

PESTICIDE TYPE	<b>Fungicide</b>
CHEMICAL CLASS	Succinate Dehydrogenase Inhibitor (SDHI) Frac Code: 7
COMMON TRADE NAMES	Fontelis®, Vertisan®, Velista® <u>Pre-Mix Combinations (a.i.)</u> Treois® (chlorothalonil)
APPLICATION RATE (lbs a.i./A)	Single: 0.21 -0.31 (0.95 Turf) Max. Annual: 0.53 – 0.94 (2.9 Turf)
REGISTRATION STATUS	EPA: 2012
TOXICITY PROFILE FOR APPLICATORS	Signal word- CAUTION Toxicity III, IV
BASIC MANUFACTURER	DuPont
LABORATORY CAPABILITIES	Through spike recovery: feasibility analysis

## HUMAN HEALTH

NON-CANCER	Acute PAD = 1.25 mg/kg/day Chronic PAD = 0.27 mg/kg/day
CANCER	Suggestive Evidence of Carcinogenicity

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

## ENVIRONMENTAL AQUATIC TOXICITY

FISH	Acute: 145 ppb Chronic: 100 ppb
INVERTEBRATE	Acute: 29.8 ppb Chronic: 10.61 ppb
PLANT	Vascular: >1,205 ppb Non-vascular: 1,200 ppb

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

## Introduction

Penthiopyrad is a broad-spectrum systemic fungicide for controlling foliar and soil-borne plants diseases on a broad range of agricultural crops and turfgrass, and has preventative, curative, and locally systemic activity. It can be applied to plant foliage or in-furrow through a variety of application methods including: aerial, ground equipment, backpack, and hand held equipment. Penthiopyrad is a pyrazole carboxamide that stops spore germination, inhibits mycelium growth, and has antispore activity. Similar fungicides include boscalid and carboxin. Penthiopyrad has been granted reduced risk status by EPA because of its favorable human health risk profile when compared to registered fungicides. Minnesota Department of Agriculture (MDA) extensive review of the U.S. Environmental Protection Agency (EPA) penthiopyrad labels and risk assessments for issues relevant to Minnesota is summarized below.

## Projected Use in Minnesota

Penthiopyrad is labeled for use on two major crops in Minnesota: potato and sugar beet. It may also be used on a number of minor crops. According to extension, this fungicide is anticipated in the sugarbeet market to control rhizoctonia root rot, and is valuable for managing fungicide resistance. It is expected to play a minor role in potato production according to a potato grower. It is expected to be applied during the spring and summer months. Extension turf specialists have communicated that penthiopyrad controls dollar spot and brown patch in turfgrass. It will be used to control those diseases and manage resistance. Penthiopyrad is registered for residential uses.

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

- **Fontelis** (EPA Reg # 352-834; registered in MN) – EPA conditionally registered; a suspension concentrate product for foliar and in-furrow uses on a broad range of Minnesota crops, including alfalfa, legume (soybean immature seed, peas, and possibly dry beans), apple.
- **Vertisan** (EPA Reg # 352-836; registered in MN)- an emulsifiable concentrate for foliar and in-furrow application to field crops, including cereals, oilseeds, sugar beets, legumes, and root and corm vegetables.
- **Treois** (EPA Reg. # 352-833)- a pre-mix with chlorothalonil to control diseases on potatoes and cucurbits.
- **Velista** (EPA Reg # 352-835; registered in MN) - a water dispersible granule formulation to control turf diseases.

## Label Environmental Hazards

### Water Quality:

- The label carries advisories for surface water and groundwater impacts, runoff reduction potential from vegetative buffers, and avoiding applications before rainfall.

### Other:

- Penthiopyrad is toxic to fish. Runoff may be hazardous to aquatic organisms in water adjacent to treated areas.

## Toxicology and Exposure

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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 having "Suggestive Evidence of Carcinogenicity." 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 penthiopyrad 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. Margins of exposure do not exceed EPA's level of concern.
- **Residential risk** - Penthiopyrad is proposed for registration that could result in residential exposure from turfgrass. All residential handler exposure scenarios resulted in margin of exposures that do not exceed EPA's level of concern. These risks were estimated using standard default assumptions with respect to the amount of residue on the turf and the amount of time spent on lawns or golfing.

### Environment- Non-target Species

- **Aquatic Life Exposure** – High-end screening exposure estimates for risks to fish and invertebrates generated some concern and penthiopyrad is classified as moderately to highly toxic to fish and invertebrates; however, EPA concludes risks are mitigated by labeling requirements. Estimated surface water concentrations may exceed 50% of the freshwater fish and invertebrate estimated benchmark, and may exceed 10-50% of the freshwater vascular and non-vascular estimated benchmark.
- **Co-Formulation Toxicity Data** – There were no synergistic effects identified for co-formulation products. Based on toxicity studies, formulations that contain chlorothalonil are more toxic to fish, invertebrates and aquatic non-vascular plants. The greater toxicity appears to be driven by chlorothalonil.

## Environmental Fate

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### Soil

- **Half-life**- Aerobic = Persistent in many compartments of the environment, degrading in shaded and aquatic areas by slow aerobic biodegradation (half-life 60-406 days); Anaerobic = no substantial degradation
- **Adsorption**- Koc: 720 (parent); 9.1 (PAM degradate)
- **Persistence**- Degrades mainly via indirect photolysis in soil (half-life of 6.2 days). Persists in anaerobic conditions, does not undergo hydrolysis or photolysis in water bodies and is not readily biodegraded in aerobic activated sludge. May bioaccumulate in benthic invertebrates.

### Water

- **Half-life via hydrolysis**- No substantial degradation.
- **Surface water**- Moderately soluble in water, lipophilic. May move to surface water bodies via spray drift and runoff of dissolved or sorbed residues.
- **Groundwater**- Depending on soil type, may slowly move to groundwater via leaching.

### Air

- **Volatilization**- Not expected to volatilize from soil or water bodies due to a low vapor pressure ( $2.2 \times 10^{-8}$  torr) and Henry's Law Constant ( $7.6 \times 10^{-9}$  atm·m<sup>3</sup>/mol).

### Degradates

- All major degradates were found to be less toxic than the parent penthiopyrad. PAM, PCA, DM-PCA and carbon dioxide (via photolysis in soil and aerobic biodegradation in soil and water). Major degradates are highly mobile in soil. Maximum exposure estimates for PAM are substantially higher than those for the parent compound. PAM was included in the human health drinking water risk assessment, in which exposure estimates were below the level of concern.