



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

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

MEMORANDUM

DATE: April 21, 2021

SUBJECT: **Dicamba.** Second Revision: Human Health Risk Assessment Addendum for Registration Review.

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128944, 029803, 100094 & 129043

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40 CFR: §180.227

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Introduction

The Pesticide-Re-evaluation Division (PRD) has requested that the Health Effects Division (HED) evaluate the scope of work necessary to assess the herbicide dicamba for Registration Review. At the time of the previous draft registration review assessment (D431272, May 2016¹), HED had recently conducted a human health risk assessment for new uses on dicamba-tolerant cotton and soybean in March of 2016². The March 2016 assessment had provided an up-to-date assessment of dicamba, particularly related to its toxicity, dietary, residential and aggregate risk picture and had identified no risks of concern. In order to fulfill the requirements for Registration Review, HED determined it necessary to provide an update on the residue chemistry data requirements and tolerance expressions, and updates to the occupational exposure assessment. The May 2016 addendum (D431272) provided those updates. Since that time however, there have been updates to the occupational exposure data; the occupational scenarios assessed in both the March 2016 assessment and the May 2016 addendum have been updated in this revised document. HED has also recommended that all crop tolerances be consolidated into a single tolerance expression and that a number of established tolerances be revised to be consistent with the Organization for Economic Co-operation and Development (OECD) rounding class practices. Therefore, for registration review, this revised addendum³ provides a summary of findings for toxicity, dietary, residential and aggregate risk from the March 2016 risk assessment (no changes), reflects HED's updated tolerance recommendations, and provides an updated occupational exposure assessment that supersedes both previous documents.

Hazard Identification/Toxicology

The March 2016 risk assessment provides a full assessment of the hazard and toxicology of dicamba, including consideration of the Safety Factor for Infants and Children (FQPA Safety Factor) and dose response/endpoint selection. As noted in the March 2016 risk assessment, the toxicology database on dicamba is extensive and complete with respect to 870 guideline requirements for characterizing the hazard of dicamba, with routes of administration that are consistent with potential exposure scenarios. No additional data are required, nor are additional updates required at this time. The endpoints, doses, and safety factors used in the most recent risk assessment reflect current HED practices and policies for hazard evaluation.

Residue Chemistry/Dietary Exposure

As noted in the March 2016 risk assessment, the dicamba residue chemistry database is complete. Data were required by the 2005 dicamba RED for guidelines 860.1340 Residue Analytical Method (plant and livestock commodities), 860.1360 Multiresidue Method (recovery of metabolites 5-OH dicamba and DCSA), 860.1380 Storage Stability (sugarcane molasses), and 860.1500 Crop Field Trials (barley, field corn, sugarcane, and wheat raw agricultural commodities (RACs), as well as cotton gin byproducts, soybean forage and hay). The 2008 human health risk assessment (HHRA) supporting the registration of sweet corn also required an

¹ Memo, D431272, P. Savoia et al., 05/18/2016. Dicamba: Addendum to the Human Health Risk Assessment for Proposed Section 3 New Uses on Dicamba-tolerant Cotton and Soybean

² Memo, D378366, D404917, D402514, D421306, D402551, W. Irwin et al., 03/29/2016. Dicamba and Dicamba BAPMA Salt: Human Health Risk Assessment for Proposed Section 3 New Uses on Dicamba-tolerant Cotton and Soybean

³ This memo supersedes a previous version (D461280, P. Savoia et al., 04/13/2021) and fixes an error in a reported Margin of Exposure in the *Occupational Handler Exposure and Risk Assessment* section on p. 9.

additional three (3) crop field trials to satisfy 860.1500 guideline requirements. As part of a dicamba scoping exercise, HED has determined that these requirements, except those noted for 860.1380 Storage Stability, have been addressed and fulfilled by the registrants. In regard to the remaining data gap, sugarcane molasses samples stored for up to 64-days are noted not to be supported by adequate storage stability data. To support these results, the Agency will allow translation of existing freezer storage stability data which show residues of dicamba are stable in field corn RACs for well over 2-years as well as in refined oil for up to 3-months. The 860.1380 data requirement is considered fulfilled for dicamba for the currently registered uses.

Tolerance Assessment and International Harmonization

Permanent tolerances are established under 40 CFR §180.227 for the registered uses of dicamba on a number of crop and livestock commodities. A summary of the international residue limits established for dicamba and its metabolites is presented in Appendix A (Table A.1). There are maximum residue limits (MRLs) set by Canada and Codex on a number of established crop uses registered in the U.S. Mexico adopts U.S. tolerances and/or Codex MRLs for its export purposes. The Canadian MRLs established for dicamba are all harmonized with U.S. tolerance levels. At present, the tolerance expression for dicamba is not harmonized with Codex or Canada following the U.S. registration for use on genetically modified dicamba-tolerant crops starting in 2016. Because Codex only regulates on the parent compound and the U.S. includes metabolites, lowering tolerances for harmonization is unavoidable. However, the U.S. tolerances for asparagus, barley grain and sugarcane cane are lower than the Codex MRLs established on these crops. For the purposes of harmonization, the tolerances can be raised for asparagus to 5 ppm, barley grain to 7 ppm, and sugarcane cane to 1 ppm. All U.S. tolerances are therefore harmonized with international MRLs to the greatest extent possible.

For dicamba, a new petition was submitted in 2018 requesting Section 3 registration for its amended use on genetically modified (GM) dicamba-tolerant field corn (PP#8F8659). For this action, HED recommended consolidation of dicamba tolerances for field corn with all other crop commodities into a single tolerance expression for dicamba under 40 CFR §180.227(a)(1). The HED Residues of Concern Knowledgebase Subcommittee (ROCKS) was consulted for this reassessment of the residues of concern in plants for dicamba tolerance enforcement and risk assessment (D450731, P. Savoia, 03/05/2019). An evaluation of the supporting field trial data for this petition was conducted and updated field corn tolerances were recommended (D446725, P. Savoia, 03/05/2019). The updated tolerance expression concluded for dicamba under 40 CFR §180.227(a)(1) was recommended to read as follows:

“Tolerances are established for residues of the herbicide dicamba (3,6-dichloro-2-methoxybenzoic acid), including its metabolites and degradates, in or on the commodities in the table below. Compliance with the tolerance levels specified below is to be determined by measuring only the sum of the residues of dicamba (3,6-dichloro-2-methoxybenzoic acid), and its metabolites 3,6-dichloro-5-hydroxy-2-methoxybenzoic acid, and 3,6-dichloro-2-hydroxybenzoic acid, calculated as the stoichiometric equivalent of dicamba, in or on the following commodities:”

At this time, HED notes that these recommended tolerance revisions summarized above are still pending. In addition, the following established tolerances should also be revised in order to be

consistent with the OECD rounding class practices: asparagus at 4 ppm, barley grain at 6 ppm, barley hay at 2 ppm, barley straw at 15 ppm, cattle kidney at 25 ppm, cattle meat byproducts except kidney at 3 ppm, field corn forage at 6 ppm, field corn stover at 20 ppm, pop corn stover at 3 ppm, sweet corn forage at 0.5 ppm, sweet corn stover at 0.5 ppm, cotton undelinted seed at 3 ppm, goat kidney at 25 ppm, goat meat byproducts except kidney at 3 ppm, grass forage at 125 ppm, grass hay at 200 ppm, hog kidney at 25 ppm, hog meat by products except kidney at 3 ppm, horse kidney at 25 ppm, horse meat byproducts except kidney at 3 ppm, proso millet forage at 90 ppm, proso millet grain at 2 ppm, proso millet hay at 40 ppm, proso millet straw at 30 ppm, oat forage at 90 ppm, oat grain at 2 ppm, oat hay at 40 ppm, oat straw at 30 ppm, rye forage at 90 ppm, rye grain at 2 ppm, rye straw at 30 ppm, sheep kidney at 25 ppm, sheep meat byproducts except kidney at 3 ppm, sorghum forage 3 ppm, sorghum grain at 4 ppm, sorghum stover at 10 ppm, soybean hulls at 30 ppm, soybean seed at 10 ppm, sugarcane molasses at 5 ppm, teff forage at 90 ppm, teff grain at 6 ppm, teff hay at 40 ppm, teff straw at 30 ppm, wheat forage at 90 ppm, wheat grain at 2 ppm, wheat hay at 40 ppm, wheat straw at 30 ppm,

The recommended revisions for the 40 CFR §180.227(a) *General*. (1) tolerances based on this updated registration review of dicamba are summarized below in Table 1.

Table 1. Summary of Tolerance Revisions for Dicamba (40 CFR §180.227(a) General. (1)).			
Commodity/ Correct Commodity Definition	Established Tolerance (ppm)	Recommended Tolerance (ppm)	Comments
Asparagus	4.0	5	Crop tolerances consolidated under a single tolerance expression (D450731, P. Savoia, 03/05/2019). Corrected value to be consistent with OECD Rounding Class Practice. Harmonization with Codex.
Barley, grain	6.0	7	Corrected value to be consistent with OECD Rounding Class Practice. Harmonization with Codex.
Barley, hay	2.0	2	
Barley, straw	15.0	15	
Corn, field, forage	3.0	6	Tolerance revision recommend to support PP#8F8659 (D446725, P. Savoia, 03/05/2019). Corrected value to be consistent with OECD Rounding Class Practice.
Corn, field, stover	3.0	20	
Corn, pop, stover	3.0	3	Corrected value to be consistent with OECD Rounding Class Practice.
Corn, sweet, forage	0.50	0.5	Corrected value to be consistent with OECD Rounding Class Practice.
Corn, sweet, stover	0.50	0.5	
Cotton, gin byproducts	70	70	Crop tolerances consolidated under a single tolerance expression (D450731, P. Savoia, 03/05/2019). Corrected value to be consistent with OECD Rounding Class Practice.
Cotton, undelinted seed	3.0	3	
Grain, aspirated fractions	1000	1000	Crop tolerances consolidated under a single tolerance expression (D450731, P. Savoia, 03/05/2019).
Grass, forage, fodder and hay, group 17, forage	125.0	125	Corrected value to be consistent with OECD Rounding Class Practice.
Grass, forage, fodder and hay, group	200.0	200	Corrected value to be consistent with

Table 1. Summary of Tolerance Revisions for Dicamba (40 CFR §180.227(a) General. (1)).			
Commodity/ Correct Commodity Definition	Established Tolerance (ppm)	Recommended Tolerance (ppm)	Comments
17, hay			OECD Rounding Class Practice.
Millet, proso, forage	90.0	90	Corrected value to be consistent with OECD Rounding Class Practice.
Millet, proso, grain	2.0	2	
Millet, proso, hay	40.0	40	
Millet, proso, straw	30.0	30	
Oat, forage	90.0	90	Corrected value to be consistent with OECD Rounding Class Practice.
Oat, grain	2.0	2	
Oat, hay	40.0	40	
Rye, forage	90.0	90	Corrected value to be consistent with OECD Rounding Class Practice.
Rye, grain	2.0	2	
Rye, straw	30.0	30	
Sorghum, grain, forage	3.0	3	Corrected value to be consistent with OECD Rounding Class Practice.
Sorghum, grain, grain	4.0	4	
Sorghum, grain, stover	10.0	10	
Soybean, forage	60	60	Crop tolerances consolidated under a single tolerance expression (D450731, P. Savoia, 03/05/2019). Corrected value to be consistent with OECD Rounding Class Practice.
Soybean, hay	100	100	
Soybean, hulls	30.0	30	
Soybean, seed	10.0	10	
Sugarcane, cane	0.3	1	Harmonization with Codex.
Sugarcane, molasses	5.0	5	Corrected value to be consistent with OECD Rounding Class Practice.
Teff, forage	90.0	90	Corrected value to be consistent with OECD Rounding Class Practice.
Teff, grain	6.0	6	
Teff, hay	40.0	40	
Teff, straw	30.0	30	
Wheat, forage	90.0	90	Corrected value to be consistent with OECD Rounding Class Practice.
Wheat, grain	2.0	2	
Wheat, hay	40.0	40	
Wheat, straw	30.0	30	

The recommended revisions for the 40 CFR §180.227(a) *General. (2)* tolerances based on this updated registration review of dicamba are summarized below in Table 2.

Table 2. Summary of Tolerance Revisions for Dicamba (40 CFR §180.227(a) General. (2)).			
Commodity/ Correct Commodity Definition	Established Tolerance (ppm)	Recommended Tolerance (ppm)	Comments
Asparagus	4.0	remove	Crop tolerances consolidated under a single tolerance expression (D450731, P. Savoia, 03/05/2019).
Cattle, kidney	25.0	25	Corrected value to be consistent with OECD Rounding Class Practice.
Cattle, meat byproducts, except kidney	3.0	3	
Goat, kidney	25.0	25	Corrected value to be consistent with OECD Rounding Class Practice.
Goat, meat byproducts, except kidney	3.0	3	Corrected value to be consistent with OECD Rounding Class Practice.
Hog, kidney	25.0	25	Corrected value to be consistent with OECD Rounding Class Practice.
Hog, meat byproducts, except kidney	3.0	3	

Table 2. Summary of Tolerance Revisions for Dicamba (40 CFR §180.227(a) General. (2)).			
Commodity/ Correct Commodity Definition	Established Tolerance (ppm)	Recommended Tolerance (ppm)	Comments
Horse, kidney	25.0	25	Corrected value to be consistent with OECD Rounding Class Practice.
Horse, meat byproducts, except kidney	3.0	3	
Sheep, kidney	25.0	25	Corrected value to be consistent with OECD Rounding Class Practice.
Sheep, meat byproducts, except kidney	3.0	3	

The tolerances listed under 40 CFR §180.227(a) *General. (3)* are to be removed from this listing and consolidated under 40 CFR §180.227(a) *General. (3)* as summarized above in Table 1.

The March 2016 risk assessment provided acute and chronic aggregate (food + water) dietary risk assessments incorporating all current uses of dicamba. Neither the acute nor chronic dietary assessments were of concern. Additional updates to the dietary assessment are not required at this time since the most recent risk assessment reflects current HED practices and policies.

Residential Exposure and Risk Assessment

There are residential uses of dicamba that were assessed in the March 2016 risk assessment and reflect HED's 2012 Residential SOPs⁴. Registered uses of dicamba include solid products, liquid products in concentrates, or ready-to-use sprays for use on turf. Based on a review of currently registered labels, the March 2016 residential assessment is protective of currently registered residential uses, and therefore, an updated assessment is not necessary. A summary of the residential assessment is provided here.

There is no potential hazard *via* the dermal route for dicamba. Only inhalation risk estimates were quantitatively assessed. Residential handler risk estimates are not of concern for dicamba for all scenarios. Residential post-application risk estimates are also not of concern for dicamba. MOEs are greater than the level of concern of 100 for incidental oral scenarios and episodic ingestion. All scenarios are short-term exposures, except episodic granular ingestion which is an acute scenario.

Non-Occupational Exposure from Spray Drift and Volatilization

Non-Occupational Exposure and Risk from Spray Drift

In the March 2016 risk assessment, a qualitative assessment of non-occupational exposure from spray drift was conducted for dicamba, comparing the maximum agricultural rate to the registered rate for use on turf. The maximum agricultural application rate noted in that assessment was 1 lb ae/A. A higher application rate (2 lb ae/A for liquid formulation applications) for registered agricultural uses was identified based on a review of labels for registration review. However, this higher rate multiplied by the adjustment factor for drift of 0.26 (0.52 lb ae/A) is still less than the maximum direct spray residential turf application rate of

⁴ Available: https://www.epa.gov/sites/production/files/2015-08/documents/usepa-opp-hed_residential_sops_oct2012.pdf

1 lb ae/A⁵ for any dicamba products. The direct turf post-application MOEs for dicamba are protective of potential exposure from spray drift, and are not of concern.

The March 2016 risk assessment also provided a separate quantitative spray drift assessment for the BAPMA (N, N-Bis-(3-aminopropyl) methylamine) salt of dicamba since its use pattern does not include a use on turf. A quantitative assessment of non-occupational exposure and risk resulting from spray drift for the BAPMA salt resulted in no risk estimates of concern (i.e., all MOEs ≥ 100) at the field edge for aerial and groundboom applications at the maximum agricultural application rate of 1 lb ae/A (which is the maximum application rate for the registered BAPMA salt uses). Additional updates to the spray drift assessment are not required at this time since the most recent risk assessment reflects current HED practices and policies.

Non-Occupational Exposure and Risk from Volatilization

The potential non-occupational exposure to vapor phase dicamba residues emitted from treated fields was also evaluated in the most recent risk assessment. A submitted flux study⁶ was reviewed by the Environmental Fate and Effects Division (EFED), which estimated the flux of dicamba vapors after spray application of the DGA salt formulation. This study was determined to be acceptable for use in the human health risk assessment. The dicamba DGA salt formulation was used alone without any tank adjuvants, and the test surface was zoysia grass. The trial was performed in August 2012 near Columbia, IL, and experienced minimum and maximum temperatures of 21.1°C and 26.2°C, respectively. The estimated 6 hour average flux was 0.0004 $\mu\text{g}/\text{m}^2/\text{sec}$, representing 0.008% of the application rate.

Exposure modeling for a single day was completed using Probabilistic Exposure and Risk model for FUMigants (PERFUM). There are a variety of factors that potentially affect the emission rates of dicamba and subsequent offsite transport including: field condition (bare soil, growing or mature crop canopy), field parameters (soil type, moisture, etc.), formulation type, meteorological conditions, and application scenario (rate, method). The flux estimate from the study (0.0004 $\mu\text{g}/\text{m}^2/\text{s}$), a single 40A field, and the Bradenton, FL meteorological data (which would provide worst case meteorological conditions) were used with PERFUM to estimate risk based on the dicamba field volatility study. The results indicate that volatilization of dicamba from treated crops does occur and could result in bystander exposure; however, PERFUM modeling indicates that airborne concentrations, even at the edge of the treated fields, are negligible, and risk estimates are not of concern.

While the flux data are specific to the DGA salt of dicamba, it is considered protective for the other forms of dicamba (e.g., the sodium salt, the potassium salt, and the BAPMA salt), with the exception of the DMA salt and the dicamba acid formulations, for the following reasons:

- Based on modeling data using Estimation Programs Interface Suite (EPISuite), the volatility of the sodium salt, the potassium salt, and the BAPMA salt is lower than that of

⁵ 2 lb ae/A $\times$ 0.26 $\leq$ 1 lb ae/A

⁶ Memo, D411382, W. Eckel. MRID 49022501. Sall, E.; Smith, H.; Findley, D.; et al. (2013) Measurement of the Volatile Flux of Dicamba under Field Conditions using the Theoretical Profile Shape Method. Project Number: RPN/2012/0662, MSL0024798. Unpublished study prepared by Monsanto Company. 52p.

the DGA salt.

- Based on registrant submitted information, the vapor pressure of the DGA salt is less than that of the DMA salt. In addition, the DGA salt formulation showed a 7-fold decrease in volatility as compared to the DMA formulation under identical conditions.⁷
- A BASF patent⁸ provides a relative ranking of the volatility of the various forms of dicamba, with the DMA, DGA, and BAPMA salt being 17.8%, 5.4% and 0.5% of the volatility of the dicamba acid (100%), respectively.

Based on the relative ranking of volatility, it appears that the DGA salt is approximately 20x and 4x less volatile than the dicamba acid and the DMA salt, respectively. In order to address this uncertainty, HED modeled the volatilization of the DGA salt assuming 10x (0.004 $\mu\text{g}/\text{m}^2/\text{sec}$) and 100x (0.04 $\mu\text{g}/\text{m}^2/\text{sec}$) the estimated flux rate from the available flux study. When assuming 10x or 100x the flux rate, air concentrations were still found to be negligible at the edge of the treated fields, and not of concern. Additional updates to the volatilization assessment are not required at this time since the most recent risk assessment reflects current HED practices and policies.

Aggregate Risk Assessment

An aggregate assessment for dicamba, incorporating food, drinking water, and potential residential exposure from currently registered uses, was conducted in the March 2016 risk assessment. The acute and chronic aggregate exposure estimates are equal to the acute and chronic dietary assessments and are not of concern for the U.S. population or any population sub-group. The short-term aggregate (food, water, and residential) assessment for children is not of concern since the MOE is 3600 (LOC = 100). For adults, there is no short-term aggregate assessment since there is no dermal hazard identified and the inhalation effects are not systemic. Dicamba is not likely to be carcinogenic to humans, thus a quantitative cancer risk is not applicable and not assessed. Additional updates to the aggregate assessment are not required at this time since the most recent risk assessment reflects current HED practices and policies.

Occupational Risk Assessment

The dicamba registration review case includes the acid and salt forms of dicamba (see Appendix B). Registered use sites include asparagus, barley, corn, cotton, forestry, golf courses, grass grown for seed, hay, oats, pasture/rangeland, proso millet, small grains, sod farms, sorghum, soybeans, sugarcane, triticale, wheat, residential gardens/ornamentals, non-crop areas (including rights-of-way), and commercial and residential turf. Registered formulations include dry flowable/water dispersible granulars (DF/WDG), granulars (G), and liquids (including ready to use), and are expected to be made via aerial, groundboom, tractor-drawn spreader, and handheld equipment; in addition, impregnated dry bulk fertilizer can be used on sorghum and corn (see Appendix C). All registered occupational labels require handlers to wear, at a minimum, long-sleeved shirts, long pants, chemical-resistant gloves, shoes plus socks, and protective eyewear.

⁷ BASF Reg Doc 1975/5161, 1994/5202, 1982/5169, 1986/5195, 1984/5093.

⁸ Low volatile amine salts of anionic pesticides. USPTO Application: #20150210723.
<http://images3.freshpatents.com/pdf/US20150210723A1.pdf>

Occupational Handler Exposure and Risk Assessment

Both the March 2016 risk assessment and the May 2016 addendum included inhalation assessments for various occupational handler scenarios relevant to the registered uses of dicamba. However, as noted above, there have been several updates to the underlying occupational exposure data, and, therefore, all of the occupational handler scenarios have been updated. The occupational handler assessment included here supersedes both the March 2016 and the May 2016 assessments.

A summary of the occupational handler scenarios and associated risk estimates is provided in Appendix D. Most scenarios are not of concern (i.e., MOEs $\geq$ the LOC of 30) with no respirator (a respirator is currently not required on product labels). For those scenarios that are of concern without a respirator, several are not of concern with the addition of a PF10 respirator, and include the following:

- Mixing/loading dry flowable formulations for aerial applications to:
 - Sod – MOE = 5.1 with no respirator and 51 with a PF10 respirator
 - Typical acreage field crops (at rates greater than 0.138 lb ai/A⁹)
 - @0.275 lb ai/A – MOE = 19 with no respirator and 190 with PF10 respirator
 - @0.525 lb ai/A – MOE = 10 with no respirator and 100 with PF10 respirator
 - @1.05 lb ai/A – MOE = 5.1 with no respirator and 51 with PF10 respirator
 - High acreage field crops (at all rates up to and including 0.525 lb ai/A¹⁰)
 - @0.131 lb ai/A – MOE = 12 with no respirator and 120 with PF10 respirator
 - @0.263 lb ai/A – MOE = 5.9 with no respirator and 59 with PF10 respirator
 - @0.525 lb ai/A – MOE = 3.0 with no respirator and 30 with PF10 respirator
- Mixing/loading dry flowable formulations for groundboom applications to:
 - Sod – MOE = 22 with no respirator and 220 with PF10 respirator
 - Typical acreage field crops (at rates greater than 0.525 lb ai/A)
 - @1.05 lb ai/A – MOE = 22 with no respirator and 220 with PF10 respirator
 - High acreage field crops (at rates greater than 0.263 lb ai/A)
 - @0.525 lb ai/A – MOE = 18 with no respirator and 180 with PF10 respirator
 - @1.05 lb ai/A – MOE = 8.9 with no respirator and 89 with PF10 respirator

One scenario was of concern both with the addition of a PF10 respirator and with consideration of engineering controls (i.e., use of water soluble bags): mixing/loading dry flowable formulations for aerial applications to high acreage field crops at a rate of 1.05 lb ai/A (MOE = 15 with PF10 respirator and MOE = 5.1 with engineering controls).

⁹ Multiple rates were assessed for typical acreage field crops including 0.138, 0.275, 0.525 and 1.05 lb ai/A.

¹⁰ Multiple rates were assessed for high acreage field crops including 0.131, 0.263, 0.525 and 1.05 lb ai/A.

Occupational Post-application Exposure and Risk Assessment

Since there is no potential hazard *via* the dermal route for dicamba, a quantitative occupational post-application dermal risk assessment was not completed. Restricted entry intervals (REIs) vary across labels (e.g., 24 hours versus 48 hours). The REI should be based on the technical grade active ingredient acute toxicity requirements. These requirements may vary since each dicamba form might have a different acute toxicity profile, in addition to the potential presence of other active ingredients in a product.

References

P. Savoia et al., D431272. Dicamba: Addendum to the Human Health Risk Assessment for Proposed Section 3 New Uses on Dicamba-tolerant Cotton and Soybean, 05/18/2016.

P. Savoia., D450731. Dicamba. Reassessment of the Residues of Concern in Plants for Dicamba Tolerance Enforcement and Risk Assessment, 03/05/2019.

P. Savoia., D446725. Dicamba. Section 3 Registration for the Amended Use of Dicamba on Genetically Modified Dicamba-Tolerant Field Corn. Summary of Analytical Chemistry and Residue Data, 03/05/2019.

W. Eckel., D411382. MRID 49022501. Sall, E.; Smith, H.; Findley, D.; et al. (2013) Measurement of the Volatile Flux of Dicamba under Field Conditions using the Theoretical Profile Shape Method. Project Number: RPN/2012/0662, MSL0024798. Unpublished study prepared by Monsanto Company. 52p. 01/11/2016

W. Irwin et al., D378366, D404917, D402514, D421306, D402551. Dicamba and Dicamba BAPMA Salt: Human Health Risk Assessment for Proposed Section 3 New Uses on Dicamba-tolerant Cotton and Soybean, 03/29/2016.

Appendix A. International Residue Limits Spreadsheet for Dicamba

The International Residue Limits presented below for the herbicide dicamba are harmonized with U.S. tolerances to the greatest extent possible. For those limits not harmonized, a different pattern of use is followed in the U.S. which can incur higher residues.

Dicamba (029801, 029802, 029806, 128931, 128944 & 129043; 11/17/2015)

Table A.1. Summary of US and International Tolerances and Maximum Residue Limits.					
Residue Definition:					
US	Canada			Mexico	Codex
40 CFR 180.227: (a) <i>General</i> . (1) Compliance with the tolerance levels is to be determined by measuring only the sum of the residues of dicamba (3,6-dichloro-2-methoxybenzoic acid), and its metabolites 3,6-dichloro-5-hydroxy-2-methoxybenzoic acid, and 3,6-dichloro-2-hydroxybenzoic acid, calculated as the stoichiometric equivalent of dicamba	All food crops except dry soybeans: benzoic acid,3,6-dichloro-2-methoxy including the metabolite benzoic acid, 2,5-dichloro-3-hydroxy-6-methoxy-				Dicamba
Commodity ¹	Tolerance (ppm)/Maximum Residue Limit (mg/kg)				
	US Established	HED- Recommended	Canada	Mexico ¹	Codex
Asparagus	4.0	5			5
Barley, grain	6.0	7			7
Barley, hay	2.0	2			
Barley, straw	15.0	15			50 barley straw and fodder, dry
Corn, field, forage	3.0	6			
Corn, field, grain	0.1	0.1	0.1		0.01 (*)
Corn, field, stover	3.0	20			0.6 maize fodder dry
Corn, pop, grain	0.1	0.1			
Corn, pop, stover	3.0	3			1
Corn, sweet, forage	0.50	0.5			
Corn, sweet, kernel + cob with husks removed	0.04	0.04	0.04		0.02 sweet corn (kernels)
Corn, sweet, stover	0.50	0.5			
Cotton, gin byproducts	70	70			
Cotton, undelinted seed	3.0	3			0.04
Grain, aspirated fractions	1000	1000			
Grass, forage, fodder & hay, group 17, forage	125.0	125			
Grass, forage, fodder & hay, group 17, hay	200.0	200			30 hay or fodder (dry) of grasses
Millet, proso, forage	90.0	90			
Millet, proso, grain	2.0	2	7		
Millet, proso, hay	40.0	40	7		
Millet, proso, straw	30.0	30			
Oat, forage	90.0	90			
Oat, grain	2.0	2			
Oat, hay	40.0	40			
Oat, straw	30.0	30			
Rye, forage	90.0	90			
Rye, grain	2.0	2			

Rye, straw	30.0	30			
Sorghum, grain, forage	3.0	3			
Sorghum, grain, grain	4.0	4			4
Sorghum, grain, stover	10.0	10			8 sorghum straw and fodder, dry
Sugarcane, cane	0.3	1			1
Sugarcane, molasses	5.0	5			
Soybean, forage	60	60			
Soybean, hay	100	100			
Soybean, hulls	30.0	30			
Soybean, seed	10.0	10	10		10
Teff, forage	90.0	90			
Teff, grain	6.0	6			
Teff, hay	40.0	40			
Teff, straw	30.0	30			
Wheat, forage	90.0	90			
Wheat, grain	2.0	2			2
Wheat, hay	40.0	40			
Wheat, straw	30.0	30			50 wheat straw and fodder, dry
Summary of US and International Tolerances and Maximum Residue Limits.					
Residue Definition:					
US	Canada			Mexico	Codex
40 CFR 180.227: (2) Compliance with the tolerance levels is to be determined by measuring only the residues of dicamba (3,6-dichloro-2-methoxybenzoic acid), and its metabolite 3,6-dichloro-2-hydroxybenzoic acid, calculated as the stoichiometric equivalent of dicamba.	Food and crops, same as above.				Sum of dicamba and DCSA expressed as dicamba. The residue is not fat-soluble.
Commodity ¹	Tolerance (ppm)/Maximum Residue Limit (mg/kg)				
	US Established	HED-Recommended	Canada	Mexico ¹	Codex
Cattle, fat	0.3	0.3			0.07 mammalian fats except milk fats
Cattle, kidney	25.0	25			0.7 edible offal mammalian
Cattle, meat	0.25	0.25			0.03 meat from mammals other than marine mammals)
Cattle, meat byproducts, except kidney	3.0	3			0.7 edible offal mammalian
Goat, fat	0.3	0.3			0.07 mammalian fats except milk fats
Goat, kidney	25.0	25			0.7 edible offal mammalian
Goat, meat	0.25	0.25			0.03 meat from mammals other than marine mammals)
Goat, meat byproducts, except kidney	3.0	3			0.7 edible offal mammalian
Hog, fat	0.3	0.3			0.07 mammalian fats except milk fats
Hog, kidney	25.0	25			0.7 edible offal mammalian
Hog, meat	0.25	0.25			0.03 meat from mammals other than marine mammals)
Hog, meat byproducts, except kidney	3.0	3			0.7 edible offal mammalian
Horse, fat	0.3	0.3			0.07 mammalian fats except milk fats
Horse, kidney	25.0	25			0.7 edible offal mammalian

Horse, meat	0.25	0.25			0.03 meat from mammals other than marine mammals)
Horse, meat byproducts, except kidney	3.0	3			0.7 edible offal mammalian
Milk	0.2	0.2			0.2
Sheep, fat	0.3	03			0.07 mammalian fats except milk fats
Sheep, kidney	25.0	25			0.7 edible offal mammalian
Sheep, meat	0.25	0.25			0.03 meat from mammals other than marine mammals)
Sheep, meat byproducts, except kidney	3.0	3			0.7 edible offal mammalian
Completed using Global MRL. 09-Mar-2021					

¹ Mexico adopts US tolerances and/or Codex MRLs for its export purposes.

* = absent at the limit of quantitation; Po = postharvest treatment, such as treatment of stored grains. PoP = processed postharvest treated commodity, such as processing of treated stored wheat. (fat) = to be measured on the fat portion of the sample. MRLs indicated as proposed have not been finalized by the CCPR and the CAC.

Appendix B. Dicamba Active Ingredients in Case No. 0065

Active ingredient name	PC code
Dicamba	029801
Dicamba, dimethylamine salt (DMA)	029802
Dicamba, diethanolamine salt	029803
Dicamba, sodium salt	029806
Dicamba, diglycoamine salt (DGA)	128931
Dicamba, potassium salt	129043
Dicamba, isopropylamine salt	128944
BAPMA salt of Dicamba	100094

Appendix C. Summary of Use Directions for Dicamba

Use Site	Chemical	Application Method Type	Application Method Equipment	Formulation	A. I. Max App Rate	REI (hr)
Agricultural / Farm Premises	Dicamba, isopropylamine salt (128944)	Broadcast	Handheld sprayer	Liquid	0.004 lb ae/gal	NS
	Dicamba, dimethylamine salt (029802)		Aerial and Groundboom		2 lb ae/A	
Agricultural Fallow / Idleland / Conservation Reserve	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	NS
	Dicamba, potassium salt (129043)			Liquid	1.17 lb ae/A ^b	
Agricultural uncultivated areas	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	24
	Dicamba, dimethylamine salt (029802)			Liquid	1 lb ae/A	
Asparagus	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.525 lb ae/A	24
	Dicamba (029801)			Liquid	0.5 lb ae/A	
Barley	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.263 lb ae/A	24
	Dicamba (029801)			Liquid	0.25 lb ae/A	
Commercial Lawns/Turf	Dicamba, dimethylamine salt (029802)	Broadcast	Tractor-drawn spreader	G	0.124 lb ae/A	NS
	Dicamba, dimethylamine salt (029802)		Groundboom	Liquid	0.145 lb ae/A	
Commercial/Residential Lawns/Turf	Dicamba, dimethylamine salt (029802)	Spot treatment	Aerosol can	PRGS	0.0004375 lb ae/can	NS
	Dicamba (029801)	Broadcast	Rotary or push-type spreader	G	0.12 lb ae/A	
	Dicamba, diglycoamine salt (128931)	Broadcast	Aerial and Groundboom	Liquid	1 lb ae/A	
	Dicamba, dimethylamine salt (029802)	Spot treatment	Handheld sprayer		0.0046 lb ae/gal ^c	
Corn	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.525 lb ae/A	24 - 48
	Dicamba (029801)	Impregnated dry bulk fertilizer treatment.	Tractor-drawn spreader	Liquid	0.3 lb ae/A and 3 lb ae/ton fertilizer	
	Dicamba, diglycoamine salt (128931)	Broadcast	Aerial and Groundboom		1 lb ae/A	
Cotton	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.263 lb ae/A	24
	Dicamba, isopropylamine salt (128944)			Liquid	1 lb ae/A	
Cut stump treatment	Dicamba (029801)	Stump treatment.	Handheld sprayer	Liquid	0.03 lb ae/gal	48

Use Site	Chemical	Application Method Type	Application Method Equipment	Formulation	A. I. Max App Rate	REI (hr)
Forestry	Dicamba, diglycoamine salt (128931)	Broadcast	Aerial and Groundboom	Liquid	2 lb ae/A	24
Golf courses	Dicamba, dimethylamine salt (029802)	Broadcast	Tractor-drawn spreader	G	0.124 lb ae/A	24
	Dicamba (029801)	Broadcast	Drop or rotary spreader		0.12 lb ae/A	
	Dicamba, diglycoamine salt (128931)	Broadcast	Aerial and Groundboom	Liquid	1 lb ae/A	
	Dicamba, dimethylamine salt (029802)	Spot treatment	Handheld sprayer		0.0009 lb ae/gal	
Grass forage/fodder/hay	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.275 lb ai/A ^d	24
	Dicamba, diglycoamine salt (128931)			Liquid	1 lb ae/A	
Grass grown for seed	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	24
	Dicamba, sodium salt (029806)			Liquid	2 lb ae/A	
Hay	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	24
	Dicamba (029801)			Liquid	1 lb ae/A	
Home Gardens/Ornamentals	Dicamba, dimethylamine salt (029802)	Broadcast	Rotary or push-type spreader	G	0.09 lb ae/A	NS
	Dicamba, dimethylamine salt (029802)	Spot treatment	Aerosol can	PRGS	0.0004375 lb ai/can ^d	
	Dicamba, dimethylamine salt (029802)	Spot treatment	Handheld sprayer	RTU	0.0028 lb ae/gal	
Industrial / Construction Areas (Outdoor)	Dicamba, diglycoamine salt (128931)	Broadcast	Aerial and Groundboom	Liquid	1 lb ae/A	NS
Non agricultural rights of way / fencerows / hedgerows	Dicamba, diglycoamine salt (128931)	Broadcast	Aerial and Groundboom	Liquid	2 lb ae/A	NS
	Dicamba (029801)	Spot treatment	Handheld sprayer		0.03 lb ae/gal	
Nonagricultural uncultivated areas/soils	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	NS
	Dicamba, dimethylamine salt (029802)			Liquid	1 lb ae/A	
Non-crop areas (highway rights-of-way (principal, interstate, county, private, and unpaved roads); roadsides, roadside ditches, road shoulders, road embankments, dividers and medians;	Dicamba (029801)	Broadcast	Drop or rotary spreader	G	0.12 lb ai/A	NS
	Dicamba (029801)		Aerial and Groundboom	Liquid	1.5 lb ae/A	
	Dicamba (029801)	Spot treatment	Handheld sprayer	Liquid	0.01 lb ae/gal	

Use Site	Chemical	Application Method Type	Application Method Equipment	Formulation	A. I. Max App Rate	REI (hr)
municipal, state and federal lands; airports and military installations)						
Oats	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.131 lb ae/A	24 - 48
	Dicamba, isopropylamine salt (128944)			Liquid	0.13 lb ae/A	
Pastures / Rangeland	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	24 - 48
	Dicamba, dimethylamine salt (029802)			Liquid	2 lb ae/A	
	Dicamba (029801)	Spot treatment	Handheld sprayer	Liquid	0.009 lb ae/gal	
Proso Millet	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.138 lb ai/A ^d	24
	Dicamba (029801)			Liquid	0.125 lb ae/A	
Recreation area lawns	Dicamba, diglycoamine salt (128931)	Broadcast	Aerial and Groundboom	Liquid	1 lb ae/A	NS
Residential Lawns	Dicamba, potassium salt (129043)	Spot treatment	Hose-end sprayer	Liquid	0.0012 lb ae/gal ^e	NS
	Dicamba, potassium salt (129043)	Spot treatment	Pump-up sprayer.		0.0012 lb ae/gal ^e	
	Dicamba, dimethylamine salt (029802)	Broadcast	Hose-end sprayer		0.0038 lb ai/1000 ft ² and 0.0009 lb ai/gal	
	Dicamba, dimethylamine salt (029802)	Spot treatment	Trigger spray bottle	RTU	0.000025 lb ai/bottle	
Residential patios, sidewalks, driveways and pathways.	Dicamba, dimethylamine salt (029802)	Spot treatment	Aerosol can	PRL	0.0004375 lb ai/can	NS
	Dicamba, dimethylamine salt (029802)	Spot treatment	Handheld sprayer	RTU	0.0028 lb ae/gal	
	Dicamba, potassium salt (129043)	Spot treatment	Hose-end sprayer	Liquid	0.00132 lb ai/gal	
	Dicamba, potassium salt (129043)	Spot treatment	Pump-up sprayer.		0.00132 lb ai/gal	
Small Grains	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	Liquid	1 lb ae/A	24
Sod farms	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	24
	Dicamba (029801)	Broadcast		Liquid	1 lb ae/A	
Sorghum	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.263 lb ae/A	24 - 48
	Dicamba (029801)	Impregnated dry bulk fertilizer treatment.	Tractor-drawn spreader	Liquid	0.3 lb ai/A and 3 lb ai/ton fertilizer	
	Dicamba, dimethylamine salt (029802)	Broadcast	Aerial and Groundboom	Liquid	0.35 lb ae/A	

Use Site	Chemical	Application Method Type	Application Method Equipment	Formulation	A. I. Max App Rate	REI (hr)
Soybeans	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	24
	Dicamba (029801)			Liquid	1 lb ae/A	
Sugarcane	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	1.05 lb ae/A	24
	Dicamba, dimethylamine salt (029802)			Liquid	2 lb ae/A	
Triticale	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.131 lb ae/A	24
	Dicamba (029801)			Liquid	0.125 lb ae/A	
Wheat	Dicamba, sodium salt (029806)	Broadcast	Aerial and Groundboom	DF	0.263 lb ae/A	24 - 48
	Dicamba (029801)			Liquid	0.73 b ae/A	

a. Formulations: DF = dry flowable; G = granular; RTU = ready to use; PRL = pressurized liquid.

b. This rate is from a label identified as a RUP (Restricted Use Pesticide).

c. NOTE: no lb ae/gallon listed; used % ae given and density of water for app rate conversion.

d. NOTE: the app rate is representative of the salt; no acid equivalent was provided. Represents slightly higher rate than would expect for acid equivalent.

e. NOTE: no lb ae/gallon listed; used % ae given and density of water for app rate conversion.

Appendix D. Occupational Handler Risk Estimates

Table D.1. Occupational Handler Non-Cancer Exposure and Risk Estimates for Dicamba.									
Exposure Scenario	Crop or Target ^a	Inhalation Unit Exposure (µg/lb ai)	Level of PPE or Engineering control	Maximum Application Rate ^b	App Rate Unit	Area Treated or Amount Handled Daily ^c	Area Treated/Amount Handled Unit	Inhalation	
								Dose (mg/kg/day) ^d	MOE (LOC = 30) ^e
Mixer/Loader									
Dry Flowable, Aerial, Broadcast	Sod	8.96	No-R	1.05	lb ai/acre	350	acres	0.0411	5.1
		0.896	PF10 R					0.00411	51
	Field crop, typical	8.96	No-R	1.05				0.0411	5.1
		0.896	PF10 R					0.00411	51
		8.96	No-R	0.525				0.0206	10
		0.896	PF10 R					0.00206	100
		8.96	No-R	0.275				0.0108	19
		0.896	PF10 R					0.00108	190
		8.96	No-R	0.00541				39	
		Liquid, Backpack, Broadcast	Rights-of-way (e.g., utilities, railroad, roadways)	0.219				No-R	0.03
Liquid, Mechanically-pressurized Handgun, Broadcast									
Dry Flowable, Aerial, Broadcast	Field crop, high-acreage	8.96	No-R	1.05	lb ai/acre	1200	acres	0.141	1.5
		0.896	PF10 R					0.0141	15
		2.6	EC					0.041	5.1
		8.96	No-R	0.525				0.0705	3.0
		0.896	PF10 R					0.00705	30
		8.96	No-R	0.263				0.0354	5.9
		0.896	PF10 R					0.00354	59
		8.96	No-R	0.131				0.0176	12
		0.896	PF10 R					0.00176	120

Exposure Scenario	Crop or Target ^a	Inhalation Unit Exposure (µg/lb ai)	Level of PPE or Engineering control	Maximum Application Rate ^b	App Rate Unit	Area Treated or Amount Handled Daily ^c	Area Treated/Amount Handled Unit	Inhalation		
								Dose (mg/kg/day) ^d	MOE (LOC = 30) ^e	
Dry Flowable, Groundboom, Broadcast	Sod	8.96	No-R	1.05	lb ai/acre	80	acres	0.00941	22	
		0.896	PF10 R					0.000941	220	
	Field crop, typical	8.96	No-R	1.05				0.00941	22	
		0.896	PF10 R					0.000941	220	
		8.96	No-R	0.525				0.0047	45	
		8.96	No-R					0.00246	85	
		8.96	No-R	0.138				0.00124	170	
		8.96	No-R					0.0235	8.9	
	Field crop, high-acreage	8.96	No-R	1.05		200		0.00235	89	
		0.896	PF10 R					0.0118	18	
		8.96	No-R	0.525				0.00118	180	
		0.896	PF10 R					0.00589	36	
		8.96	No-R	0.263				0.00294	71	
		8.96	No-R							
Granule, Tractor-drawn Spreader, Broadcast	Golf course (fairways, tees, greens)	0.825	No-R	0.124	lb ai/acre		40	acres	0.0000511	4,100
	Golf course (tees and greens only)						5		0.0000064	33,000
Liquid, Aerial, Broadcast	Sod	0.219	No-R	1	lb ai/acre	350	acres	0.000959	220	
	Field crop, typical			2				0.00191	110	
Liquid, Impregnation, Commercial treatment	Fertilizer, dry bulk, impregnated	0.083	EC	3	lb ai/ton	960	tons	0.00299	70	
Liquid, Impregnation, On-farm treatment	Fertilizer, dry bulk, impregnated	0.219	No-R	0.3	lb ai/acre	160	acres	0.000131	1,600	
Liquid, Aerial, Broadcast	Field crop, high-acreage			2		1200		0.00658	32	
	Forestry			2		1200		0.00658	32	
Liquid, Groundboom, Broadcast	Golf course (tees and greens only)			1		5		0.0000138	15,000	
	Golf course (fairways, tees, greens)			1		40		0.00011	1,900	
	Sod			1		80		0.000219	960	
	Field crop, typical			2		80		0.000438	480	

Table D.1. Occupational Handler Non-Cancer Exposure and Risk Estimates for Dicamba.									
Exposure Scenario	Crop or Target ^a	Inhalation Unit Exposure (µg/lb ai)	Level of PPE or Engineering control	Maximum Application Rate ^b	App Rate Unit	Area Treated or Amount Handled Daily ^c	Area Treated/Amount Handled Unit	Inhalation	
								Dose (mg/kg/day) ^d	MOE (LOC = 30) ^e
	Field crop, high-acreage			2		200		0.0011	190
Applicator									
Spray (all starting formulations), Aerial, Broadcast	Sod	0.0049	EC	1.05	lb ai/acre	350	acres	0.0000225	9,300
	Field crop, typical			2				0.0000429	4,900
	Field crop, high-acreage			2		1200		0.000148	1,400
	Forestry			2				0.000148	1,400
Spray (all starting formulations), Groundboom, Broadcast	Golf course (tees and greens only)	0.34	No-R	1	lb ai/acre	5	acres	0.0000213	9,900
	Golf course (fairways, tees, greens)			1		40		0.00017	1,200
	Sod			1.05		80		0.000358	590
	Field crop, typical			2		80		0.00068	310
	Field crop, high-acreage			2		200		0.0017	120
Spray (all starting formulations), Mechanically-pressurized Handgun, Broadcast	Rights-of-way (e.g., utilities, railroad, roadways)	8.68	No-R	0.03	lb ai/gallon solution	1000	gallons solution	0.00325	65
Fertilizer, dry bulk, impregnated, Tractor-drawn Spreader, Commercial treatment	Field crop, typical	0.518	No-R	0.3	lb ai/acre	320	acres	0.000621	340
Fertilizer, dry bulk, impregnated, Tractor-drawn Spreader, On-farm treatment						160		0.000311	680
Fertilizer, dry bulk, impregnated, Tractor-drawn Spreader, Commercial treatment	Field crop, high-acreage					320		0.000621	340
Fertilizer, dry bulk, impregnated, Tractor-drawn Spreader, On-farm treatment						160		0.000311	680
Granule, Tractor-drawn Spreader, Broadcast	Golf course (fairways, tees, greens)	0.518	No-R	0.124	lb ai/acre	40	acres	0.0000321	6,500
	Golf course (tees and greens only)					5		0.00000401	52,000

Table D.1. Occupational Handler Non-Cancer Exposure and Risk Estimates for Dicamba.

Exposure Scenario	Crop or Target ^a	Inhalation Unit Exposure (µg/lb ai)	Level of PPE or Engineering control	Maximum Application Rate ^b	App Rate Unit	Area Treated or Amount Handled Daily ^c	Area Treated/Amount Handled Unit	Inhalation	
								Dose (mg/kg/day) ^d	MOE (LOC = 30) ^e
Liquid, Trigger-spray bottle, Spot	Landscaping, turf (lawns, athletic fields, parks, etc.)	61.2	No-R	0.000025	lb ai/bottle	10	bottles	0.000000191	1,100,000
Pressurized Liquid, Aerosol can, Broadcast (foliar)	Landscaping, plants/flowers	1041	No-R	0.0004375	lb ai/can	10	cans	0.0000569	3,700
Flagger									
Spray (all starting formulations), Aerial, Broadcast	Sod	0.202	No-R	1.05	lb ai/acre	350	acres	0.000928	230
	Field crop, typical			2				0.00176	120
	Field crop, high-acreage			2				0.00176	120
Mixer/Loader/Applicator									
Liquid, Trigger-spray bottle, Frill (hack-and-squirt)	Rights-of-way (e.g., utilities, railroad, roadways)	61.2	No-R	0.03	lb ai/gallon solution	2.5	gallons solution	0.0000574	3,700
Liquid, Backpack, Broadcast (foliar)	Landscaping, trees/shrubs/bushes	69.1		0.0028	lb ai/gallon solution	40	gallons solution	0.0000968	2,200
	Landscaping, plants/flowers								
Liquid, Backpack, Broadcast	Landscaping, turf (lawns, athletic fields, parks, etc.)	69.1		0.0046	lb ai/gallon solution	40	gallons solution	0.000159	1,300
Liquid, Backpack, Spot	Landscaping, turf (lawns, athletic fields, parks, etc.)	2.58						0.00000594	35,000
Liquid, Manually-pressurized Handwand, Broadcast (foliar)	Landscaping, trees/shrubs/bushes	23.6		0.0028	lb ai/gallon solution	40	gallons solution	0.000033	6,400
	Landscaping, plants/flowers								
Liquid, Manually-pressurized Handwand, Broadcast	Landscaping, turf (lawns, athletic fields, parks, etc.)			0.0046	lb ai/gallon solution	40	gallons solution	0.0000543	3,900
Liquid, Mechanically-pressurized Handgun, Broadcast	Golf course (tees and greens only)	1.9		1	lb ai/acre	5	acres	0.000119	1,800
	Golf course (fairways, tees, greens)								
Liquid, Mechanically-pressurized Handgun, Broadcast (foliar)	Landscaping, trees/shrubs/bushes	8.68		0.0028	lb ai/gallon solution	1000	gallons solution	0.000304	690
Liquid, Mechanically-pressurized Handgun, Broadcast	Landscaping, turf (lawns, athletic fields, parks, etc.)	1.9		1	lb ai/acre	5	acres	0.000119	1,800
Liquid, Mechanically-pressurized Handgun, Broadcast (foliar)	Field crop, typical	8.68		0.009	lb ai/gallon solution	1000	gallons solution	0.000976	220

Table D.1. Occupational Handler Non-Cancer Exposure and Risk Estimates for Dicamba.									
Exposure Scenario	Crop or Target ^a	Inhalation Unit Exposure (µg/lb ai)	Level of PPE or Engineering control	Maximum Application Rate ^b	App Rate Unit	Area Treated or Amount Handled Daily ^c	Area Treated/Amount Handled Unit	Inhalation	
								Dose (mg/kg/day) ^d	MOE (LOC = 30) ^e
Loader/Applicator									
Liquid, Backpack, Broadcast	Rights-of-way (e.g., utilities, railroad, roadways)	69.1	No-R	0.03	lb ai/gallon solution	40	gallons solution	0.00104	200
Granule, Belly grinder, Broadcast	Landscaping, trees/shrubs/bushes	80.6		0.12	lb ai/acre	1	acres	0.000121	1,700
	Landscaping, plants/flowers								
	Landscaping, turf (lawns, athletic fields, parks, etc.)								
Granule, Rotary spreader, Broadcast	Golf course (tees and greens only)	10				5		0.000075	2,800
	Golf course (fairways, tees, greens)								
	Landscaping, turf (lawns, athletic fields, parks, etc.)								
	Industrial/commercial (tires, rail yards, junk yards, etc.)								

- a. For dry flowable formulations, the crops covered by the rates assessed for typical acreage field crops include the following:

1.05 lb ae/A = agricultural fallowland, agricultural uncultivated areas, hay, pastures/rangelands
 0.525 lb ae/A = asparagus
 0.275 lb ae/A = grass/fodder
 0.138 lb ae/A = proso millet

- For dry flowable formulations, the crops covered by the rates assessed for high acreage field crops include the following:

1.05 lb ae/A = soybeans, grass grown for seed, sugarcane
 0.525 lb ae/A = corn
 0.263 lb ae/A = barley, wheat, cotton
 0.131 lb ae/A = triticale, oats

For liquid formulations, the crops covered by typical acreage field crops include: agricultural/farm premises, agricultural fallowland, agricultural uncultivated areas, asparagus, grass/forage, non-crop areas, pastures/rangeland, proso millet, small grains.

For liquid formulations, the crops covered by high-acreage field crops include: barley, corn, cotton, forestry, grass grown for seed, hay, oats, sorghum, soybeans, sugarcane, triticale, wheat.

- b. Application rate = maximum rates identified in Appendix C use summary table. Additional rates for the dry flowable formulation scenarios were included since risk estimates of concern were identified at the highest registered rates.
- c. Exposure Science Advisory Council Policy #9.1
- d. Inhalation Dose = Inhalation Unit Exposure (µg/lb ai) × Conversion Factor (0.001 mg/µg) × Application Rate (lb ae/acre or gal) × Area Treated or Amount Handled Daily (A or gal/day) ÷ BW (kg).
- e. Inhalation MOE = Inhalation POD (mg/kg/day) ÷ Inhalation Dose (mg/kg/day).