DEFINE ™ DF HERBICIDE

SECTION 1. CHEMICAL PRODUCT AND COMPANY INFORMATION

<table>
<thead>
<tr>
<th>Product Name</th>
<th>DEFINE ™ DF HERBICIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Name</td>
<td></td>
</tr>
<tr>
<td>Synonym</td>
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<tr>
<td>MSDS Number</td>
<td>585</td>
</tr>
<tr>
<td>Chemical Family</td>
<td></td>
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<tr>
<td>Chemical Formulation</td>
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<tr>
<td>EPA Registration No.</td>
<td>264-765</td>
</tr>
<tr>
<td>Canadian Registrat. No.</td>
<td></td>
</tr>
</tbody>
</table>

Bayer CropScience
2 T.W. Alexander Drive
Research Triangle PK, NC  27709
USA

For Product Use Information: (866)-992-2937 Monday through Friday(CRLF) 8:00AM-4:30PM(CRLF) For Medical Emergency contact DART: (800) 334-7577  24 Hours/Day(CRLF)
For Transportation Emergency CHEMTREC: (800) 424-9300  24 Hours/Day

Product Use Description  For control of certain grass and broadleaf weeds in corn and soybeans.

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component Name</th>
<th>CAS No.</th>
<th>Concentration % by Weight</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Flufenacet</td>
<td>142459-58-3</td>
<td>58.2000</td>
</tr>
<tr>
<td>Crystalline Silica (Quartz)</td>
<td>14808-60-7</td>
<td>1.1100</td>
</tr>
</tbody>
</table>

SECTION 3. HAZARDS IDENTIFICATION

NOTE: Please refer to Section 11 for detailed toxicological information.

Emergency Overview  Warning! May be fatal if swallowed. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals. Avoid contact with skin, eyes and clothing.

Physical State  Solid granules

Odor  Disinfectant-like

Appearance  Tan to Brown
Material Safety Data Sheet

DEFINE ™ DF HERBICIDE

MSDS Number: 000000000585
MSDS Version 1.3

Routes of Exposure

Inhalation, skin contact, skin absorption, eye contact.

Immediate Effects

General

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 I 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."

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

OSHA: Not regulated.

Eye

May cause mild irritation to eyes.

Skin

May cause slight irritation.

Chronic or Delayed Long-Term

Based on animal studies, no adverse effects or symptoms would be expected from chronic exposure to this material. This product contains respirable 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.

Medical Conditions Aggravated by Exposure

No specific medical conditions are known which may be aggravated by exposure to this product. Pulmonary and respiratory diseases may be aggravated by exposure to respirable crystalline silica.

SECTION 4. FIRST AID MEASURES

Eye

Flush eyes with plenty of water for at least 15 minutes. Seek medical attention if irritation develops or persists.

Skin

Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

Ingestion

Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.
Inhalation
Move person to fresh air. Call a poison control center or doctor for further treatment advice.

Note to Physician
Treat symptomatically. No specific antidote available.

SECTION 5. FIRE FIGHTING MEASURES

Flash Point
Not applicable

Suitable Extinguishing Media
Water, Carbon dioxide (CO2), Dry chemical, Foam

Fire Fighting Instructions
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.

SECTION 6. ACCIDENTAL RELEASE MEASURES

General and Disposal
Keep unnecessary people away, isolate hazard area and deny entry. Do not walk through spilled material.

Land Spill or Leaks
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. Use dry 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.

SECTION 7. HANDLING AND STORAGE

Handling Procedures
Do not ingest. Do not get in eyes, on skin, or on clothing.

Storing Procedures
Do not contaminate water, food, or feed by storage or disposal.

Store in a cool, dry place and in such a manner as to prevent cross contamination with other pesticides, fertilizers, food, and feed. Store in original container and out of the reach of children, preferably in a locked storage area.

Work/Hygienic Procedures
Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
Remove Personal Protective Equipment (PPE) immediately after handling this product. Wash the outside of gloves before removing. As soon as practical, wash thoroughly and change into clean clothing.

**Min/Max Storage Temperatures**
- Do not transport or store below -18 °C
- Do not transport or store above 38 °C

### SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Engineering Controls**
Maintain exposure levels below the exposure limit through the use of general and local exhaust ventilation.

**Eye/Face Protection**
Protective eyewear

**Hand Protection**
Chemical resistant gloves made of any waterproof material such as polyethylene or polyvinyl chloride.

**Body Protection**
- Coveralls
- Long-sleeved shirt and long pants
- Shoes plus socks

**Respiratory Protection**
A dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C) or a NIOSH approved respirator with any N, R, P or HE filter.

**General Protection**
Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

### Exposure Limits

<table>
<thead>
<tr>
<th>Substance</th>
<th>NIOSH REL</th>
<th>Form of Exposure</th>
<th>Limit</th>
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<tbody>
<tr>
<td>Crystalline Silica (Quartz)</td>
<td>0.05 mg/m3</td>
<td>TWA</td>
<td>0.1 mg/m3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA PEL</td>
<td>0.1 mg/m3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total dust.</td>
<td>0.3 mg/m3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACGIH TWA</td>
<td>0.05 mg/m3</td>
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</table>
### SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td>Tan to Brown</td>
</tr>
<tr>
<td><strong>Physical State</strong></td>
<td>Solid granules</td>
</tr>
<tr>
<td><strong>Odor</strong></td>
<td>Disinfectant-like</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>4 - 5 at 20 °C 10% slurry in distilled H2O</td>
</tr>
<tr>
<td><strong>Vapor Pressure</strong></td>
<td>$1.5 \times 10^{-7}$ mm Hg as Flufenacet N-Isomer at 20 °C</td>
</tr>
<tr>
<td><strong>Bulk Density</strong></td>
<td>32-33 lbs/cu. ft.</td>
</tr>
<tr>
<td><strong>Boiling Point</strong></td>
<td>Decomposes</td>
</tr>
<tr>
<td><strong>Solubility (in water)</strong></td>
<td>Dispersible</td>
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### SECTION 10. STABILITY AND REACTIVITY

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td><strong>Chemical Stability</strong></td>
<td>This is a stable material.</td>
</tr>
<tr>
<td><strong>Conditions to Avoid</strong></td>
<td>Unstable under basic conditions.</td>
</tr>
<tr>
<td></td>
<td>Temperatures above 70 °C.</td>
</tr>
<tr>
<td><strong>Incompatibility</strong></td>
<td>Bases</td>
</tr>
<tr>
<td><strong>Hazardous Products of Decomposition</strong></td>
<td>Flufenacet N-isomer</td>
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<tr>
<td></td>
<td>Others unknown</td>
</tr>
</tbody>
</table>
SECTION 11. TOXICOLOGICAL INFORMATION

Acute Oral Toxicity
Male Rat: LD50: 1,365 mg/kg
Female Rat: LD50: 371 mg/kg

Acute Dermal Toxicity
Male/Female Combined Rat: LD50: > 5,000 mg/kg

Acute Inhalation Toxicity
Male/Female Combined Rat: LC50: > 5.23 mg/l 4 h (analytical)

Skin Irritation
Rabbit: A slight skin irritant.

Eye Irritation
Rabbit: Minimal irritation to the conjunctiva was observed with all irritation cleared within 4 days post-treatment.

Sensitization
Guinea pig: Sensitizing

The above acute studies have been performed on this product as formulated. The following non-acute data pertains to the active ingredient, Flufenacet Technical.

Sub-Chronic Toxicity
In 3 month feeding studies in mice, rats, and dogs, the main target organs affected by exposure to the active ingredient, Flufenacet technical, were brain, thyroid, liver, kidney, and spleen as indicated by changes in clinical chemistries, organ weights and/or histopathological findings. Alterations in circulating serum thyroid hormones (thyroxine abd triiodothyronine) were observed in each species and were considered indicative of hepatic interference. Primary hematological parameters affected by treatment in each species included changes in erythrocytes, platelets, hemoglobin, and hematocrit concentrations. Histopathological findings generally correlated with alterations in organ weights. A decrease in body weight gain was observed in mice and rats.

In a subacute dermal toxicity study, rats were treated with Flufenacet technical at doses of 20, 150 or 1000 mg/kg. Animals were treated for 6 hours/day such that males received 17 applications and females received 18 applications in a period of 21-and 22-days, respectively. An additional control and high-dose group were treated and maintained for a period of two weeks so as to ascertain the extent of recovery. Effects observed included decreased levels for thyroxine (T4) and free thyroxine (FT4), increased liver weights, and centrilobular hepatocytomegaly. They additional animals treated with 1000 mg/kg demonstrated a complete recovery. The no-observed-effect-level (NOEL) was 20 mg/kg.

Chronic Toxicity
Dogs were administered Flufenacet technical at dietary concentrations of 40,
800 and 1600 ppm for 1 year. Effects observed included decreased terminal body weights, head tilt, computerized electrocardiography findings, quantitative electroencephalography findings, clinical neurological findings, organ weight differences, and changes in clinical chemistry and hematology parameters. Micropathological observations were noted in the liver, kidney, eye, brain, spinal cord and sciatic nerve. The NOEL was 40 ppm.

In a 2 year feeding study, rats were administered Flufenacet technical 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-, hematologica/spleen-, and thyroid-related endpoints. Eye effects were observed and included cataracts and ocular scleral mineralization. The NOEL was 25 ppm.

Assessment Carcinogenicity
Flufenacet technical was investigated for carcinogenicity in chronic feeding studies using mice and rats at maximum levels of 400 and 00 ppm, respectively. There was no evidence of a carcinogenic potential observed in either species.

ACGIH
Crystalline Silica (Quartz) 14808-60-7 Group A2
NTP
Crystalline Silica (Quartz) 14808-60-7
IARC
OSHA
None

Reproductive & Developmental Toxicity
REPRODUCTION: In a reproduction study using rats, Flufenacet technical was administered at dietary concentrations of 25, 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 25 and 500 ppm, respectively.

DEVELOPMENTAL TOXICITY: In a developmental toxicity study, rats were administered Flufenacet technical 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 technical 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.

Neurotoxicity
In an acute neurotoxicity study using rats, Flufenacet technical was administered as a single oral dose of 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 for both sexes with all-high dose females dying within 3 days following treatment. All clinical signs and neurobehavioral effects observed were ascribed to acute systemic toxicity. Based on these results, the NOEL for neurotoxicity was 450 mg/kg for males and 150 mg/kg for females (the highest doses with survivors).

In a 13 week neurotoxicity study, Flufenacet technical 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, and increased relative brain weight.
Microscopic examinations revealed an increased incidence of axonal swelling in
the brain and spinal cord tissues at the mid-and high-dose levels. The NOEL for
subchronic neurotoxicity was 120 ppm based on microscopic lesions.

Mutagenicity
In vivo and in vitro mutagenicity studies conducted on Flufenacet technical have
all been negative. Thus Flufenacet technical is not mutagenic.

SECTION 12. ECOLOGICAL INFORMATION

Environmental Precautions
Do not apply directly to water, to areas where surface water is present or to
intertidal areas below the mean high water mark. Do not apply when weather
conditions favor drift from treated areas. Do not contaminate water when
disposing of equipment washwaters. Drift or runoff may adversely affect non-
target plants.

SECTION 13. DISPOSAL CONSIDERATIONS

General Disposal Guidance
Pesticide Disposal: Wastes resulting from use of this product may be disposed of
on site or at an approved waste disposal facility.

Container Disposal
Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture
and dispose of in a sanitary landfill, or by other procedures approved by state
and local authorities. If burned, stay out of smoke.

RCRA Classification
Not Regulated under this Statute

SECTION 14. TRANSPORT INFORMATION

DOT CLASSIFICATION:
Not regulated for transportation

FREIGHT CLASSIFICATION:
Compounds, Tree or Weedkilling, N.O.I., other than poison, having a density of 20 LBS. or greater per cubic foot
### SECTION 15. REGULATORY INFORMATION

#### US Federal Regulations
- **EPA Registration No.** 264-765
- **TSCA list**
  - Crystalline Silica (Quartz) 14808-60-7
- **TSCA 12b export notification** None
- **SARA Title III - section 302 - notification and information** None
- **SARA Title III - section 313 - toxic chemical release reporting** None

#### US States Regulatory Reporting
- **CA Prop65**
  - This product contains a chemical known to the state of California to cause cancer. Crystalline Silica (Quartz) 14808-60-7

#### US State right-to-know ingredients
- Crystalline Silica (Quartz) 14808-60-7 IL, MA, MN, PA

#### Canadian Regulations
- **Canadian Registrat. No.**
- **Canadian Domestic Substance List**
  - Crystalline Silica (Quartz) 14808-60-7

#### Environmental
- **CERCLA** None
- **Clean Water Section 307 Priority Pollutants** None
- **Safe Drinking Water Act Maximum Contaminant Levels** None

#### International Regulations
- **EU Classification**
  - **Flufenacet** 142459-58-3 Harmful Dangerous for the environment
  - **R Phrases**
    - Harmful if swallowed. May cause sensitization by skin contact. Harmful: danger of serious damage to health by prolonged exposure if swallowed. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
  - **S Phrases**
    - Keep out of the reach of children. Keep away from food, drink and animal feedingstuffs. Avoid contact with the skin. Wear suitable gloves. This material and its container must be disposed of as hazardous waste. Avoid release to the
SECTION 16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health</th>
<th>Flammability</th>
<th>Reactivity</th>
<th>Others</th>
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</table>

MSDS REVISION INDICATOR: Update Sections: 2 (Composition/Information on Ingredients); 3 (Hazards Identification); 4 (First Aid Measures); 6 (Accidental Release Measures); 7 (Handling and Storage); 8 (Exposure Control/Personal Protection); 9 (Physical and Chemical Properties); 12 (Ecological Information); 13 (Disposal Considerations)

Print Date: 09/23/2003
Supersedes MSDS, which is older than: 09/23/2003

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