MATERIAL SAFETY DATA SHEET

For Emergencies Involving a Spill, Leak, Fire,
Exposure or Accident Contact:
CHEMTREC (800) 424-9300
For other Emergencies phone:
(770) 801-3248 or (770) 433-6421

SECTION: 1 IDENTIFICATION

THIRAM GRANUFLO®

Tetramethylthiuram Disulfide
(syn: Thiram, TMTD, Bis [Dimethylthiocarbamyl] Disulfide)

HMIS HAZARD RATINGS

Tetramethylthiuram Disulfide Health 2
(syn: Thiram, TMTD, Bis [Dimethylthiocarbamyl] Disulfide) Flammability 1
Reactivity 0
0=Least; 1=Slight
2=Moderate; 3=High
4=Extreme

SECTION 2: PRODUCT COMPONENTS

<table>
<thead>
<tr>
<th>INGREDIENTS</th>
<th>CAS NO.</th>
<th>WT.%</th>
<th>EXPOSURE LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetramethylthiuram disulfide</td>
<td>137-26-8</td>
<td>75</td>
<td>5 mg/m³ TWA-PEL</td>
</tr>
<tr>
<td>(active ingredient)</td>
<td></td>
<td></td>
<td>1 mg/m³ TWA-TLV</td>
</tr>
</tbody>
</table>

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is tan/brown granules with no odor. It is not defined as flammable or combustible but will burn under fire conditions.

Direct contact with the eyes or skin may cause irritation. May cause allergic skin reaction. May be absorbed through the skin and cause toxic effects. Inhalation of dust may cause mucous membrane and respiratory irritation. Ingestion may cause systemic poisoning with symptoms of nausea, vomiting, tremor, numbness, weakness and death.

SECTION 4: EMERGENCY and FIRST AID PROCEDURES

INGESTION: If conscious, give a large quantity of milk, egg whites, gelatin solution or, if these are not available, drink large quantities of water. Never give anything by mouth to or induce vomiting in a person who is unconscious or convulsing. Get immediate medical attention.

SKIN CONTACT: Wash contact area thoroughly with soap and water until no traces of the chemical remain. Remove contaminated clothing immediately and launder before reuse. Get medical attention if irritation develops.

EYE CONTACT: Immediately flush eye with water for at least 15 minutes while lifting the upper and lower lids. Get immediate medical attention.

INHALATION: Remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult have qualified personnel administer oxygen. Get immediate medical attention.

NOTE: Tetramethylthiuram Disulfide is the methyl analog of antabuse. Consumption of small amounts of alcohol and acute or chronic tetramethylthiuram disulfide exposure will cause similar effects as antabuse. These include palpitations, nausea, vomiting, headaches, shortness of breath.

SECTION 5: FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: Not applicable
METHOD: Not applicable
FLAMMABLE LIMITS: (vol. % in air) 30 g/m³ as dust at 270°C
AUTOIGNITION TEMPERATURE: Not available
EXTINGUISHING MEDIA: Not defined as flammable or combustible. Product may support combustion under fire condition. Use carbon dioxide, dry chemicals, foam, water or water fog.

SPECIAL FIRE FIGHTING PROCEDURES: Evacuate area of all non emergency personnel. Firefighters should wear full, emergency equipment and NIOSH approved positive pressure self-contained breathing apparatus. Fight fire from upwind and cool exposed intact containers and structures with water spray or stream at maximum range. Decontaminate all protective equipment after use, prevent skin contact. This product is toxic to fish. Contain all water run-off with diking. This product is toxic to fish.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition products are toxic. Very high concentrations of this product suspended in air may present an explosion hazard.

SECTION 6: ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Wear appropriate protective clothing as described in Section VII to prevent eye and skin contact and appropriate respirator to prevent overexposure. Isolate area and keep out unprotected persons. Stop leak at source. Carefully sweep up dry spilled material and collect into labeled containers for proper disposal. If liquid, dike and absorb with inert...
**Appearance and Odor:** Tan/brown granules. No odor.

**Coefficient of Water/Oil:** Not available

**Decomposition are available, use detergent and hot water. Keep and wash (launder) PPE separately from other laundry.**

**Note:** Follow the manufacturer’s instructions for cleaning and maintaining Personal Protective Equipment (PPE). If no specific instructions for decontamination are available, use detergent and hot water. Keep and wash (launder) PPE separately from other laundry.

**Precautions to be taken in Handling and Storing:** Protect containers from physical damage. Store in a cool, well-ventilated area away from excessive heat, oxidizers and acids. Store in original container only. Do not put concentrate or dilute material into food or drink containers. Keep away from food and feed. Do not contaminate water. Prevent eye and skin contact. Do not breathe dusts, mists or aerosols. Use only with adequate ventilation and appropriate protective equipment. Carefully open containers. Immediately remove and launder contaminated clothing before re-use. Wash thoroughly after handling and before eating, drinking, smoking or using toilet facilities. Remove personal protective equipment (PPE) immediately after handling product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Do not apply this product in such a manner as to directly or thorough drift expose workers or other persons. Only protected handlers may be in the area during application. For any requirements specific to your state, province or Tribe, consult the agency responsible for pesticide regulation. Use this product only in accordance with its labeling and the Worker Protection Standard, 40CFR Part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification and emergency assistance. Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours. PPE required for early entry to treated areas that is permitted under the Worker Protection Standard is described in Section 8 of this MSDS. Notify workers of the application by warning them orally and by posting warning signs at entrances to treated areas.

**Other Precautions:** Keep containers tightly closed. Empty containers retain product residues and are hazardous. Follow all MSDS precautions in handling empty containers. This product is toxic to fish. Do not apply directly to water. Do not apply where run-off is likely to occur. Do not contaminate water when disposing of equipment washwaters. Apply this product only as specified on the product label.

**Respiratory Protection:** Use a properly fit-tested NIOSH approved full-facepiece respirator with pesticide cartridge or half-face respirator with non-venting chemical goggles recommended for applicators and other handlers and when performing any operation where exposure to Ziram is likely. Selection of respiratory protection depends on the contaminant type, form and concentration. Select in accordance with OSHA 1910.134 and good Industrial Hygiene practice.

**Engineering Controls:** When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard for agricultural pesticides [40CFR 170.240(d)], the handler PPE requirements may be reduced or modified as specified in the Worker Protection Standard.

**Protective Clothing:** Applicators and other handlers must wear rubber or other chemical resistant, waterproof gloves, long sleeved shirt and long pants and shoes plus socks. Early entry to treated areas that is permitted under the Worker Protection Standard requires the wearing of coveralls, rubber or other chemical resistant, waterproof gloves and shoes plus socks. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove personal protective equipment (PPE) immediately after handling product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

**Eye Protection:** Non-venting chemical safety goggles are recommended if full face-piece respirator is not worn. Do not wear contact lenses.

**Other Protective Equipment:** For operations where contact can occur, a safety shower and an eye wash facility should be immediately available.

**Note:** Follow the manufacturer’s instructions for cleaning and maintaining Personal Protective Equipment (PPE). If no specific instructions for decontamination are available, use detergent and hot water. Keep and wash (launder) PPE separately from other laundry.

**Boiling Point (@760 mmHg):** Decomposes

**Vapor Pressure (@ 20 c mm Hg):** Negligible

**Volatility:** 0%

**Evaporation Rate:** Not applicable

**Coefficient of Water/Oil:** Not available

**Appearance and Odor:** Tan/brown granules. No odor.

**Melting Point @ 760 mmHg:** 147/297(°C/°F)

**Specific Gravity (H2O=1):** Not available

**Vapor Density (Air=1):** Not applicable

**Solubility in Water:** Partially (30 mg/liter at room temp)

**pH:** No data available

**Stability:** Stable

**Conditions to Avoid:** Excessive heat.

**Incompatibility:** Acids, oxidizers, copper.

**Hazardous Decomposition Products:** Decomposed by excessive heat and acids. Heating to decomposition generates carbon disulfide and oxides of carbon, nitrogen and sulfur. Acid decomposition may evolve carbon disulfide and hydrogen sulfide.

**Hazardous Polymerization:** Will not occur.
SECTION 11: TOXICOLOGICAL INFORMATION

EYE CONTACT: May cause irritation based on a study in rabbits.
SKIN CONTACT: May cause irritation and possibly sensitization. Animal studies indicate that this product is a moderate sensitizer. Limited toxicity by skin absorption based on a proprietary study Dermal LD50 (rat) - > 2 g/kg.
INHALATION: Dust may cause mucous membrane and respiratory irritation with coughing, choking and labored breathing.
INGESTION: May cause systemic poisoning with symptoms of weakness, nausea, vomiting, diarrhea, confusion, dizziness, delirium, tremor, hallucinations, ataxia, ascending paralysis, hypothermia and peripheral neuropathy (pain, numbness and weakness of the extremities). Respiratory paralysis and death may occur.
OTHER TOXIC EFFECTS: An antabuse-like reaction with flushing, sweating, headache, weakness and hypotension may occur when ethyl alcohol (alcoholic beverages) is ingested following exposure to this material.
CHRONIC EFFECTS of OVEREXPOSURE: Thiram has been found to be mutagenic in some test systems and to cause adverse reproductive effects in laboratory animals.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Individuals with chronic respiratory and skin diseases may be at increased risk from exposure to this material.

TOXICOLOGY DATA:

<table>
<thead>
<tr>
<th>LD50</th>
<th>LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiram</td>
<td></td>
</tr>
<tr>
<td>2.4 g/kg oral rat *</td>
<td>4.42 mg/L/4 hr rat *</td>
</tr>
</tbody>
</table>

>5 gm/kg dermal rat
>2 gm/kg dermal rabbit *

* UCB Proprietary Study

This product is not listed as a carcinogen or suspect carcinogen by NTP, IARC or OSHA.
This material may cause skin sensitization.
Thiram is mutagenic in some test systems.
Thiram has been found to cause adverse reproductive effects and teratogenic effects in laboratory animals.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity Values for Thiram:
LC50 Salmo (trout) 0.13 mg/L
LC50 Xenopus Laevis (amphibian) stage 47 0.017 ppm/24 hr
LD50 Redwing Blackbird oral >100 mg/kg

SECTION 13: DISPOSAL INFORMATION

WASTE DISPOSAL METHOD: Pesticide wastes are toxic. Do not dispose of product (or container) in or near any body of water. Dispose in accordance with all local, state/provincial and federal regulations. Completely empty container into application equipment then dispose of empty container in a sanitary landfill, by incineration or by other procedures approved by state/provincial and local authorities. Do not reuse empty containers.

SECTION 14: TRANSPORTATION INFORMATION

DOT SHIPPING NAME: Environmentally Hazardous Substance, Solid, N.O.S. (Thiram), 9, UN3077, PG III, RQ
DOT HAZARD CLASSIFICATION: Class 9 (Miscellaneous Hazardous Material)
DOT LABELS REQUIRED (49CFR 172.101): Class 9
UN NUMBER: UN3077
REPORTABLE QUANTITY: 13 lbs (5.9 kg) for product

SECTION 15: REGULATORY INFORMATION

OSHA HAZARD CLASSIFICATION: Irritant, toxic, target organ effect, sensitizer
EPA SARA 311 HAZARD CLASSIFICATION: Acute health, chronic health
SARA TITLE 111 SECTION 313 INFORMATION: The following components are regulated under SARA Title 313

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CAS#</th>
<th>WT%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiram</td>
<td>137-26-8</td>
<td>75</td>
</tr>
</tbody>
</table>

CERCLA HAZARDOUS SUBSTANCE (40CFR116): Thiram
REPORTABLE QUANTITY: 10 lbs (4.54 kg). Product RQ = 13 lbs (5.9 kg)

STATE R-T-K COMPOSITION INFORMATION

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CAS #</th>
<th>WT%</th>
<th>PA</th>
<th>MA</th>
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<tbody>
<tr>
<td>Thiram</td>
<td>137-26-8</td>
<td>75</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
CALIFORNIA PROPOSITION 65 INFORMATION: This product contains no California Proposition 65 regulated chemicals.

WHMIS CLASSIFICATION: Toxic material causing other toxic effects (Class D-Subdivision 2, Subdivision B)

SECTION 16: OTHER INFORMATION

Approved By: ________________________ Dated: ____________

ESHA Manager