

PESTICIDE TYPE	HERBICIDE
Chemical Class	Benzoic Acid
Common Trade Names	Engenia <sup>®</sup> , XtendiMax <sup>®</sup> with VaporGrip <sup>®</sup> Technology, Tavium <sup>®</sup> Plus VaporGrip <sup>®</sup> Technology
Application Rate (lb a.e./A)	Single: 0.5 Max Annual: 2.0 (combined total for dicamba)
Registration Status	EPA: DGA salt - Nov 2016 BAPMA salt - Dec 2016 Minnesota: Registered
Toxicity Profile for Applicators	Signal word: Caution Toxicity III or IV (oral, dermal, inhalation), II (eye & dermal irritant)
Basic Manufacturer	Bayer, BASF, Syngenta
MDA Laboratory Capabilities	Method developed for parent chemical
HUMAN HEALTH	
Non-Cancer	Acute PAD= 0.29 mg/kg/day Chronic PAD= 0.04 mg/kg/day
Cancer	Not likely to be carcinogenic to humans
<i>Acute and chronic PADs are doses that include all relevant uncertainty and safety factors</i>	
ENVIRONMENTAL AQUATIC TOXICITY	
Fish	Acute: 14,000 ppb Chronic: N/A
Invertebrate	Acute: 50,000 ppb* Chronic: No data
Aquatic Plants	Vascular: > 3250 ppb Non-vascular: 61 ppb
POLLINATOR TOXICITY	
Honey Bee	Acute Contact (LD <sub>50</sub> ): 36.3 µg a.i./bee** Acute Oral (LD <sub>50</sub> ): N/A
Level of Concern (LOC) has been applied to all values. *Value may be lower for certain dicamba salts. Toxicity values of the formulated product were higher than Technical Grade Active Ingredient (TGAi). ** Value generated from technical end-use product.	

## INTRODUCTION

Dicamba is a systemic plant growth regulator (Group 4) herbicide that is used for postemergence selective control of broadleaf weeds in a variety of food and feed crops and in residential areas. Dicamba mimics auxin plant hormone and kills weeds by causing abnormal cell growth. Dicamba is currently registered in a variety of formulations including diglycolamine (DGA), N, N-Bis-(3-aminopropyl) methylamine (BAPMA), dimethylamine, and sodium salts. In 2016, the U.S. Environmental Protection Agency (EPA) approved a new use of certain formulations of dicamba as a postemergence application for weed control in dicamba-tolerant (DT) soybeans. These products include two formulations of dicamba: (1) the BAPMA salt, a less volatile form, and (2) the DGA salt formulations containing VaporGrip<sup>®</sup>, a volatility reducing agent. Previously, DGA dicamba formulations were only registered for preplant and preharvest applications in soybeans. The new use allows postemergence or over-the-top (OTT) applications of dicamba on DT soybeans to control many broadleaf weeds including pigweeds (*Amaranthus* spp.), ragweeds (*Ambrosia* spp.), horseweed (*Conyza* spp.), and kochia.

Dicamba is a highly volatile herbicide and can damage non-target plant species through drift of spray droplets and/or vapor. In 2020, the EPA introduced new control measures to address drift and volatility of dicamba products registered for OTT use on DT soybeans. The new requirements include a national application cutoff date of June 30th in DT soybeans in addition to crop growth stage cutoffs. In 2022, EPA approved Minnesota Department of Agriculture (MDA) state specific application restrictions which includes an application cutoff date of June 12 in areas south of Interstate 94. The application cutoff date is June 30 north of I-94.

In addition, application is not allowed if air temperature in 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 exceeds 85 degrees Fahrenheit.

The MDA review of dicamba products registered for OTT use on DT soybeans and the risk assessments for issues relevant to Minnesota are summarized below.

## PROJECTED USE IN MINNESOTA

The dicamba products registered for OTT use on DT soybeans are “Restricted Use Pesticides” and are considered less volatile than previous dicamba products. The University of Minnesota Extension expects that farmers will adopt this technology to control glyphosate resistant and other problem broadleaf weeds in soybeans. Three products are currently registered for OTT use on DT soybeans in Minnesota:

- **XtendiMax<sup>TM</sup> with VaporGrip<sup>®</sup> Technology** (EPA Reg. No. 264-1210), from Bayer contains dicamba DGA salt (42.8%) with VaporGrip Technology.
- **Engenia<sup>TM</sup> (EPA Reg. No. 7969-472)** - from BASF contains dicamba BAMPA salt (60.8%).
- **Tavium<sup>®</sup> Plus VaporGrip<sup>®</sup> Technology (EPA Reg. No. 100-1623)** from Syngenta, contains dicamba DGA salt (17.7%) and S-metolachlor (24.0%).

## LABEL ENVIRONMENTAL HAZARDS

New product labels for postemergence applications on DT soybeans carry the following restrictions or advisories.

### Water Quality

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- Dicamba has properties and characteristics making it prone to leach through soil into groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Spray drift, runoff, or volatilization may adversely affect aquatic invertebrates and non-target plants.

### Other Restrictions

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- Do not apply if listed sensitive plant species are in adjacent downwind area.
- Maintain a 240-foot downwind buffer between the last treated row and the nearest downwind field edge.
- Leave a 310-foot downwind buffer between the last treated row and the nearest downwind field edge in areas where federally endangered and threatened species are present. A 57-foot in-field buffer is required on the other field edges. Use EPA's "[Bulletins Live](#)" website to determine the presence of endangered species in an area.
- Product labels have additional restrictions on mixing, loading, and applications buffers, spray nozzles and pressure, spray volume, boom height, ground speed, wind speed, time of day for application, drift and volatility reduction adjuvants, pH buffers, spray additives, tank-mix partners, and preharvest intervals.
- Applicators must complete an annual dicamba-specific training. Information about webinar and online training is available on the manufacturer's websites.

## TOXICOLOGY AND EXPOSURE

EPA's screening models generate high-end, conservative exposure estimates for active ingredients and toxicologically significant degradates. Model inputs include annual usage at maximum use rates, maximum treated acres, maximum food residues, peak runoff and drift scenarios, etc. Some proposed products, application rates, and use scenarios are not relevant to Minnesota. EPA's estimates, therefore, may not reflect future use and impacts in Minnesota.

### Human Health

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- **Carcinogenic Effects** – Classified as "Not likely to be carcinogenic to humans."

- **Drinking Water Guidance** – Dicamba is known to leach into groundwater under certain conditions, specifically where soils are permeable and the water table is shallow. However, drinking water exposure estimates are considered protective of general U.S. population and sub-groups.
- **Occupational Exposure** – The occupational handler risk estimates are not of concern for dicamba on DT soybeans for most scenarios. However, inhalation risk estimates are of concern for the BAPMA salt in absence of respiratory protection PPE. The label requires a 24-hour restricted entry interval.

### Non-target Species

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- **Aquatic Life Exposure** – Based on the available ecotoxicity information, dicamba is practically non-toxic to moderately toxic on an acute basis to freshwater fish and freshwater invertebrates.
- **Others** – Dicamba is practically non-toxic to moderately toxic to mammals and birds.

## ENVIRONMENTAL FATE

### Soil

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- **Half-life** – Aerobic: 72.9 days  
Anaerobic: 423 days
- **Half-life via hydrolysis** – Stable
- **Photolysis in water** (half-life) – 105 days

### Water

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- **Half-Life** – Aerobic: 72.9 days
- **Half-life via hydrolysis** – Stable
- **Photolysis in water** (half-life) – 313 days

### Air

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- **Volatilization** – Vapor pressure =  $3.41 \times 10^{-5}$  Torr; Henry's law constant  $1.6 \times 10^{-9}$  atm m<sup>3</sup> mole<sup>-1</sup>

### Degradates

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3,6-dichlorosalicylic acid (DCSA) is the major degradate of dicamba. Because DCSA is primarily formed in plants, the EPA does not expect DCSA to reach groundwater at levels that would be of concern. DCSA is more toxic than the parent compound to certain species of birds and mammals; therefore, there could be potential adverse effects on those species. Measures were taken to alleviate these risks. Other minor degradates of dicamba include 3,6-dichlorogentisic acid (DCGA) and 5-OH-dicamba.