

PESTICIDE TYPE	Fungicide
CHEMICAL CLASS	Succinate Dehydrogenase Inhibitor (SDHI) Frac Code: 7
COMMON TRADE NAME(S)	LUNA Privilege® & multiple LUNA pre-mix combinations Propulse® (also contains prothioconazole)
APPLICATION RATE (lbs a.i./A)	Single: 0.09- 0.22; (0.18 potato) Max. Annual: 0.18 – 0.45 (0.36 potato)
REGISTRATION STATUS	EPA: 2012
TOXICITY PROFILE FOR APPLICATORS	Signal word- CAUTION Toxicity Category III, IV
BASIC MANUFACTURER	Bayer CropScience
MDA LABORATORY CAPABILITIES	Through spike recovery: feasibility analysis

Introduction

Fluopyram is a broad-spectrum fungicide with preventative, systemic and curative properties labeled for control or suppression of certain crop diseases. It can be applied to plant foliage using ground, airblast or aerial spray equipment. Fluopyram represents a new group of fungicide chemistry called pyridinyl ethylbenzimidates that are SDHI's within the fungal mitochondrial chain, thus blocking electron transport. Similar fungicide active ingredients include boscalid and carboxin. Minnesota Department of Agriculture (MDA) extensive review of the U.S. Environmental Protection Agency (EPA) fluopyram labels and risk assessments for issues relevant to Minnesota is summarized below.

Projected Use in Minnesota

Fluopyram is labeled for use on two major Minnesota crops: potato and sugarbeet. It may also be used on minor Minnesota crops including; dried beans, apples, wine grapes and strawberries. Minnesota Extension believes this fungicide will be important for potato leaf spot control, has excellent efficacy against potato foliar diseases and is highly anticipated for use in the field. Fluopyram is efficacious on two mutations of early blight that are resistant to the other fungicides in the same chemical class. There are no labeled residential uses for fluopyram. According to Extension, this fungicide is not projected to be used a great deal in sugarbeet production; however, apple growers throughout the state are likely to welcome fluopyram use as an additional control for apple scab.

This fungicide is found in five end-use conditionally registered products labeled to be used on two major crops in Minnesota:

- **LUNA Privilege** (EPA Reg. No. 264-1078) – a suspension concentrate for uses on a variety of Minnesota specific crops notably potato and sugar beets.
- **LUNA Tranquility** (EPA Reg. No. 264-1085; Registered in MN) – a suspension concentrate co-formulation with pyrimethanil for uses on a potato and apple.
- **LUNA Experience** (EPA Reg. No. 264-1091; Registered in MN) – a suspension concentrate co-formulation with tebuconazole for uses on Minnesota specific crops: wine grape and watermelon.
- **LUNA Sensation** (EPA Reg. No. 264-1090; Registered in MN) – a suspension concentrate co-formulation with trifloxystrobin for uses on a variety of Minnesota specific crops notably potato and sugarbeets.
- **Propulse** (EPA Reg. No. 264-1091; Registered in MN) – a suspension concentrate co-formulation with prothioconazole for uses on Minnesota specific crops: dried beans and sugarbeet.

HUMAN HEALTH

NON-CANCER	Acute PAD = 0.50 mg/kg/day Chronic PAD = 0.012 mg/kg/day
CANCER	Likely to be Carcinogenic <u>Unit Risk Factor</u> 1.55 x 10 ⁻² mg/kg/day <u>Lifetime Dietary Risk (U.S. Population)</u> 2.9 x 10 ⁻⁶

Acute and chronic PADs are doses that include all relevant uncertainty and safety factors

Label Environmental Hazards

Water Quality:

- Labels for crop applications carry advisories for surface water and groundwater impacts, runoff reduction potential from vegetative buffers, and avoiding applications before rainfall.
- Unique mention is made of crop application products having high potential for runoff for several months or more after application.

Other:

- No other specific environmental hazards are noted on the label.

ENVIRONMENTAL AQUATIC TOXICITY

FISH	Acute: 890 ppb Chronic: 135 ppb
INVERTEBRATE	Acute: 8,500 ppb Chronic: 1,214 ppb
PLANT	Vascular: 280 ppb Non-vascular: 1,170 ppb

Level of Concern (LOCs) have been applied to all values

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:** "Likely to be Carcinogenic to Humans" EPA has determined the chronic population adjusted dose (PAD) is protective of all long-term effects, including potential carcinogenicity. As a result, a separate dietary exposure assessment for the purpose of assessing cancer risk was not necessary.
- **Drinking Water Guidance:** High-end, screening exposure estimates for drinking water suggest that applications of fluopyram may result in surface water and groundwater detections; however, EPA concludes that conservative exposure estimates are below levels of concern for the general population and all population subgroups.
- **Occupational Exposure:** Low acute toxicity. Dermal inhalation exposures are expected for handler activities associated with proposed agricultural uses for fluopyram. Non-cancer occupational risk estimates for dermal (with gloves) and inhalation short- and intermediate-term exposure durations and occupational post-application non-cancer margins of exposure do not exceed EPA's level of concern.
- **Conditional Registration:** Pending registrant submittal of a 90-day subchronic inhalation study.

Environment- Non-target Species

- **Co-formulation Toxicity Data:** Fluopyram co-formulated with both tebuconazole and trifloxystrobin was more toxic to freshwater fish and invertebrates, algae, rats, honey bees, and terrestrial plants than fluopyram alone. This increase appears to be tebuconazole's and trifloxystrobin's greater toxicity. Fluopyram co-formulated with pyrimethanil and prothioconazole show similar toxicity as fluopyram alone.
- **Aquatic Life Exposure** - High-end screening exposure estimates did not generated concern for any aquatic life. Estimates suggest that surface water concentrations will not exceed 10% of the available aquatic life toxicity benchmarks.

Environmental Fate

Soil

- **Half-life- Aerobic** 162-746 days =); Anaerobic = stable
- **Adsorption- K_{oc}** 266 – 460 (moderate mobility)
- **Persistence- 648- 1,470 days (aerobic); 1,410 – 1,580 days (anaerobic).** The n-octanol water partition coefficient (K_{ow} ; 2,060) suggests a moderate potential for bioaccumulation in aquatic organisms such as fish.

Water

- **Half-life via hydrolysis-** highly stable, 57-87 days (slow)
- **Surface water-** Due to the mobility of fluopyram and its stability to hydrolysis and soil photolysis it can be expected to occur in surface water runoff. It will most likely reach surface water through erosion, drift and/or run-off events.
- **Groundwater-** Fluopyram can be expected to reach ground water based on the fact that it is highly persistent and moderately mobile.

Air

- Partitioning to the air is not expected to be important due to the low vapor pressure 2.33×10^{-8} @ 25°C (low) and Henry's Law constant, 2.94×10^{-10} @ 25°C (low).

Degradates

- There are four degradates that are expected to form from the breakdown of fluopyram, all of which are considered minor. The four degradates are: fluopyram-7-hydroxy, fluopyram-benzamide, fluopyram-PCA (pyridyl-carboxylic acid) which degrades to methyl-sulfoxide, lactam. None of the four degradates are considered more toxic than the parent. These metabolites are not considered of concern for both human health and in aquatic and terrestrial ecosystems. Based on fate and transport properties and the degradation profile of fluopyram, it is the only residue of concern in drinking water exposure.