Mefluidide

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: mefluidide

CHEMICAL NAME: N-[2,4-dimethyl-5-[[(trifluoromethyl)sulfonyl]amino]phenyl] acetamide

CAS No. 53780-34-0

CHEMICAL TYPE: acetamide compound

PESTICIDE CLASSIFICATION: plant growth regulator

REGISTERED USE STATUS: "General Use."

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 concern were placed on List 4.

The inert ingredients of the Embark® formulation are not classified by the USEPA as inert ingredients of toxicological concerns to humans or the environment.

The contents of the mefluidide formulations are listed below:

Embark®	Mefluidide	3.20%
	Inert	96.80%

RESIDUE ANALYTICAL METHODS: Following extraction, mefluidide is derivatized with diazomethane and analyzed by gas chromatography using flame ionization detection.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: Embark® is registered as a plant growth regulator to suppress seedhead formation and to regulate the vegetative growth of various turfgrass species and woody ornamentals in commercial, residential, public, and non-cropland areas.

OPERATIONAL DETAILS:

TARGET PLANTS: Many, mainly turfgrasses and weeds such as Johnsongrass, shattercane, volunteer corn, and volunteer sorghum.

MODE OF ACTION: Mefluidide inhibits the growth and development of the meristematic regions of the affected plants.

METHOD OF APPLICATION: Conventional power spray equipment using a non-ionic surfactant. Manufacturer recommends use of colorant to control even application.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Mefluidide must be applied before emergence of seedheads.

DRIFT CONTROL: Apply only when conditions will prevent drift to non-target areas and surface waters.

RESTRICTIONS/WARNINGS/LIMITATIONS: Do not apply through any type of irrigation system. Do not allow animals to graze treated areas.

III. ENVIRONMENTAL EFFECTS/FATE

SOIL:

RESIDUAL SOIL ACTIVITY: Mefluidide residual activity is reported not to exceed 3 hours after application.

ADSORPTION: Mefluidide has a K(oc) of 200. Adsorption of mefluidide after 3 hours, however, is insignificant.

PERSISTENCE AND AGENTS OF DEGRADATION: The half-life of mefluidide is 4 days.

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

WATER:

SOLUBILITY: 180 mg/l water at 23° C (Pure Compound)

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER*:* Mefluidide is weakly adsorbed onto soil and organic particles but is not persistent in soils or plants. Leaching into groundwater should be minimal or nonexistent if application methods are followed.

SURFACE WATERS: See above.

AIR:

VOLATILIZATION: <13 mPa at 25° C (Pure Compound).

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

IV. ECOLOGICAL TOXICITY EFFECTS TO NON-TARGET SPECIES

MICROORGANISMS:

ACUTE CONTACT TOXICITY*:* LD_{50} (honey bee contact) >25 µg/bee

OVERALL TOXICITY: Practically Non-Toxic

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

AQUATIC VERTEBRATES:

ACUTE TOXICITY*:* LC_{50} (rainbow trout 96-hour) <100 mg/l

ACUTE TOXICITY: LC_{50} (bluegill sunfish 96-hour) <100 mg/l

OVERALL TOXICITY: Slightly Toxic

AQUATIC FRESHWATER INVERTEBRATES:

ACUTE TOXICITY*:* LC_{50} (*Daphnia magna* 48-hour) No information.

OVERALL TOXICITY: [Not available.]

AQUATIC ESTUARINE/MARINE INVERTEBRATES:

ACUTE TOXICITY*:* EC_{50} (Eastern oyster larvae 48-hour) No information.

ACUTE TOXICITY*:* LC_{50} (sheepshead minnow 96-hour) No information.

OVERALL TOXICITY: [Not available.]

TERRESTRIAL ANIMALS:

AVIAN ACUTE ORAL TOXICITY*:* LD_{50} (mallard duck) >4640 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC_{50} (bobwhite quail) >10,000 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC_{50} (mallard duck) >10,000 mg/kg

MAMMAL ACUTE ORAL TOXICITY: LD_{50} (rat) >4000 mg/kg

OVERALL TOXICITY: Practically Non-Toxic

BIOACCUMULATION POTENTIAL: No Potential

THREATENED AND ENDANGERED SPECIES: Mefluidide may be a hazard if applied to pre-emerging endangered plants and if applied directly to waters containing endangered aquatic life. It probably would not be a hazard to most endangered terrestrial animals, due to its low toxicity.

V. TOXICOLOGICAL DATA

ACUTE TOXICITY:

ACUTE ORAL TOXICITY

LD_{50} (rat) >4000 mg/kg
LD_{50} (mice) >1920 mg/kg

ACUTE DERMAL TOXICITY:

Rabbit LD_{50} >4,000 mg/kg

PRIMARY IRRITATION SCORE: none

PRIMARY EYE IRRITATION: Mild irritation to rabbits

ACUTE INHALATION: LC_{50} (rat, 4-hour) >8.5 mg/l.

OVERALL TOXICITY: Category III – Caution – Slightly Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: No data.

DEVELOPMENTAL: No effects.

REPRODUCTIVE: No effects.

MUTAGENICITY: No effects.

HAZARD: Based on the results of animal studies, mefluidide does not cause genetic damage or birth defects and has little or no effect on fertility, reproduction or development of offspring. There are no data on the potential cancer-causing effects of mefluidide.

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: None reported.

POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCTS: No information available.

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: There have been no reported effects on workers manufacturing the products.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: None reported.

HEALTH RISK MANAGEMENT PROCEDURES: See Section VII.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

MEFLUIDIDE - **CAUTION** – HARMFUL IF SWALLOWED OR ABSORBED THROUGH THE SKIN. AVOID BREATHING SPRAY MIST. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. WEAR PROTECTIVE CLOTHING INCLUDING RUBBER GLOVES WHEN HANDLING.

PROTECTIVE PRECAUTIONS FOR WORKERS: Use safety glasses. Use impervious gloves when prolonged or frequently repeated contact could occur. Long-sleeved shirt, long pants, shoes, and socks are recommended.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Flush eyes with water; call physician if irritation develops.

SKIN: Wash all exposed areas with soap and water. Wash all contaminated clothing prior to reuse. Call a physician if irritation develops.

INGESTION: Do not induce vomiting. Call a physician or Poison Control Center. Do not wait for symptoms to appear. Immediately transport to a medical care facility.

INHALATION: Remove individual to fresh air. If breathing difficulty occurs, provide CPR assistance and seek immediate medical attention.

HANDLING, STORAGE AND DISPOSAL: Keep dry and store away from food, feed, or other material to be used or consumed by humans or animals. Do not contaminate water. Dispose only in accordance with local, state and federal regulations.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Contain and sweep up material of small spills and dispose as waste. Large spills should be reported to CHEMTREC (800-424-9300) for assistance. Prevent runoff. 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

EC_{50} - 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) = conc. adsorbed/conc. dissolved/% organic carbon in soil

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

LD_{50} – 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

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Extension Toxicology Network, Toxicology Information Briefs: Bioaccumulation, Revised 1993, http://ace.orst.edu/info/extoxnet/tibs/bioaccum.htm

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Weed Science Society of America, Herbicide Handbook, 6th Edition, 1989

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 (Acute Oral LD_{50} mg/kg)	Avian (Acute Oral LD_{50} mg/kg)	Avian LC_{50} (mg/kg)	Fish or Aquatic Invertebrates 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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