

PESTICIDE TYPE	INSECTICIDE
Chemical Class	Diamide
Common Trade Names	Nurizma; Cimegra; Teraxxa; Vedira; Terinda
Major Degradate	DC-8007
Application Rate (lb a.i./A/year)	Max Single: 0.045 (in-furrow) Max Annual: 0.045 (in-furrow)
Registration Status	EPA: Registered unconditionally in January 2021 Minnesota: 2021
Toxicity Profile for Applicators	Signal word: CAUTION Toxicity Category IV (oral, dermal, and inhalation exposure)
Basic Manufacturer	BASF Corporation Mitsui Chemicals Agro, Inc.
MDA Laboratory Capabilities	In discussion
HUMAN HEALTH	
Non-Cancer	Acute PAD= no value* Chronic PAD= 0.03 mg/kg/day
Cancer	Likely to be carcinogenic to humans
<i>Acute and chronic population adjusted doses (PAD) are doses that include all relevant uncertainty and safety factors.</i>	
<i>* A toxicological endpoint attributable to a single dose was not identified.</i>	
ENVIRONMENTAL AQUATIC TOXICITY	
Fish	Acute: 125.5 ppb Chronic: 51 ppb
Invertebrate	Acute: >161 ppb Chronic: 5.93 ppb
Aquatic Plants	Vascular: >630 ppb Non-vascular: 570 ppb
POLLINATOR TOXICITY	
Honey Bee	Acute Contact: 0.0035 µg ai/bee Acute Oral: 0.0060 µg ai/bee
<i>Level of Concern (LOC) has been applied to all values.</i>	

INTRODUCTION

Broflanilide is a new insecticide active ingredient and the first compound in the Insecticide Resistance Action Committee (IRAC) Group 30. It has a new mode of action and functions by binding to target sites in the gamma-aminobutyric acid (GABA) receptor and inhibiting neurotransmission. The inhibited neurotransmission results in muscle contractions, paralysis, and death of target pests. Broflanilide is registered by the Environmental Protection Agency (EPA) for use in agriculture as an in-furrow treatment in corn and tuberous and corm vegetables and as a seed treatment in cereal grains (wheat, barley, oats, etc.). It can control a range of soil-dwelling insects including corn rootworm larvae, seedcorn maggot, white grubs, and wireworms. Broflanilide is also registered by the EPA for use in industrial, commercial, and residential areas to control flies, ants, cockroaches, spiders, termites, and other insects.

The Minnesota Department of Agriculture’s (MDA) extensive review of the EPA broflanilide labels and risk assessments for issues relevant to Minnesota is summarized below.

PROJECTED USE IN MINNESOTA

Broflanilide is expected to be a valuable tool for growers to manage a variety of pests in Minnesota crops including corn and potatoes. In particular, broflanilide seed treatments are expected to provide important protection against wireworms for wheat.

For agricultural uses, the maximum in-furrow single application rate is 0.045 lb a.i./A with one yearly application, and the maximum seed treatment rate is 0.005 lb a.i./100 lb-seed. End-use products are formulated as liquids, water-dispersible granules, granules, pressurized liquids, gels, and foams.

Twelve end-use products containing broflanilide are currently registered by the EPA including the products listed below. Note that only the Teraxxa seed treatment products have been registered for use in Minnesota at the time of this review.

- **Teraxxa Seed Treatment** (EPA Reg. No. 7969-418) – 34.93% broflanilide; for seed treatment use in cereal grains.
- **Teraxxa F4 Seed Treatment** (EPA Reg. No. 7969-419) – 1.55% broflanilide (also contains triticonazole, metaxyl, fluxapyroxad, and pyraclostrobin); for seed treatment use in cereal grains.

Other EPA registered products include Nurizma Insecticide (EPA Reg. No. 7969-420), Cimegra Insecticide (EPA Reg. No. 7969-423), Vedira Ant Gel Bait (EPA Reg. No. 7969-424), and Terinda Foam Termiticide/Insecticide (EPA Reg. No. 7969-421).

LABEL ENVIRONMENTAL HAZARDS

Water Quality

- **Groundwater Advisory** – This chemical has properties and characteristics associated with chemicals detected in groundwater. The chemical may leach into groundwater if used in areas where soils are permeable, particularly where the water table is shallow.
- **Surface Water Advisory** – This product is classified as having high potential for reaching aquatic sediment via runoff for several months or more after application. A level, well-maintained vegetative buffer strip between areas where this product is applied and surface water features, such as ponds, streams, and springs, will reduce the potential loading of this active ingredient or its degradates from runoff water and sediment.

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

- **Carcinogenic Effects** – Broflanilide is classified by the EPA as "Likely to be carcinogenic in humans" [Q1* = 2.48×10^{-3} (mg/kg/day)-1].
- **Drinking Water Guidance** – Broflanilide and its DC-8007 degradate were considered residues of concern in drinking water in the EPA's dietary (food + water) risk assessment. Non-cancer chronic dietary risk estimates were below levels of concern for all populations using an estimated drinking water concentration (EDWC) of 0.9 µg/L. An EDWC of 0.7 µg/L was used to calculate a cancer dietary risk estimate of 2×10^{-7} . The EPA generally considers cancer risk estimates below 1×10^{-6} to be negligible.
- **Occupational Exposure** – All exposure scenarios assessed by the EPA resulted in risk estimates not of concern. Restricted entry intervals range from 12 to 24 hours.

Non-target Species

- **Stressor** – The parent, broflanilide, is considered to be the only residue of concern.
- **Aquatic Life Exposure** – Broflanilide is highly toxic to freshwater fish on an acute basis and there is potential for bioaccumulation (log Kow = 5.2). Risks to benthic invertebrates exceeded the EPA's level of concern for all uses; however, buffer requirements have been added to product labels to mitigate these risks. Risks to both vascular and nonvascular aquatic plants were below levels of concern.

- **Terrestrial Life Exposure** – Broflanilide is practically non-toxic to birds and mammals on an acute oral basis, and the risk to terrestrial plants is presumed to be low. Risks from the consumption of treated seed were considered by the EPA to be low on an acute basis, but there was uncertainty regarding chronic risk.
- **Pollinators** – Broflanilide is highly toxic to honey bees and bumble bees on acute oral and contact exposure basis. It is not likely systemic in plants, and the risk of exposure through nectar or pollen contaminated by spray drift is expected to be low based on use patterns. However, all non-target invertebrates, including bees, that interact with soil (e.g., foraging, nesting) are at risk.

ENVIRONMENTAL FATE

Broflanilide is persistent in both terrestrial and aquatic environments and has the potential to accumulate in soil with successive applications. It has low mobility in soil, and the major routes of dissipation are expected to be runoff with eroded sediment and photodegradation in acidic and alkaline waters.

Soil

- **Half-life** (25°C) – Aerobic: 1173 to 2220 days
Anaerobic: 157 to 2354 days
- **Mobility** – K_f values range from 113 to 248 L/kg
Solubility in water (20°C) is 0.71 mg/L
- **Photolysis** (half-life) – Stable
- **Persistence** – DT_{50} value range from 13 to 188 days

Aquatic

- **Half-Life** (25°C) – Aerobic: 1430 days
Anaerobic: 871 to 1411 days
- **Photolysis Half-life** – pH dependent: 18 days (pH 5);
80 days (pH7); 4 days (pH 9)
- **Hydrolysis Half-life** – Stable

Air

- **Volatilization** – Not a major route of dissipation. Vapor pressure (25°C) = 6.6×10^{-11} torr; Henry's law constant 3.0×10^{-14} atm m³ mol⁻¹

Degradates

No major degradates of broflanilide were observed in aerobic soil metabolism studies, though one was observed under anaerobic conditions (DC-8007). DC-8007 was also a major degradate in aqueous photolysis and aquatic metabolism studies. An additional four major degradates (not including carbon dioxide) were identified in aqueous photolysis studies. Available toxicity data suggest broflanilide degradates are less toxic than the parent and their formation is limited due to the persistence of broflanilide.

In accordance with the Americans with Disabilities Act, this information is available in alternative forms of communication upon request by calling 651-201-6000. TTY users can call the Minnesota Relay Service at 711. The MDA is an equal opportunity employer and provider. Broflanilide Tier1.indd 3.24.21

All active ingredient technical information, risk assessment values, fate and transport data, and label hazards have been summarized from final registration documents available at www.regulations.gov Docket ID: EPA-HQ-OPP-2018-0053.