Product Safety Assessment

Fenbuconazole

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

Names
- CAS No. 114369-43-6
- Fenbuconazole
- ENABLE® fungicide
- INDAR® fungicide
- IMPALA® fungicide
- α-[2-(4-chlorophenyl)ethyl]-α-phenyl-1H-1,2,4-triazole-1-propanenitrile
- 4-(4-Chlorophenyl)-2-phenyl-2-(1H-1,2,4-triazol-1-ylmethyl)butanenitrile

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

Product Overview
- Fenbuconazole is the common name for the active ingredient in several fungicides marketed by Dow AgroSciences LLC, a wholly owned subsidiary of The Dow Chemical Company, and foreign affiliated companies. Fenbuconazole formulations are sold under the trade names ENABLE® fungicide, IMPALA® fungicide, and INDAR® fungicide. These products are formulated as liquids and powders. For further details, see Product Description.
- Fenbuconazole is a triazole fungicide that works systemically to prevent the growth of fungi by interrupting their normal growth cycle. Fenbuconazole is used to control powdery mildew, leaf spots and blights, rusts, smuts, root/stem rots, and fruit scab. It is primarily used as a preventative fungicide. For further details, see Product Description.
- Fenbuconazole is registered for use on a variety of crops, including cereals, bananas, vines, pome and stone fruits, pecans, and rice. Fenbuconazole is registered for commercial use only. For further details, see Product Label and Product Uses.
- Workers could be exposed to fenbuconazole during manufacture, formulation, or application in the field. Consumers could be exposed to fenbuconazole by consuming trace residues in food or drinking water. For further details, see Exposure Potential.
- Eye and skin contact with fenbuconazole is essentially nonirritating and non-sensitizing. Even prolonged skin contact is unlikely to result in absorption of harmful amounts. No adverse effects are anticipated by inhalation. This material has low toxicity if swallowed. For further details, see Health Information or the Safety Data Sheet.

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Fenbuconazole biodegrades slowly in soil over time. Its half-life in soil depends on the soil type and ranges from 32 to 260 days. Fenbuconazole binds tightly to soil and is practically insoluble in water, meaning it is unlikely to leach into ground water. It is considered toxic to fish and other aquatic organisms on an acute basis (exposure to a large amount). Fenbuconazole is practically nontoxic to wildlife, mammals, birds, and bees. For further details, see the relevant Product Label and Environmental Information.

Fenbuconazole is stable under recommended storage and use conditions, but can decompose at elevated temperatures. Avoid contact with ignition sources. Avoid contact with oxidizing agents and acids. Consult the Product Label for specific use and storage information. For further details, see Physical Hazard Information.

Manufacture of Product

- **Manufacture** – Fenbuconazole is manufactured by Dow AgroSciences LLC, a wholly owned subsidiary of The Dow Chemical Company, and foreign affiliated companies.
- **Process** – Fenbuconazole is produced using a complex and proprietary multistep process. The structure of fenbuconazole is shown below.

![Chemical Structure of Fenbuconazole](image)

Product Description

Fenbuconazole is the common name for α-[2-(4-chlorophenyl)ethyl]-α-phenyl-1H-1,2,4-triazole-1-propanenitrile, the active ingredient in several fungicides marketed by Dow AgroSciences LLC, a wholly owned subsidiary of The Dow Chemical Company, and foreign affiliated companies. Fenbuconazole is an off-white powdery material. Fenbuconazole is a systemic fungicide, meaning it is absorbed and translocated throughout the plant. It interferes with fungal sterol production, thereby slowing or stopping fungal growth. Fenbuconazole formulations are sold under the trade names ENABLE® fungicide and INDAR® fungicide in the United States along with other trade names outside the U.S. These products are usually formulated as white to off-white liquids and powders containing 23 to 75% active ingredient.

Product Uses & Regulatory Information

Fenbuconazole is a triazole fungicide used to control fruit scab, black and brown rot, powdery mildew, and blossom blight. It is registered by the U.S. Environmental Protection Agency (EPA) for the following crops:
- Stone fruits – apricot, cherry, nectarine, peach, plum, prune
- Pecans
- Citrus fruits – grapefruit, kumquat, lime, lemon, oranges (including sweet, sour, and mandarin), pomelo, tangerine, and citrus hybrids
- Sugar beets
- Apples
- Blueberries

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Fenbuconazole products are also registered for use on vines, fruits, and cereal crops in Europe; bananas and rice in Latin America; and stone fruit in Asia.

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of fenbuconazole. 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.

Back to top

Exposure Potential

Fenbuconazole is used in the production of commercial fungicides. Based on the uses for fenbuconazole, the public could be exposed through:

- **Workplace exposure** – Exposure could occur in facilities that manufacture or formulate fenbuconazole. Those working with fenbuconazole in manufacturing or formulating operations could be exposed during maintenance, sampling, testing, or other procedures. Each facility has a thorough training program for employees and appropriate work processes and safety equipment in place to limit exposure. Agricultural workers could be exposed while applying fungicide in the field. Applicators are expected to follow label precautions, including wearing personal protective equipment that is appropriate to the application method. See Health Information and Product Label.

- **Consumer exposure to products containing fenbuconazole** – In theory, consumers could be exposed to fenbuconazole residues by eating foods that have been treated with it. The maximum daily intakes possible in a human diet are well below the proposed acceptable daily intake (ADI) of 0.03 mg/kg body weight/day (U.S. Environmental Protection Agency). See Health Information.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil, ditches, sewers, waterways, or groundwater. This material is nonvolatile (does not evaporate), practically insoluble in water, and binds tightly to soil, meaning that a release is unlikely to leach into ground water. A release would tend to remain on the soil, where it would slowly biodegrade. It would not persist in the environment and would be removed by biological wastewater-treatment facilities. For small spills, sweep up spilled solid material or absorb spilled liquid with sand or earth. Collect in suitable and properly labeled containers. Avoid breathing product dust or vapor. This description provides a general overview; please consult the relevant Safety Data Sheet or Product Label for more information about protective equipment and procedures. See Environmental Information, Health Information, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, dike the area to keep the material contained and out of waterways. Personnel engaged in clean up of spills must wear appropriate protective equipment. Consult the relevant Safety Data Sheet or Product Label for more detailed information about protective equipment and procedures. See Environmental Information, Health Information, and Physical Hazard Information.

- **In case of fire** – Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA). Use carbon-dioxide or dry-chemical extinguishers or foam to fight the fire. Foam systems are preferred because uncontrolled water can spread possible contamination. Toxic and irritating gases and fumes can be formed in a fire. Consult the Product Label and Safety Data Sheet for specific firefighting measures. Follow emergency procedures carefully. See Environmental Information, Health Information, 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 please use the phone number listed on the Safety Data Sheet for the appropriate country. In some countries, the Emergency Response number is also provided on the artwork of the commercial package. In the United States call **800-992-5994**. In Europe, Middle East & Africa countries call **31-115-694-982** (Netherlands).
Health Information

Laboratory Testing – Fenbuconazole has been evaluated by comprehensive regulatory schemes used to register products in the U.S. and European Union (i.e. U.S. Federal Insecticides Fungicides Rodenticides Act and EU Directives for Plant Protection and Biocidal Products). These schemes require laboratory testing for potential short-term (acute) and long-term (chronic) health effects. Pesticide products used according to label directions are unlikely to cause toxic effects. None of the effects described in this section should occur in humans during the normal handling and use of fenbuconazole products.

Health information for products containing fenbuconazole is summarized on the relevant Safety Data Sheets. It is important to note that health risks associated with individual products may vary based on their formulation or intended use. These materials may contain solvents, minor components, or additives that have additional health risks. The Safety Data Sheet is the preferred source for specific health information. An overview of health information for technical fenbuconazole appears below.

Eye contact – Contact may cause slight, temporary eye irritation.

Skin contact – Contact is essentially nonirritating and non-sensitizing. Even prolonged contact is unlikely to result in absorption of harmful amounts.

Inhalation – No adverse effects are anticipated by inhalation, incidental to proper handling.

Ingestion – This material has low toxicity if swallowed.

Cancer and birth defect information – Fenbuconazole is not carcinogenic, not mutagenic, and not toxic for reproduction. Doubts may exist concerning carcinogenicity depending on assessment techniques. Fenbuconazole is classified by the U.S. EPA as a possible human carcinogen. This does not appear to apply to applicators using recommended application methods.

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

Environmental Information

Based on the product chemistry and environmental data, when used appropriately fenbuconazole formulations are expected to have minimal impact on the environment. This material is nonvolatile (does not evaporate), practically insoluble in water, and binds tightly to soil, meaning that a release is unlikely to leach into ground water. A release would tend to remain on the soil, where it would slowly biodegrade. Its half-life in soil depends on the soil type and ranges from 32 to 260 days. It would not persist in the environment and would be removed by biological wastewater-treatment facilities.

Fenbuconazole is practically nontoxic to wildlife, mammals, birds, honeybees, and earthworms on an acute basis. However, it is toxic to freshwater fish and aquatic invertebrates on an acute basis.

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

Physical Hazard Information

Fenbuconazole fungicide formulations are stable under normal use and storage conditions, but can decompose at temperatures above 300°C (573°F). Use good personal hygiene. Avoid dust build-up. Avoid contact with acids and oxidizers. Store this material away from ignition sources.
Under fire conditions, smoke may contain the original material in addition to combustion products that may be toxic or irritating. Consult the Product Label for specific use and storage information.

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

Additional Information

- Safety Data Sheets and product labels (www.dowagro.com/products/label/index.htm)
- Contact Us (www.dowagro.com/company/contact/index.htm)
- ENABLE® 2F Fungicide Specimen Label, Dow AgroSciences LLC, Label Code: D02-833-004 (www.dowagro.com/products/label/index.htm)
- INDAR® 75WSP Fungicide Specimen Label, Dow AgroSciences LLC, Label Code: D02-845-005 (www.dowagro.com/products/label/index.htm)
- INDAR 2F Fungicide Specimen Label, Dow AgroSciences LLC, Label Code: D02-349-003 (www.dowagro.com/products/label/index.htm)

For more business information about fenbuconazole, visit the Dow AgroSciences LLC website at www.dowagro.com/.

References


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Product Safety Assessment: Fenbuconazole

16 INDAR 75WSP Fungicide Specimen Label, Dow AgroSciences LLC, Label Code: D02-845-005, page 3.

Back to top
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