

# MATERIAL SAFETY DATA SHEET



Emergency Phone: 800-992-5994  
Dow AgroSciences LLC  
Indianapolis, IN 46268

## DITHANE<sup>®</sup> M-45 FUNGICIDE

Date: 6/1/01  
Product Code: 88788

### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: Dithane<sup>®</sup> M-45 Fungicide

COMPANY IDENTIFICATION:  
Dow AgroSciences  
9330 Zionsville Road  
Indianapolis, IN 46268

EMERGENCY TELEPHONE NUMBER:  
800-992-5994

### 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	

NOTE: The "!", or "Bar", in the WEIGHT (%) column is used to denote two or more components whose weight percents sum to the total shown by the figure either to the right of or immediately above the "Bar".

See Section 8, Exposure Controls / Personal Protection

### 3. HAZARDS IDENTIFICATION

#### Primary Routes of Exposure

Inhalation  
Eye Contact  
Skin Contact

#### Inhalation

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

#### 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<sup>®</sup> M-45 Fungicide at high levels has caused hind leg 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<sup>®</sup> 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.

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### 4. FIRST AID MEASURES

#### Inhalation

Move subject to fresh air.

#### Eye Contact

Flush eyes with water. 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. See a physician. Never give anything by mouth to an unconscious person.

### 5. FIRE FIGHTING MEASURES

Flash Point .....	Not Applicable
Auto-ignition Temperature .....	No Data
Lower Explosive Limit .....	0.16 oz/ft <sup>3</sup> 160.18 g/m <sup>3</sup>
Upper Explosive Limit .....	No Data

#### Unusual Hazards

Pesticide particulates can become airborne.  
Combustion generates toxic fumes of the following: hydrogen sulfide - 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 - foam

#### Personal Protective Equipment

Wear self-contained breathing apparatus (pressure-demand 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.

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### 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

Keep spectators away. Avoid breathing dust. 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.

Keep container tightly closed when not in use.

#### 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.

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### 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. No.	Units	Dow AgroSciences		OSHA		ACGIH	
		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

End users must follow label instructions when using this product.

#### Respiratory Protection

A respiratory protection program meeting OSHA 1910.134 and ANSI Z88.2 requirements or equivalent 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 properly fitted NIOSH approved (or equivalent) half-mask, air-purifying respirator.

**Up to 50 times the exposure limit:** Wear a properly fitted NIOSH approved (or equivalent) full-face piece, air-purifying respirator, OR full-face piece, airline respirator in the pressure demand mode.

**Above 50 times the exposure limit or Unknown:** Wear a properly fitted NIOSH approved (or equivalent) self-contained breathing apparatus in the pressure demand mode, OR full-face piece, airline respirator in the pressure demand mode with emergency escape provision.

Air-purifying respirators should be equipped with NIOSH approved (or equivalent) organic vapor cartridges and N100 filters. If oil mist is present, use R100 or P100 filters.

#### 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.

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### 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 .....	Negligible
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

The physical and chemical data given in Section 9 are typical values for this product and are not intended to be product specifications.

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.

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### 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, hind leg 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 hind leg 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 in rats produced an increased incidence of thyroid tumors at 750 ppm (29 mg/kg/day). No evidence of carcinogenicity was observed in long-term studies with mice.

Two-year feeding studies of ETU produced an increased incidence of thyroid and pituitary tumors in rats at 83 ppm (4 mg/kg/day) and higher levels, and an increased incidence of thyroid, pituitary and liver tumors in mice at dietary concentrations of 330 ppm (56 mg/kg/day) and higher levels.

Information on the mechanism of the observed thyroid and pituitary tumors establishes a threshold for the thyroid and pituitary tumors and indicates that none of these tumor types are relevant to humans at likely exposure levels.

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### 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 exposure levels high enough to produce non-reproductive toxic effects in two-generation reproduction studies of mancozeb or ETU in rats.

Exposure to levels of mancozeb high enough to cause maternal toxicity produced developmental effects in rats, including malformations. No developmental toxicity was observed in rats below adult toxic levels; the NOAEL for maternal toxicity was 32 mg/kg/day, and the NOAEL for developmental toxicity was 128 mg/kg/day. No developmental effects were observed in rabbits; the NOAEL for maternal toxicity was 30 mg/kg/day, and the NOAEL for developmental toxicity in rabbits was >80 mg/kg/day (highest dose tested).

Exposure to thyroid-inhibiting levels of ETU produced malformations in rats and hamsters, and embryofetotoxicity in mice and rabbits. There was no evidence of developmental toxicity in guinea pigs or cats. The overall NOAEL in developmental toxicity studies with ETU is 5 mg/kg/day.

### 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

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### 12. ECOLOGICAL INFORMATION

#### Environmental Toxicity

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

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 ..... NON-REGULATED

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.



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### 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 non-designated RCRA ICR substance(s). (Non-designated 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

**MSDS STATUS:** New

Document Code: D03-825-001

The Information Herein Is Given In Good Faith, But No Warranty, Express or Implied, Is Made. Consult Dow AgroSciences for Further Information