Product Safety Assessment

Cyhalofop-butyl

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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. 122008-85-9
- Cyhalofop-butyl
- Butyl (R)-2-[4-(4-cyano-2-fluorophenoxy)phenoxy]propionate
- Propanoic acid, 2-[4-(4-cyano-2-fluorophenoxy)phenoxy]-, butyl ester, (R)-

Product Overview

- Cyhalofop-butyl is the common name for butyl (R)-2-[4-(4-cyano-2-fluorophenoxy)phenoxy]propionate, the active ingredient in several herbicides registered to Dow AgroSciences LLC, a wholly owned subsidiary of The Dow Chemical Company. Cyhalofop-butyl is an off-white solid with a sweet odor, normally formulated as a water-dispersible, emulsifiable concentrate or oil-based spray. The formulated herbicides are yellow liquids that contain 17 to 30% active ingredient, with the balance petroleum solvents and stabilizers. The herbicides are marketed primarily under the trade name CLINCHER® Herbicide.\(^1\) For further details, see the relevant Product Label and Product Description.
- The active ingredient Cyhalofop-butyl is used in foliar applied, post-emergence herbicides for the selective control of grass weeds in transplanted, dry drill-seeded, and water-seeded rice.\(^3\) For further details, see the relevant Product Label and Product Uses.
- Exposure could occur in facilities that manufacture or formulate cyhalofop-butyl. Agricultural workers and others using this product could be exposed while applying herbicide in the field. Consumers could be exposed to trace amounts of cyhalofop-butyl through ingestion of residues in food or drinking water. In the event of a spill, the focus is on containing the spill to prevent contamination of soil, surface water, or groundwater. Some herbicide formulations are combustible; dense smoke is produced when this product burns.\(^4\) For further details, see the relevant Product Label and Exposure Potential.
- Contact with cyhalofop-butyl may cause moderate, temporary eye irritation and slight skin irritation. It has low toxicity if swallowed. Some formulations of cyhalofop-butyl herbicides may contain naphthalene (CAS No. 91-20-3), which is classified as a carcinogen by some agencies.\(^6\) For further details, see Health Information or the Safety Data Sheet.
- Based on the chemistry and environmental data, when used appropriately cyhalofop-butyl herbicide formulations are expected to have minimal environmental impact. If released to soil,
cyhalofop-butyl will stay in place and biodegrade relatively quickly. If released to water, it will adhere to sediments and biodegrade. It will not persist in the environment and will be removed by wastewater-treatment facilities. Its bioconcentration potential is moderate. Cyhalofop-butyl is highly toxic to aquatic organisms. For further details, see the relevant Product Label and Environmental Information.

- Cyhalofop-butyl herbicide formulations are stable under recommended storage and use conditions. Avoid contact with oxidizers. For further details, see the relevant Product Label and Physical Hazard Information.

Back to top

Manufacture of Product

- Manufacture – Cyhalofop-butyl is manufactured in several countries, including China, Japan, and U.S.A. Product formulations containing cyhalofop-butyl are manufactured in many countries such as Argentina, Brazil, Colombia, France, Indonesia, Japan, New Zealand and U.S.A.
- Process – Cyhalofop-butyl is produced using a complex and proprietary process. The chemical structure of cyhalofop-butyl is shown below:

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\begin{align*}
\text{NC} & \quad \text{F} \\
\text{O} & \quad \text{O} \\
\text{O(CH}_2\text{)}_3\text{CH}_3 & \quad \text{H}
\end{align*}
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Product Description

Cyhalofop-butyl is the common name for butyl (R)-2-[4-(4-cyano-2-fluorophenoxy)phenoxy]propionate, belonging to the aryloxyphenoxy propionate class of chemicals. Cyhalofop-butyl works by inhibiting production of a key enzyme, acetyl-CoA carboxylase, to compromise cell division at the plant’s meristem.

Cyhalofop-butyl is the active ingredient in several herbicide formulations manufactured by Dow AgroSciences LLC, a wholly owned subsidiary of The Dow Chemical Company. Cyhalofop-butyl is an off-white solid with a sweet odor, normally formulated as a water-dispersible, emulsifiable concentrate. The formulated herbicides are yellow liquids that contain 17 to 30% active ingredient, with the balance petroleum solvents and stabilizers. Cyhalofop-butyl herbicide formulations are sold primarily under the trade name CLINCHER® Herbicide in the U.S.A. Other trade names are in use in other parts of the world.

Product Uses & Regulatory Information

Cyhalofop-butyl is the active ingredient in postemergence herbicides used for the selective control of grass weeds in transplanted, dry drill-seeded, and water-seeded rice. Cyhalofop-butyl formulations are used as a systemic herbicide; it is absorbed by the leaves of target weeds and disrupts the internal growth processes, resulting in plant death beginning approximately 1 week following application.

In dry-seeded, water-seeded, and transplanted rice, cyhalofop-butyl herbicide formulations are applied as a postemergence, foliar application to the leaves of grass weeds. The active ingredient is applied with up to two applications per growing season. Single application rates will vary by country, but use rates are from 50 to 300 grams active ingredient (AI) per hectare. In transplanted...
rice, cyhalofop-butyl may also be applied as a granular formulation into the paddy water to control grass weeds. The oil in the granular formulation disperses the active ingredient on the surface of the water to enable uptake via the foliage of susceptible grasses. Cyhalofop-butyl granule is applied at rates of between 180 and 300 grams active ingredient per hectare. Cyhalofop-butyl is low use rate technology for weed control in rice compared to many herbicides used in rice.

Products containing the active ingredient Cyhalofop-butyl are registered for control of grass weeds in rice including barnyardgrass, bearded sprangletop, broadleaf signalgrass, fall panicum, johnsongrass, junglerice, red spangletop, early and late watergrass, and large crabgrass.

Registrations have been approved in important rice-producing countries including Argentina, Australia, Brazil, China, India, Italy, Japan, South Korea, Spain, Thailand, U.S.A. and Vietnam.

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of products containing cyhalofop-butyl. 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.

**Exposure Potential**

Cyhalofop-butyl is used in the formulation of commercial herbicides. Based on the uses for this product, the public could be exposed through:

- **Workplace exposure** – Exposure could occur in facilities that manufacture or formulate cyhalofop-butyl. Those working with these products in such 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, ventilation, and safety equipment in place to limit exposure. Agricultural workers and others using this product could be exposed while applying herbicides 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 cyhalofop-butyl** – Consumers could be exposed to trace amounts of cyhalofop-butyl through ingestion of residues in food or drinking water. To ensure pesticide safety with regard to human health, regulatory agencies, including the United States Environmental Protection Agency (EPA), perform comprehensive risk-assessment calculations using conservative estimates of pesticide concentrations in drinking water, food, and nonfood sources. Risk-assessment calculations for cyhalofop-butyl were performed for long-term exposures from applications to rice crops. Based on these assessments, the EPA concluded “there are no risks of concern for the use of Cyhalofop-butyl.” See Health Information and Product Label.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil, surface water, or groundwater. Respiratory protection is necessary for cleaning up spills and leaks. For small spills, cyhalofop-butyl should be absorbed with nonreactive materials such as sand or Zorball. If released to soil or water, cyhalofop-butyl will bind to soil or sediment and degrade fairly rapidly. Cyhalofop-butyl is not expected to persist in the environment. Its bioconcentration potential is moderate, but it is considered highly toxic to some aquatic organisms on an acute basis. Consult the relevant Safety Data Sheet or Product Label for more detailed information about protective equipment and procedures. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Some cyhalofop-butyl herbicide formulations are combustible; do not use or store near heat or flame. Deny any unnecessary entry into the area and consider the use of unmanned hose holders. Dense smoke is produced when this product burns. Use water spray or fog, carbon-dioxide or dry-chemical extinguishers, or foam to fight the fire. Use of a direct water stream may spread the fire. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Keep fire water out of waterways and sewers to minimize the potential for environmental damage. Follow
emergency procedures carefully. Consult the Product Label and Safety Data Sheet for specific firefighting measures. 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, 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 commercial package.

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

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**Health Information**

*Laboratory testing* – Cyhalofop-butyl has been comprehensively evaluated under regulatory frameworks used for registration and approval of pesticide products in Australia, the European Union, Japan, the United States, and several other countries. These legal frameworks require laboratory testing for potential acute, short-term, and long-term health effects. These tests help scientists and regulators determine how chemicals might affect humans, domestic animals, or wildlife in cases of exposure. Herbicide products used according to label directions are unlikely to cause toxic effects. The amount of herbicide that people and pets may be exposed to is very low compared to that used in laboratory testing.

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

*Eye contact* – Cyhalofop-butyl herbicides may cause moderate, temporary irritation, which may be slow to heal. Contact may cause slight corneal injury.

*Skin contact* – Brief contact is essentially nonirritating. Prolonged contact may cause slight skin irritation with local redness, but is unlikely to result in absorption of harmful amounts.

*Inhalation* – Prolonged exposure is not expected to cause adverse effects.

*Ingestion* – Cyhalofop-butyl herbicides have low toxicity if swallowed. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury. Cyhalofop-butyl herbicides are not likely to be an aspiration hazard.

*Repeated exposure* – In animals, repeated exposure to cyhalofop-butyl has been shown to affect the kidney, liver, and gall bladder.

*Other* – In laboratory animals, cyhalofop-butyl has been found to be toxic to the fetus at doses toxic to the mother. Some cyhalofop-butyl formulated herbicides contain small amounts of naphthalene (CAS No. 91-20-3), which has been shown to cause cancer in laboratory animals. Most of in vitro genetic toxicity studies of naphthalene showed negative results.

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

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**Environmental Information**

Based on the product chemistry and environmental data, when used appropriately, cyhalofop-butyl herbicide formulations are expected to have minimal environmental impact and are not
expected to leach into groundwater. The bioconcentration potential (tendency to accumulate in the food chain) for cyhalofop-butyl herbicides is moderate.

Although not considered readily biodegradable (OECD 301B screening tests showed 40% of the material biodegrades over a 29-day period under normal environmental conditions) or photodegradable, it does degrade in soil and water under environmental conditions. If released to the environment, it will adhere to soil and sediment and degrade fairly rapidly. Cyhalofop-butyl would not be expected to persist and would be removed by normal wastewater-treatment processes.

Cyhalofop-butyl is highly toxic to aquatic organisms (LC$_{50}$/EC$_{50}$ between 0.1 and 1.0 mg/L in the most sensitive species).

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

Physical Hazard Information$^{32,33,34}$

Cyhalofop-butyl herbicide formulations are stable under recommended storage and use conditions. Avoid high temperatures, which could cause the products to decompose. Decomposition products may include carbon monoxide, carbon dioxide, and other toxic gases.

Some formulations are combustible; do not use or store near heat or open flame. Dense smoke is produced when products burn.

Avoid contact with oxidizing materials.

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

Additional Information

- Safety Data Sheet (www.dowagro.com/products/)
- Product labels (www.dowagro.com/Label/index.htm)
- Contact Us (www.dowagro.com/company/contact/)
- “Chemicals Known to the State to Cause Cancer or Reproductive Toxicity,” Environmental Protection Agency, State of California, March 16, 2012 (http://oehha.ca.gov/propp65/propp65_list/Newlist.html)

For more business information about cyhalofop-butyl herbicides, visit the Dow AgroSciences LLC website at www.dowagro.com/.

References


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Product Safety Assessment: Cyhalofop-butyl

8 “Chemicals Known to the State to Cause Cancer or Reproductive Toxicity,” Environmental Protection Agency, State of California, March 16, 2012.
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18 CLINCHER® CA Herbicide Specimen Label, Dow AgroSciences LLC, UN Number 1993, January 4, 2011, pages 1 and 4.
22 Technical Summary for Cyhalofop-butyl: Active Ingredient in Clincher Herbicide for Use in Rice, Dow AgroSciences LLC, (Confidential Information), pages 2–3.
33 CLINCHER® SF Herbicide Specimen Label, Dow AgroSciences LLC, UN Number 1993, June 2, 2009, page 2.

Back to top

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Created: December 21, 2012   The Dow Chemical Company   Page 6 of 7
NOTICES:

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its herbicides globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

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