Flumioxazin Herbicide

Technical Brochure

Valent Canada - Crop & Professional Products
A Division of VALENT CANADA, INC.

The active ingredient flumioxazin, developed by Valent Canada Inc. and Valent U.S.A. Corporation, is a low use rate pre-emergent herbicide. It is a member of the protox inhibitor type of herbicides (Group 14), and offers new management options for weeds resistant to Group 2 & 5 herbicides.

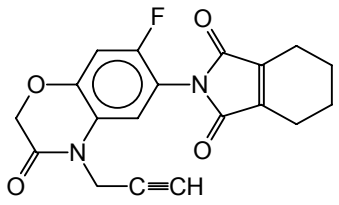
In Canada, flumioxazin is registered on fruit, vegetable and ornamental crops, as well as for industrial vegetation management under the following trade names:

- *Chateau* (tree fruit, grapes, potatoes, highbush blueberries, strawberries, asparagus)
- *BroadStar* (container ornamentals)
- *SureGuard* (field grown ornamentals, Christmas trees)
- *Payload* (industrial vegetation management)

Flumioxazin provides residual control of susceptible weeds including pigweeds, common ragweed, dandelion, green foxtail, common lamb's-quarters, eastern black nightshade and hairy nightshade.

CHEMICAL & PHYSICAL PROPERTIES

ACTIVE INGREDIENT
Common Name: Flumioxazin (ANSI, BSI)
Chemical Name: 2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2*H*-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1*H*-isoindole-1,3(2*H*)-dione
Chemical Family: N-phenylphthalimide derivative
Water Solubility: 1.78 mg/L @ 25°C
Vapor Pressure: 2.41×10^{-6} mm Hg @ 22°C
Chemical Stability: Stable @ 54°C for 14 days
CAS No: 103361-09-7
Molecular Formula: $C_{19}H_{15}FN_2O_4$
Molecular Weight: 354.34
Melting Point: 201.8 - 203.8°C
Odor: Odorless
Structural Formula:
pKa: Does not dissociate



FORMULATION: Water dispersible granular
Percent Active Ingredient: 51.1% (0.25% for BroadStar)
Appearance: Light brown solid granules
Oxidizing or Reducing Action: No oxidizing or reducing properties
Flash Point: NA
pH: 5.4 at 25°C, 1% suspension
Corrosion Characteristics: Not corrosive to containers

MODE OF ACTION

Flumioxazin is an N-phenylphthalimide herbicide. The mode of action in this family of chemistry is believed to be inhibition of protoporphyrinogen oxidase, an enzyme important in the synthesis of chlorophyll.

Mechanistic study findings suggest that porphyrins accumulate in susceptible plants causing photosensitization, which leads to membrane lipid peroxidation. The peroxidation of membrane lipids leads to irreversible damage of membrane function and structure in susceptible plants. Treatment of soil with flumioxazin will cause susceptible emerging plants to turn necrotic and die shortly after exposure to sunlight.

Resistance Management: Some weed species have developed a resistance to several classes of herbicides, including triazines, sulfonylureas and imidazolinones. Because flumioxazin has a mode of action distinctly different from the classes listed above, it has an excellent opportunity to provide a new weed resistance alternative for growers. By using flumioxazin in rotation or in combination with other herbicides, the grower helps to preserve the effectiveness of other herbicides and decreases or delays the chance of developing weed resistance.

ENVIRONMENTAL FATE

Flumioxazin degrades rapidly in water and soil. Dissipation occurs by a combination of hydrolysis and microbial oxidation. Although flumioxazin dissipates rapidly, discrete intermediates do not accumulate and the ultimate environmental products are incorporated into soil organic matter and carbon dioxide. Based on column leaching studies and the short aerobic soil half-life, the potential for flumioxazin or its degradation products to leach in field agricultural soils is low. The low use rate and rapid soil dissipation results in low carryover potential to rotational crops.

Flumioxazin Half-lives:

Soil Photolysis	3.2 days
Aerobic Soil Metabolism	11.9 - 17.5 days
Hydrolysis	pH 5: 3.4 - 5.1 days pH 7: 21.4 - 24.6 hours pH 9: 14.6 - 22.0 minutes

ECOLOGICAL EFFECTS

Flumioxazin technical is practically non-toxic to bees and avian species. It is slightly to moderately toxic to freshwater fish and moderately to highly toxic to aquatic invertebrates.

Bobwhite Quail and Mallard Duck	Oral LD_{50}>2250 mg/kg
Bobwhite Quail and Mallard Duck	Dietary LC_{50}>5620 ppm
Bluegill Sunfish	LC_{50} > 21 mg/L
Rainbow Trout	LC_{50} = 2.3 mg/L
Daphnia magna	EC_{50} > 6 mg/L
Oyster Shell Deposition	EC_{50} = 2.8 mg/L
Sheepshead Minnow	LC_{50}> 4.7 mg/L
Mysid Shrimp	LC_{50} = 0.23 mg/L
Honeybee Acute Contact	LC_{50} > 105µg/bee

HEALTH EFFECTS

Acute Toxicity (Formulated Product):

	LD_{50}/LC_{50} / Observation	Toxicity Category
Oral Toxicity	>5,000 mg/kg	IV
Dermal Toxicity	>2,000 mg/kg	III
Inhalation Toxicity	>0.969 mg/L	III
Eye Irritation	Minimal eye irritation clearing in 48 hours	III
Skin Irritation	Slight skin irritation at 72 hours	IV
Dermal Sensitization	No skin sensitization	-

Chronic Health Effects (Technical):
Flumioxazin technical has been tested extensively in rats, mice and dogs. Results from these studies show that this chemical is not carcinogenic. Adverse effects observed in animals exposed to high doses of flumioxazin technical for long periods of time included effects on blood, liver and kidney.

Developmental and Reproductive Effects (Technical):
Flumioxazin technical produced adverse effects on the offspring of rats exposed during pregnancy. However, it did not produce any adverse effects in the offspring of rabbits exposed during pregnancy. Reproductive toxicity was observed in a two-generation study with rats exposed to high levels of flumioxazin technical. A risk assessment for mixers, loaders and applicators (separate or combined jobs) indicated that the Margin of Exposure (MOE) was greater than the minimum acceptable value of 100, assuming workers wore protective clothing consisting of long pants, long sleeved shirt, waterproof gloves and shoes plus socks.

Genotoxicity: Flumioxazin technical does not present a genetic hazard.

PRECAUTIONS

Please consult the product label and current Material Safety Data Sheet (MSDS) for precautionary statements and the most up to date information on protective equipment, first aid and toxicology.

The information contained herein is, to our knowledge, true and accurate as of the published date of this bulletin.

THIS IS NOT A LABEL AND DOES NOT PROVIDE COMPLETE USE INFORMATION. READ ENTIRE LABEL. USE STRICTLY IN ACCORDANCE WITH PRECAUTIONARY STATEMENTS AND DIRECTIONS, AND WITH APPLICABLE PROVINCIAL AND FEDERAL REGULATION.