Product Safety Assessment

Quinoxyfen

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Names
- CAS No.124495-18-7
- Quinoxyfen
- phenoxyquinolines
- 5,7-Dichloro-4-(4-fluorophenoxy)quinoline
- Fortress™ Fungicide
- Legend™ Fungicide
- Orka™ Fungicide

Product Overview
- Quinoxyfen is a protectant fungicide from the chemical class, the phenoxyquinolines, with specific activity against powdery mildew. Technical grade quinoxyfen is a white to off-white odorless solid material containing more than 99% quinoxyfen. Products containing quinoxyfen are sold under trade names such as Fortress™, Orka™ and Legend™ fungicides. For further details, see Product Description.
- Quinoxyfen has primarily been developed for use against cereal and grape powdery mildews. For further details, see the country-specific Product Label, Product Uses, or Contact Us.
- Those working in manufacturing, packaging, or distribution operations could be exposed to quinoxyfen. Workers using quinoxyfen based products must wear proper protective equipment and follow label instructions carefully. For further details, see the country-specific Product Label, Product Uses or Contact Us.
- Contact with quinoxyfen may cause slight eye irritation. Corneal injury is unlikely. Brief contact with quinoxyfen is essentially nonirritating to the skin. Prolonged excessive exposure to quinoxyfen dust may cause adverse effects. For further details, see Health Information or the Safety Data Sheet.
- Quinoxyfen is toxic to aquatic organisms but practically non-toxic to birds, honeybees, or soil dwelling organisms. For further details, see Environmental Information or Product Label.
- Quinoxyfen is stable under recommended storage conditions. Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems. Consult the Product Label for specific use and storage information. For further details, see Physical Hazard Information.
Product Safety Assessment: Quinoxyfen

Manufacture of Product
Quinoxyfen is a protectant fungicide from the chemical class, the phenoxyquinolines, with specific activity against powdery mildew. It is currently marketed in liquid form either by itself or in combination with other fungicidal actives. Fortress™, Orka™ and Legend™ fungicides are registered to Dow AgroSciences LLC, a wholly owned subsidiary of The Dow Chemical Company.

- **Capacity** – Dow AgroSciences, manufactures and formulates quinoxyfen active at facilities in several countries including Australia, Japan and The United States of America.
- **Process** – Quinoxyfen is produced using proprietary processes and materials. The chemical structure is shown below:

![Chemical structure of Quinoxyfen](image)

Product Description
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Product Uses and Regulatory Information
*Note-This topic lists major registered uses, examples of pests and countries where registered.*

Quinoxyfen products are registered for use in several countries. Examples of countries where Quinoxyfen products are registered include: Australia, Austria, Belgium, Canada, Chile, Croatia, Czech Republic, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Malta, Mexico, Moldova, New Zealand, Poland, Portugal, Spain, Serbia, Slovakia, Slovenia, South Africa, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom, and the United States.

Quinoxyfen is a fungicide that has been primarily developed for use against cereal and grape powdery mildews.

Quinoxyfen has been comprehensively evaluated under several regulatory frameworks used for registration and approval of fungicide products, including the United States Environmental Protection Agency (EPA) and the European Union. These legal frameworks require both laboratory and field testing.

For further details, consult the country-specific Safety Data Sheet, Product Label, or Contact Us.
Regulations exist that govern the manufacture, sale, transportation, use, and/or disposal of Quinoxyfen. In addition to federal regulation, additional regulations may apply which vary by state or locality. Information may be found by consulting the relevant Product Label, Safety Data Sheet, or Contact Us.

Exposure Potential

Quinoxyfen is used in the formulation of fungicides. Based on the uses for these various products, potential exposures could occur through:

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

- **Consumer exposure** – Consumers could be exposed to trace amounts of quinoxyfen through residues in food products or drinking water. To ensure pesticides meet the standard for registration in the United States with regard to human health, the Environmental Protection Agency (EPA) performs comprehensive risk-assessment calculations using conservative estimates of pesticide concentrations in drinking water, food, and nonfood sources. Based on these assessments, the EPA concluded that “there is reasonable certainty that no harm will result to the general population, or to infants and children from aggregate exposure to quinoxyfen residues.” See Health Information.

- **Environmental releases** – In the event of a spill, the focus should be on containing the spill to prevent contamination of soil, surface water or groundwater. Keep unnecessary and unprotected personnel from entering the area. Please consult the country-specific Safety Data Sheet or Product Label for more information about personal protective equipment and procedures. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Keep people away. Isolate fire and deny unnecessary entry. Consult the country-specific Safety Data Sheet for specific firefighting measures. Follow emergency procedures carefully. 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, 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 label on the commercial package.

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

Health Information

**Eye contact** – Flush eyes thoroughly with water for several minutes. Remove any contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.
**Skin contact** – Remove material from skin immediately by washing with soap and plenty of water. Remove contaminated clothing and shoes while washing. Seek medical attention if irritation persists. Wash clothing before reuse. Discard items that cannot be decontaminated, including leather articles such as shoes, belts and watchbands.

**Inhalation** – Move person to fresh air; if effects occur, consult a physician.

**Ingestion** – Swallowing small amounts incidental to normal handling operations is not likely to cause injury. However, swallowing larger amounts may cause injury. Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center representative or doctor. Do not give anything by mouth to an unconscious person.

**Repeated exposure** – In animals, effects have been reported on the following: kidney, liver, and blood.

**Developmental and/or Reproductive Effects:** In animal studies, did not interfere with reproduction.

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

**Environmental Information**

**Soil**
The laboratory degradation of quinoxyfen shows it is slowly degraded in soil (DT50 up to around one year). This is due to its strong soil sorption which reduces the bioavailability of residues for degradation. The predominant mechanism for breakdown is microbial which produces the 2-oxo-quinoxyfen and DCHQ metabolites.

Under field conditions, dissipation of quinoxyfen is dependant on the soil type and environmental conditions, particularly temperature. Field dissipation studies for quinoxyfen have shown a DT50 range of 15-20 days in North American soils and from 11-454 days in European soils. The 2-oxo-quinoxyfen and DCHQ metabolites occur at low levels and are not considered to pose a risk to the environment.

Because quinoxyfen is strongly sorbed to soil particles (Koc >10,000), it remains in the upper soil layer and has no leaching potential to groundwater.

**Water**
Quinoxyfen has low water solubility (0.116 mg/L) and strong soil sorption. Therefore, only low concentrations would be expected in aqueous solution. In aquatic water/sediment systems quinoxyfen has been shown to either quickly adsorb to the sediment followed by slow degradation primarily to 2-oxo-quinoxyfen, or to be rapidly degraded to 2-chloro-10-fluoro-7a,11a-dihydrchromeno[2,3,4-de]quinoline (CFBPQ) through aqueous photolysis (DT50 <2 hours, based on the quantum yield). CFBPQ is a photoproduc that is itself very rapidly degraded.

**Air**
Quinoxyfen has a low vapor pressure, and therefore, environmental concentrations will be negligible. Any small amount of quinoxyfen in the air will be degraded by indirect phototransformation with a calculated DT50 of 1.88 days (Atkinson calculation).
Ecotoxicology
Quinoxyfen is highly toxic to aquatic organisms including fish, aquatic invertebrates, and algal species. Quinoxyfen is practically non-toxic to birds and soil dwelling organisms such as earthworms.

Quinoxyfen is practically non-toxic to honeybees.

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

Physical Hazard Information
Store in a dry place. Store in original container. Do not store near food, foodstuffs, drugs or potable water supplies.

Consult the Product Label for specific use and storage information. Some products may be combustible because of the solvents used.

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

Additional Information - includes links to the SDS, Contact Us, Labels, EPA Fact Sheet, etc.
- Safety Data Sheets and Product Labels (http://www.dowagro.com/products/label/index.htm)
- Contact Us (http://www.dowagro.com/company/contact/index.htm)
- Dow AgroSciences Product website (http://www.dowagro.com/products/)

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