Product Safety Assessment

**Mancozeb**


Select a Topic:
- Names
- Product Overview
- Manufacture of Product
- Product Description
- Product Uses
- Exposure Potential
- Health Information
- Environmental Information
- Physical Hazard Information
- Regulatory Information
- Additional Information
- References

**Names**
- CAS No. 8018-01-7
- Mancozeb
- Manganese ethylenebis(dithiocarbamate) (polymeric) complex with zinc salt
- \([1,2\text{-ethanediylbis[carbamodithioato](2-)}]\text{-manganese mixture with}[1,2\text{-ethanediylbis[carbamodithioato](2-)}]\text{-zinc}\)
- Dithane® fungicide
- Dithane® 75DF Rainshield® fungicide

Much of the information in this document relates to the registration and sale of mancozeb in the United States of America. For details applicable to other geographies, consult the relevant Product Label, Safety Data Sheet or Contact Us.

**Product Overview**
- Mancozeb is a yellowish powder with a musty odor that is not soluble in water and decomposes upon exposure to heat, moisture, and air.\(^1\) It is the active ingredient in a series of fungicides formulated by Dow AgroSciences LLC, a subsidiary of The Dow Chemical Company. Formulated material is sold under the trade name Dithane® fungicide. See Product Description.
- Mancozeb is used in agriculture, professional turf management (golf courses, municipal, and industrial areas), and horticulture. Mancozeb is used on a wide variety of crops, depending on geographic region. Some of these include potatoes, grapes, apples, onions, pears, tomatoes, squash, and melons. Mancozeb is also registered for some home uses.\(^3\) See Product Label and Product Uses.
- Occupational exposure to mancozeb could occur in manufacturing or formulating operations during sampling, maintenance, testing, or other procedures. Agricultural workers and groundskeepers using mancozeb could be exposed during field application or by contact with treated foliage or crops. Wearing proper protective equipment as recommended in the Safety Data Sheet and carefully following label instructions will reduce exposure risk.\(^4\) See Exposure Potential.

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• Consumers could be exposed to mancozeb by consumption of trace residues in food and/or drinking water, use on home gardens, residues on transplanted turf from sod farms, or golfing on treated golf courses. The U.S. Environmental Protection Agency has determined that acute, short-term, and chronic (non-cancer) aggregate risk is negligible or not of risk concern and aggregate cancer-risk estimates are within a negligible range⁵ (aggregate risk refers to the combined risk from food, drinking water, and residential exposures). See Exposure Potential.

• Mancozeb has very low toxicity by ingestion, in contact with skin and by inhalation. Contact by these routes of exposure might cause transient local irritation, which may be significant in contact with eyes and include transient corneal injury. Repeated skin contact may also cause an allergic skin reaction.⁶ For further details, see Health Information or the Safety Data Sheet.

• Mancozeb is stable under normal storage and use conditions. Keep this material away from moisture, heat, or flame and avoid contact with oxidizing agents and acids.⁷ Consult the Product Label for specific use and storage information. For further details, see Physical Hazard Information.

Manufacture of Product

• Manufacture – Dow AgroSciences is one of several producers of mancozeb.
• Process – Mancozeb is manufactured and formulated at Dow AgroSciences facilities in Columbia, Brazil and China. The chemical structure of mancozeb is shown below.

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H
S
\[NH_{2}\]
S
Mn
\[Zn\]_y
\[Mn\]_x
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Product Description⁸,⁹

Mancozeb is an ethylene bisdithiocarbamate (EBDC) fungicide and the active ingredient in a series of fungicides formulated by Dow AgroSciences LLC, a subsidiary of The Dow Chemical Company. Mancozeb is a yellowish powder with a musty odor that is not soluble in water and decomposes upon exposure to heat, moisture, and air. As a broad-spectrum contact fungicide, mancozeb is registered around the world for use on vegetable, fruit, field, vine, and specialty crops. It is sold by Dow AgroSciences under the trade name Dithane® fungicide. Dithane fungicide is a high molecular weight polymer composed of repeating single units containing manganese and zinc ions. Dithane formulations include granules, powders, and liquids. These are typically dispersed in water and applied to foliage by spray. They generally remain effective for 7 to 10 days.

Product Uses¹⁰,¹¹,¹²,¹³

Mancozeb fungicide is widely used in agriculture, horticulture, and professional turf management. It is registered by the U.S. Environmental Protection Agency (EPA) for the following applications:

• Agricultural – potatoes, apples, grapes, onions, pears, tomatoes, squash, melons, seed treatment for rice, wheat, cotton, and numerous other fruit and vegetable crops
• Professional turf management – golf courses, sod farms, and industrial and municipal areas
• Horticulture – ornamental plants in nurseries and greenhouses
• Home garden use
Mancozeb products are also registered for use on a global basis. Countries in the European Union with registrations include Belgium, France, Germany, Italy, Poland, Spain, the United Kingdom and seventeen other Member States. Registrations also authorize sales in more than 70 other countries, including Argentina, Australia, Brazil, Canada, Columbia, Japan, Mexico, Russia and Ukraine.

**Exposure Potential**

Based on the uses for mancozeb, the public could potentially be exposed through:

- **Workplace exposure** – Exposure could occur in a mancozeb manufacturing or formulating facility. Workers could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing and formulating facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. Agricultural workers and groundskeepers could be exposed during field application, contact with treated foliage, or harvesting treated crops. Applicators are expected to follow label precautions, including wearing personal protective equipment appropriate for the application method. See Health Information and Product Label.

- **Consumer exposure to products containing mancozeb** – Consumers could possibly be exposed to mancozeb and its degradation product ethylenethiourea (ETU) through consumption of food and drinking water, home garden use, contact with transplanted turf pretreated with mancozeb, or playing golf on treated courses. Mancozeb was evaluated for reregistration (product use) eligibility by the U.S. Environmental Protection Agency (EPA) in 2005. The EPA conducted the following aggregate risk assessments: exposure from mancozeb alone, ETU exposure resulting from mancozeb use, and ETU exposure from all sources (including other fungicides). Aggregate risk refers to the combined risks from food, drinking water, residential, and recreational exposure (i.e., golfing). The EPA conducted acute, short-term, and chronic (cancer and non-cancer) assessments. The EPA determined that “the human health risks from these combined exposures to both mancozeb and ETU are within acceptable levels. In other words, the EPA has determined that the tolerances for mancozeb meet Food Quality Protection Act (FQPA) safety standards. In reaching this determination, [the] EPA has considered the available information on the special sensitivity of infants and children, as well as aggregate exposure from mancozeb and ETU.” See Health Information.

- **Environmental releases** – Sweep up small spills and place material in suitable containers for disposal. Thoroughly wash all exposed skin areas with soap and water immediately after handling. Consult the relevant Safety Data Sheet or Product Label for more information about protective equipment and procedures. See Environmental, Health and Physical Hazard Information.

- **Large release** – In the event of a large spill, the focus is on containing the spill to prevent material from reaching ditches, sewers, and open bodies of water. Appropriate protective equipment must be worn when handling a large spill. Contain mancozeb and place the material in suitable containers for disposal. If personnel are exposed to material during clean-up operations, remove contaminated clothing promptly and wash all exposed skin areas with soap and water immediately. Consult the relevant Safety Data Sheet or Product Label for more detailed information about protective equipment and procedures.

- **In case of fire** – Self-contained breathing apparatus and full protective clothing must be worn. Fight fire with carbon-dioxide, dry-chemical, or foam-based extinguisher or water spray. Remain upwind. Avoid breathing smoke. Consult the Product Label and Safety Data Sheet. See Environmental, Health and Physical Hazard Information.

- **Emergency Response Information** - In the case of an emergency such as poisoning, product spillage or fire associated with a Dow AgroSciences product in the United States contact us at 800-992-5994 (additional information is available at http://www.dowagro.com/rc/response/na.htm). For emergencies outside the United States, access http://www.dowagro.com/rc/response/index.htm for a list of country sites or contact pages for relevant information.
Health Information

None of the effects described in this section should occur in humans during the normal handling and use of Dithane® products.

Eye and Skin Contact – Mancozeb may cause moderate eye irritation with possible corneal injury. Prolonged skin contact may cause slight irritation with local redness, or an allergic reaction in some people.

Ingestion – Mancozeb has very low toxicity if swallowed.

Inhalation – Mancozeb has very low toxicity if inhaled but dust may cause irritation of the nose, throat, and lungs.

Systemic Effects – Animal studies have shown the primary effect to be altered thyroid gland function; effects in the nervous system and liver may occur at higher doses.

Cancer and Birth Defect Information – The EPA's cancer concern for mancozeb is limited to risk from the metabolite ethylenethiourea (ETU). The estimated lifetime dietary exposure to ETU from all sources correspond to a cancer risk estimate of $2 \times 10^{-6}$, which is within the negligible range of $10^{-6}$, and not to be considered of concern (EPA Reregistration Eligibility Decision for Mancozeb, page 21, September, 2005).

For more information, see the relevant Product Label or Safety Data Sheet.

Environmental Information

Mancozeb has high or very high acute toxicity to aquatic organisms. Mancozeb is practically nontoxic to birds on an acute or dietary basis. Mancozeb is expected to degrade in soil and the environment.

For more information, see the relevant Product Label or Safety Data Sheet.

Physical Hazard Information

Mancozeb is stable under normal storage and use conditions. Keep away from moisture, heat, or flame. Avoid contact with oxidizing agents and acids. Consult the Product Label for specific use and storage information.

For more information, see the relevant Product Label or Safety Data Sheet.

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of mancozeb. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Product Label, Safety Data Sheet, or Contact Us.
Additional Information

- Safety Data Sheet (http://www.dowagro.com/label/index.htm)

For more business information about mancozeb, visit the Dow AgroSciences website: www.dowagro.com

References


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Back to top

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