

PESTICIDE TYPE	Insecticide
CHEMICAL CLASS IRAC Code	Bisamides 28 (Ryanodine receptor modulator)
COMMON TRADE NAMES	Exirel, Verimark, Benevia, Fortenza, A17960A, Spinner, A16901B
MAJOR DEGRADATES	Multiple (13)
APPLICATION RATE (lbs a.i./A)	Single: 0.04 - 0.4 Max Annual: 0.4
HONEY BEE ICON	Present
REGISTRATION STATUS	EPA: February 2014 Minnesota: February 2014
TOXICITY PROFILE FOR APPLICATORS	Signal word: Caution Toxicity III or IV
BASIC MANUFACTURER	DuPont & Syngenta
MDA LABORATORY CAPABILITIES	In discussion
HUMAN HEALTH	
NON-CANCER	Acute PAD = N/A Chronic PAD = 0.01 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: >5,000 ppb Chronic: 10,700 ppb
INVERTEBRATE	Acute: 10.2 ppb Chronic: 6.56 ppb
AQUATIC PLANTS	Vascular: > 12,100 ppb Non-vascular: >10,000 ppb
POLLINATOR TOXICITY	
HONEY BEE	Acute Contact: >0.0374 µg a.i./bee Acute Oral: >0.0422 µg a.i./bee
Level of Concern (LOC) has been applied to all values	

Introduction

Cyantraniliprole is the member of bisamides class of insecticides. It is a ryanodine receptor (RyR) modulator which kills insects through unregulated activation of RyR. Insects exposed to cyantraniliprole become lethargic, paralyzed, and eventually die. Cyantraniliprole is a systemic insecticide which is active through both ingestion and contact routes; however, it is more potent via ingestion. The evaluation of cyantraniliprole was conducted in collaboration with Regulatory Authorities of France, the United Kingdom, Canada, and Australia as a "Global Joint Review" project. EPA has registered cyantraniliprole as a broad-spectrum insecticide for controlling insects with mandibulate as well as piercing-sucking mouthparts. Cyantraniliprole is registered for use on vegetables, bush berries, turf, and oilseed crops. It is also registered for residential use on lawns and ornamental plants and labeled for use in and around residential, public and commercial structures, and transportation vehicles. Cyantraniliprole is formulated as a liquid, granular, or granular bait. Cyantraniliprole was registered for use in Minnesota in February 2014. Minnesota Department of Agriculture (MDA) extensive review of the U.S. Environmental Protection Agency (EPA) cyantraniliprole labels and risk assessments for issues relevant to Minnesota is summarized below.

Projected Use in Minnesota

Cyantraniliprole is registered for use on the following major crops in Minnesota: vegetable crops, potatoes, sunflower, canola, bush berries, turf grass, vegetables, and ornamental crops. It will be of use against insects with mandibulate and piercing-sucking mouthparts. According to the University of Minnesota (UMN) Extension, the different mode of action for cyantraniliprole compared to neonicotinoids provides an effective tool in managing neonicotinoid resistant Colorado Potato Beetles in central MN and the Red River Valley. This insecticide is found in 14 end-use products unconditionally registered by EPA, and the following three products in Minnesota:

- **Verimark™** (EPA Reg. No. 352-860) – a suspension concentrate product comprising 18.66% a.i. for soil application to approved crops.
- **Exirel™ WG** (EPA Reg. No. 352-859) – a suspoemulsion (oil in water) product comprising 10.20% a.i. for foliar application on approved crops.
- **Fortenza™** (EPA Reg. No. 100-1420) – a water based slurry product comprising 48.8% a.i. for seed treatment application on approved crops.

Label Environmental Hazards

Water Quality:

Label lists advisories for surface and ground water including: This chemical has properties and characteristics associated with chemicals detected in ground water. This product has a high potential for reaching surface water via runoff for several weeks after application.

Do not make ground applications within 25ft or aerial applications within 50ft of lakes, rivers, reservoirs, permanent streams, marshes, natural ponds, estuaries, or coastal areas.

Drift or runoff may be hazardous to aquatic organisms in water adjacent to use sites.

Other:

- This pesticide is toxic to aquatic invertebrates.
- This pesticide is highly toxic to bees exposed to direct treatment or resides on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are foraging in the treatment area. Product label carries "Pollinator Box."



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**- Classified as "Not likely to be carcinogenic to humans".
- **Drinking Water Guidance**- Model estimates suggest that cyantraniliprole and its degradates have a potential to reach ground water through leaching. Cyantraniliprole may move from the treated field to surface water through run-off. Persistence and mobility of cyantraniliprole's degradates may be of concern for drinking water, however, EPA concludes that conservative exposure estimates are below levels of concern for the general population and all population subgroups.
- **Occupational Exposure**- Occupational risks do not exceed EPA's levels of concern.

Environment- Non-target Species

- **Stressor of concern** – Because of mobility and persistence, cyantraniliprole may move from the treated field to surface water through run-off.
- **Aquatic Life Exposure** – Cyantraniliprole is highly toxic to aquatic and benthic invertebrates. Label statements are intended to mitigate anticipated risks. Nevertheless, estimates suggest that surface water concentrations could exceed 50% of the acute freshwater aquatic invertebrate toxicity benchmark.
- **Pollinators** – High-end, screening exposure estimates show cyantraniliprole's risk to honey bees as highly toxic for acute exposure; however product label requirements are designed to mitigate these risks.

Environmental Fate

Soil

- **Half-life**- Aerobic: Cyantraniliprole = 16.2 to 89.4 days; degradates IN-J9Z38 = 77.1 to 200 days; IN-PLT97 = 429 to 1638 days.
Anaerobic: Cyantraniliprole = 4.3 days
- **Adsorption**- 241 mL/g
- **Persistence**- Phototransformation is an important route of cyantraniliprole transformation in moist soils with the DT₅₀ value = 12.5 days. Cyantraniliprole was found to be stable in air-dried soil photolysis with a half-life of 308 days. Cyantraniliprole is not likely to accumulate in soil.

Aquatic

- **Half-life**- Aerobic: 3.9 to 25.1 days
- Anaerobic: 2.4 to 12 days
- Photodegradation is a major degradation pathway in aqueous environment (half-life = 7.9hrs).
- **Hydrolysis**: Hydrolysis is pH dependent, DT₅₀ ranges from 0.86 to 222 days at pH 9 to 4, respectively.
- IN-J9Z38 is a major transformation product under aerobic aquatic conditions.
- IN-J9Z38 and IN-K5A78 are major transformation products under anaerobic aquatic conditions.
- Cyantraniliprole is not expected to partition into sediment.
- **Surface water**- Because of high solubility (14.2mg/L) cyantraniliprole and its degradates may contaminate surface water through run-off which occurs shortly after application. Surface water is also expected to be contaminated by the major degradate, IN-J9Z38.
- **Groundwater**- Cyantraniliprole and its degradates are expected to reach groundwater through leaching.

Air

- **Volatilization**- Not volatile. Vapor pressure = < 3.85 x 10⁻¹⁷ mm Hg; Henry's Law = 1.7 x 10⁻¹⁸ atm m³ mole⁻¹.

Degradates

Cyantraniliprole degrades into 13 degradation products of which eight are major and five are minor. Important degradates include IN-J9Z38, IN-NXX69, IN-QKV54, IN-RNU71, IN-JCE76, IN-JCZ38, IN-K5A78, and IN-PLT97. Six of the eight major degradates were found to be more persistent while three were found to be more mobile than the parent compound. Persistence of degradates may result in accumulation of residues over time. Toxicity of degradates is considered to be equivalent to the parent compound. However, two degradates, IN-J9Z38 and IN-HGW 87 (minor degradate) were found to be more toxic than the parent compound to honey bees.