



MATERIAL SAFETY DATA SHEET

BAYER CORPORATION
AGRICULTURE DIVISION
P.O. Box 4913 Hawthorn Road
Kansas City, MO 64120-001

TRANSPORTATION EMERGENCY:
 CALL CHEMTREC: (800) 424-9300
 DISTRICT OF COLUMBIA: (202) 483-7616

NON-TRANSPORTATION:
 BAYER EMERGENCY PHONE: (800) 414-0244
 BAYER INFORMATION PHONE: (800) 842-8020

1. CHEMICAL PRODUCT IDENTIFICATION:
PRODUCT NAME: DOMAIN DF Herbicide
PRODUCT CODE: 14304
CHEMICAL FAMILY: Heteroaryloxyacetamide; Triazinone
CHEMICAL NAME: N-(4-Fluorophenyl)-N-(1-methylethyl)-2-((5-(trifluoromethyl)-1,3,4-thiadiazol-2-yl)oxy)acetamide; 4-Amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one
SYNONYMS: Flufenacet / Metribuzin
PRODUCT USE: Commercial Herbicide

COMPOSITION/INFORMATION ON INGREDIENTS Continued:

INGREDIENT NAME	EXPOSURE LIMITS	CONCENTRATION (%)
***** HAZARDOUS INGREDIENTS *****		
Ingredient 1979		
Specific chemical identity is withheld as a trade secret.		
	OSHA : Not Established	5-10%
	ACGIH: Not Established	
Ingredient 2091		
Specific chemical identity is withheld as a trade secret.		
	OSHA : Not Established	3-5%
	ACGIH: Not Established	

2. COMPOSITION/INFORMATION ON INGREDIENTS:

INGREDIENT NAME	EXPOSURE LIMITS	CONCENTRATION (%)
***** HAZARDOUS INGREDIENTS *****		
Flufenacet		
142459-58-3	OSHA : Not Established ACGIH: Not Established	24%
Metribuzin		
21087-64-9	OSHA : 5.00 mg/m3 TWA ACGIH: 5.00 mg/m3 TWA	36%
Ingredient 2090		
Specific chemical identity is withheld as a trade secret.		
	OSHA : Not Established ACGIH: Not Established	3-5%
Ingredient 1611		
Specific chemical identity is withheld as a trade secret.		
	OSHA : Not Established ACGIH: Not Established	1-3%
Total crystalline silica (quartz)		
14808-60-7	OSHA : .10 mg/m3 TWA (respirable) ACGIH: .10 mg/m3 TWA (respirable)	< 1%
Ingredient 1606		
Specific chemical identity is withheld as a trade secret.		
	OSHA : 5.00 mg/m3 TWA (respirable) ACGIH: 2.00 mg/m3 TWA (respirable)	15-20%
Ingredient 1901		
Specific chemical identity is withheld as a trade secret.		
	OSHA : Not Established ACGIH: Not Established	1-3%

3. HAZARDS IDENTIFICATION:

EMERGENCY OVERVIEW CAUTION!

Color: Tan; **Form:** Solid; Granules; **Odor:** Disinfectant-like

POTENTIAL HEALTH EFFECTS:

ROUTE(S) OF ENTRY: Inhalation; Skin Contact; Skin Absorption; Eye Contact

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE:

ACUTE EFFECTS OF EXPOSURE: Based on EPA Toxicity Category criteria, this product is mildly toxic by the oral and dermal routes of exposure. In addition, animal studies have shown that it can cause moderate irritation to the eyes.

CHRONIC EFFECTS OF EXPOSURE: No chronic human health effects to the active ingredients in this product are known. However, this product may contain up to approximately 1% total crystalline silica. Excessive long-term exposure to respirable crystalline silica may cause silicosis, a form of progressive pulmonary fibrosis. Severe and permanent lung damage may result.

CARCINOGENICITY: This product is not listed as a carcinogen by NTP or IARC, or regulated as a carcinogen by OSHA. However, it may contain crystalline silica (quartz), a substance which is classified by NTP as a Group 2 carcinogen and by IARC as a Group 1 carcinogen. Crystalline silica is a naturally-occurring mineral component of many sands and clays. Although controversial, the carcinogenic potential of crystalline silica must be considered if it is inhaled under excessive exposure conditions. However, the respirable portion of the silica which may be contained in this product is small, such that excessive inhalation exposure during normal conditions of use is unlikely.

NTP: Crystalline Silica is classified as an NTP Anticipated Human Carcinogen - "Substances or groups of substances that may reasonably be anticipated to be carcinogens."

HAZARDS IDENTIFICATION Continued:

IARC: IARC has classified crystalline silica as a Group 1 carcinogen. "There is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica (quartz) from occupational sources."

OSHA: Not regulated

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: No specific medical conditions are known which may be aggravated by exposure to the active ingredients in this product; however, pulmonary and respiratory diseases may be aggravated by exposure to respirable crystalline silica.

4. FIRST AID MEASURES:

FIRST AID FOR EYES: Hold eyelids open and flush with copious amounts of water for 15 minutes. Call a physician if irritation develops or persists after flushing.

FIRST AID FOR SKIN: Remove contaminated clothing. Wash skin with plenty of soap and warm water. Get medical attention if irritation develops or persists. If signs of intoxication (poisoning) occur, get medical attention immediately.

FIRST AID FOR INHALATION: If a person is overcome by excessive exposures to dusts or aerosols of this material, remove to fresh air or uncontaminated area. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention as soon as possible.

FIRST AID FOR INGESTION: If ingestion is suspected, call a physician or poison control center. Drink one or two glasses of water and induce vomiting by touching back of throat with finger, or, if available, by administering syrup of ipecac. If syrup of ipecac is available, administer 1 tablespoonful (15 mL) of syrup of ipecac followed by 1 to 2 glasses of water. If vomiting does not occur within 20 minutes, repeat the dose once. Do not induce vomiting or give anything by mouth to an unconscious person.

NOTE TO PHYSICIAN: No specific antidote is available. Treat patient symptomatically. In case of overexposure, it is also requested that Bayer Corporation, Agriculture Division, Kansas City, Missouri be notified. Telephone: 1-800-414-0244

5. FIRE FIGHTING MEASURES:

FLASH POINT: Not applicable

EXTINGUISHING MEDIA: Water; Carbon Dioxide; Dry Chemical; Foam

SPECIAL FIRE FIGHTING PROCEDURES: Keep out of smoke. Cool exposed containers with water spray. Fight fire from upwind position. Use self-contained breathing equipment. Contain runoff to prevent entry into sewers or waterways. Equipment or materials involved in pesticide fires may become contaminated.

6. ACCIDENTAL RELEASE MEASURES:

SPILL OR LEAK PROCEDURES: Isolate area and keep unauthorized people away. Do not walk through spilled material. Avoid breathing dusts and skin contact. Avoid generating dust (a fine water spray mist, plastic film cover, or floor sweeping compound may be used if necessary). Use recommended protective equipment while carefully sweeping up spilled material. Place in covered container for reuse or disposal. Scrub contaminated area with soap and water. Rinse with water. Use dry

ACCIDENTAL RELEASE MEASURES Continued:

SPILL OR LEAK PROCEDURES continued:

absorbent material such as clay granules to absorb and collect wash solution for proper disposal. Contaminated soil may have to be removed and disposed. Do not allow material to enter streams, sewers, or other waterways.

7. HANDLING AND STORAGE:

STORAGE TEMPERATURE(MIN/MAX): 0 / 30-day average not to exceed 100°F

SHELF LIFE: Time/temperature-dependent. Contact Bayer for details.

SPECIAL SENSITIVITY: Avoid prolonged storage at temperatures exceeding 100°F

HANDLING/STORAGE PRECAUTIONS: Store in a cool dry area designated specifically for pesticides. Do not store near any material intended for use or consumption by humans or animals.

8. PERSONAL PROTECTION:

EYE PROTECTION REQUIREMENTS: Goggles should be used when needed to prevent dust or spray mixture from getting into the eyes.

SKIN PROTECTION REQUIREMENTS: Avoid skin contact. Use chemical-resistant gloves such as nitrile and wear long sleeves and trousers to prevent dermal exposure.

VENTILATION REQUIREMENTS: Maintain exposure levels below the applicable exposure limits through the use of general and local exhaust ventilation.

RESPIRATOR REQUIREMENTS: When needed, based on the conditions of use, wear a NIOSH-approved particulate respirator.

ADDITIONAL PROTECTIVE MEASURES: Clean water should be available for washing in case of eye or skin contamination. Educate and train employees in safe use of the product. Follow all label instructions. Launder clothing after handling product. Wash thoroughly after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES:

PHYSICAL FORM: Solid
APPEARANCE: Granules
COLOR: Tan
ODOR: Disinfectant-like
MOLECULAR WEIGHT: 363.3 (flufenacet); 214.3 (metribuzin)
BOILING POINT: Not applicable
MELTING/FREEZING POINT: 76-81 (flufenacet); 126.5 (metribuzin)
SOLUBILITY IN WATER: Dispersible
SPECIFIC GRAVITY: Not applicable
BULK DENSITY: 30-35 lb/cu-ft
VAPOR PRESSURE: Not established

10. STABILITY AND REACTIVITY:

STABILITY: This is a stable material.

HAZARDOUS POLYMERIZATION: Will not occur.

INCOMPATIBILITIES: Bases

STABILITY AND REACTIVITY Continued:

INSTABILITY CONDITIONS: Temperatures above 70°C; unstable under basic conditions

DECOMPOSITION PRODUCTS: None known

11. TOXICOLOGICAL INFORMATION:

Only acute studies have been performed on this product as formulated. The non-acute information pertains to the active ingredients, flufenacet technical and metribuzin technical.

ACUTE TOXICITY:

ORAL LD50: Male Rat: 1920 mg/kg - Female Rat: 1830 mg/kg

DERMAL LD50: Male and Female Rat: >2000 mg/kg

INHALATION LC50: 4 Hr Exposure to Dust: Male and Female >2.660 mg/L (analytical) -- 1 Hr Exposure to Dust (extrapolated from 4 Hr LC50): Male and Female Rat: >10.64 mg/L (analytical)

EYE EFFECTS: Rabbit: Moderate irritation to the iris and conjunctiva was observed with all irritation cleared by 72 hours post-treatment.

SKIN EFFECTS: Rabbit: Not a dermal irritant.

SENSITIZATION: Guinea pig: Not a dermal sensitizer.

SUBCHRONIC TOXICITY:

In 3 mo. feeding studies in mice, rats, and dogs, the main target organs affected by exposure to flufenacet were brain, thyroid, liver, kidney, & spleen as indicated by changes in clinical chemistries, organ weights and/or histopathological findings. Alterations in circulating serum thyroid hormones (thyroxine & triiodothyronine) were observed in each species & considered indicative of hepatic interference. Primary hematological parameters affected by treatment in each species included changes in erythrocytes, platelets, hemoglobin, & hematocrit concentrations. Histopathological findings generally correlated with alterations in organ weights. A decrease in body weight gain was seen in mice & rats. In a subacute dermal toxicity study, rats were treated with flufenacet at doses of 20, 150 or 1000 mg/kg. Animals were treated for 6 hr/day such that males received 17 applications & females received 18 applications in a period of 21- & 22-days, respectively. An additional control & high-dose group were treated & maintained for two weeks to ascertain extent of recovery. Effects observed included decreased levels for thyroxine (T4) & free thyroxine (FT4), increased liver weights, & centrilobular hepatocytomegaly. The additional animals treated with 1000 mg/kg demonstrated a complete recovery. The NOEL was 20 mg/kg. In a 3 wk. dermal toxicity study, rabbits were treated with metribuzin at 40, 200 or 1000 mg/kg for 6 hr/day, 5 days/wk. At the high dose, there was evidence of increased cholesterol levels & liver enzyme induction. Thyroxine levels were increased at doses of 200 mg/kg & above. All of these effects were slight & reversible. The NOEL was 40 mg/kg. In subacute inhalation studies, rats were exposed to aerosol conc. of metribuzin ranging from 31 to 745 mg/m³ for 6 hr/day, 5 days/wk for 3 wk. Effects included behavioral changes, decreased body weight gains, liver enzyme induction & organ weight effects. The NOEC was 31 mg/m³.

CHRONIC TOXICITY:

Dogs were administered flufenacet at dietary concentrations of 40, 800 or 1600 ppm for 1 year. Effects observed included decreased terminal body weights, head tilt, computerized electrocardiography Product Code: 14304 findings, quantitative electroencephalography findings, clinical neurological findings, organ weight differences, and changes in clinical chemistry and

TOXICOLOGICAL INFORMATION Continued:**CHRONIC TOXICITY:**

ppm. In a 2 year feeding study, rats were administered flufenacet at dietary concentrations of 25, 400 or 800 ppm. The toxicological response of the rat could be broadly characterized as involving structural and/or functional alterations in liver-, kidney-, hematologic/spleen-, and thyroid-related endpoints. Eye effects were also observed and included cataracts and ocular scleral mineralization. The NOEL was 25 ppm. Dogs were administered metribuzin for 2 years at dietary concentrations of 25, 100 and 1500 ppm. Effects observed at the high concentration included decreases in body weight and food consumption, anemia, liver effects, kidney effects, testicular effects and mortality. The NOEL was 100 ppm. In chronic studies using rats, metribuzin was administered for 2 years at dietary concentrations ranging from 25 to 900 ppm. At concentrations of 300 ppm and greater, effects observed included decreased body weight gains, increased thyroid weights and changes in thyroid hormones. At 900 ppm, there was an increased incidence of follicular hyperplasia seen in the thyroid. The systemic NOEL was 30 ppm.

CARCINOGENICITY:

Flufenacet was investigated for carcinogenicity in chronic feeding studies using mice and rats at maximum levels of 400 and 800 ppm, respectively. There was no evidence of a carcinogenic potential observed in either species. Metribuzin was investigated for carcinogenicity in chronic feeding studies using rats and mice at maximum levels of 900 and 3200 ppm, respectively. There was no evidence of a carcinogenic potential observed in either species.

MUTAGENICITY:

In vivo and in vitro mutagenicity studies conducted on flufenacet have all been negative. Thus, flufenacet is not mutagenic. Numerous in vitro and in vivo mutagenicity studies have been conducted with metribuzin. The data, taken collectively, demonstrate that metribuzin is not genotoxic.

DEVELOPMENTAL TOXICITY:

In a developmental toxicity study using rats, flufenacet was administered by oral gavage during gestation at doses of 5, 25 or 125 mg/kg. The NOEL for both maternal and developmental toxicity was 25 mg/kg. In a developmental toxicity study using rabbits, flufenacet was administered by oral gavage during gestation at doses of 5, 25, 125, or 200 mg/kg. The NOELs for maternal and developmental toxicity were 5 and 25 mg/kg, respectively. In a developmental toxicity study using rats, metribuzin was administered orally during gestation at doses of 25, 70 or 200 mg/kg. Maternal toxic effects were observed at all doses. Developmental effects were observed at 200 mg/kg. The NOELs for maternal and developmental toxicity were less than 25 mg/kg and 70 mg/kg, respectively. When rabbits were administered metribuzin by oral gavage during gestation at doses of 10, 30 or 85 mg/kg, there was no evidence of any developmental effects. The NOELs for maternal and developmental toxicity were 30 and 85 mg/kg, respectively.

REPRODUCTION:

In a reproduction study using rats, flufenacet was administered at dietary concentrations of 20, 100, or 500 ppm for 2 generations. There were no compound-related effects on the adult reproductive or pup parameters. The NOELs for parental and reproductive toxicity were 20 and 500 ppm, respectively. In a reproduction study using rats, metribuzin was administered for 2 generations at dietary concentrations of 30, 150 or 750 ppm. Offspring at the high dose exhibited reduced body weight gains starting at Day-14

TOXICOLOGICAL INFORMATION Continued:

REPRODUCTION continued:

lactation, an age correlating with the consumption of treated diets. The NOELs for maternal and reproductive toxicity were 30 and 750 ppm, respectively.

NEUROTOXICITY:

In an acute neurotoxicity study using rats, flufenacet was administered as a single oral dose at doses of 75, 200, or 450 mg/kg for males and 75, 150, or 300 mg/kg for females. Compound-related deaths occurred at the high dose-dose for both sexes with all high-dose females dying within three days following treatment. All clinical signs & neurobehavioral effects observed were ascribed to acute systemic toxicity. Based on these results, the NOEL for neurotoxicity was 450 mg/kg for males & 150 mg/kg for females (the highest doses with survivors). The overall NOEL was 75 mg/kg for males & less than 75 mg/kg for females. In a subsequent study, an overall NOEL of 50 mg/kg was established for females. In a 13-week neurotoxicity study, flufenacet was administered to rats at dietary concentrations of 120, 600, or 3000 ppm. Effects observed at the high-dose included reduced body weights, reduced forelimb grip strength, slightly uncoordinated righting response, decreased body temperature, increased hindlimb footsplay, increased activity, & increased relative brain weight. Microscopic examinations revealed an increased incidence of axonal swelling in the brain & spinal cord tissues at the mid- & high-dose levels. The NOEL for subchronic neurotoxicity was 120 ppm based on microscopic lesions. In an acute neurotoxicity screening study using rats, metribuzin technical was administered as a single oral dose at doses of 2, 5, 20 or 100 mg/kg. Transient neurobehavioral effects were evident in both sexes at dose levels of 5 mg/kg & greater. There were no treatment-related lesions within the skeletal muscle or neural tissues. Based on these results, the NOEL for microscopic lesions for both sexes is 100 mg/kg, the highest dose tested. The overall NOEL for both sexes from this study was 2 mg/kg based on transient neurobehavioral effects. In a 13 week neurotoxicity screening study, metribuzin technical was administered to rats at dietary concentrations of 30, 300 or 900 ppm. Body weight & food consumption was reduced for females at concentrations of 300 or 900 ppm. Functional observational battery (FOB) & automated measures of motor and locomotor activity were not affected by treatment. There were no treatment-related microscopic lesions in neural tissues or skeletal muscle in any of the treated animals. There was no evidence of neurotoxicity at any dietary concentration. The NOEL for microscopic lesions was 900 ppm, the highest concentration tested. The NOEL for overall toxicity was 900 ppm for males and 30 ppm for females.

12. ECOLOGICAL INFORMATION:

This compound has been thoroughly evaluated for ecological effects. Bayer will provide a summary of specific data upon written request. As with any pesticide, this product should be used according to label directions and should be kept out of streams, lakes and other aquatic habitats of concern. In case of accidents involving environmental release of this material, please call Bayer's emergency number at 1-800-414-0244.

13. DISPOSAL CONSIDERATIONS:

WASTE DISPOSAL METHOD: Follow container label instructions for disposal of wastes generated during use in compliance with the product label. In other situations, dispose in a RCRA hazardous waste incinerator.

DISPOSAL CONSIDERATIONS Continued:

EMPTY CONTAINER PRECAUTIONS: Do not reuse the container unless authorized in writing by Bayer Corporation. Clean and empty containers should be disposed in accordance with state and local laws.

14. TRANSPORTATION INFORMATION:

TECHNICAL SHIPPING NAME: Flufenacet / Metribuzin
FREIGHT CLASS PACKAGE: Herbicides, NOI - NMFC 50320, Sub. 2
PRODUCT LABEL: Not Noted
DOT (DOMESTIC SURFACE)
HAZARD CLASS OR DIVISION: Non-Regulated
IMO / IMDG CODE (OCEAN)
HAZARD CLASS DIVISION NUMBER: Non-Regulated
ICAO / IATA (AIR)
HAZARD CLASS DIVISION NUMBER: Non-Regulated

15. REGULATORY INFORMATION:

OSHA STATUS: This product is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.
TSCA STATUS: This product is exempt from TSCA Regulation under FIFRA Section 3 (2)(B)(ii) when used as a pesticide.
CERCLA REPORTABLE QUANTITY: None
SARA TITLE III:
SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: None
SECTION 311/312 HAZARD CATEGORIES: Immediate Health Hazard; Delayed Health Hazard
SECTION 313 TOXIC CHEMICALS: Metribuzin 36% (CAS # 21087-64-9)
RCRA STATUS: If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24)

16. OTHER INFORMATION:

NFPA 704M RATINGS:

Health 2	Flammability	Reactivity	Other
0=Insignificant	1=Slight	2=Moderate	3=High
			4=Extreme

Bayer's method of hazard communication is comprised of Product Labels and Material Safety Data Sheets. NFPA ratings are provided by Bayer as a customer service.

REASON FOR ISSUE: Create New MSDS
PREPARED BY: V. C. Standart
APPROVED BY: D. C. Eberhart
TITLE: Product Safety Manager
APPROVAL DATE: 08/13/1999
SUPERSEDES DATE: None
MSDS NUMBER: 35540

MATERIAL SAFETY DATA SHEET

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