MATERIAL SAFETY DATA SHEET
Rohm and Haas Company

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

DITHANE® M-45 Fungicide

Product Code : 62433
Key : 904305-5

MSDS Date : 10/16/95

COMPANY IDENTIFICATION

ROHM AND HAAS COMPANY
100 INDEPENDENCE MALL WEST
PHILADELPHIA, PA 19106-2399

EMERGENCY TELEPHONE NUMBERS

HEALTH EMERGENCY : 215-592-3000
SPILL EMERGENCY : 215-592-3000
CHEMTREC : 800-424-9300

DITHANE® is a trademark of Rohm and Haas Company or one of its subsidiaries or affiliates

2. COMPOSITION/INFORMATION ON INGREDIENTS

No		CAS REG NO	WEIGHT (%)
1	Mancozeb	8018-01-7	80-85
2	Related reaction products	None	15-20
3	Calcium lignosulfonate	8061-52-7	

See Section 8, Exposure Controls / Personal Protection

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure

Inhalation
Skin Contact
Eye Contact

Inhalation

Inhalation of dust can cause the following:
- irritation of nose and throat

Eye Contact

Direct contact with material can cause the following:
- moderate irritation

Skin Contact

Prolonged or repeated skin contact can cause the following:
- possible skin irritation - dermatitis due to skin sensitization

Delayed Effects

DITHANE® M-45 Fungicide at high levels has caused hindleg paralysis in test animals and an increased incidence of retinal degeneration. It has caused thyroid tumors and birth defects in test animals, resulting from ethylenethiourea (ETU) formation. ETU, a trace contaminant and breakdown product of DITHANE® M-45

Fungicide, primarily affects the thyroid and liver. It has also caused other endocrine and blood effects, tumors and birth defects in test animals.

4. FIRST AID MEASURES

Inhalation

Move subject to fresh air.

Eye Contact

Flush eyes with a large amount of water for at least 15 minutes. Consult a physician if irritation persists.

Skin Contact

Wash affected skin areas thoroughly with soap and water. Consult a physician if irritation persists. Remove and wash contaminated clothing thoroughly. Do not take clothing home to be laundered.

Ingestion

If swallowed, give 2 glasses of water to drink. Consult a physician. Never give anything by mouth to an unconscious person.

5. FIRE FIGHTING MEASURES

Flash Point	146°C/295°F Tag Open Cup
Auto-ignition Temperature	No Data
Lower Explosive Limit	0.16 oz/ft3 160.18 g/^{m}3
Upper Explosive Limit	No Data

Unusual Hazards

Pesticide particulates can become airborne.
Combustion generates toxic fumes of the following:
- hydrogen sulfide - carbon disulfide - sulfur oxides - nitrogen oxides - carbon oxides
The minimum ignition temperature of dust cloud is 310C/590F.
The minimum ignition temperature of dust layer is 132C/270F.
Dusts at sufficient concentrations can form explosive mixtures with air.

Extinguishing Agents

Use the following extinguishing media when fighting fires involving this material:
- carbon dioxide - dry chemical - water spray

Personal Protective Equipment

Wear self-contained breathing apparatus (pressure-demand MSHA/NIOSH approved or equivalent) and full protective gear.

Special Procedures

Contain run-off. Remain upwind. Avoid breathing smoke. Use water spray to cool containers exposed to fire.

6. ACCIDENTAL RELEASE MEASURES

Personal Protection

Appropriate protective equipment must be worn when handling a spill of this material. See SECTION 8, Exposure Controls/Personal Protection, for recommendations. If exposed to material during clean-up operations, see SECTION 4, First Aid Measures, for actions to follow.
Remove all contaminated clothing promptly. Wash all exposed skin areas with soap and water immediately after exposure. Thoroughly launder clothing before reuse. Do not take clothing home to be laundered.

Procedures

Transfer spilled material to suitable containers for recovery or disposal. Keep dust to a minimum.
CAUTION: Keep spills and cleaning runoff out of municipal sewers and open bodies of water.

7. HANDLING AND STORAGE

Storage Conditions

Do not store this material near food, feed or drinking water. Store in a well ventilated area. Store in a dry area. DO NOT allow DITHANE® to become wet or overheated in storage; decomposition, impaired activity or fire may result. Material is combustible; do not ignite. Store bagged material only on pallets no more than 3 high. Provide access aisles for each 2 rows. Loose bags should not be stacked more than 2x2x2 meters. Dense packing of unvented stacks of bags may lead to product decomposition posing a fire hazard. Decomposition produces a foul odor. Check for hot containers and immediately remove to open areas for disposal.

Handling Procedures

Do not handle material near food, feed or drinking water.

Avoid high concentrations of dust in air and accumulation of dust on equipment. An airborne dust of this material can create a dust explosion. When handling and processing this material local exhaust ventilation may be required to control dust and reduce exposure to vapors. To prevent dust explosions employ bonding and grounding for operations capable of generating static electricity. Protect all equipment from explosions by following the guidelines in NFPA-68 and NFPA-69. For electrical equipment follow local codes and electrical classification NFPA-70 (the National Electrical Code), class II, division 2, group G.

Other

Completely empty bag into application equipment. Dispose empty bag in a sanitary landfill or by incineration as allowed by state and local authorities. Avoid inhalation of smoke if incinerated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limit Information

No		CAS REG NO	WEIGHT (%)
1	Mancozeb	8018-01-7	80-85
2	Related reaction products	None	15-20
3	Calcium lignosulfonate	8061-52-7	

Comp.		ROHM AND HAAS		OSHA		ACGIH	
No.	Units	TWA	STEL	TWA	STEL	TWA	STEL
1	mg/m3	1	None	None	None	None	None
2		None	None	None	None	None	None
3		None	None	None	None	None	None

Respiratory Protection

A respiratory protection program meeting OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. None required if airborne concentrations are maintained below the exposure limit listed in 'Exposure Limit Information'.

Up to 10 times the exposure limit: Wear a MSHA/NIOSH approved (or equivalent) half-mask, air-purifying respirator.

Up to 100 times the exposure limit: Wear a MSHA/NIOSH approved (or equivalent) full-facepiece, air-purifying respirator,
OR
full-facepiece, airline respirator in the demand mode.

Above 100 times the exposure limit or Unknown: Wear a MSHA/NIOSH approved (or equivalent) self-contained breathing apparatus in the pressure demand mode,
OR
MSHA/NIOSH approved (or equivalent) full-facepiece, airline respirator in the pressure demand mode with emergency escape provision.

Air-purifying respirators should be equipped with MSHA/NIOSH approved (or equivalent) cartridges for protection against pesticides.

Eye Protection

Use chemical splash goggles (ANSI Z87.1 or approved equivalent). Eye protection worn must be compatible with respiratory protection system employed.

Hand Protection

Chemical-resistant gloves should be worn whenever this material is handled.
The glove(s) listed below may provide protection against permeation:
- Polyvinyl chloride-coated glove or other chemical-resistant rubber-coated glove
Gloves should be removed and replaced immediately if there is any indication of degradation or chemical breakthrough.
Rinse and remove gloves immediately after use. Wash hands with soap and water.

Other Protection

Use chemically resistant apron or other impervious clothing to avoid prolonged or repeated skin contact. Work clothing should be removed at the end of the shift and laundered by the employer.

Engineering Controls (Ventilation)

Use local exhaust ventilation with a minimum capture velocity of 150 ft/min. (0.75 m/sec.) at the point of dust or mist evolution. Refer to the current edition of Industrial Ventilation: A Manual of Recommended Practice published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.

Other Protective Equipment

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color	Yellow
State	Powdered solid
Odor Characteristic	Musty odor
pH	Not Applicable
Viscosity	Not Applicable
Specific Gravity (Water = 1)	0.35 to 0.50 g./cc. Bulk Density
Vapor Density (Air = 1)	Not Applicable
Vapor Pressure	No Data
Melting Point	192° to 204°C/378° to 399°F Not Applicable--Decomposes
Boiling Point	Not Applicable
Solubility in Water	Dispersible
Percent Volatility	1% Water
Evaporation Rate (BAc = 1)	Not Applicable

See Section 5, Fire Fighting Measures

10. STABILITY AND REACTIVITY

Instability

This material is considered stable. However, keep away from moisture, heat or flame.

Hazardous Decomposition Products

Thermal decomposition may yield the following:
- carbon disulfide - hydrogen sulfide

Hazardous Polymerization

Product will not undergo polymerization.

Incompatibility

Avoid contact with the following:
- oxidizing agents - acids

11. TOXICOLOGICAL INFORMATION

Acute Data

Oral LD50 - rat: >5000 mg/kg
Dermal LD50 - rabbit: >5000 mg/kg
Skin irritation - rabbit: practically non-irritating
Eye Irritation - rabbit:
not irritating (EEC Classification)
moderately irritating (US Classification)
Inhalation LC50 - rat: >5.14 mg/L for 4 hr

Subchronic/Chronic Data

Repeated exposure to mancozeb at high doses affects the thyroid, liver, and nervous systems in laboratory animals. The thyroid and liver effects are due to its metabolism in small amounts to ETU, which interferes with thyroid hormone synthesis and induces stress-related liver growth. These effects are reversible when exposure is brief or intermittent, but prolonged exposures can produce secondary changes, including anemia and thyroid, pituitary and liver tumors in rodents. In common with other ethylenebisdithiocarbamates, hindleg paralysis and related neurotoxic effects including retinal atrophy were noted at high doses.

In studies with mancozeb, a two-year feeding study in rats indicated thyroid effects and tumors and an increased incidence of retinopathy at a dietary concentration of 750 ppm. The NOAEL was 125 ppm (5 mg/kg bw/day).
An 18 month feeding study in mice indicated thyroid effects at 1000 ppm. The NOAEL was 100 ppm (13-18 mg/kg bw/day).
A one-year feeding study in dogs indicated effects on the thyroid, liver, blood and other organs at 800 ppm or higher levels. The NOAEL was 200 ppm (7mg/kg bw/day). A 3-month neuropathology study indicated hindleg paralysis and associated microscopic changes at 750 and 5000 ppm. The NOAEL was 125 ppm (8 mg/kg bw/day).

Thus, the overall NOAEL from long-term feeding studies with mancozeb is 5 mg/kg bw/day. The overall NOAEL from long-term feeding studies of ETU was 0.37 mg/kg bw/day.

Carcinogenicity Data

A two-year feeding study of mancozeb indicated thyroid tumors in rats at a dietary concentration level of 750 ppm. No evidence of carcinogenicity was observed in long-term studies with mice.

Two-year feeding studies of ETU indicated thyroid and pituitary tumors in rats at dietary concentrations of 83 ppm or higher and also thyroid, pituitary and liver tumors in mice at dietary concentrations of 330 ppm or higher.

Information on the mechanism of these tumors establishes a threshold for the thyroid and pituitary tumors, and indicates that none of these tumor types is relevant for human risk assessment at likely exposure levels.

Mutagenicity Data

Both mancozeb and ETU have been adequately tested in a wide variety of in vitro and in vivo mutagenicity tests. The weight of the evidence of these tests indicates that mancozeb and ETU are not mutagenic in mammalian systems.

Reproductive/Teratology Data

No reproductive effects were seen below adult toxic levels in two generation reproduction studies of mancozeb or ETU.

In developmental toxicity studies, exposure to maternally toxic levels of mancozeb produced developmental effects including malformations in rats. There was no evidence of developmental toxicity in rats below adult toxic levels or in rabbits at any dose. The NOAEL for developmental toxicity was 128 mg/kg bw/day in rats and >80 mg/kg bw/day HDT in rabbits. The NOAEL for maternal toxicity was 30-32 mg/kg bw/day in both species.

In developmental toxicity studies with ETU, malformations were produced at thyroid-inhibiting levels in studies with rats and hamsters. Embryofetotoxicity, but no malformations were produced in mice and rabbits, and there was no evidence of developmental toxicity in guinea pigs or cats. The overall NOEL is 5-15 mg/kg bw/day in the rat.

Sensitization Data

Mancozeb causes skin sensitization in guinea pigs when tested using the Maximization procedure, but not when tested using the Buehler procedure. Consequently, mancozeb may have a weak potential for skin sensitization in humans.

Other Toxicity Data

Acceptable Daily Intake (ADI) for mancozeb: 0.05 mg/kg bw/day

Acceptable Daily Intake (ADI) for ethylenebisdithiocarbamates as a group: 0.03 mg/kg bw/day

Acceptable Daily Intake (ADI) for ETU: 0.004 mg/kg bw/day

12. ECOLOGICAL INFORMATION

Environmental Toxicity

Mallard duck, 10 day LD50: > 6400 mg/kg; [1]
Japanese quail, 10 day LD50: 6400 mg/kg; [1]
Mallard duck, Reproduction, NOAEL: 125 ppm; [1]
Bobwhite quail, Reproduction, NOAEL: 500 ppm; [1]
Rainbow trout (Salmo gairdneri), 48 Hour LC50: 1.9 mg/l; [1]
Bluegill sunfish (Lepomis macrochirus), 48 Hour LC50: 1.63 mg/l; [1]
Daphnia magna, 48 Hour EC50: 1.0 mg/l; [1]
Sheepshead minnow, mysid shrimp, oyster, 96 Hour EC or LC50: 0.01 to 2.01 mg/l; [1]
Green algae (Selenastrum, Scenedesmus, Chlorella), 72-120 Hour EC50: 0.06 to 2.24 mg/l; [1]
Honeybee, Contact LD50: > 100 ug/bee; [1]
Honeybee, Ingestion LD50: > 100 ug/bee; [1]
Earthworm, 14 Day LC50: > 299 ppm; [1]
Rainbow trout (Salmo gairdneri), 96 Hour LC50: > 490 mg/l; [2]
Guppy, 96 Hour LC50: 7500 mg/l; [2]
Daphnia magna, 48 Hour EC50: 26 to 49 mg/l; [2]

1 Results based on mancozeb active ingredient.
2 Results based on ethylenethiourea (ETU).

13. DISPOSAL CONSIDERATIONS

Procedure

For disposal, incinerate this material at a facility that complies with local, state, and federal regulations. (See 40 CFR 268)

14. TRANSPORT INFORMATION

US DOT Hazard Class ..... NONREGULATED

This classification is used when shipping in non-bulk packages for domestic surface transportation only. Exceptions in CFR 49 Parts 171-177 may apply. Consult CFR 49 Parts 171-177 to determine appropriate classification when shipping in bulk packages or when shipping by air or ocean.

15. REGULATORY INFORMATION

Workplace Classification

This product is considered hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200).

This product is subject to regulation under the Canadian Pest Control Products Act (P.C.P. Act). Therefore, this product is excluded from the supplier labeling and material safety data sheet requirements as specified in Section 12 of the Hazardous Products Act.

SARA TITLE 3: Section 311/312 Categorizations (40CFR 370)

This product is a hazardous chemical under 29CFR 1910.1200, and is categorized as a delayed health hazard.

SARA TITLE 3: Section 313 Information (40CFR 372)

This product contains a chemical which is listed in Section 313 at or above de minimis concentrations. The following listed chemicals are present: (Quantity present is found elsewhere on this MSDS.)
- Mancozeb (8018-01-7) as manganese/zinc compound
- Mancozeb (8018-01-7) as ethylenebisdithiocarbamic acid, salts and esters

CERCLA Information (40CFR 302.4)

This material is regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304. This material is or contains chemical(s) listed in 40 CFR Table 302.4 or nondesignated RCRA ICR substance(s). (Nondesignated ICR substances apply to materials that will not be reused.) The Reportable Quantity(s) (RQ) are listed below. Releases in excess of its reportable quantity must be reported to the National Response Center (1-800-424-8802) and to the appropriate state and local emergency response organizations.
Ethylenebisdithiocarbamic acid, salts & esters (111-54-6) 5000 lbs. as Mancozeb (8018-01-7)

Waste Classification

When a decision is made to discard this material as supplied, it is classified as a RCRA hazardous waste, hazardous waste number: U114 (40 CFR 261).

United States

This product is subject to regulation under the US Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and is therefore exempt from U.S. Toxic Substances Control Act (TSCA) Inventory listing requirements.

California (Proposition 65)

This product contains trace levels of a component or components known to the state of California to cause cancer and birth defects or other reproductive harm:
- Ethylene thiourea (96-45-7)

This product contains a component or components known to the state of California to cause cancer:
- Mancozeb (8018-01-7)

16. OTHER INFORMATION

Rohm and Haas Hazard Rating		Scale
Toxicity	1	4=EXTREME
Fire	1	3=HIGH
Reactivity	0	2=MODERATE
Special	-	1=SLIGHT
		0=INSIGNIFICANT

Ratings are based on Rohm and Haas guidelines, and are intended for internal use.

ABBREVIATIONS:

ACGIH = American Conference of Governmental Industrial Hygienists
OSHA = Occupational Safety and Health Administration
TLV = Threshold Limit Value
PEL = Permissible Exposure Limit
TWA = Time Weighted Average
STEL = Short-Term Exposure Limit
BAc = Butyl acetate
| Bar denotes a revision from previous MSDS in this area.