

PESTICIDE TYPE	FUNGICIDE
Chemical Class	Pyrazole carboxamide
Common Trade Names	Miravis™ Duo, Miravis™ Neo, Picatina™ Flora, Posterity®
Major Degradate	SYN545547
Application Rate (lb a.i./A/year)	Max Annual: 0.14 to 0.36
Registration Status	EPA: Registered unconditionally in March 2018 Minnesota: 2018
Toxicity Profile for Applicators	Signal word: Caution/Warning III or IV ( <i>oral, dermal, inhalation, and eye exposure</i> )
Basic Manufacturer	Syngenta Crop Protection
MDA Laboratory Capabilities	In discussion
HUMAN HEALTH	
Non-Cancer	Acute PAD= 1 mg/kg/day Chronic PAD= 0.092 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: 93 ppb Chronic: 27 ppb
Invertebrate	Acute: 210 ppb Chronic: 42 ppb
Aquatic Plants	Vascular (IC <sub>50</sub> ): >6300 ppb Non-vascular (IC <sub>50</sub> ): 1500 ppb
POLLINATOR TOXICITY	
Honey Bee	Acute Contact (LD <sub>50</sub> ): >40 µg/bee Acute Oral (LD <sub>50</sub> ): >46.4 µg/bee
<i>Level of Concern (LOC) has been applied to all values.</i>	

## INTRODUCTION

Pydiflumetofen is a newest member of succinate dehydrogenase inhibition (SDHI) family of fungicides that belongs to FRAC (Fungicide Resistance Action Committee) Group 7. Pydiflumetofen disrupts the energy production by inhibiting the functioning of succinate dehydrogenase, an enzyme involved in both the citric acid cycle and mitochondrial electron transport chain. The proposed use of this new active ingredient is against a variety of fungal diseases including Fusarium, Cerospora, Botrytis, and Alternaria. The USEPA has unconditionally registered pydiflumetofen for use on a variety of crops including cereals, corn, soybeans, potato, and golf course turf. As per USEPA, pydiflumetofen is classified as a reduced risk chemical in comparison to the identified alternatives for the specific use sites evaluated. Pydiflumetofen is formulated as suspension concentrate or suspoemulsion and can be applied using variety of methods such as aerially, ground (including airblast), chemigation, and handheld equipment spray. It should be used as part of an Integrated Disease Management Program for disease control. The Minnesota Department of Agriculture (MDA) extensive review of the USEPA pydiflumetofen product labels and risk assessments for issues relevant to Minnesota is summarized below.

## PROJECTED USE IN MINNESOTA

The single application rate and the maximum annual application rate of pydiflumetofen varies with the application site (crops, ornamentals, and turf). The maximum single application rate of pydiflumetofen ranges from 0.11 to 0.18 lb a.i./A (12.8 fl oz product/A). The maximum annual application rate ranges from 0.14 to 0.36 lb a.i./A/year. Depending upon the application site, the minimum retreatment interval varies from 7 or 14 days. In MN, pydiflumetofen can be used for controlling diseases such as frogeye leaf spot, fusarium head blight, dollar spot, etc. According to the University of Minnesota extension, pydiflumetofen was evaluated in efficacy trials. This fungicide is found in multiple end-use products such as Miravis, Miravis™ Duo, Miravis™ Neo, Miravis™ Prime, Picatina™ Flora, Picatina™ Gold, Picatina, A21461 300SE, and Posterity®. Pydiflumetofen products registered in MN include:

- **Miravis™ Neo** (EPA Reg. No. 100-1605) – The product is a premix of three active ingredients (pydiflumetofen-7.0%, azoxystrobin-9.3%, and propiconazole-11.6%) and is approved on corn, canola, cereal grains, soybeans.
- **Posterity®** (EPA Reg. No. 100-1600) – The product carries 18.3% of pydiflumetofen and is approved on golf course turfgrass.

## LABEL ENVIRONMENTAL HAZARDS

Pydiflumetofen product label carries following groundwater and surface water advisories:

### Water Quality

- **Groundwater** – This chemical has properties and characteristics 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. This is especially true for poorly draining soils. This product has high potential for reaching aquatic sediment via runoff several months after application. Therefore, a level, well-maintained vegetative buffer strip between areas to which product is applied and surface water bodies is recommended.

### Other

The product label requires applicator to follow spray drift 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** – Pydiflumetofen is classified as “not likely to be carcinogenic to humans”.
- **Drinking Water Guidance** – Pydiflumetofen is classified as slightly mobile in soil based on the adsorption coefficient ( $K_{oc} = 1383$  to  $2463$  mL/kg<sub>oc</sub>). According to the USEPA, Environmental Fate and Effects Division (EFED), Estimated Drinking Water Concentrations (EDWCs) of 95.0 and 93.4 ppb should be used for peak and post-breakthrough mean concentrations, respectively for use in the human health dietary risk assessments. The USEPA's dietary (food + water) risk assessments suggested that drinking water estimates were below the level of concern for the U.S. population or any population subgroups. The Minnesota Department of Health developed health based guidance value (concentration of a chemical in water that is unlikely to cause harm to people who drink the water) for pydiflumetofen is 8 ppb.
- **Occupational Exposure** – Based on EPA's occupational handler exposure and post-application exposure risk assessments, there are no occupational risk estimates of concern. A restricted-entry interval (REI) of 12 hours is required for most labels except for solo products which require 4 hours.

## Non-target Species

- **Stressor of Concern** – The use of pydiflumetofen for terrestrial crop sites as a foliar spray with aerial and ground-boom equipment has the potential to adversely affect survival, reproduction, and/or growth of non-target aquatic and terrestrial fauna and flora. Pydiflumetofen is classified as highly toxic to aquatic animals and larval honey bees on an acute exposure basis.
- **Aquatic & Terrestrial Life Exposure** – Pydiflumetofen is classified as highly toxic to fish, aquatic invertebrates, vascular and nonvascular plants and larval honey bees on an acute exposure basis. Model estimates suggested that pydiflumetofen used at labelled rates will not result in exceedances of level of concerns for freshwater fish, aquatic invertebrates, aquatic plants, birds, reptiles, and terrestrial phase amphibians. It is classified as practically nontoxic to birds and mammals on an acute exposure basis. Pydiflumetofen is practically non-toxic to adult honey bees on an acute oral and contact exposure basis.

## ENVIRONMENTAL FATE

Pydiflumetofen is slightly mobile and is likely to persist in soil and aquatic environments. This fungicide may reach water bodies by spray drift and runoff.

### Soil

- **Half-life** – Aerobic (22°C): 467 to 4515 days  
Anaerobic (25°C): 312 to 1967 days
- **Mobility** –  $K_{oc}$  is 1383 to 2463 mL/kg<sub>oc</sub>
- **Photolysis** (half-life) – 76.6 days
- **Persistence** –  $DT_{50}$  value 84 to 811 days

### Aquatic

- **Half-Life** – Aerobic (20°C): 239 to 301 days  
Anaerobic (25°C): 148 to 181 days
- **Half-life via hydrolysis** (25°C) – Stable
- **Photolysis in water** (25°C) – 95.3 days

### Air

- **Volatilization** – slightly volatile, vapor pressure =  $3.97 \times 10^{-9}$  Torr; Henry's law constant  $6.07 \times 10^{-8}$  atm m<sup>3</sup> mole<sup>-1</sup>

### Degradates

Pydiflumetofen transforms into SYN545547, major degradate, which is moderately mobile. Both parent (pydiflumetofen) and degradate (SYN545547) are likely to be sorbed to sediment and soil. Studies confirmed that residues of parent and degradate either stay within top 6" of soil or do not show any signs of leaching. Parent compound is more toxic to freshwater fish and invertebrates than degradate. However, on green algae, degradate is as toxic as parent compound.