Forestry Herbicide Facts

► Weed-control chemicals are used in forestry for site preparation, herbaceous weed control, and release of established crop trees from competing woody vegetation. Easy-to-read charts will help you learn the most important characteristics of weed control chemicals used in forestry.

Weed-control chemicals are used in forestry for site preparation before planting, herbaceous weed control during the first 2 years after planting, and release of established crop trees from competing woody vegetation. The purpose of this publication is to provide one-page summaries of the most important characteristics of weed control chemicals used in forestry. These summaries should be used for general reference, not as prescriptions or application guides. Applicators must carefully read the product label before using any pesticide and must follow all directions, precautions, and restrictions.

The herbicides are listed in alphabetical order by their common names. For example, the formulation widely known as Roundup is listed under the common name of its principal active ingredient, glyphosate. While common names are sometimes not as well known as trade names, it is the active ingredient that has the greatest influence on the behavior and properties of the product. Organizing by common names eliminates repetition. To assist in finding information when only the trade name is known, Table 1 lists a trade name with the corresponding common name of the active ingredient.

Information Categories

The following information categories are presented for each chemical:

Activity. Herbicides are either foliar active, soil active, or both. This refers to the principal pathway the chemical enters the plant. Foliar-active chemicals must usually have adequate leaf surface area in order to be absorbed by the plant, although in some cases, such as when applied in an oil-based carrier, foliar-active chemicals can be applied directly to the stem. Soil-active chemicals are pulled into the plant through the roots as they take up water and transpire.

Movement in Plants. Chemicals are translocated in the food transport system of the plant (the phloem) or in the water transport system (the xylem) or in both. Chemicals transported in the xylem are characteristically soil-active and move with the transpiration flow—from the base of the tree toward the tips of branches and leaves. Chemicals transported in the phloem move both up and down the plant.

Mode of Action. A general statement is provided as to how the chemical affects plant biochemistry.

Selectivity. Types or classes of plants that are generally considered tolerant to the effects of the chemical are presented.

Environmental Considerations. Information is provided on four key characteristics related to the environment:

- **Volatility**—Refers to a chemical's tendency to go from a liquid to a gas after application.
- **Photodecomposition**—Indicates whether a chemical is broken down or decomposed by sunlight.
- **Mobility in Soil**—Provides the potential for off-site movement through leaching.
- **Half-life**—Indicates the expected time after application that one-half of the chemical would naturally decompose in the environment. For example, suppose that an application is made of 2 pounds of an active ingredient with a half-life of 30 days. One month after application, 1 pound of the chemical would have decomposed and 1 pound would still be present.

Toxicity. LD_{50} is the lethal dose of a chemical required to kill 50 percent of a test-animal (rat) population. It is expressed in milligrams of chemical for each kilogram of test-animal weight. For reasons of comparison, the following toxicities are provided:

Nicotine LD_{50} = 50 mg/kg (high toxicity)

Caffeine LD_{50} = 192 mg/kg (moderate toxicity)

Table salt LD_{50} = 3,000 mg/kg (low toxicity)

Note that for the LD_{50} measure of toxicity, the lower the number the more toxic the compound.

Product Formulation. Active ingredients are often sold under one or more formulations. This section provides the percentage of the active ingredient and indicates whether it is an amine (water soluble) or ester (oil soluble) liquid or a dry formulation. Trade names and manufacturers are also given.

This section provides only the more common formulations and in no way lists all the commercially available products for all active ingredients.

Additional Sources of Information

CDMS agro-chemical database: www.cdms.net

National Pesticide Information Center: www.npic.orst.edu/npicfact.htm

Crop Protection Handbook. Vol. 97. Willoughby, OH: Meister Media Worldwide, 2011.

Herbicide Handbook. 10th ed. Champaign, IL: Weed Science Society of America, 2014.

Table 1. Weed Control Products Used in Forestry

Product	Active Ingredient
Aatrex	atrazine
Accord	glyphosate
Arsenal	imazapyr
Banvel	dicamba
Chopper	imazapyr
2,4-D	2,4-D
Escort	metsulfuron
Garlon	triclopyr
Krenite	fosamine
Milestone	aminopyralid
Oust	sulfometuron
Roundup	glyphosate
Tordon	picloram
Transline	clopyralid
Vanquish	dicamba
Velpar	hexazinone
Weedone	2,4-D

aminopyralid	
Activity	Foliar and soil active
Movement in plants	Translocated in both the xylem and phloem
Mode of action	Growth regulator
Selectivity	Pasture grasses and small-grains tolerant
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Rapid in water, stable on soil
Mobility in soil	Low
Half-life	34 days
Toxicity	LD_{50} - >5,000 mg/kg (practically nontoxic)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 2.22 percent aminopyralid	Milestone VM Plus (Dow AgroSciences)

atrazine	
Activity	Primarily soil, some foliar activity
Movement in plants	Translocated in the xylem
Mode of action	Photosynthesis inhibitor
Selectivity	Broad-spectrum broadleaf and grass control; minimally effective on established weeds; used as a preemergent or early postemergent
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Negligible
Mobility in soil	Highly water-soluble but readily adsorbed by organic matter and clay; potential for leaching on sandy soils
Half-life	60 days
Toxicity	LD_{50} - 3,080 mg/kg (low toxicity)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 43 percent atrazine	Aatrex 4L (syngenta)
Water-dispersible granule 88 percent atrazine	Aatrex Nine-O (syngenta)

clopyralid	
Activity	Mostly foliar but is absorbed by roots
Movement in plants	Translocated in both the xylem and phloem
Mode of action	Growth regulator
Selectivity	Highly effective against many legumes Grasses generally tolerant
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Negligible
Mobility in soil	Moderate
Half-life	14–56 days, typically around 40 days
Toxicity	LD_{50} - >5,000 mg/kg (practically nontoxic)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 41 percent clopyralid	Transline (Dow AgroSciences)

2,4-D	
Activity	Foliar
Movement in plants	Translocated in both xylem and phloem
Mode of action	Growth regulator
Selectivity	Grasses generally tolerant
Environmental Considerations	
Volatility	Related to formulation; volatility can be a problem with ester formulations
Photodecomposition	Negligible
Mobility in soil	Rapid degradation and plant uptake minimizes mobility; leaching potential in sandy soils
Half-life	10 days
Toxicity	LD_{50} - 639 mg/kg – 1,646 mg/kg (low toxicity)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 40 percent 2,4-D	Hi-Dep Broadleaf Herbicide (Gordon's Agricultural Products)
Water-soluble liquid 21 percent 2,4-D amine plus 5 percent picloram	Pathway (Dow AgroSciences) Tordon RTU (Dow AgroSciences)
Water-soluble liquid 40 percent 2,4-D plus 10 percent picloram	Todon 101 Mixture (Dow AgroSciences)
Forms an emulsion when mixed with water 63 percent 2,4-D ester	Weedone LV4 (Nufarm)
Forms an emulsion when mixed with water; soluble in petroleum distilates; 87 percent 2,4-D ester	Weedone 650 (Nufarm)

dicamba	
Activity	Foliar and soil
Movement in plants	Translocated in both the xylem and phloem
Mode of action	Growth regulator
Selectivity	Grasses generally tolerant
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Negligible
Mobility in soil	Relatively mobile in soil, but degrades rapidly
Half-life	14 days
Toxicity	LD_{50} - 1,707 mg/kg (low toxicity)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 40 percent dicamba	Banvel (Arysta LifeScience)
Water-soluble liquid 13 percent dicamba plus 25 percent 2,4-D amine	Banvel 720 (Arysta LifeScience)
Ready-to-use water-based liquid 13 percent dicamba	Banvel CST (Arysta LifeScience)

fosamine	
Activity	Foliar
Movement in plants	Translocated in both the xylem and phloem
Mode of action	Growth regulator; stops bud development
Selectivity	Labeled for broad-spectrum woody plant control
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Negligible
Mobility in soil	Negligible
Half-life	8 days
Toxicity	LD_{50} - >5,000 mg/kg (practically nontoxic)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 42 percent fosamine	Krenite S (Albaugh Inc.)

glyphosate	
Activity	Foliar
Movement in plants	Translocated in both the xylem and phloem
Mode of action	Inhibits the synthesis of specific amino acids
Selectivity	Nonselective
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Negligible
Mobility in soil	Tightly bound to soil and organic matter
Half-life	47 days
Toxicity	LD_{50} - >5,000 mg/kg (practically nontoxic)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 41 percent glyphosate	Roundup Pro (Monsanto)
Water-soluble liquid 50 percent glyphosate	Roundup Pro Concentrate (Monsanto)
Water-soluble liquid 54 percent glyphosate plus surfactant	Accord XRT (Dow AgroSciences)
Water-soluble liquid 54 percent glyphosate, no surfactant	Accord Concentrate (Dow AgroSciences)
Water-soluble liquid 52 percent glyphosate	Refuge (Sygenta)

hexazinone	
Activity	Primarily soil-active; some foliar activity
Movement in plants	Translocated in the xylem
Mode of action	Inhibits photosynthesis
Selectivity	Broad-spectrum control with some conifer tolerance
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Slow; reported to be 10 percent per week
Mobility in soil	Adsorbed by organic matter and clay; highly water-soluble with potential for leaching on sandy soils
Half-life	90 days
Toxicity	LD_{50} - 1,690 mg/kg (low toxicity)
Product Formulations	**Trade Name and Manufacturer**
Water-dispersible liquid 25 percent hexazinone	Velpar L (Dupont)
Dispersible granules 63 percent hexazinone plus 12 percent sulfometuron	Oustar (Dupont)
Dry flowable 75 percent hexazinone	Velpar DF (Dupont)

imazapyr	
Activity	Foliar and soil
Movement in plants	Translocated in the xylem and phloem
Mode of action	Inhibits the synthesis of specific amino acids
Selectivity	Conifers generally tolerant
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Significant in water, slow on soils
Mobility in soil	Adsorbed by soil particles; leaching usually not a problem
Half-life	27 days
Toxicity	LD_{50} - >5,000 mg/kg (practically nontoxic)
Product Formulations	**Trade Name and Manufacturer**
Water-soluble liquid 53 percent imazapyr	Arsenal Applicators Concentrate (BASF)
Oil- or water-soluble liquid 28 percent imazapyr	Chopper (BASF)
Water-soluble liquid 27 percent imazapyr	Chopper Gen2 (BASF)
Dispersible granules 63 percent imazapyr plus 10 percent metsulfuron	Lineage Clearstand (Dupont)

metsulfuron	
Activity	Foliar and soil
Movement in plants	Translocates in both the xylem and phloem
Mode of action	Inhibits the synthesis of specific amino acids
Selectivity	Broad-spectrum herbicide with some conifer tolerance
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Negligible
Mobility in soil	Low adsorption to clay but some adsorption to organic matter; solubility increases with increasing pH; some leaching potential but use rates very low
Half-life	30 days
Toxicity	LD_{50} - >5,000 mg/kg (practically nontoxic)
Product Formulation	**Trade Name and Manufacturer**
Dry flowable 60 percent metsulfuron methyl	Escort XP (Dupont)
Dispersible granules 10 percent metsulfuron plus 63 percent imazapyr	Lineage Clearstand (Dupont)

picloram	
Activity	Soil and foliar
Movement in plants	Translocated in both the xylem and phloem
Mode of action	Growth regulator
Selectivity	Broad-spectrum herbicide although most grasses tolerant
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Reported to photodecompose but actual rates not conclusively measured
Mobility in soil	Very mobile in soil
Half-life	90 days
Toxicity	LD_{50} - >5,000 mg/kg (practically nontoxic)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 24 percent picloram	Tordon K (Dow AgroSciences)
Water-soluble liquid 10 percent picloram plus 40 percent 2,4-D	Tordon 101 Mixture (Dow AgroSciences)
Water-soluble liquid, ready to use 5 percent picloram plus 21 percent 2,4-D	Tordon RTU (Dow AgroSciences)
Ready-to-use liquid 5 percent picloram plus 21 percent 2,4-D	Pathway (Dow AgroSciences)
Water-soluble liquid 24 percent picloram	Tordon 22K (Dow AgroSciences)

sulfometuron	
Activity	Soil and foliar
Movement in plants	Translocates in both the xylem and phloem
Mode of action	Inhibits the synthesis of specific amino acids
Selectivity	Conifers and other woody perennials tolerant
Environmental Considerations	
Volatility	Negligible
Photodecomposition	Negligible
Mobility in soil	Mobility increases with higher pH; adsorbed by soil organic matter
Half-life	20–28 days
Toxicity	LD_{50} - >5,000 mg/kg (practically nontoxic)
Product Formulation	**Trade Name and Manufacturer**
Water-dispersible granule 75 percent sulfometuron	Oust (Dupont)
Water-dispersible granule 12 percent sulfometuron plus 63 percent hexazinone	Oustar (Dupont)

triclopyr	
Activity	Foliar
Movement in plants	Translocated in both the xylem and phloem
Mode of action	Not known exactly but similar to 2,4-D and picloram
Selectivity	Most grasses tolerant
Environmental Considerations	
Volatility	Can be a problem with ester formulations
Photodecomposition	Rapid
Mobility in soil	Not readily leached
Half-life	30 days
Toxicity	LD_{50} - 713 mg/kg (low toxicity)
Product Formulation	**Trade Name and Manufacturer**
Water-soluble liquid 44 percent triclopyr amine	Garlon 3A (Dow AgroSciences)
Water- and oil-soluble liquid 62 percent triclopyr ester	Garlon 4 (Dow AgroSciences)
Water- and oil-soluble liquid 84 percent triclopyr	Forestry Garlon XRT (Dow AgroSciences)
Ready-to-use liquid 14 percent triclopyr	Pathfinder II (Dow AgroSciences)

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Use pesticides only according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

The pesticide rates in this publication are recommended only if they are registered with the Environmental Protection Agency and the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply any pesticide, check with your county Extension agent for the latest information.

Trade names are used only to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.

For more information, contact your county Extension office. Visit www.aces.edu/directory.

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