Material Safety Data Sheet

Section I. Chemical Product and Company Identification

PRODUCT NAME/ TRADE NAME: Ultra Yield Manganese Sulfate 27%

SYNONYM: Manganese sulfate, Manganous sulfate

CHEMICAL NAME: Manganese sulfate

CHEMICAL FAMILY: An inorganic metal salt.

CHEMICAL FORMULA: MnSO₄

MATERIAL USES: Agricultural use: Fertilizer ingredient.

MANUFACTURER: Various

SUPPLIER:

Agrrium
North American Wholesale
13131 Lake Fraser Drive, S.E.
Calgary, Alberta, Canada, T2J 7E8

Agrium U.S. Inc.
Suite 1700, 4582 South Ulister St.
Denver, Colorado, U.S.A., 80237

MSDS NUMBER: 14175

REVISION NUMBER: 4.5

MSDS prepared by the Environment, Health and Safety Department on:
March 5, 2001

24 HR EMERGENCY TELEPHONE NUMBER:
Transportation Emergency: 1 (800) 792-8311
Medical Emergency: 1 (888) 670-8123

Section II. Hazardous Ingredients

<table>
<thead>
<tr>
<th>NAME</th>
<th>CAS #</th>
<th>TLV-TWA mg/m³</th>
<th>TLV-TWA ppm</th>
<th>STEL mg/m³</th>
<th>STEL ppm</th>
<th>CEIL mg/m³</th>
<th>CEIL ppm</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese sulfate</td>
<td>7785-87-7</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27% as Mn</td>
</tr>
</tbody>
</table>

TOXICOLOGICAL DATA ON INGREDIENTS

Ultra Yield Manganese Sulfate 27%:

ORAL (LD50): Acute: 2330 mg/kg [Mouse] as manganese sulfate

Section III. Hazards Identification.

POTENTIAL ACUTE HEALTH EFFECTS

Acute systemic intoxication rarely occurs as it is poorly absorbed from the lungs or the gut. Systemic poisoning may result from chronic inhalation or chronic ingestion; chronic exposure to low concentrations may lead to the accumulation of toxic concentrations in critical organs. May cause eye and skin irritation.

POTENTIAL CHRONIC HEALTH EFFECTS

The usual form of chronic manganese poisoning primarily involves the CNS. The brain appears to sustain permanent cellular damage at exposure levels which do not otherwise affect a person. The characteristic pathological lesion in man is destruction of the ganglion cells of the basal ganglia, although symptoms appear before damage becomes discernible. Onset of chronic poisoning is insidious. Early symptoms include languor, sleepiness, tremors, and weakness in legs. A stolid mask like appearance of face, slurred speech, emotional disturbances such as anorexia, apathy, and inability to concentrate, uncontrollable laughter, and loss of balance with a spastic gait and a tendency to fall while walking are findings in more advanced cases.

Continued on Next Page
While high levels of manganese may increase anemia by interfering with iron absorption, iron deficiency may increase an individual's susceptibility to manganese. Experimental studies suggest that populations at greatest risk of adverse effects due to manganese exposure are the very young and those with iron deficiency. Effects have been reported in the scientific literature at or below the U.S. OSHA Permissible Exposure Limit of 5 mg/m$^3$ as a ceiling value.

Although permanently disabled unless treated; chronic manganese poisoning is not a fatal disease. Disorders are reversible if recognized early and overexposure is eliminated. Not classifiable as a human or animal carcinogen, teratogen or mutagen.

**CARCINOGENIC EFFECTS:** NONE by ACGIH, EPA, IARC, NTP, OSHA.
**MUTAGENIC EFFECTS:** NONE by ACGIH, EPA, IARC, NTP, OSHA.
**TERATOGENIC EFFECTS:** NONE by ACGIH, EPA, IARC, NTP, OSHA.

### Section IV. First Aid Measures

<table>
<thead>
<tr>
<th>EYE CONTACT</th>
<th>May cause eye irritation due to mechanical action. Flush with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Obtain medical attention if irritation persists.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINOR SKIN CONTACT</td>
<td>May cause skin irritation. Wash contaminated skin with soap and water. Cover irritated skin with an emollient. If irritation persists, obtain medical attention. Wash contaminated clothing before reusing.</td>
</tr>
<tr>
<td>EXTENSIVE SKIN CONTACT</td>
<td>No additional information.</td>
</tr>
<tr>
<td>MINOR INHALATION</td>
<td>Allow to rest in a well ventilated area. Seek medical attention, if not feeling well.</td>
</tr>
<tr>
<td>SEVERE INHALATION</td>
<td>Over-exposure by inhalation may cause respiratory irritation. Rescuers should put on appropriate protective gear. Remove from area of exposure. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Keep warm. Get immediate medical attention.</td>
</tr>
<tr>
<td>SLIGHT INGESTION</td>
<td>If conscious, have person drink several glasses of water or milk and induce vomiting. Never give anything by mouth to an unconscious person. Lower the head so that the vomit will not reenter the mouth and throat. Obtain medical attention.</td>
</tr>
<tr>
<td>EXTENSIVE INGESTION</td>
<td>No additional information.</td>
</tr>
</tbody>
</table>

### Section V. Fire and Explosion Data

| THE PRODUCT IS                   | Non-flammable.                                                                                                                                                                                        |
| AUTO-IGNITION TEMPERATURE        | Not applicable.                                                                                                                             |
| FLASH POINT                      | Not applicable.                                                                                                                             |
| FLAMMABILITY LIMITS             | Not applicable.                                                                                                                             |
| PRODUCTS OF COMBUSTION           | Not applicable.                                                                                                                             |
| FIRE HAZARD IN THE PRESENCE OF VARIOUS SUBSTANCES | Not applicable.                                                                 |
| EXPLOSION HAZARD IN THE PRESENCE OF VARIOUS SUBSTANCES | This substance is non-explosive.                                                                                                          |
| FIRE FIGHTING MEDIA AND INSTRUCTIONS | Non-flammable.                                                                 |
| SPECIAL REMARKS ON FIRE HAZARDS | No additional remark.                                                                                                                     |

Continued on Next Page
Section VI. Accidental Release Measures

SMALL SPILL
Use appropriate tools to put spilled solid in a suitable container for intended use or disposal. Clean up spills immediately, observing precautions in the Protective Equipment section.

LARGE SPILL
No additional information.

Section VII. Handling and Storage

PRECAUTIONS
DO NOT breathe dust or ingest product. After handling, always wash hands thoroughly with soap and water. Keep container tightly closed and dry. Keep out of reach of children. Use only in well ventilated areas.

STORAGE
Keep container tightly closed. Contains moisture sensitive material; store in a dry place. Product will absorb moisture and will cake when dried. Keep away from food, drink and animal feed.

Section VIII. Exposure Controls/Personal Protection

ENGINEERING CONTROLS
Local exhaust ventilation may be necessary to control any air contaminants to within their TLVs during the use of this product. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

PERSONAL PROTECTION
The selection of personal protective equipment varies, depending upon conditions of use. Under well controlled conditions where no direct contact with the substance exists and exposures are below the occupational exposure limit, normal work clothing may suffice. However, protective clothing and appropriate respiratory protection must be available in the area in the event of emergency.

PERSONAL PROTECTION IN CASE OF LARGE RELEASE
Wear a NIOSH approved dust respirator if engineering, work practise or other control measures are not adequate to prevent overexposure. Where skin and eye contact may occur as a result of prolonged or repeated exposures, wear long sleeved clothing, coveralls, leather gloves, and safety glasses with side shields. For U.S. work sites where respiratory protection is required, ensure that a respiratory protection meeting 29 CFR 1910.134 is in place.

EXPOSURE LIMITS
ACGIH TLV-TWA: 0.2 mg/m$^3$ as manganese
U.S. OSHA Permissible Exposure Limit: 5 mg/m$^3$ Ceiling
Federal, State, and Provincial exposure limits may vary. Consult local officials for acceptable exposure limits in your jurisdiction.

Section IX. Physical and Chemical Properties

PHYSICAL STATE AND APPEARANCE
Granular solid.

MOLECULAR WEIGHT
Not applicable.

pH (10% SOLN/WATER)
4.5 - 5.5

BOILING POINT
Decomposes.

MELTING POINT
700°C (1292°F)

CRITICAL TEMPERATURE
Not available.

SPECIFIC GRAVITY g/cc
1.28 particle density (Water = 1)

BULK DENSITY kg/m$^3$; lbs/ft$^3$
1284 kg/m$^3$; 80 lbs/ft$^3$

VAPOR PRESSURE
Not available.

VAPOR DENSITY
Not available.

COLOR
Dark brown or grey.

ODOR
Odorless.

ODOR THRESHOLD
Not available.

TASTE
Not available.

VOLATILITY
Not available.

SOLUBILITY
Soluble in hot or cold water.

DISPERNSION PROPERTIES
See solubility in water.

WATER/OIL DIST. COEFF.
Not available.

Continued on Next Page
### Section X. Stability and Reactivity Data

<table>
<thead>
<tr>
<th>STABILITY</th>
<th>The product is stable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSTABILITY</td>
<td>Not available.</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
</tr>
<tr>
<td>CONDITIONS OF</td>
<td>No additional remark.</td>
</tr>
<tr>
<td>INSTABILITY</td>
<td></td>
</tr>
<tr>
<td>INCOMPATABILITY WITH VARIOUS SUBSTANCES</td>
<td>Highly reactive with oxidizing agents.</td>
</tr>
<tr>
<td>CORROSIVITY</td>
<td>No specific information is available in our database regarding the corrosivity of this product in presence of various materials. Slightly corrosive to copper, iron, and steel.</td>
</tr>
<tr>
<td>SPECIAL REMARKS ON REACTIVITY</td>
<td>Avoid strong oxidizing agents</td>
</tr>
<tr>
<td>SPECIAL REMARKS ON CORROSIVITY</td>
<td>Contact your sales representative or metallurgical specialist to ensure compatibility with system equipment.</td>
</tr>
</tbody>
</table>

### Section XI. Toxicological Information

| SIGNIFICANT ROUTES OF EXPOSURE | Ingestion. |
| TOXICITY TO ANIMALS | Acute oral toxicity (LD50): 2330 mg/kg [Mouse]. |
| SPECIAL REMARKS ON TOXICITY TO ANIMALS | Low toxicity for humans or animals under normal conditions of use. May be harmful to livestock and wildlife if ingested. Clean up all spilled material, especially where bulk fertilizer loading of equipment occurs to prevent animal exposure. Aquatic/Marine Toxicity: Avoid spills or release to watercourses. Will disperse with current. Release to watercourses may cause effects down stream from the point of release. U.S. D.O.T.: This material NOT listed as a Marine pollutant. |
| OTHER EFFECTS ON HUMANS | No additional information is available in our database regarding other toxic effects of this material. |
| SPECIAL REMARKS ON CHRONIC EFFECTS ON HUMANS | No additional remark. |
| SPECIAL REMARKS ON OTHER EFFECTS ON HUMANS | No additional remark. |

### Section XII. Ecological Information

| ECOTOXICITY | No additional information. |
| BOD and COD | Not available. |
| PRODUCTS OF DEGRADATION | Some metallic oxides. Sulfur oxides (SO2, SO3 ...). |
| TOXICITY OF THE PRODUCTS OF DEGRADATION | The products of degradation are as toxic as the original product. |
| SPECIAL REMARKS ON THE PRODUCTS OF DEGRADATION | Oxides of sulfur and manganese |

**Continued on Next Page**
### Section XIII. Disposal Considerations

| WASTE DISPOSAL OR RECYCLING | Recover spilled material and use for intended purpose. Consult your environmental advisor for information on recycling or disposal alternatives. |

### Section XIV. Transport Information

<table>
<thead>
<tr>
<th>DOT / TDG CLASSIFICATION</th>
<th>Not controlled under TDG (Canada) or D.O.T. (U.S.A.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN</td>
<td>Not applicable (PIN and PG).</td>
</tr>
<tr>
<td>SPECIAL PROVISIONS FOR TRANSPORT</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

**DOT (U.S.A) (Pictograms)**

### Section XV. Other Regulatory Information and Pictograms

<table>
<thead>
<tr>
<th>OTHER REGULATIONS</th>
<th>No additional information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTHER CLASSIFICATIONS</td>
<td>HCS (U.S.A.): HCS CLASS: Target organ effects.</td>
</tr>
<tr>
<td></td>
<td>DSCL (EEC): Not available.</td>
</tr>
</tbody>
</table>

**National Fire Protection Association (U.S.A.)**

Hazards presented under acute emergency conditions only:

- Health
- Reactivity
- Specific Hazard

**TDG (Pictograms - Canada)**

**DSCL (Europe) (Pictograms)**

- Not Available
- No Disponible
- Pas Disponible

**ADR (Europe) (Pictograms)**

- Not Available
- No Disponible
- Pas Disponible

### Section XVI. Other Information

**REFERENCES**

- 29 CFR Part 1910
- 40 CFR Part 1-799
- 49 CFR Parts 1-199
- American Conference of Governmental Industrial Hygienists, TLVs™ and other Occupational Exposure Values, 2000.

*Continued on Next Page*
OTHER SPECIAL CONSIDERATIONS

No additional remark.

FOR FURTHER SAFETY, HEALTH, OR ENVIRONMENTAL INFORMATION ON THIS PRODUCT, CONTACT

AGRIUM
Environment, Health and Safety Department
Telephone (780) 998-6134 or Fax (780) 998-6143

NOTICE TO READER

The buyer assumes all risk in connection with the use of this material. The buyer assumes all responsibility for ensuring this material is used in a safe manner in compliance with applicable environmental, health and safety laws, policies and guidelines. Agrium Inc. assumes no responsibility or liability for the information supplied on this sheet, including any damages or injury caused thereby. Agrium Inc. does not warrant the fitness of this material for any particular use and assumes no responsibility for injury or damage caused directly or indirectly by or related to the use of the material. The information contained in this sheet is developed from what Agrium Inc. believes to be accurate and reliable sources, and is based on the opinions and facts available on the date of preparation.