



Chemical Weed Control in Tree Plantings

Selecting herbicides

This publication serves as a guide for selecting herbicides for use in tree and shrub planting. It does not present all the information needed to make a selection. Carefully read the labels of any herbicide before purchasing and applying.

Types of herbicides

Herbicides are either preemergent, applied before weed seeds germinate, or postemergent, applied after weed-seed germination. Preemergent herbicides are soil-applied and control weeds by inhibiting seed germination and seedling development. Postemergent herbicides are generally applied to the foliage of established weeds. Some herbicides persist in the soil and control all stages of plant growth. These chemicals may be nonselective and should not be used near trees or shrubs.

The choice of a herbicide depends on four major factors: 1) the kind of tree or shrub to be treated, 2) the kind of weeds to be controlled, 3) application methods, and 4) the site. Select a herbicide compatible with the kinds of trees or shrubs in the planting. A herbicide recommended for one kind of plant may not be safe for another. Also consider the age of the trees and shrubs and how long they have been planted.

The choice between preemergent and postemergent herbicides depends on the presence or absence of vegetation. Often preemergent and postemergent herbicide are mixed to control both existing vegetation and new germinating seeds. Most herbicides used in tree and shrub plantings are effective against a particular group of weed species. Select a herbicide that will control the primary kinds of weeds present. When selecting a herbicide, consider the various formulations available and your ability to make the application.

Several site factors must be considered when selecting a herbicide. Preemergent herbicides are usually more effective when applied to tilled, weed-free soil. Soil type

and humus content (organic matter) affect the application rate of preemergent herbicides. Generally, sandy or low humus soils require less chemical than heavier or high humus soils.

Application

Proper application begins with the selection of the proper herbicide and using the correct equipment.

Precautions

1. Follow instructions for precautions and application rates.
2. Do not spray the foliage of desirable trees with postemergence herbicides.
3. Herbicide drift is a serious problem. Spray herbicides with low pressure (25 to 30 pounds per square inch maximum) on calm days only. Use special care when applying 2,4-D or other phenoxy-type chemicals. Use the amine salt formulations when possible. If the ester formulation must be used, be sure it is the low-volatile form and that the air temperature will stay below 85 degrees Fahrenheit for several hours.
4. Application equipment should be in proper working condition, calibrated, and free of contamination. Clean equipment immediately after use.
5. Wettable powder formulations require constant agitation for uniform application.
6. When mixing two different chemicals, be sure to determine their compatibility by checking the labels or consulting your local K-State Research and Extension office.
7. Most preemergent herbicides require sufficient moisture for activation. Failure to water or incorporate according to label instructions will usually result in reduced weed control.
8. Use lower rates of herbicide on coarse, sandy soil.

Preplant weed control

Weed control efforts can begin before trees or shrubs are planted. This should be a standard practice when hard-to-control, perennial weeds, such as bindweed, are present. Preplant weed control practices may include growing a cover crop, repeated preplant cultivation, chemical fallow with certain nonselective herbicides, or combinations of these methods.

Often trees and shrubs are planted in areas with established vegetation that you may not want to destroy completely. In such a situation, a nonselective, nonresidual herbicide should be applied in 4-foot-wide strips or in 4-foot-diameter circles where the trees or shrubs are to be planted. One important advantage of preplant weed control is that certain effective herbicides that are harmful to trees and shrubs can be easily and safely applied.

Application procedure

Trees are usually planted on a wide spacing, making either band or spot herbicide treatment most practical. With young trees, a band treatment should be 2 to 4 feet wide (12 to 24 inches on each side of the trees). Band treatments are more efficiently applied with power spray equipment, and while they do require more spray material than spot spraying, they require less labor.

Spot treatments are ideally suited for small plantings with widely spaced trees or when hand sprayers or small power sprayers are used. With young trees, a spot treatment should consist of a 2- to 4-foot-diameter circle around each tree. Directed herbicide sprays can be most safely applied with handheld sprayers. A stovepipe or other protective shield may be placed around the tree while spraying to protect it from herbicide damage. One suggestion is to create a slit along the entire length of the shield (up one side) so the pipe can be widened and placed around the seedling rather than having to slide the shield over the seedling. By doing so, the likelihood of the seedling coming in contact with any residual herbicide on the shield is reduced.

Calibration

Accurate calibration is the only way to know your actual application rate. If too much herbicide is applied, injury to desirable plants will occur. However, if too little herbicide is applied, the result will be ineffective weed control. Some herbicides have a narrow window of tolerance between the two consequences; therefore calibration should be checked every time chemicals or application rates change. Nozzle tips should be clean, checked for wear or changes in discharge patterns, and appropriate for the sprayer being used.

Handheld sprayers

Uniform application and distribution is difficult with garden-type sprayers or small power sprayers. Both application rate and spray distribution will vary with changes in spray tank pressure, and nozzle height and speed over the area being treated.

Special care is needed when applying selective, soil-active chemicals, such as preemergence herbicides, because overlapping of spray swaths or concentration of spray material near the trees can cause injury. Uniform application is particularly difficult with spot treatments. To increase application uniformity, the applicator should first practice making spot treatments by spraying water on a warm, bare surface such as a concrete slab and observing the spray pattern. The areas that dry last received the most spray.

To calibrate, determine the total amount of spray solution needed to treat the area and the amount of herbicide product to be used in the spray. Start with a full tank of water and spray a measured area of $\frac{1}{100}$ acre (436 square feet). Establish a constant spraying pattern and pressure, and proceed as if you were actually spraying trees.

When planning to make spot treatments, spray 35, 4-foot-diameter circles (total area about 436 square feet). After spraying the measured area, refill the spray tank to determine water used. The number of gallons used times 100 is the number of gallons per acre the sprayer is applying at the speed you walked and the pressure you used. If, for example, you used $\frac{1}{2}$ gallon of water to spray 436 square feet, the sprayer delivery rate is 50 gallons per acre.

To calculate the amount of spray needed: determine the size of the area to be treated (5,000 square feet) and multiply by the amount of water used in calibration plot ($\frac{1}{2}$ gallon) and divide by the size of calibration plot in square feet (436 square feet) as follows:

$$\frac{5,000 \text{ ft}^2 \times 0.5 \text{ gal}}{436 \text{ ft}^2} = 5.73 \text{ gallons} = 5 \text{ gal } 3 \text{ quarts}$$

Herbicide calculations

Assume the sprayer applied 50 gallons per acre, and you want to mix only 1 gallon of spray.

Example 1. You want to apply $\frac{1}{2}$ pound active ingredient per acre of a material with 4 pounds active ingredient per gallon.

$\frac{1}{2}$ pound per acre $\div$ 4 pounds per gallon = $\frac{1}{8}$ gallon per acre = 1 pint per acre = 16 fluid ounces per acre.

$16 \text{ fluid ounces per acre} \div 50 \text{ gallons per acre} = 0.32 \text{ ounces per gallon.}$

Put some water in the sprayer, add the chemical, and fill to 1 gallon.

Example 2. You want to apply 8 pounds of active ingredient per acre of a 75 percent wettable powder.

$8 \text{ pounds per acre} \div 0.75 = 10.7 \text{ pounds of product to be applied per acre.}$

$10.7 \text{ pounds per acre} \times 16 \text{ ounces per pound} = 170.7 \text{ ounces per acre.}$

$170.7 \text{ ounces per acre} \div 50 \text{ gallons per acre} = 3.4 \text{ ounces per gallon.}$

Example 3. You want to apply 2 pounds active ingredient per acre of a 3-pound-per-gallon herbicide.

$2 \text{ pounds active ingredient} \div 3 \text{ pounds per gallon} = 0.666 \text{ gallons per acre.}$

$0.666 \text{ gallons per acre} \times 128 \text{ fluid ounces per gal} = 85.3 \text{ fluid ounces per gallon}$

$85.3 \text{ fluid ounces per gallon} \div 50 \text{ gallons per acre} = 1.7 \text{ fluid ounces per gallon}$

Large power sprayers

Large, agricultural-type sprayers can be used in young plantings when trees are small enough to clear the equipment.

To calibrate a sprayer, follow these steps:

(A worksheet is provided on the back page)

1. Determine the volume of output per minute by sprayer
 Example: At 30 pounds per square inch, one nozzle delivers 44 ounces per minute. So if the boom has two nozzles, it delivers 88 ounces per minute. Therefore 88 ounces per minute divided by 128 ounces (the number of ounces in 1 gallon) = 0.6875 gallons per minute.

2. Determine the width of coverage the boom produces.

Example: Each nozzle produces 18-inch-wide bands. If there are two nozzles, the coverage = 36 inches

3. Determine the total amount of water to be applied by acre. This is found on the label of the product being used.

Example: A herbicide label may recommend 5 to 20 gallons per acre be applied

4. Determine the equipment (tractor) travel speed so the correct amount of water per acre to be applied (#3 above) is delivered.

Example: The boom delivers 0.6875 gallons per minute at 30 pounds per square inch. You decide to deliver 20 gallons of water per acre in accordance with the recommendations from the label. You now need to determine the total gallons per acre per minute that the boom delivers. Therefore divide 0.6875 gallons per minute by 20 gallons = 0.03438 gallons per acre per minute. Next multiply the total square feet found in 1 acre (43,560 square feet per acre) by the total gallons per acre per minute delivered by the sprayer. (0.03438 gallons per acre per minute $\times$ 43,560 square feet per acre = 1497.59 square feet per minute). You know that it takes 1497.59 square feet to deliver 20 gallons of water per acre using your nozzles.

5. However, you do not need to know how many square feet it takes for the tractor to apply 20 gallons of water in 1 minute. Rather, you need to know how many linear feet the tractor must travel in 1 minute to apply 20 gallons. So:

Example: The tractor must cover 1497.59 square feet in 1 minute to apply 20 gallons of water per acre. So divide 1497.59 square feet by the width of the spray boom pattern (#2 above which is 36 inches or 3 feet). Therefore, 1497.59 divided by 3 = 499.19 feet in 1 minute.

6. Lastly, measure out 499 feet and travel that distance using different speeds until you travel 499 feet in 1 minute.

Herbicide Recommendations

Chemical Product Name	Common Name	Amount to Apply per Acre	Comments
Preplant Treatments			
Oust	Sulfometuron	0.5 – 1.0 ounce	Preemergent control of many grass and broadleaf weeds. Apply in fall prior to planting in spring. May be ineffective on soils with pH above 6.9.
Roundup	Glyphosate		Postemergent, nonselective control for grass or broadleaf weeds. Spray to wet with a 1 to 2 percent solution for herbaceous weeds and 2 percent for undesirable woody plants.
Treflan	Trifluralin	1 – 2 pints	Excellent preemergent control for grass and weak for broadleaf weeds. Requires incorporation within 24 hours. May need to reapply for season-long control.
Preemergent Treatments in New Plantings			
Casoron 4G	Dichlobenil	100 – 150 pounds	Controls annual grass and broadleaf and certain biennial weeds. Don't apply until 4 weeks after planting. Apply on weed-free soil.
Dacthal Flowable	DCPA	7 – 8 quarts	Controls annual grass and certain broadleaf weeds. Apply immediately after planting before weeds emerge. May need to reapply for season-long control.
Gallery	Isoxaben	0.66 – 1.33 pounds	Controls certain broadleaf weeds. Apply before weed emergence. Soil must settle around the tree roots prior to applying.
Goal T/O	Oxyfluorfen	2 – 8 pints	Controls certain annual grass and broadleaf weeds. Apply prior to bud break or after new growth has hardened off in conifer plantings. Care must be taken to avoid contact of spray drift or mist with foliage or green bark of deciduous trees; or apply before bud swell, or after dormancy in fall. Two or three applications may be needed for season-long control.
Pendulum WDG	Pendimethalin	3.3 – 6.6 pounds	Controls most annual grass and certain broadleaf weeds. Apply before weeds emerge and after the soil settles around the roots. Use the lower application rate for short term control and the higher rate for season-long control.
Surflan A.S.	Oryzalin	2 – 4 quarts	Controls many grass and broadleaf weeds. Apply after the soil has settled around the roots but before weeds emerge.
Velpar L	Hexazinone	4 pints	Controls many annual, biennial, and perennial herbaceous and woody weeds. Use only with the tree species approved on the label; it kills almost all other plants. Apply only after soil settles around the roots. Apply before bud break or direct spray to avoid foliage. Kills almost all weeds up to 4 inches in height.

Chemical Product Name	Common Name	Amount to Apply per Acre	Comments
Preemergent Treatments in Established Plants			
Casoron 4G	Dichlobenil	100 – 150 pounds	Controls annual grass and broadleaf and certain biennial weeds. Apply late fall or early spring prior to weeds emerging.
Dacthal Flowable	DCPA	7 – 8 quarts	Controls annual grass and broadleaf and certain biennial weeds. Apply late fall or early spring prior to weeds emerging.
Gallery	Isoxaben	0.66 – 1.33 pounds	Controls certain broadleaf weeds. Apply before weeds emerge.
Goal T/O	Oxyfluorfen	5 – 10 pints	Controls certain annual grass and broadleaf weeds. Apply prior to bud break or after new growth has hardened off in conifer plantings. Care must be taken to avoid contact of spray drift or mist with foliage or green bark of deciduous trees, or apply before bud swell. Or after dormancy in fall. Two or three applications may be needed for season-long control. Kills many weeds up to 4 inches in height.
Kerb WSP	Pronamide	2 – 4 pounds	Restricted Use Pesticide. For fall applications to established woody plants for both preemergence and early postemergence control of winter annual and perennial grasses and chickweed, and for preemergence control only of certain other broadleaf weeds and certain other grasses. Do NOT soil incorporate.
Oust	Sulfometuron	0.5 – 1.0 ounces	Controls many grass and broadleaf weeds. Apply in fall or spring before weeds emerge or shortly thereafter. May be ineffective on soils with pH above 6.9.
Pendulum WDG	Pendimethlin	3.3 – 6.6 pounds	Controls most annual grass and certain broadleaf weeds. Apply before weeds emerge. Use the lower application rate for short-term control and the higher rate for season-long control.
Princep Liquid	Simazine	2 – 4 quarts	Controls wide variety of annual grass and broadleaf weeds. Apply in late fall or early spring before weeds emerge. Don't use until 1 year after planting. Use lower rate on sandy soils.
Velpar L	Hexazinone	4 pints	Controls many annual, biennial and perennial herbaceous and woody weeds. Use only with the tree species approved on the label; it kills most other plants. Apply before bud break or direct spray to avoid foliage. Kills almost all weeds up to 4 inches in height.

Chemical Product Name	Common Name	Amount to Apply per Acre	Comments
Postemergent Treatments in Established Plants			
Fusilade II	Fluazifop-P-butyl	16 – 24 ounces	Controls annual and perennial grass weeds. Apply while weeds are actively growing. Add nonionic surfactant.
Goal T/O	Oxyfluorfen	5 – 10 pints	Controls certain annual grass and broadleaf weeds. Apply prior to bud break or after new growth has hardened off in conifer plantings. Care must be taken to avoid contact of spray drift or mist with foliage or green bark of deciduous trees, or apply before bud swell, or after dormancy in fall. Two or three applications may be needed for season-long control. Kills many weeds up to 4 inches in height.
Kerb WSP	Pronamide	2 – 4 pounds	Restricted Use Pesticide. For fall applications to established woody plants for both preemergence and early postemergence control of winter annual and perennial grasses and chickweed, and for preemergence control only of certain other broadleaf weeds and certain other grasses. Do not soil incorporate.
Poast	Sethoxydim	1.5 – 2.5 pints	Controls many annual and perennial grass weeds. Apply while weeds are actively growing. Add an oil concentrate at 2 pints per acre. Its safe use has not been determined on all trees and shrubs. Test on a small area. Any adverse conditions should be visible within 7 days. Use only on broadleaf trees and shrubs.
Roundup	Glyphosate		Postemergence, nonselective control for grass or broadleaf weeds. Spray to wet with a 1 to 2 percent solution for herbaceous weeds and 2 percent for undesirable woody plants. Kills all green plant material — keep off foliage of desirable plants.
Stinger	Clopyralid	0.25 – 0.33 pints	This is a selective, postemergence control of broadleaf weeds. Can be applied over the top of actively growing trees. Apply to actively growing weeds.
Vantage	Sethoxydim	2.2 – 3.75 pints	Controls many annual and perennial grass weeds. Apply while weeds are actively growing. It will slow or stop grass growth within 2 days. Burnback may take 3 weeks.
Velpar L	Hexazinone	4 pints	Controls many annual, biennial and perennial herbaceous and woody weeds. Use only with the tree species approved on the label; it kills most other plants. Apply only after soil settles around the roots. Apply before bud break or direct spray to avoid foliage. Kills most weeds up to 4 inches in height.

Summary of Tree-Herbicide Compatibility per 2006 Labels

	Dacthal W75 (AG, AB)	Casoron 4G (AG, AB, BW)	Fusilade II (AG, PG)	Gallery (AB, BW, PB)	Goal T/O (AG, AB)	Kerb WSP (AG, PG, AB)	Oust (AG, AB)	Pendulum WDG (AG, AB)	Princep Liquid** (AG, AB)	Stinger (AB, BW)	Surflan A.S. (AG, AB)	Treflan (AG, AB)	Vantage (AG, PG)	Velpar L (ALL)
Arborvitae	×	×	×	×	×	×			×		×		×	
Austrian pine	×		×	×	×	×		×	×		×	×	×	×
Bald cypress								×				×		
Bur Oak	×	×				×	×				×			
Chinkapin oak	×	×				×	×	×			×			
Cotoneaster	×	×	×			×			×				×	
Cottonwood	×	×		×	×			×		×	×	×		
Dogwood	×	×				×		×	×					
Fragrant sumac			×											
Golden currant				×										
Green ash	×	×	×		×	×	×		×		×			
Hackberry		×	×										×	
Honeylocust	×	×	×	×		×		×	×		×	×	×	
Lacebark elm	×	×		×		×					×		×	
Lilac	×	×		×	×			×				×	×	
Pecan		×		×	×			×	×		×			
Plum				×	×			×				×	×	
Ponderosa pine	×		×		×	×	×			×	×		×	×
Red oak	×	×		×	×	×	×	×	×		×	×		
Redbud	×		×	×	×	×					×	×		
Redcedar	×	×	×	×	×	×		×	×		×		×	
Rocky Mt. juniper	×	×	×	×	×	×		×	×		×			
Russian mulberry				×							×			
Sawtooth Oak	×			×			×							
Siberian elm	×	×				×			×					
Silver maple	×	×	×	×							×	×	×	
Sycamore	×		×	×	×		×	×						
Walnut	×			×	×	×		×	×		×	×	×	
White pine	×		×	×	×	×	×	×	×	×	×	×	×	

× indicates label-approved species compatibility per 2006 product label

* AG = certain annual grass plants

AB = certain annual broadleaf weeds

BW = certain biennial weeds

PG = certain perennial grass weeds

PB = certain perennial broadleaf weeds

ALL = all types with certain restrictions

** Use Princip 4L for plum, pecan, and walnut.

Calibrating Sprayer Worksheet

1. Each nozzle delivers _____ ounces per minute.
2. _____ ounces per minute (Line 1) $\times$ nozzles = ounces per minute delivered by boom.
3. _____ ounces per minute (Line 2) divided by 128 ounces per gallon = gallons per minute delivered by boom.
4. Each nozzle sprays a width of _____ inches.
5. There are _____ nozzles on the boom.
6. The total width of spray pattern is _____ feet. $((\text{Line 4} \times \text{Line 5}) \div 12)$
7. Total amount of water to be applied to 1 acre is _____ gallons (Found on label of product).
8. gallons per minute (Line 3) divided by _____ gallons per acre (Line 7) = _____ acres per minute.
9. _____ acres per minute (Line 8) $\times$ 43,560 square feet per acre = square feet per minute being applied.
10. _____ square feet per minute (Line 9) divided by _____ (Line 6) = linear feet per minute needed to be traveled by the tractor to apply the product as desired.

Joshua Pease
Kansas Forest Service
785-532-3300
www.kansasforests.org

Wayne A. Geyer
Professor, Forestry



This publication is made
available in cooperation with
the USDA Forest Service.

Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. Persons using such products assume responsibility for their use in accordance with current label directions of the manufacturer.

Publications from Kansas State University are available on the World Wide Web at: www.oznet.ksu.edu

Contents of this publication may be freely reproduced for educational purposes. All other rights reserved. In each case, credit Joshua Pease and Wayne A. Geyer, *Chemical Weed Control in Tree and Shrub Plantings*, Kansas State University, April 2007

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF-656

April 2007

K-State Research and Extension is an equal opportunity provider and employer. Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, as amended. Kansas State University, County Extension Councils, Extension Districts, and United States Department of Agriculture Cooperating, Fred A. Cholick, Director.