

ENDOTHALL CHEMICAL FACT SHEET

Formulations

Endothall was registered with the U.S. EPA for aquatic use in 1960, reregistered in 2005, and is currently under registration review. An interim registration review decision was released in 2021. Endothall is the common name of the active ingredient endothall acid (7-oxabicyclo[2,2,1] heptane-2,3-dicarboxylic acid). Endothall products are labeled for control of submersed aquatic plants using surface or subsurface application. Granular and liquid formulations are currently registered by the U.S. EPA and DATCP. Two types of endothall are available: dipotassium salt and dimethylalkylamine salt (“mono-N,N-dimethylalkylamine salt” or “monoamine salt”). Commercial formulations approved for aquatic use in Wisconsin include Aquathol® K and Hydrothol® 191.*

Aquatic Use and Considerations

Endothall is a contact herbicide (i.e., it affects plant cells on contact and does not move throughout the plant tissue) that inhibits respiration, prevents the production of proteins and lipids, and disrupts the cellular membrane in plants. It is a WSSA Group 31 herbicide, meaning the mechanism of action is by inhibiting serine-threonine protein phosphatase 1 (PP1). Although typical endothall application rates inhibit plant respiration, higher concentrations have been shown to increase respiration. Factors such as density and size of the plants present, water movement, and water temperature determine how quickly endothall works. For effective control, endothall should be applied when plants are actively growing. Under favorable conditions, plants begin to decompose within a few days after application. Uptake of endothall

is increased at higher water temperatures and higher light levels.

If endothall is applied to a pond or enclosed bay with abundant vegetation, no more than one-third to one-half of the surface should be treated at one time because excessive decaying vegetation may deplete the oxygen content of the water and kill fish. Untreated areas should not be treated until the vegetation exposed to the initial application decomposes.

Endothall products vary somewhat in the target species they control, so it is important to always check the product label for the list of affected species. Endothall products are labeled to control the invasive species curly-leaf pondweed (*Potamogeton crispus*)[†] and Eurasian watermilfoil (*Myriophyllum spicatum*). Native species that are labeled as susceptible to endothall include coontail (*Ceratophyllum demersum*), naiads (*Najas* spp.), milfoils (*Myriophyllum* spp.), pondweeds (*Potamogeton* spp.), sago pondweed (*Stuckenia pectinata*), water stargrass (*Heteranthera dubia*) and horned pondweed (*Zannichellia palustris*).[‡]

Post-Treatment Water Use Restrictions

Due to the many formulations of this chemical the post-treatment water use restrictions vary. All endothall products have a drinking water standard of 0.1 parts per million (ppm) endothall acid and cannot be applied within 600 feet of a potable water intake. Use restrictions for dimethylalkylamine salt

[†] The chemical manufacturers of endothall recommend that targeted treatment areas be greater than 5 acres for effective curly-leaf pondweed control.

[‡] May vary by formulation, application rate, and/or product. Every product label must be carefully reviewed and followed by the user.

* Product names are provided solely for your reference and should not be considered exhaustive nor endorsements.

formulations have additional irrigation and aquatic life restrictions.†

Herbicide Degradation, Persistence and Trace Contaminants

Endothall disperses with water movement and is broken down by microorganisms into carbon, hydrogen and oxygen. Field studies show that low concentrations of endothall persist in water for several days to several weeks depending on environmental conditions. Degradation of endothall is primarily microbial and the half-life (the time it takes for half of the active ingredient to degrade) of the dipotassium salt formulations averages four to ten days, although dissipation due to water movement may significantly shorten the effective half-life in some treatment scenarios. Complete degradation by microbial action is 30 to 60 days. The initial breakdown product of endothall is an amino acid, glutamic acid, which is rapidly consumed by bacteria.

Endothall is highly water soluble and does not readily adsorb to sediments or lipids. The degradation rate of endothall increases with increasing water temperature and decreases under anaerobic conditions. Relative to other herbicides, endothall is unique in that it is comprised of carbon, hydrogen and oxygen with the addition of potassium and nitrogen in the dipotassium and dimethylalkylamine formulations, respectively. This allows for complete breakdown of the herbicide without additional intermediate breakdown products.

Impacts on Fish and Other Aquatic Organisms

The dipotassium salt formulations are considered slightly to moderately toxic to freshwater fish and slightly toxic to freshwater invertebrates. However, certain species may be more sensitive than others. At recommended rates, the dipotassium salt formulations appear to have few short-term behavioral or reproductive effects on bluegill (*Lepomis macrochirus*) or largemouth bass (*Micropterus salmoides*). Bioaccumulation (the process by which chemicals in the environment or in a food source are taken up by plants or animals)

of dipotassium salt formulations by fish from water treated with the herbicide is unlikely.

The dimethylalkylamine formulations are more active on aquatic plants than the dipotassium formulations but are also more toxic to non-target aquatic organisms. They are highly toxic to both freshwater fish and invertebrates at concentrations above 0.3 ppm. In recognition of the extreme toxicity of the dimethylalkylamine salt, product labels do not recommend treatment where fish are an important resource.

Tadpoles and freshwater scuds are sensitive to dimethylalkylamine salt at levels ranging from 0.5 to 1.8 ppm.

Human Health

Most concerns about adverse health effects revolve around applicator exposure. Endothall may be harmful or fatal if inhaled, swallowed, or absorbed through skin. It can also cause irreversible eye damage. Wear proper personal protective equipment and follow label instructions while handling.

Endothall poses no risk to water users if water use restrictions are followed. Endothall is not a neurotoxicant or mutagen, nor is it likely to be a human carcinogen.

For Additional Information

U.S. Environmental Protection Agency (EPA)
Office of Pesticide Programs
epa.gov/pesticides

Wisconsin Department of Agriculture, Trade,
and Consumer Protection
datcp.wi.gov/Pages/Programs_Services/ACMOVerview.aspx

Wisconsin Department of Natural Resources
608-266-2621
dnr.wi.gov/lakes/plants

Wisconsin Department of Health Services
dhs.wisconsin.gov

National Pesticide Information Center
1-800-858-7378
npic.orst.edu

