

Sulfentrazone

HERBICIDE FACT SHEET

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION

This fact sheet is one of a series issued by the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions. A list of definitions is included in Section VIII of this fact sheet.

I. BASIC INFORMATION

COMMON NAME: sulfentrazone

CHEMICAL NAME: N-[2,4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl]phenyl]methanesulfonamide

Cas No. 122836-35-5

CHEMICAL TYPE: aryl triazolinone

PESTICIDE CLASSIFICATION: herbicide

REGISTERED USE STATUS: General Use Pesticide.

FORMULATIONS: Commercial herbicide products generally contain one or more ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, EPA announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52FR13305). This policy focuses on the regulation of inert ingredients. EPA's strategy for implementing this policy included the development of four lists of inerts, based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3, and inerts of minimal and no concern were placed on List 4A and 4B, respectively.

The contents of the sulfentrazone formulation for Portfolio® / Authority® are listed below:

Portfolio® and/or Authority® Herbicide		
Active Ingredient	sulfentrazone	75.0 %
Inert Ingredients		32.0 %
The above total contains:		
Surfactant Blend		<12.3 %
Toluene (CAS 108-88-3)*		<2.4 %

*Toluene:
EPA Inert List 2
CA Prop 65
IARC Group 3
CERCLA 313 RQ 1000 lb Technical
RCRA Regulated (Code U220)

RESIDUE ANALYTICAL METHODS: No information available.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: Sulfentrazone is registered for use in crop and non-crop sites for selective pre- and early post-emergent weed control. For terrestrial use only.

OPERATIONAL DETAILS:

TARGET PLANTS: Selective, pre- and early post-emergent herbicide for control of broadleaf weeds, grasses and sedges.

MODE OF ACTION: Sulfentrazone control weeds by process of protoporphyrinogen oxidase inhibition (membrane disruption), a mode-of-action commonly referred to as PPO inhibition. Sulfentrazone is primarily taken up by the roots of treated plants. Plants emerging from treated soil turn necrotic and die after exposure to light. Foliar contact causes rapid desiccation and necrosis of exposed plant tissue. Shoot-root soil placement studies indicate that sulfentrazone is primarily absorbed by the roots of the plant following soil applications

METHOD OF APPLICATION AND RATES: Ground broadcast spray, spot and localized spray applications. Rates adjustable from 5.33 to 8 ounces per acre.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Timing is dependent on the target plant and desired results. Total vegetation management is best obtained with early spring applications coupled with later summer treatment for residual control. Rainfall is required to activate this product.

DRIFT CONTROL: Care should be exercised not to overspray or apply the herbicide to adjacent non-target areas. Drift control is achieved by observing weather conditions and following label and sprayer instructions. Spray droplet size should be 150 microns or larger. Tank or hose pressure should not exceed 25 psi.

Restrictions/Warnings/Limitations:

T&E toxicity warning for aquatic species (invertebrates).

T&E toxicity warning for ALL plants.

Groundwater/Surface Water Advisory.

Do not apply within 50 feet of wells, other surface waters, or where surface water is, or likely to be, seasonally present.

Do not apply to soils with particles classified as sands or larger with less than 1 % organic matter.

Do not apply this herbicide via any type of irrigation system.

Do not apply by aerial application.

Do not graze or crop treated areas.

III. ENVIRONMENTAL EFFECTS/FATE

SOLUBILITY: 7.8×10^2 mg/l in water (pH 7 at 25° C).

HYDROLYSIS: Stable.

PHOTOLYSIS IN WATER: Extremely susceptible.

PHOTOLYSIS ON SOIL: Stable.

AEROBIC SOIL METABOLISM: AVERAGE: 1.5 years

ANAEROBIC SOIL METABOLISM: 9 years.

K_{OC}: 43

MOBILITY-UNAGED LEACHING: Very high.

MOBILITY-AGED LEACHING: Persistent. The product will partition in the water column and remain very mobile in the soil and water columns.

PERSISTENCE AND AGENTS OF DEGRADATION/DISSIPATION: Sulfentrazone is persistent in the plant, soil and water. The primary routes of dissipation are aqueous photolysis and leaching. This product does not degrade through biodegradation

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS:
Information not available.

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER: There is a very high potential for sulfentrazone to leach into groundwater when applied as directed. Sulfentrazone could potentially reach surface waters via spray drift and/or runoff when certain conditions exist.

VOLATILIZATION: 1.0×10^{-9} mm Hg.

POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION: Information not available.

IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

TERRESTRIAL:

AVIAN ACUTE ORAL TOXICITY: LD₅₀ >2250 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC₅₀ >5620 mg/kg

SMALL MAMMAL ACUTE ORAL TOXICITY: LD₅₀ <2000 mg/kg

OVERALL TOXICITY: Slightly Toxic

PLANTS: Contact will injure or kill target and non-target plants.

FRESHWATER AQUATIC SPECIES:

ACUTE TOXICITY: LC₅₀ (rainbow trout 96-hour) >120 mg/l

ACUTE TOXICITY: LC₅₀ (bluegill sunfish 96-hour) 93.8 mg/l

ACUTE TOXICITY: EC₅₀ (Daphnia 48-hour) 0.51 mg/l

OVERALL TOXICITY: Highly Toxic

BIOACCUMULATION POTENTIAL: Information not available.

THREATENED AND ENDANGERED SPECIES: Federally listed freshwater and marine species may be adversely affected if the product is applied directly to water, or indirectly to water as the result of drift or leaching.

Federally listed terrestrial and aquatic plants may be adversely affected if the product is applied directly to the plants, or indirectly as the result of drift or leaching.

V. TOXICOLOGICAL DATA

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (rat) 2416 mg/kg

ACUTE DERMAL TOXICITY: LD₅₀ (rat) >5000 mg/kg

ACUTE INHALATION: LC₅₀ (rat) >3.6 mg/l

OVERALL TOXICITY: Category II – Moderately Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: No evidence of carcinogenicity in test animals.

DEVELOPMENTAL/REPRODUCTIVE: Some effects at highest dose levels.

MUTAGENICITY: No information available.

HAZARD: The end-use product labels for the sulfentrazone formulation Portfolio[®] carries the *Caution* signal word due to potential eye, skin, and inhalation hazards.

VI. HUMAN HEALTH EFFECTS

ACUTE TOXICITY (POISONING):

REPORTED EFFECTS: None reported.

CHRONIC TOXICITY:

REPORTED EFFECTS: None reported.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM CONTACTING OR CONSUMING TREATED VEGETATION, WATER OR ANIMALS: Information not available.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCTS: This product contains toluene.

Inhalation exposure to Toluene may cause irritation of the nose and throat with sneezing, sore throat or runny nose; headache, nausea and weakness; and central nervous system depression with dizziness, confusion, incoordination drowsiness or unconsciousness.

Ingestion of Toluene may cause irritation of the digestive tract with stomach pain, heartburn, nausea, vomiting or diarrhea; however there may be no symptoms at all.

Repeated and/or prolonged inhalation or ingestion exposure to Toluene may cause abnormal liver or kidney function with altered results on blood tests; irregular heart beat with a strange sensation in the chest, "heart thumping", apprehension, lightheadedness, feeling of fainting, dizziness, weakness, sometimes progressing to loss of consciousness and death; or low blood pressure.

Increased susceptibility to the effects of Toluene may be observed in persons with pre-existing disease of the central nervous system. Chromosomal changes in the circulating blood of exposed workers have been reported. The significance of these reports is unclear because of exposure to other substances. Epidemiology studies suggest that overexposure to Toluene may be associated with an increased incidence of neurological effects.

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: None reported.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

SULFENTRAZONE (*Portfolio*[®]) - **CAUTION** – HARMFUL IF INHALED OR ABSORBED THROUGH THE SKIN. CAUSES MODERATE EYE IRRITATION. AVOID BREATHING DUST AND SPRAY MIST. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING.

PROTECTIVE PRECAUTIONS FOR WORKERS: Applicators and other handlers must wear waterproof gloves, long-sleeved shirt and long pants, shoes plus socks.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Flush eyes with water. Call physician.

SKIN: Wash all exposed areas with soap and water, call physician if irritation persists.

INGESTION: Rinse mouth thoroughly with water. Do not induce vomiting. Call physician.

INHALATION: Remove to fresh air. Call a physician if breathing difficulty persists.

HANDLING, STORAGE AND DISPOSAL: Store at room temperature or cooler. Do not reuse container. Rinse container and dispose accordingly.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Contain and sweep up material of small spills and dispose as waste. Do not contaminate water, food, or feed by storage or disposal.

VIII. DEFINITIONS

adsorption – the process of attaching to a surface

avian – of, or related to, birds

CAEPA – California Environmental Protection Agency

carcinogenicity – ability to cause cancer

CHEMTREC – Chemical Transportation Emergency Center

dermal – of, or related to, the skin

EC₅₀ - median effective concentration during a bioassay

ecotoxicological – related to the effects of environmental toxicants on populations of organisms originating, being produced, growing or living naturally in a particular region or environment

FIFRA – Federal Insecticide, Fungicide and Rodenticide Act

formulation – the form in which the pesticide is supplied by the manufacturer for use

half-life – the time required for half the amount of a substance to be reduced by natural processes

herbicide – a substance used to destroy plants or to slow down their growth

Hg – chemical symbol for mercury

IARC – International Agency for Research on Cancer

K(oc) – the tendency of a chemical to be adsorbed by soil, expressed as: $K(oc) = \text{conc. adsorbed}/\text{conc. dissolved}/\% \text{ organic carbon in soil}$

LC₅₀ – the concentration in air, water, or food that will kill approximately 50% of the subjects

LD₅₀ – the dose that will kill approximately 50% of the subjects

leach – to dissolve out by the action of water

mg/kg – weight ratio expressed as milligrams per kilogram

mg/l – weight-to-liquid ratio expressed as milligrams per liter

microorganisms – living things too small to be seen without a microscope

mPa – milli-Pascal (unit of pressure)

mutagenicity – ability to cause genetic changes

NFPA – National Fire Protection Association

NIOSH - National Institute for Occupational Safety and Health

NOEL - no observable effect level

non-target – animals or plants other than the ones that the pesticide is intended to kill or control

OSHA - Occupational Safety and Health Administration

Pa – Pascal (unit of pressure)

persistence – tendency of a pesticide to remain to remain in the environment after it is applied

pesticides – substances including herbicides, insecticides, rodenticides, fumigants, repellents, growth regulators, etc., regulated under FIFRA

PPE – personal protective equipment

ppm – weight ratio expressed as parts per million

residual activity – the remaining amount of activity as a pesticide

T&E – Threatened and Endangered Species (from the Endangered Species Act)

µg – micrograms

volatility – the tendency to become a vapor at standard temperatures and pressures

IX. INFORMATION SOURCES

Du Pont and Company, Authority[®] Herbicide, Specimen Product Label, SL-797 101501, May 21, 2002

Du Pont and Company, Authority[®] Herbicide, Material Safety Data Sheet M0000414, Revised November 4, 2002

USEPA, Pesticide Fact Sheet, Sulfentrazone, Registration of a New Chemical, February 27, 1997

Wilbur-Ellis Company, Portfolio[®] Herbicide, Specimen Product Label, F-010705, January 7, 2005

Wilbur-Ellis Company, Portfolio[®] Herbicide, Material Safety Data Sheet, January 7, 2005

X. TOXICITY CATEGORY TABLES

TABLE I: HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Acute Oral LD ₅₀ (mg/kg)	Acute Dermal LD ₅₀ (mg/kg)	Acute Inhalation LC ₅₀ (mg/l)	Eye irritation	Skin irritation
I (Highly Toxic)	DANGER (poison)	0-50	0-200	0-0.2	corrosive: corneal opacity not reversible within 7 days	corrosive
II (Moderately Toxic)	WARNING	>50-500	>200-2000	>0.2-2	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III (Slightly Toxic)	CAUTION	>500-5000	>2000-20.000	>2-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV (Practically Non-toxic)	NONE	>5000	>20,000	>20	no irritation	moderate irritation at 72 hours

After *Pesticide User's Guide*, Ohio State University, Extension Bull. No. 745, 1998.

TABLE II: ECOTOXICOLOGICAL RISKS TO WILDLIFE (TERRESTRIAL AND AQUATIC)

Risk Category	Mammals	Avian	Avian	Fish or Aquatic Invertebrates
	Acute Oral LD ₅₀ (mg/kg)	Acute Oral LD ₅₀ (mg/kg)	Acute Dietary LC ₅₀ (mg/kg)	Acute Concentration LC ₅₀ (mg/l)
Very Highly Toxic	<10	<10	<50	<0.1
Highly Toxic	10-50	10-50	50-500	0.1 – 1
Moderately Toxic	51-500	51-500	501-1,000	>1 – 10
Slightly Toxic	501-2,000	501-2,000	1,001-5,000	>10 – 100
Practically Non-toxic	>2,000	>2,000	>5,000	>100

Table II created from information contained in *Pesticides and Wildlife*, Whitford, Fred, et al., Purdue University Cooperative Extension Service PPP-30, 1998.

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