Penflufen

CAS 494793-67-8; EPA PC CODE 100249

New Active Ingredient Review
July 2012

PESTICIDE TYPE	**FUNGICIDE**
CHEMICAL CLASS	Succinate-dehydrogenase inhibitor (SDHI) Frac Code: 7
COMMON TRADE NAMES	Pre-Mix Combinations (a.i.) Seed treatments (clothianidin, trifloxystrobin, metalaxyl, or prothioconazole)
APPLICATION RATE (lbs a.i./A)	0.0019 – 0.14 equivalent in treated seed or potato seed pieces; not to exceed 0.143 per year
REGISTRATION STATUS	EPA: Registered 2012
TOXICITY PROFILE FOR APPLICATORS	Signal word- Caution Toxicity III or IV
BASIC MANUFACTURER	Bayer CropScience LP
MDA LABORATORY CAPABILITIES	In discussion

HUMAN HEALTH	
NON-CANCER	Acute PAD = 0.50 mg/kg/day Chronic PAD = 0.38 mg/kg/day
CANCER	Suggestive Evidence of Carcinogenic Potential

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

ENVIRONMENTAL AQUATIC TOXICITY	
FISH	Acute: 45 ppb Chronic: 18.1 ppb
INVERTEBRATE	Acute: > 2,330 ppb Chronic: 1,530 ppb
AQUATIC PLANTS	Vascular: > 4,700 ppb Non-vascular: > 5,100 ppb

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

Introduction

Penflufen is a systemic, xylem-mobile fungicide used as an in-furrow treatment on potato seed pieces and as seed treatment fungicide on alfalfa, cereal grains, vegetables, legume, and oil seeds. It is formulated as a flowable concentrate for seed treatment. Penflufen has fungicidal activity against many phytopathogenic fungi (such as *Rhizoctonia spp.* and *Ustilago spp.*) and has a different mode of action than currently registered fungicides for use on the listed crops. Penflufen is a loco-systemic carboxamide fungicide which inhibits mitochondrial respiration by inhibiting succinate dehydrogenase, an enzyme in the electron transport system. Minnesota Department of Agriculture (MDA) extensive review of the U.S. Environmental Protection Agency (EPA) penflufen labels and risk assessments for issues relevant to Minnesota is summarized below.

Projected Use in Minnesota

Penflufen is labeled for use on the following major crops in Minnesota: soybean, potato, alfalfa, and cereal grains. According to extension, it has done well in controlling *Rhizoctonia* on potatoes. A number of penflufen fungicides contain a combination of actives in order to achieve effective resistance management and/or to increase the spectrum of controlled pests. It is not labeled for residential uses.

This fungicide is found in six end-use unconditionally registered products that may be registered in Minnesota:

- **EverGol Prime** *(EPA Reg. No. 264-1119; Registered in MN)* – Seed piece application for potatoes, in-furrow application with seed piece treatment for potato and commercial seed treatment for alfalfa, beans and cereal grains.
- **Penred 240 FS** *(EPA Reg. No. 264-1120)* - Seed piece application for potatoes, in-furrow application with seed piece treatment for potato and commercial seed treatment for alfalfa, beans, and cereal grains.
- **Emesto Silver** *(EPA Reg. No. 264-1123; Registered in MN)* – Co-formulation with prothioconazole as a seed piece application on potato.
- **EverGol Xtend** *(EPA Reg No. 264-1124)* – Co-formulation with trifloxystrobin as a seed treatment on alfalfa, beans and cereal grains.
- **EverGol Energy** *(EPA Reg. No. 264-1122; Registered in MN)* – Co-formulation with prothioconazole and metalaxyl for commercial seed treatment of alfalfa, beans and cereal grains.
- **Prosper EverGol** *(EPA Reg. No. 264-1121; Registered in MN)* – Co-formulation with clothianidin, trifloxystrobin and metalaxyl as a seed dressing for canola, rapeseed and mustard.

Label Environmental Hazards

Water quality:

- The penflufen label carries enforceable language related to direct application to surface waters and equipment cleaning.

Other:

- Penflufen is toxic to fish. Runoff may be hazardous to aquatic organisms in water adjacent to treated areas.
- The label carries enforceable language for planting equipment that will plant treated seed into the soil to a minimum depth of 0.5 inch, and for covering or collecting seeds spilled during loading.
- The label carries treated seed disposal recommendations (including use restrictions in ethanol production) and EPA-enforceable language related to the Federal Seed Act regarding dyes and colorants, and use of treated seed for feed, food or oil purposes.

MINNESOTA DEPARTMENT OF AGRICULTURE

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TTY users can call the Minnesota Relay Service at 711 or 1-800-627-3529. The MDA is an equal opportunity employer and provider.

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 "Suggestive Evidence of Carcinogenic Potential." 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 penflufen 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. No dermal hazard has been identified; therefore occupational handler and postapplication risks were assessed for the inhalation route of exposure only. All inhalation risk estimates have margins of exposure greater than 100 and therefore, are not of concern to EPA. Proposed labels require that workers wear long-sleeved shirt, long pants, socks and chemical-resistant gloves when opening bags of treated seed or loading/pouring the treated seed. The proposed personal protective equipment (PPE) also applies to all mixers, loaders, applicators and other handlers.

Environment- Non-target Species

- Aquatic Life Exposure - High-end, screening exposure estimates for risks to fish and invertebrates generated some concern and penflufen is classified as very highly toxic to fish and moderately toxic to invertebrates; however, EPA concludes risks are mitigated by labeling requirements. Nevertheless, estimates suggest that surface water concentrations could exceed 50% of the freshwater fish aquatic toxicity benchmark.
- Terrestrial Life Exposure - High-end screening exposure estimates for risks to animals directly ingesting treated seed and birds generated some concern; however, EPA concludes risks are mitigated by directions for spilled seed on product labels.
- Ecotoxicity Database - The ecological risk assessment included several uncertainties related to chemical fate, metabolism, and chronic exposure concerns for non-target species. These uncertainties could be reduced with registrant submittal of additional studies. In the absence of such studies, subsequent risk screening using conservative assumptions together with label mitigation appear to address the uncertainties.

Environmental Fate

Soil

- Half-life- Aerobic = 117 – 433 days (slowly); Anaerobic = 866 days (very slowly)
- Adsorption- K_{oc}: 365 mg/L (moderately mobile to mobile). Mobility may be partially affected by the soil fraction of organic carbon.
- Persistence- Expected to be persistent in aerobic and anaerobic conditions, but is not expected to bioaccumulate. Moderately binds to soil particles and has moderate to low potential for leaching.

Water

- Half-life via hydrolysis- stable
- Surface water- The potential exists for penflufen to reach surface water resources do to its mobility and persistence in the environment. Runoff may be hazardous to aquatic organisms in water adjacent to treated areas.
- Groundwater- The potential exists for penflufen to reach groundwater resources and was detected in terrestrial field dissipation studies.

Air

- Volatilization- Penflufen has a low vapor pressure (9.0×10^{-9} torr) and is; therefore, not a volatile pesticide.

Degradates

Pen-3HB and penflufen-pyrazolyl-AAP were identified as major degradates in drinking water. Degradate toxicity data indicate that penflufen degradates are less toxic than the parent and effects are not expected at environmentally relevant concentrations. Exposure estimates are based on exposure from penflufen alone. Pen-3HB is much more mobile than the parent, but the AAP degradate is comparatively immobile.