	☐	☐	☐
a. Notice of Inspection	☐	☐	☐
3. Farmers	☐	☐	☐
4. Other _____	☐	☐	☐

FOR OFFICE USE ONLY

Reviewed by:	Name	Date
Supervisor		
A.A.	Claude Kennedy	8-28-19
Review Officer	[illegible signature]	8-29-19

Received
[illegible]

CF19-228

EXHIBIT 12-Page4

INSPECTOR NARRATIVE REPORT

Written by ASPB Inspector Heath Holden

07/01/2019 I, Heath Holden ASPB Inspector, received an email from the ASPB pesticide division stating that Claude Kennedy had initiated case file 19-0228 regarding a possible Dicamba drift onto soybeans on the Lon Mann Cotton Research Station in Marianna.

07/08/2019 I met with Mr. Claude Kennedy and had him fill out and sign a DP-2B giving me consent to investigate his property.

07/08/2019 I began my investigation on the Research station. After investigating all soybean fields, I found that cupping symptoms consistent with Dicamba drift were present on some of the non Dicamba soybean varieties. I then surveyed all surrounding areas for a possible application of Dicamba. I found healthy pigweeds in all surrounding fields showing no recent application of Dicamba to be present. I photo documented all symptoms present as well as no source field being present.

Conclusion: The symptoms of cupping on some soybean fields on the Reasearch Station were from an apparent application of Dicamba however a source from which it came could not be determined.

Heath Holden

Agriculture Specialist

08/21/2019

Exhibit 5

INSPECTOR NARRATIVE REPORT

Written by AAD Inspector Aaron Gifford

06/17/2020 I, Aaron Gifford AAD Inspector, received an email from the AAD pesticide division stating that Claude Kennedy had initiated case file 20-211 regarding a possible drift on his Soybeans.

06/18/2020 Dillon Bobo and I met with Claude Kennedy Experiment Station Manager. Claude signed and filled out the DP2. He noted on the DP2 that he had symptomology on cotton and soybeans at the station. We made photos of the symptomology around the station. There were widespread symptoms of strapping and cupping on the soybeans and cotton. The symptoms were inconsistent within the same plots, where one plant would show auxin symptoms and the adjacent plant would show none. While surveying the surrounding fields we found no signs of any auxin type chemicals being sprayed.

Conclusion: There were no signs of any Auxin type chemicals being sprayed around the property. The cupping and strapping on the experiment station could not be tracked to an application in the area. No source could be determined.

Aaron Gifford

Aaron Gifford

Agriculture Specialist

02/24/2021

Dillon Bobo

Dillon Bobo

Agriculture Specialist

02/24/2021

Received
MAR 16 2021
Pesticide Division

Case File 20-339

Scott Hayes (Rohwer Research Station)

140 Experiment Station Loop

Watson, AR 71674

7/08/2020 I, Cole Vanaman, Agriculture Program Coordinator for the Arkansas Department of Agriculture Plant Industry Division received an email from the Arkansas Department of Agriculture Plant Industry Division-Pesticide Section that Scott Hayes requested the investigation of CF20-339 concerning an alleged pesticide exposure of the Rohwer Research Station's soybeans.

7/14/2020 I met with Mr. Hayes of Rohwer, Ar., and collected a completed Request for Investigation/Consent form (DP-2B).

7/14/2020 I inspected the surrounding area and photo documented Rohwer Research Station. I found Dicamba pesticide symptoms on the Rohwer Research Station's soybeans. (photo 2 through 29).

Fields-1A, 2AB, 3A, 2EF, W1B, M1B, M1A, M2B, M2A, M3AN, M3AS, W3, BW1D, and BW8 all showed puckering, blistering, and cupping symptoms on the soybeans. The symptoms are consistent with the pesticide Dicamba.

Conclusion: Based on the evidence that was collected, I could not determine the source of Dicamba drift to the Rohwer Research Station's soybeans. After checking the surrounding area, I could not find any other possible application in a mile radius to Rohwer Research Station's affected soybeans. Outside the mile radius around the Rohwer Research Station, there were two applications after the date of Dicamba. Case file 20-303, which was 2 miles South of the Research Station and Case file 20-358 that was 3 miles North of the Research Station. I could not determine the two case files caused the Dicamba drift to the Rohwer Research Station's soybeans.

Cole Vanaman 9/15/2020

Cole Vanaman Agriculture Program Coordinator Date

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 13

Progressive FARMER powered by DTN

Dicamba Settlement Claims Commence

Soybean Farmers Can Now File Dicamba Yield Loss Claims

12/30/2020 | 10:37 AM CST

By Emily Unglesbee, DTN Staff Reporter

Connect with Emily:

@Emily_Unglesbee

Soybean farmers who experience soybean yield losses from dicamba injury can now file claims if they can prove the loss. (DTN photo by Pamela Smith)

ROCKVILLE, Md. (DTN) -- Soybean farmers whose fields had yield losses resulting from off-target dicamba movement in the past six years can now file claims as part of a $400 million settlement with Monsanto (now a subsidiary of Bayer).

The claims period began on Dec. 29, 2020. The deadline to submit claims is May 28, 2021. Submit claims at www.dicambasoybeansettlement.com or call 855-914-4672.

The settlement is part of Bayer's efforts to settle ongoing lawsuits involving its herbicides, including multi-district litigation pending in the U.S. District Court for the Eastern District of Missouri over dicamba injury claims. The settlement was originally announced in June 2020, but the agreement was not signed until December 2020, said Don Downing, an attorney with the St. Louis law firm Gray, Ritter & Graham, who serves as chair of the court-appointed executive committee that negotiated the settlement.

The legal settlement with Monsanto provides compensation for damage and yield losses occurring from the introduction of the Xtend crop system. Anyone with specific types of evidence of dicamba damage in soybeans in any of year from 2015 through 2020 is eligible to participate in the settlement -- $300 million is designated for soybean farmers and $100 for administrative costs. BASF was not part of the signed agreement.

More Recommended for You

Dicamba Settlement Is a Go

$300 Million Dicamba Settlement Finalized, Claim Filing to Start Shortly

12/21/2020 | 2:36 PM CST

A website for filing soybean yield loss claims for dicamba injury is expected to launch before ...

Dicamba Injury Payments

Here's What we Know About Bayer's $400 Million Dicamba Settlement

6/26/2020 | 3:36 PM CDT

A final agreement regarding Bayer's dicamba settlement will be finalized soon in the coming weeks ...

Growers with non-soybean crop or plant injury in the multi-district litigation are in the process of settling their claims separately and privately with Bayer, Downing said.

"They will need evidence of dicamba symptomology on their soybeans and will need to produce yield records from which loss calculations can be made," Downing said.

As DTN has reported in the past, legally acceptable documentation of dicamba symptomology could include such things as photographs, state regulatory agency reports or expert agronomist opinions or notes. Yield loss evidence can be gleaned from field yield histories, crop insurance reports or readings from a calibrated yield monitor.

Farmers are able to complete the claim process on their own, can hire an attorney of their choice, or can retain one of the Plaintiffs' Executive Committee firms to assist with putting together the claim form and supporting documentation.

The settlement was negotiated by the court-appointed Plaintiffs' Executive Committee: Don Downing of Gray Ritter & Graham; Rene Rocha of Morgan & Morgan; Paul Lesko of Peiffer Wolf Carr Kane & Conway; Hart Robinovitch of Zimmerman Reed; James Bilsborrow of Weitz & Luxenberg; Paul LLP; Bev Randles of Randles & Splittgerber; Paul Byrd of Paul Byrd Law Firm.

To read more about the dicamba settlement, and who it applies to, see this DTN story: https://www.dtnpf.com/...

To read more about the larger $11 billion settlement over glyphosate that Bayer also negotiated this summer, in addition to this dicamba settlement, see this DTN story: https://www.dtnpf.com/...

Pamela Smith contributed to this report.

Emily Unglesbee can be reached at emily.unglesbee@dtn.com

Follow her on Twitter @Emily_Unglesbee

EXHIBIT 13-Page1

Dicamba Settlement Is a Go

$300 Million Dicamba Settlement Finalized, Claim Filing to Start Shortly

12/17/2020 | 2:29 PM CST

A website for filing soybean yield loss claims from dicamba injury is...

Enlist Duo Survives Appeal

Ninth Circuit Rejects Request to Rehear Enlist Duo Lawsuit

11/19/2020 | 11:40 AM CST

The Ninth Circuit Court of Appeals has declined to rehear a lawsuit on...

Glyphosate Still Under Review

Glyphosate's Effects on Endangered Species Scrutinized in New EPA Docs

11/25/2020 | 11:04 AM CST

EPA determined that glyphosate is likely to have adverse effects on...

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Plan Would Raise Taxes on High-Income Farmers, Complicate Farm Sales and Estate Taxes

New Round of Crop, Livestock Aid Included in Congressional Deal

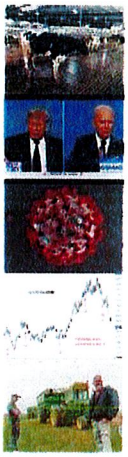
Ag Policy Blog

Todd's Take

What 2014 Can Teach Us About Soybean Prices in 2021

Family Treasures Vintage Deere Tractors

Vintage Deere Tractors Run in Family and Keep on Running



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Emily Unglesbee

About the Author

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EXHIBIT 13-Page2

Bayer Settles Dicamba Drift Lawsuits

By **Jackie Pucci (https://www.croplife.com/author/jackie-pucci/)**

June 24, 2020

(mailto:?subject=Bayer+Settles+Dicam out this site https%3A%2F%2Fwww.cropl inputs%2Fherbicides%2Fbay settles-dicamba-drift-lawsuits%2F)

f () () in ()

As almost a footnote to Bayer's massive Roundup settlement for up to $10.9 billion (https://www.croplife.com/management/bayer-settles-roundup-cancer-lawsuits-for-up-to-10-9-billion/) on Wednesday, the company announced a mass tort agreement to settle dicamba drift litigation involving alleged damage to crops.

Bayer will pay up to $400 million to resolve the multi-district litigation pending in the U.S. District Court for the Eastern District of Missouri and claims to soybean producers and certain producers of other crops who suffered dicamba damage from dicamba sprayed over-the-top of dicamba-tolerant soybeans or cotton from 2015 through 2020. The company will also pay litigation expenses, attorneys' fees, claims administration expenses and other costs in addition to the amounts provided to qualified claimants.

Bayer expects a contribution from its co-defendant, BASF, towards this settlement.

Claimants will be required to provide proof of damage to crop yields and evidence that it was due to dicamba in order to collect.

According to Peiffer Wolf, which represents dozens of farmers with dicamba damage, it is expected that the claims process will begin later this year after the 2020 harvest has been completed. Details and timing issues are still being worked out. Farmers who want to stay informed can go to **dicambadrift.com (https://dicambadrift.com/)**, where Peiffer Wolf will provide regular updates as the process unfolds.

Peiffer Wolf attorney Paul Lesko, a member of the plaintiff's Executive Committee that worked out the settlement, said: "We cannot stress enough the importance for farmers who have suffered dicamba damage to step forward and make their claim. This money will not flow out automatically. Farmers with dicamba crop damage will need to go through a process to get these funds, and we encourage them to get started now."

The only dicamba drift case to go to trial – **Bader Farms (https://www.croplife.com/dicamba/for-dicamba-the-future-is-lawsuits/)** – is not included in this resolution. Bayer "believes the verdict in Bader Farms is inconsistent with the evidence and the law" and will continue to pursue post-trial motions and an appeal, if necessary.

Bayer said it "stands strongly behind the safety and utility of its XtendiMax herbicide with VaporGrip technology and continues to enhance training and education efforts to help ensure growers use these products successfully."

Earlier this month, the U.S. Ninth Circuit Court of Appeals **vacated registrations for three dicamba herbicides (https://www.croplife.com/crop-inputs/federal-court-vacates-three-dicamba-registrations/)** — including Monsanto/Bayer's Xtendimax — after finding that the U.S. Environmental Protection Agency (EPA) substantially understated risks that it acknowledged and failed entirely to acknowledge other risks.

That ruling led to more legal wrangling amid the ongoing spray season. The Court **allowed EPA's decision to stand (https://www.croplife.com/crop-inputs/dicamba-decision-stands-ag-industry-responds/)** to allow the use of existing stocks of dicamba to be applied according to label for the 2020 season, no later than July 31.

The Court's June 3 ruling pertains specifically to the EPA's 2018 registration decision, which expires in December 2020. The EPA is currently reviewing a new registration for XtendiMax for the 2021 season and beyond.

"We hope the EPA completes the review and issues a new registration by this fall," Bayer said.

BASF said it will also continue to pursue EPA re-registration of Engenia for the coming seasons.

In 2017, **3.6 million acres of soybeans on 2,708 farms nationwide were damaged by dicamba, (https://ipm.missouri.edu/IPCM/2017/10/final_report_dicamba_injured_soybean/)**according to the estimate of University of Missouri Crop Science Professor Kevin Bradley.

ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 14

1 Again, like the volatility reduction
2 adjuvant, the hooded sprayer will be added to
3 the tank mix website and there'll be a tab
4 there for those qualifying hooded sprayers as
5 well.
6 So that's -- thanks for your time. I just
7 wanted to provide you a little additional
8 background. I'm sure a lot of these changes
9 you've seen other analyses on these, but I
10 thought we'd give you a little bit of
11 background on what are probably the two most
12 important and that would be the change in the
13 downwind buffer distance and the requirement
14 for use of a pH buffering adjuvant.
15 Thank you for your time.
16 CHAIRMAN FULLER: And thank you --
17 MR. WESTBURG: Thank you, Jeff.
18 MR. BURKE: We're open to take any
19 questions, if there's time.
20 CHAIRMAN FULLER: Okay. Thank you, Dr.
21 Dan and Dr. Bo and Jeff.
22 Do I have any questions for these three
23 panelists?
24 MR. EATON: I've got a question. This is
25 Marty.

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1 CHAIRMAN FULLER: Okay, Marty.
2 MR. EATON: Has anyone done any studies --
3 I see the -- I see the study with the -- just
4 say Engenia by itself and then Engenia with the
5 PowerMax and then Engenia with the PowerMax and
6 the Centrus.
7 Has anyone done any study with just
8 Engenia with Centrus? Take the PowerMax out
9 and just see what kind of damage you get if you
10 take -- if you don't tank mix any PowerMax,
11 just Engenia with Centrus?
12 MR. WESTBURG: I believe there is some of
13 that. And, obviously, I did not show that
14 here.
15 What we were trying to do is show the --
16 the improvement relative to the -- the effects
17 that the K-Glyphosate has -- what we were
18 trying to do is show that we can mitigate that.
19 MR. EATON: Yeah. I'm just -- my
20 question, you know, I would just like to see,
21 you know, just say, hey, just say we don't tank
22 mix any PowerMax because we know it increases
23 the damage when you put PowerMax in with the
24 Dicamba.
25 So see what kind of results we would get

if we said no PowerMax tank mix, just take Engenia, put the Centrus pH buffer in with it and see how -- how we calm it down from there, you know, just see how safe we could make it if we said, no, no Roundup in with the tank mix.

You have to have a buffering agent but no Roundup and just see where we would be, you know, with those two combinations.

MR. BURKE: Yeah. I would -- this is Jeff -- I would add that Engenia, in and of itself, is quite low in volatility; and, unless you do something like add a Glyphosate or just a pH some of the way where you can increase the level of volatility, it's hard to see a reduction with Centrus.

So I would suggest that what the data shows with Centrus is there's virtually no effect on Engenia alone just because the levels of volatility are so low. It's only when you have something in there that can be disruptive to that tank mixture, either pH or the cation effects, and that's where the Centrus directly interacts with those and counteracts those effects.

So, with Engenia not having those issues

in and of itself, the expectation is that Centrus would have very little impact on Engenia alone.

MR. EATON: Okay. Answered my question. Thank you.

MR. BURKE: Thank you.

MR. MEYER: This is Reynold. I have a question.

MR. WESTBURG: Okay.

MR. MEYER: One, well, I have a follow-up to Marty, but I'm going to ask my primary question first.

Did you do any low tunnel tests that were not at four times the use rate? And, if you did, how does that affect things?

MR. WESTBURG: Basically, my understanding is that if you don't elevate the rate -- so the same thing, the humidome, those are 4X rates as well. We don't see anything.

You have to really elevate it up to a high degree or a high rate in order to be able to measure anything. The effects are so low at the -- say a 1X rate, that it's not measurable.

MR. MEYER: Very good.

And, as a follow-up to the question that

1 Marty asked and y'all answered, if I looked at
2 your charts that you shared with us, it looks
3 like that even though we -- Marty was talking
4 about possibly using Engenia with the buffering
5 agent to further reduce volatility and your
6 answer was it doesn't, it looks like using the
7 volatility reducing agent with the K-Glyphosate
8 and the Engenia gives you an even lower
9 volatility than Engenia alone.
10 Am I seeing that correctly?
11 MR. WESTBURG: So, in some of the studies,
12 it did show that trend that you saw less. And
13 a lot of them showed that you brought it back
14 to parity.
15 MR. MEYER: Okay.
16 MR. WESTBURG: So in -- you know, I think
17 it brings back the parity, maybe it's slightly
18 less. I don't know that it's that dramatic of
19 a difference.
20 And, Jeff, I don't know if you have any
21 additional comment on that. But that's --
22 MR. BURKE: No. You -- you --
23 MR. WESTBURG: -- what I have to say --
24 MR. BURKE: You do see that trend. And
25 so, you know, I don't think we have a full

So the temperature does have an effect. It's one of the reasons we use that field, the tunnels, is to -- those temperatures get elevated within the tunnels. It also tries to -- anything that comes off it tries to hold it there.

Now, we don't close the ends of the tunnels typically; because, in a field setting, you'd cook your bioassay (inaudible) So, in essence, that's why we don't do that.

I hope that's helpful.

CHAIRMAN FULLER: Thank you for that.

MR. BURKE: Is one of the reasons why the -- particularly, the loading of the atmosphere at night during an inversion doesn't really -- doesn't occur; because, as that soil temperature or the soil surface cools, during an inversion is you have no volatility.

CHAIRMAN FULLER: Thank you for that, Dr. Dan. Scott, did that answer your question?

MR. MILBURN: Yes, it did. Thank you.

CHAIRMAN FULLER: Okay. Thank you.

Do I have other panelists that would like to ask a question?

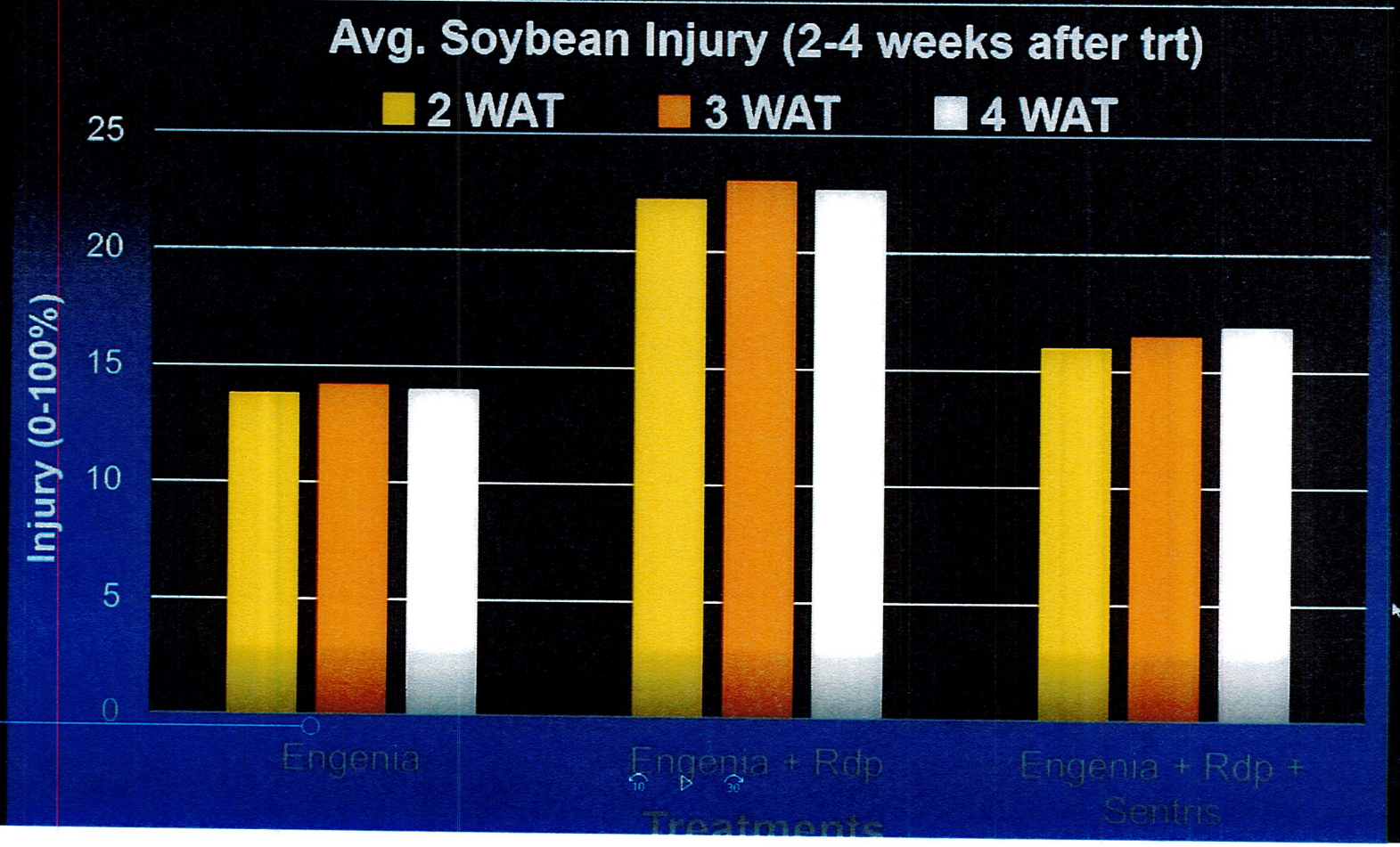
DR. SLATON: Terry, this is Nathan.

1 CHAIRMAN FULLER: Yes, Nathan.
2 DR. SLATON: So my question really goes
3 back to I think the response to Marty's
4 question.
5 But, if I understood correctly, you said
6 that the Centrus mix with Engenia, you did not
7 expect to see much benefit for reduction in
8 volatility; is that correct?
9 MR. WESTBURG: Likely not much. The one
10 difference might be, and Jeff can correct me
11 here, is if you've got a low pH water to start
12 with, that could be problematic, it would
13 mitigate that.
14 MR. BURKE: Yeah, I agree.
15 DR. SLATON: So I guess where I was going
16 is, you know, most of the work was done with
17 the Glyphosate and the tank mix.
18 But, correct me if I'm wrong, but that
19 tank mix was not allowed for the last year or
20 maybe the last two years in Arkansas.
21 So I guess my concern is whether or not
22 the Centrus would actually reduce the off-site
23 damage that we see.
24 MR. WESTBURG: So, again, it would come
25 down to the starting pH of the water. And I

1 don't have a really good feel for what your
2 starting pHs is for a lot of your water.
3 Obviously, in the western part of the
4 state where I grew up, it's typically pretty
5 high because you have a, you know, a
6 calcareous, you know, groundwater. And --
7 yeah.
8 So I think, you know, essentially, you
9 know, last two years, because of the existing
10 cutoff and with the rainfall that we had early
11 in the season, the cutoff date came into play
12 before we really had much, if any, commercial
13 applications, especially in northeast Arkansas.
14 So any, you know -- any response or most
15 of the complaints I think we had up there were
16 well after the cutoff date.
17 And I could be corrected on that. The
18 vast majority were well after.
19 DR. SLATON: Thank you.
20 CHAIRMAN FULLER: Thank you, Dr. Nathan.
21 Do you have any further follow-up question or
22 is that it? No? Good. Okay.
23 Do I have other questions from the
24 panelists?
25 UNIDENTIFIED SPEAKER: I think Reynold had

2019 Low Tunnel BASF Volatility Trial

Bioassay Results from Fayetteville, AR



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ARKANSAS STATE PLANT BOARD

FREEDOM TO FARM

COMMENT LETTER

APRIL 22, 2021

EXHIBIT 15

MESSAGE FROM THE

ACTING ASSISTANT ADMINISTRATOR, OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

This email message is being sent to EPA employees.

Dear OCSPP Colleagues – By now, I've been a part of the OCSPP team for nearly seven weeks, and I continue to be deeply impressed by and grateful for your integrity, professionalism, and unmatched commitment to public service and the public good.

I have been particularly pleased to see OCSPP career professionals speak strongly in support of Scientific Integrity. As you know, science is the backbone of EPA. Scientific integrity, in turn, is a bedrock principle for President Biden, Vice President Harris, our incoming Administrator Michael Regan, and me. Scientific Integrity ensures that our science is sound and that we earn and maintain the public's confidence in our decision-making. I affirm my commitment to you to act with scientific integrity. I expect you to do likewise when working with me and with each other.

Our work as a science-based regulatory office requires us to embody scientific integrity in many contexts. For example, I expect:

- Robust exchange of scientific views, with differing scientific opinions expressed in writing early and shared with mangers throughout the process, including me.
- Truth-telling in briefings: what do I and other managers need to know?
- Courage to point out errors early in the process and a welcoming attitude by managers and peers to those communications.
- Respect for the role of science in risk assessments and the role of policy and law in risk management decisions. This requires the assurance that risk management considerations aren't the driving influences during the risk assessment phase, and it requires respect among scientists when difficult policy choices are ultimately made.
- Integrity of scientific products.
- Clear, real-time communication with scientists to explain senior scientists' changes to draft scientific products and an opportunity for scientists to express a different view.

- Understanding that, as a regulatory office, we also need to be mindful of statutory and other deadlines.

- An environment – led in the first instance by OCSPP managers – where everyone feels comfortable identifying errors, asking questions, and expressing differing scientific opinions, all without fear either of retaliation or being denigrated for speaking up.

- An environment free from political interference in the science.

Over the past few years, I am aware that political interference sometimes compromised the integrity of our science. Here are examples:

2018 Dicamba Registration Decision: In 2018, OCSPP senior leadership directed career staff to: (1) rely on a limited data set of plant effects endpoints; (2) discount specific studies (some with more robust data) used in assessing potential risks and benefits; and (3) discount scientific information on negative impacts. This interference contributed to a court's vacating registrations based on these and other deficiencies, which in turn impacted growers' ability to use this product.

TCE: White House staff directed OCSPP career staff to alter the draft TCE risk evaluation to change the point of departure used for making determinations of risk to a less sensitive endpoint. While the risk evaluation included a description of the more sensitive endpoint (fetal heart malformations), it was no longer used to determine whether there is unreasonable risk from TCE. Unreasonable risks were nevertheless identified for most uses of TCE, but the magnitude of the risk from exposures to TCE would have been greater had EPA relied upon the fetal cardiac defect endpoint that had been used in previous EPA peer-reviewed assessments.

PFBS Toxicity Assessment: The PFBS Toxicity Assessment that was recently removed from EPA's website included conclusions purporting to reflect science when in fact they were the product of biased political interference directed in part by OSCPP's past political leadership. That interference undermined the agency's scientific integrity policy and eroded the trust that the American public has in EPA, the quality of our science, and our ability to protect their health and the environment.

This is a new day, about communication, trust, transparency and the importance of science in our regulatory decision-making process. All of us are responsible for ensuring the scientific integrity of our work. All of us are responsible for creating a work environment where everyone feels free to speak up without fear.

To this end, I encourage you to read the Science Integrity Policy. I encourage you to browse the Office of Scientific Integrity intranet page and refresh your knowledge by studying their resources and whiteboards. And please don't hesitate to contact OCSPP's Deputy Scientific Integrity Officer, Carol Ann Siciliano, at siciliano.carolann@epa.gov or (202) 564-5489, or EPA's Scientific Integrity Officer, Francesca Grifo at (202) 564-1687 (office) or (202) 657-8575 (mobile).

I also encourage you to attend the OCSPP Scientific Integrity Training series being launched by Carol Ann. You'll see more information about that shortly. The first session will feature a presentation and Q&A with Francesca Grifo. The second session will talk about ways to express and resolve Differing

Scientific Opinions (DSO). Explore the DSO toolkit here. We also plan a training on Whistleblower protections. Get to know your rights here. More training subjects will follow.

Just as important, let's make Scientific Integrity part of our daily work and our daily conversations. You can count on me. And I know that I can count on you – managers and staff, scientists and non-scientists – to do the same.

All the best,
Michal

Michal Freedhoff, Ph.D.
Acting Assistant Administrator
Office of Chemical Safety and Pollution Prevention
U.S. Environmental Protection Agency