



# 2,4-D

## Pesticide Fact Sheet: Forestry Use

### Product Information

- 2,4-D is the common name for a phenoxy herbicide and is the active ingredient in numerous broadleaf herbicide products. It is one of the most widely used herbicides in the world with approximately 500 registered end-use products in the United States. Many commercial products are mixtures of 2,4-D and other herbicides.
- Commercial forms of 2,4-D are typically ester or salt (including amines) formulations. Salts of 2,4-D are highly water soluble and supplied as water-based formulations. The much less soluble esters commonly require solvent carriers and are supplied as water emulsifiable or oil-soluble formulations. Surfactants, which are like detergents, are often added to products so they work more efficiently.
- Users apply 2,4-D at a rate of 0.5 to 3.0 pounds of active ingredient per acre of Northwest forestlands. Applications are limited to one or two treatments in the life of a tree stand.
- For comparative purposes, the EPA (Environmental Protection Agency) categorizes pesticides by their short-term toxicity. On a scale of I (most toxic) to IV (least toxic), most undiluted 2,4-D formulations are Toxicity Category III.

### Public Health

#### *Dioxins*

- Dioxins are a family of chemicals that include the highly toxic TCDD. Current 2,4-D manufacturing practices have reduced dioxin contamination to trace amounts that are below levels of concern to EPA.

#### *Toxicity*

- Researchers use animal studies to define the potential for a pesticide to cause harmful effects to human health. It is important to know that these tests are carried out using doses high enough to cause toxicity (poisoning). Effects seen at toxic doses in animals are unlikely to occur after short-term, low-level exposure in humans. The level of exposure must be considered to estimate the risk of harmful effects.
- 2,4-D is classified as slightly toxic to mammals on a short-term (acute) basis and moderately toxic on a long-term (chronic) basis.
- 2,4-D is absorbed quickly from the lungs, stomach, and intestines. It is absorbed less quickly through the skin. 2,4-D is excreted rapidly from the body with a typical half-life of 13 hours. (Half-life is the time required for half of the compound to disappear.)
- Some laboratory studies on birth defects (teratogenicity) indicate that 2,4-D may be weakly teratogenic at high doses, which were also toxic to the mother. 2,4-D did not cause birth defects when studies were conducted under current EPA guidelines.

- Data from laboratory tests and attempted suicide cases indicate that high doses of 2,4-D can impair the nervous system.
- Some older studies show that 2,4-D may cause genetic damage (be mutagenic) at high doses, but newer studies have not confirmed this earlier observation.
- The carcinogenicity (ability of a substance to cause cancer) of 2,4-D has been the focus of numerous laboratory studies. Overall results do not provide evidence that 2,4-D causes cancer. Field surveys have been inconsistent in linking occupational herbicide exposure (including 2,4-D) and cancer.
- The EPA has classified 2,4-D as a Group D carcinogen (not classifiable as to human carcinogenicity). EPA is currently reviewing available data for the reregistration of the herbicide.

### Wildlife Effects

- Most 2,4-D formulations are slightly toxic to birds and practically non-toxic to bees on a short-term (acute) basis.
- 2,4-D toxicity to fish and aquatic invertebrates is highly variable and dependent on formulation type. Ester formulations are moderately to highly toxic; salt formulations are slightly toxic. 2,4-D is more toxic under conditions of lower (acidic) pH.
- 2,4-D does not bioaccumulate in wildlife.

## Environmental Fate

- It is difficult to summarize the environmental behavior of 2,4-D because of the variety of formulation types.
- The half-life of 2,4-D in water ranges from 10 to 50 days. 2,4-D esters degrade more rapidly under basic conditions and may persist longer in nutrient-poor water. One study detected significant residues of 2,4-D in ponds and reservoirs as long as 6 months after treatment.
- Factors that influence the breakdown of 2,4-D in water include pH, temperature, organic particulate material, microbial degradation, and oxygen content. 2,4-D is not expected to bind tightly to sediments.
- 2,4-D is of moderate to low persistence in soils. A typical half-life for the chemical ranges from 7 to 10 days, but it has a longer half-life in dry, sandy soils. Microbial breakdown of 2,4-D is the primary degradation pathway.
- 2,4-D is classified as moderately mobile in soils, depending on soil characteristics and the formulation of 2,4-D. It has been found in some groundwater samples, presumably due to spills. The risk of groundwater contamination from normal 2,4-D use is relatively low because the chemical does not last long in soil.

## Risk Assessment

- The EPA has evaluated use practices, environmental fate, potential exposure routes, and toxicity of 2,4-D and has set a Reference Dose (RfD) for 2,4-D of 0.01 mg/kg/day. A 70 kg (154 lb) person would have an RfD of 0.7 mg/day. The RfD is the amount of daily pesticide exposure judged to pose no appreciable risk over a 70-year lifetime. The RfD for 2,4-D is based on the results of the most sensitive animal studies (dog) and includes built-in safety measures.

- EPA has determined that the expected exposure associated with 2,4-D in forestry use will not result in adverse health effects. However, you should take reasonable precautions to avoid exposure. Do not walk through freshly sprayed vegetation. Do not eat berries, mushrooms, or other edibles, or drink the water from newly treated areas. If you are concerned about exposure, consult the resources listed in **Additional Information**.

## References

- 2,4-D Task Force II. 1996. Swansboro, NC.
- Meister, R.T., editor. 1996. Farm Chemicals Handbook '96. Meister Publishing Company. Willoughby, OH.
- National Library of Medicine. 1995. Hazardous Substances Data Bank (HSDB). MEDLARS Management Section. Bethesda, MD. CD ROM Version.
- U.S. Forest Service. 1984. Pesticide Background Statements. Vol. 1. Herbicides. Agriculture Handbook Number 633. U.S. Department of Agriculture. Washington, D.C.
- U.S. Environmental Protection Agency. 1995. Integrated Risk Information System (IRIS). Environmental Criteria and Assessment Office. Cincinnati, OH.
- U.S. Environmental Protection Agency. 1995. Pesticide Environmental Fate One-Line Summary: 2,4-D. Environmental Fate and Effects Division. Washington, D.C.
- U.S. Environmental Protection Agency. 1988. Pesticide Fact Sheet Number 94.2. 2,4-Dichlorophenoxyacetic Acid (2,4-D). Office of Pesticide Programs. Washington, D.C.
- Vogue, P.A., E.A. Kerle, and J.J. Jenkins. 1994. OSU Extension Pesticide Properties Database. Department of Agricultural Chemistry. Oregon State University. Corvallis, OR.
- World Health Organization. 1989. Environmental Health Criteria 84. 2,4-Dichloro-phenoxyacetic Acid (2,4-D) Environmental Aspects. International Programme on Chemical Safety. Geneva, Switzerland.

## Additional Information: Oregon

- Oregon State University Extension Environmental Chemistry and Toxicology Program  
**1-541-737-5993** Extension Specialist
- Oregon Poison Control  
**1-800-222-1222** (National)  
**1-503-494-8968** (Portland)  
**1-800-452-7165** (Outside Portland)
- Oregon Department of Agriculture  
**1-503-986-4550**  
**1-503-986-4635** (Pesticide Division)
- Oregon Health Division Pesticide Analytical Response Center  
**1-503-731-4025** (8 a.m.-5 p.m., M-F)  
**1-503-731-4030** (evenings, weekends)

## Washington

- Poison Control Center  
**1-800-222-1222** (National)  
**1-206-526-2121** (Seattle)  
**1-800-732-6985** (Outside Seattle)
- Washington Department of Agriculture, Pesticide Management Division  
**1-877-301-4555** (toll free)  
**1-360-902-2040** (Olympia)  
**1-509-576-3064** (Yakima)
- Washington State University Food and Environmental Quality Laboratory  
100 Sprout Road  
Richland, WA 99352-1643  
**1-509-372-7462** (phone)  
**1-509-372-7460** (fax)
- Washington Department of Health  
**1-800-525-0127**  
**1-360-236-3360** (Pesticide Program)  
**1-888-586-9427** (toll free)

## Nationwide

- National Pesticide Information Center  
**1-800-858-PEST (7378)**  
<http://npic.orst.edu/>
- Extension Toxicology Network (EXTOXNET)  
<http://ace.orst.edu/info/extoxnet/>
- DuPont Agricultural Products  
P.O. Box 80038 Wilmington, DE 19880-0038  
**1-800-441-7515**  
**1-800-441-3637** (emergency phone)  
**1-302-992-2276** (fax)