Pyroxasulfone

CAS 447399-55-5; EPA PC CODE 090099

New Active Ingredient Review
April 2012
Updated March 2013

PESTICIDE TYPE	**HERBICIDE**
CHEMICAL CLASS	Pyrazole Site of Action Group 15
COMMON TRADE NAMES	Fierce; Piper; Anthem; Zidua
APPLICATION RATE (lbs a.i./A)	Single: 0.05 – 0.21 Max Annual: 0.267
REGISTRATION STATUS	EPA: 2012
TOXICITY PROFILE FOR APPLICATORS	Signal word: CAUTION Toxicity: III or IV
BASIC MANUFACTURER	Valent
MDA LABORATORY CAPABILITIES	Added to Water Quality Monitoring Target Analyte List in 2013

HUMAN HEALTH	
NON-CANCER	Acute PAD = 1.0 mg/kg/day Chronic PAD = 0.02 mg/kg/day
CANCER	Not Likely to be Carcinogenic

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

ENVIRONMENTAL AQUATIC TOXICITY	
FISH	Acute: > 1,100 ppb Chronic: 2,000 ppb
INVERTEBRATE	Acute: > 2,200 ppb Chronic: > 1,900 ppb
AQUATIC PLANTS	Vascular: 6 ppb Non-vascular: > 3,200 ppb

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

MINNESOTA DEPARTMENT OF AGRICULTURE

Introduction

Pyroxasulfone is a selective herbicide for controlling annual grasses, sedges and annual broadleaf weeds. It may be applied as a preplant incorporated, preplant surface, preemergence, fall application (before ground freeze) or early postemergence, and can only be applied by ground application. This pyrazole herbicide kills weeds by inhibiting plant shoot growth. Minnesota Department of Agriculture (MDA) extensive review of the U.S. Environmental Protection Agency (EPA) pyroxasulfone labels and risk assessments for issues relevant to Minnesota is summarized below.

Projected Use in Minnesota

Pyroxasulfone is registered for use on corn (field corn, popcorn, and sweet corn), fallow land, non-crop areas around farms, orchards and vineyards, and to maintain bare ground on non-crop areas. EPA approved its use on soybeans in February 2013. An extension specialist believes this pesticide will be used in soybean production more than corn, and will have to be used as a pre or very early post application. Its strength will be small seeded broadleaf weeds and some grasses. There are no products registered for homeowner use or for application to residential areas.

- **Zidua** *(EPA Reg. No. 7969-338; registered in MN)* – Pyroxasulfone alone.
- **Fierce** *(EPA Reg. No. 63588-93-59639; registered in MN)* – Co-formulation of pyroxasulfone and flumioxazin. A no-till and reduced-tillage field corn preemergence herbicide that provides up to 8 weeks of residual control. In soybeans premergence application must be made within 3 days after planting and prior to soybean emergence.
- **Anthem & Anthem ATZ** (*EPA Reg. No. 279-3450 & 279-344; registered in MN*) – Co-formulation with Fluthiacet-methyl for susceptible grass and broadleaf weeds in soybeans and all corn types. Anthem ATZ has atrazine included in the co-formulation and cannot be applied to soybeans.
- **Piper** *(EPA Reg. No. 63588-93-59639; registered in MN)* – Co-formulation of pyroxasulfone and flumioxazin. Use on bare ground in non-crop areas.

Label Environmental Hazards

Water Quality:

- The label carries the following enforceable language: To prevent point source contamination DO NOT mix or load this or any other pesticide within 50 feet of wells (including abandoned wells and drainage wells, sink holes, perennial or intermittent streams and rivers, and natural or impounded lakes and reservoirs). This setback does not apply to properly capped or plugged abandoned wells and does not apply to impervious pad or dike mixing/loading areas.
- The label carries advisories for surface water and groundwater impacts, runoff reduction potential from vegetative buffers, and avoiding applications before rainfall.
- The label advises that drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. This product has a high potential for runoff according to the pesticide's mean soil partition coefficient (Kd) for several months or more after application.
- Atrazine formulation includes well and surface water application setbacks

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 "Not Likely to be Carcinogenic to Humans"
- Drinking Water Exposure- High-end, screening exposure estimates for drinking water suggest that applications of pyroxasulfone may result in surface water and groundwater detections requiring a Minnesota-specific risk assessment by the Minnesota Department of Health; however, EPA concludes that conservative exposure estimates are below levels of concern for the general population and all population subgroups. The MDA will further explore laboratory and monitoring capabilities to assess potential impacts and related risks.
- Occupational Exposure- Low acute toxicity. Occupational exposure and risk estimates indicate that worker handler and post-application exposures are not of concern at the maximum allowable application rates for the proposed uses.

Environment- Non-target Species

- Formulation Toxicity Data- Very little data using formulations of pyroxasulfone were submitted for registration, leading to uncertainty in the assessment of risk for end use products. This uncertainty does not affect the conclusions made on the technical grade active ingredient and metabolites. Due to lack of toxicity to technical grade pyroxasulfone, toxicity data on formulations are not required for a number of ecological effects.
- Terrestrial Life Exposure- High-end, screening exposure estimates for risks to birds and mammals generated some concern; however, EPA concludes the likelihood of actual chronic risk is expected to be low or is further mitigated by labeling requirements.
- Aquatic Life Exposure- High-end, screening exposure estimates for risks to aquatic vascular plants generated some concern; however, EPA concludes risks are mitigated by labeling requirements. Nevertheless, estimates suggest that surface water concentrations could exceed 10% to 50% of the vascular aquatic plant benchmark.

Environmental Fate

Soil

- Half-life- Aerobic = 142-533 days; Anaerobic = 145-156 days
- Adsorption- K_{oc}: 57 – 119 L/kg
- Persistence- Major routes of dissipation are expected to be associated with microbial-mediated degradation, leaching and runoff.

Water

- Half-life via hydrolysis- stable
- Surface water- Parent and degradation products M1, M3 and M6 are highly mobile.
- Groundwater- Modeling indicates that the persistence and mobility of pyroxasulfone residues allows accumulation of residues in groundwater.

Air

- Volatilization- Not expected to be a major dissipation pathway because of the low vapor pressure (1.8×10^{-8} torr) and Henry's Constant (2.65×10^{-9} atm-m^3/mole)

Degradates

- Degradation metabolite 5-difluoromethoxy-iH-pyrazol-4-yl methanesulfonic acid (M1) was very persistent (half- life 8–65 years) in laboratory metabolism studies. M3 is also identified as a major degradation product. M1 and M3 were included in the human health drinking water risk assessment.