BIXAFEN

DEPARTMENT OF AGRICULTURE

CAS 581809-46-3; EPA PC CODE 128400 | NEW ACTIVE INGREDIENT REVIEW | MARCH 2019

PESTICIDE TYPE	FUNGICIDE
Chemical Class	Pyrazole carboxamide
Common Trade Names	N/A
Major Degradate	None identified
Application Rate (lb a.i/A/year)	Max Annual: 0.052 to 0.209
Registration Status	EPA: Registered unconditionally in November 2018 Minnesota: 2019
Toxicity Profile for Applicators	Signal word: CAUTION Category III or IV (oral, dermal, inhalation, and eye exposure)
Basic Manufacturer	FMC Corporation
MDA Laboratory Capabilities	In discussion
HUMAN HEALTH	
Non–Cancer	Acute PAD= 2.5 mg/kg/day Chronic PAD= 0.03 mg/kg/day
Cancer	Not likely to be carcinogenic to humans
Acute and chronic PADs are doses that include all relevant uncertainty and safety factors	
ENVIRONMENTAL AQUATIC TOXICITY	
Fish	Acute: 37 ppb Chronic: 4.60 ppb
Invertebrate	Acute: 550 ppb Chronic: 53.5 ppb
Aquatic Plants	Vascular (IC50): >410 ppb Non-vascular (IC50): 15.94 ppb
POLLINATOR TOXICITY	
Honey Bee	Acute Contact (LD50): >40 µg/bee Acute Oral (LD50): >48.6 µg/bee
Level of Concern (LOC) has been applied to all values.	

INTRODUCTION

Bixafen is a new systemic fungicide registered for use on corn, soybean, sugar beet, potato, and cereal grains, among other crops. It is a succinate dehydrogenase inhibitor (SDHI) that belongs to FRAC (Fungicide Resistance Action Committee) Group 7. Bixafen functions by inhibiting succinate dehydrogenase, an enzyme involved in the citric acid cycle and mitochondrial electron transport chain, which in turn disrupts energy production. Bixafen is proposed for use against many fungal diseases (e.g., rusts and glume blotch of wheat, gray leaf spot and rust of corn). It is also expected to be a valuable tool in controlling early blight disease on potato that has developed resistance to existing alternatives (e.g., azoxystrobin and boscalid). All end-use products containing bixafen are available as premixes with a second fungicide. Products can be applied as foliar or soil sprays via aerial, ground, and chemigation.

The Minnesota Department of Agriculture's (MDA) extensive review of the USEPA bixafen product labels and risk assessments for issues relevant to Minnesota is summarized below.

PROJECTED USE IN MINNESOTA

Depending on the crop, maximum single application rates for bixafen range from 0.052 to 0.089 lb a.i./A, with 1 to 3 applications permitted per year according to product labels. Potato and sugar beet are restricted to a single application before alternating with another mode of action fungicide. All other uses allow for no more than two sequential applications before alternating. Minimum retreatment intervals (RTIs) ranging from 7 to 21 days, and pre-harvest intervals (PHIs) range from 10 to 30 days.

In Minnesota, bixafen can be used to control diseases such as rusts on wheat and corn, and leaf spots of soybean and sugar beet. According to the University of Minnesota Extension, bixafen was not evaluated in Minnesota specific conditions.

The following end-use products are registered in Minnesota:

- **F9651-2 Fungicide** (EPA Reg. No. 279-3605) – This product contains 14.03% bixafen and 29.83% tebuconazole and is approved on corn, soybean, wheat, and barley.
- **F9652-1 Fungicide** (EPA Reg. No. 279-3602) – This product contains 5.99% bixafen and 36.85% iprodione and is approved on potato.
- **F9653-1 Fungicide** (EPA Reg. No. 279-3604) – This product contains 21.6% bixafen and 21.6% azoxystrobin and is approved on corn, soybean, potato, sugar beet, etc.
- **F9654-1 Fungicide** (EPA Reg. No. 279-3603) – This product contains 15.55% bixafen and 26.47% flutriafol and is approved on corn, soybean, sugar beet, wheat, etc.

LABEL ENVIRONMENTAL HAZARDS

Environmental hazards take into account all active ingredients in the product and follow the most stringent requirements. Restrictions on bixafen product labels may relate to bixafen, another active ingredient, or both.

Water Quality

- **Groundwater** – Bixafen has properties and characteristics associated with chemicals detected in groundwater. This chemical may leach into groundwater if used in areas where soils are permeable, particularly where the water table is shallow.
- **Surface water** – This product may impact surface water quality due to runoff of rain water.

Other Restrictions

- Applicators are required to follow spray drift management and resistance management.

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** – Bixafen is classified as "not likely to be carcinogenic to humans."
- **Drinking Water Guidance** – Bixafen may reach surface and ground sources of drinking water. Estimated drinking water concentrations (EDWCs) of 16.3 and 15.2 ppb bixafen were used for acute and chronic dietary risk assessments, respectively. Neither acute nor chronic estimated dietary exposures (food + water) exceeded levels of concern.
- **Occupational Exposure** – The combined dermal and inhalation occupational handler exposure and risk estimates were not considered to be of concern. Post-application risk estimates for dermal exposure were not of concern when following a restricted entry interval (REI) of 12 hours.

Non–target Species

- **Stressor of Concern** – The parent, bixafen, is considered to be the only stressor due to its high persistence.
- **Aquatic & Terrestrial Life Exposure** – Bixafen is very highly toxic to freshwater fish, and moderately toxic to freshwater invertebrates on an acute basis. It is practically non-toxic to birds and mammals; however, reproductive effects were observed with chronic exposure. Bixafen is practically non-toxic to adult honey bees.

ENVIRONMENTAL FATE

Bixafen is highly persistent in the environment and has the potential to accumulate in soil and water/sediment systems. It is slightly mobile in soil and may reach water via spray drift and runoff.

Soil

- **Half–life** (25°C) – Aerobic: 682 to 1,254 days
  Anaerobic: 579 days
- **Mobility** – Kfoc is 3,168 to 4,605 L/kgoc (mean = 3,834
  Solubility in water is 0.5 mg/L (20°C, pH 7)
- **Photolysis** (half–life) – 336 days
- **Persistence** – DT_{50} value 132 to 763 days

Aquatic

- **Half–Life** (25°C) – Aerobic: 2.2 to 11.5 years
  Anaerobic: Stable
- **Half–life via hydrolysis** – Stable
- **Photolysis in water** (half–life) – 313 days

Air

- **Volatilization** – Low potential for volatilization, vapor pressure (25°C) = 8.25 x 10-10 Torr; Henry's law constant 6.95 x 10-7 atm m3 mole–1

Degradates

No major degradates were identified. Minor degradates include M-21, M-42, and M-44 and M-45 tautomers, all of which are persistent in the environment, but not considered to be residues of concern in water.

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. Bixafen Tier1.indd 4.22.19