



Weed Control in Christmas Tree Plantations

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Weed Control in Christmas tree plantations is one of the most important cultural practices during the early life of a plantation. Weeds compete for water, nutrients, and light and extend the time required to produce a marketable tree. Successful weed control helps the grower produce high quality trees and can result in a more rapid return on initial investments.

In addition, weed control can prevent trees from forming deformed bases since shading inhibits proper formation of lateral branches. Weed control can reduce the potential of insect and disease damage and damage by animals, such as mice or rabbits, since their habitat is removed. Weed control reduces the hazard of fires by removing unwanted fuel. Finally, reduction of weeds reduces interference with labor and equipment movement and improves the plantation's appearance for consumers.

Methods of Weed Control

Site Preparation

Weed control efforts in a Christmas tree plantation begin with site preparation activities. Repeated disking or tillage of the site destroys many weed species. Some chemicals, such as Roundup or Velpar, may also be used in site preparation activities. Many growers use a combination of mechanical and chemical control because once the weeds are controlled by mechanical methods, herbicides work well to keep the vegetation from becoming a problem during the remainder of the rotation. Some preplant herbicides can also be effective following site preparation, especially if the vegetation to be controlled is primarily annual weeds (since they kill germinating seeds and not roots capable of reproduction). Surflan is an example of a herbicide which can be applied to clean tilled soil for preplant weed control.

In Oklahoma, Christmas trees are often planted in abandoned fields. Trees have little chance of doing well if they are planted in established vegetation on a site which has not been properly prepared. Alternatives to completely tilling a site may be to strip disk the area where the trees are to be planted. A nonselective, nonresidual herbicide applied in bands 4 feet wide or in circles 4 feet in diameter where the trees are to be planted is another alternative. Complete eradication of all weeds is generally unnecessary as light vegetative cover



Weed control is an important factor in producing quality Christmas trees.

between rows, if kept under control, prevents erosion and does minimum damage to trees.

It is important to remember that vegetation control is more important around newly planted young trees than around older trees. It is also important to control weed competition while the trees are actively growing, during the time competition for water and nutrients is most critical.

Weed Control After Planting

Mechanical

Mechanical methods to control weeds include cultivation and mowing. After planting, cultivation is sometimes used to control weeds; however, there are several problems associated with continued cultivation. These include increased erosion, trees blown over due to loose soil, and the possibility of damaging root systems on larger trees. Cultivating close enough to trees in order to control weeds also poses logistical problems.

Mowing is the more common practice to mechanically control weeds between rows. Some of the limitations of mow-

ing include difficulty in getting close enough to the tree and the potential to damage branches of larger trees. As trees grow, the area to be mowed decreases and the possibility of damaging branches with large equipment increases. Many growers use deflection shields on the tractor wheels to prevent branches from being caught by the mower tires. Damage to the trunk of trees should be avoided in all cases as it opens avenues for the entry of insects and disease.

A new grower should plan the plantation around the size and maneuverability of the equipment the grower already owns or plans to use. If trees are planted on equal spacings, then the mowing can be done in two directions.

Although mowing is considered an effective treatment for weeds between rows, it is difficult to obtain adequate control immediately around the seedling or tree. It has generally been found that mowing between rows and limiting chemicals to the planting strip and tree row does the best all-around job.



Mowing between rows and using herbicides within the tree row can be an effective treatment.

Chemical

Use of herbicides to control weeds in Christmas tree plantations has become an accepted and imperative practice. Although herbicides are expensive and much care must be taken during application to avoid tree injury, they are extremely effective, especially in controlling weeds around the base of small trees.

Herbicides, to be effective, must be applied at the proper rate and time. Before applying any herbicide, a grower should follow label recommendations and make sure that the herbicide may be used for the Christmas tree species being grown and the weed species to be controlled. The grower should also learn whether weeds to be controlled are annual or perennial, grasses or broadleaves and the stages of growth in which they are most easily controlled.

The type of soil is also an important consideration when choosing the type and rate of a herbicide. High organic matter and clay content in a soil can "tie-up" certain herbicides and reduce their effectiveness. Coarse textured soils high in sand content ties up less herbicide, and so less herbicide is usually needed for effective control. Trees planted in coarse textured soils may be more susceptible to injury from soil applied herbicides.



Weed control is especially important around young trees.

How Herbicides Work

Herbicides can be grouped into preemergence and postemergence herbicides. Preemergence means that they are applied before weeds emerge while postemergence means they are applied after the weeds start growing.

Some preemergence herbicides are systemic herbicides, that is they are absorbed primarily by the root system, while others are absorbed directly into the plant surface as they emerge. Preemergence herbicides generally need rainfall or irrigation within several days after application to be activated and effective. Certain herbicides must be incorporated into the soil to be effective. These herbicides do not readily leach through the soil but remain in the surface layer. Some preemergence herbicides have the potential to injure trees, especially if the trees have not been planted long enough for the soil to settle around the roots. Rainfall can carry herbicides to tree roots through cracks in the soil. This is the reason why Princep is only recommended for application after the third growing season.

Most postemergence herbicides are contact herbicides, that is they must be applied directly on the plant in order to be lethal. It may enter the plant through the leaves, stems, or roots. Postemergence herbicides should be applied to actively growing weeds to be most effective. In some cases, the size and growth stage of the weeds can affect the herbicide performance. As an example Poast may be an effective herbicide against grasses early in the growing season but meets with less effective results if used in August or September.

Postemergent or contact herbicides can be selective or non-selective. A selective herbicide will kill the target species while not affecting desirable plants. A non-selective herbicide will affect a broad range of plants and must be used as a directed spray onto the unwanted vegetation. Poast is an example of a selective herbicide which may be applied over the top of conifers. Poast controls only established grassy weeds and provides little or no residual control. Roundup and Goal, however, can seriously injure Christmas trees, especially if they contact foliage during the growing season. In these cases the trees should be protected by a shield when spraying unwanted vegetation. Injury can also be minimized in some cases by using a lower rate of herbicide.

Some herbicides will have both pre- and postemergence control and may be both soil and foliar active. Velpar and Goal are examples of these types of herbicides.

Many factors can affect the successfulness of any herbicide. As previously discussed, the age, growth rate and rooting properties of the tree and type of soil must be considered. Weather can also determine the effectiveness of any application. Moisture is critical to incorporate many herbicides into the root zone. Too much rain can dilute the herbicide or incorporate it too deeply into the soil. Sunlight and temperature, as it affects seed germination and growth rate, can indirectly cause herbicide failure. The faster weeds grow the more rapidly herbicides are absorbed by plants. Unexpected periods of cold weather can inhibit growth and hence, herbicide effectiveness. Unlike weather, application techniques can be controlled by the growers. Proper preparation, mixing, sprayer operation, calibration, and rates will all contribute to successful weed control.

For more information on how herbicides work, please request Fact Sheets 2750, "Guide to Effective Weed Control," and 2768, "Factors Affecting Herbicide Performance."



Herbicides must be applied at the proper rate and time.

Planning a Weed Control Program

A weed control program needs to remain flexible. As weed populations change or more resistant weeds become prominent, a change in strategy is in order. Most growers use a combination of herbicides to control different weeds at different times of the year.

In Oklahoma, application of Roundup followed by tilling or disking may be used to control perennial weeds on abandoned or converted farm sites. This site preparation may be followed by a preemergent herbicide in late winter or early spring. Combinations of grass controlling herbicides such as Surflan or Aatrex may be used in conjunction with broadleaf herbicides such as Princep, Kerb, or Goal to obtain good early control. If preemergent efforts fail, Poast may be applied as a topical spray when grasses are six to 10 inches high. Goal and Roundup are often used for mid-season applications as directed sprays for control of annuals, perennials, and woody weeds.

Late season applications of Roundup have been used, especially after conifer growth has fully matured (hardened), for effective control of brush and perennials. Some growers may also apply Princep in the fall to control winter annual weeds until spring, or Kerb for perennial grasses.

The following tables list some pre- and postemergent herbicides for use in Christmas tree plantations. Listing or reference to any herbicide does not imply an endorsement or recommendation. Labels should be read completely before any application. Growers should remember that it is illegal to use any herbicide in a manner not specified on the label and by doing so can nullify the manufacturer's liability. It is recommended that any grower using herbicides consider obtaining pesticide application training. For information concerning pesticide training contact your local county Extension office or the Pesticide Coordinator Office at Oklahoma State University.

Herbicides listed are labeled for Virginia, Scotch, and Austrian Pines unless otherwise noted. Herbicide rates are presented in both rates of formulated product and active ingredient per acre. Active ingredient means the part of the formulation which actually kills the weed. For example Princep SOW is 80% Simazine. The other 20% is an inert ingredient which acts as a carrier and has no chemical activity.

The herbicides listed in Tables 1 and 2 are either specifically labeled for use in Christmas tree plantations or the label is sufficiently broad to include use in Christmas tree plantations. It should be noted that many herbicides which are listed for ornamental, forest, or nursery applications are not included, even though they may be listed as safe on the label for a particular tree species. Growers should keep abreast of changes in labelling which will allow additional herbicides to be used legally in Christmas tree plantations.

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Table 1. Herbicides for Preemergence Weed Control.

Herbicide	Rate per Acre		Primary Target	Timing	Cautions/Remarks
	Formulated Product	Active Ingredient			
Atrazine (AAtrex 80W)	2.5-5 lbs.	2-4 lbs.	Annual broadleaf weeds and annual grasses; pigweed; ragweed; nightshade; crabgrass; foxtail; morning glory.	Ten days to 3 weeks after planting or in established stands late February thru mid April. Some post-emergence control. Apply before weeds are 1 1/2 inches high.	Topical; Surface soil moisture must be present for good weed control; Acts mainly through root absorption; do not make more than 1 application per year; Not listed for Virginia pine. May be tank mixed with roundup or Princep. (Ciba-Geigy, Griffin, Platte).
(AAtrex 4L)	4-8 pints	2-4 lbs.			
(AAtrex Nine-O)	2.2-4.4 lbs.	2-4 lbs.			
Oxyfluoren (Goal 1.6 E)	5 to 10 pints	1-2 lbs	Postemergent to existing weeds such as pigweed; henbit; nettle; filaree and cheeseweed, and pre-emergent to small seeded broadleaves and grasses such as pigweed; lambsquarters, henbit; filaree and prickly lettuce.	Apply before weeds are 4 inches tall and before buds break. May be repeated. Post-emergent applications should be made prior to bud-break of after foliage has had an opportunity to harden off.	Directed; Can be applied over top of conifer seedlings before bud break; some injury has resulted when applied during flushes of new growth; Careful determination of soil conditions are necessary; adding .25% nonionic surfactant enhances goal activity on emerged weeds; can be tank mixed with Kerb, Princep, Surflan, or Roundup (Rohm and Haas)
Proamide (Kerb 50-W)	2-4 lbs.	1-2 lbs.	Winter broadleaves, annual and perennial grasses; foxtail; ryegrass; wild oats; crabgrass; tall fescue; morning glory; panicum; orchard grass; purslane.	Fall or early Spring; apply when trees are at least 1 year old in the fall to control winter weeds; should be applied when temperatures do not exceed 55° F.	Topical; Also some post-emergence activity; acts mainly through root absorption; not recommended on fine textured soils of high organic matter; do not use over trees less than 1 year old; do not incorporate. (Rohm and Haas)
Simazine (Princep 80W)	2.5 lbs	2-4 lbs.	Annual grasses and some small seeded broadleaves; annual bluegrass; chickweed; crabgrass; foxtails; goosegrass; lambsquarters; wild mustard; pigweed; prickly lettuce; ragweed.	Apply in Spring or Fall to prevent emergence.	Topical; Do not apply to trees less than 3 years old. Do not apply more than once a year; Not listed for Virginia Pine; some post-emergence activity. Can be mixed with Roundup. (Ciba-Geigy, Drexel, Griffin)
(Princep 4G)	50-100 lbs	2-4 lbs			
(Princep 4L)	2-4 quarts	2-4 lbs.			
(Princep Caliber 90)	2.2-4.4 lbs.	2-4 lbs.			
Oryzalin (Surflan 75 W)	2 3/4-5 1/3 lbs.	2-4 lbs.	Annual grasses and some small seeded broadleaves; watergrass; crabgrass; panicum; foxtails; goosegrass; seedling Johnsongrass; pusley; pigweeds; purslane; purge; lambsquarters	Apply before weeds emerge. May be applied right after planting.	Topical; Can only be legally applied in Oklahoma if used in a tank mix with Princep or Goal. May be applied over all conifers before bud-break; Best to direct onto soil; Use lower rates on sandy soils and newly planted areas; Will not control emerged weeds; Soil should be in good tilth and free of clods before application; Needs 1/2 inch of water to activate; Good results if used in conjunction with Simazine; (Elanco)
Hexazinone (Velpar L) (Velpar 90W)	4 to 8 pts 1-2 lbs.	1-2 lbs. 1-2 lbs.	A variety of annual grasses and broadleaves; bermudagrass; plantain; bluegrass; bahiagrass; broomsedge; dog fennel; cocklebur; vetch; fleabane; goldenrod; lespedeza; foxtail; honeysuckle; purge, purslane; ragweed; fescue.	Has both preemergence and postemergence activity; Best results are obtained when weeds are less than 2 inches in height and actively growing; Apply before conifer budbreak or after new growth has hardened off.	Topical; not listed for Virginia pine; do not use on any soil with less than 1% organic matter; apply only to transplant stock that is 2 years old or more; allow at least 2 months after transplanting before application; do not apply to trees under stress; do not add surfactant if applied over top of trees; need 1/2 inch rainfall within 2 weeks to activate; use lower rates on sandy soils. (DuPont)

Table 1 Continued from page 4.

Herbicide	Rate per Acre		Primary Target	Timing	Cautions/Remarks
	Formulated Product	Active Ingredient			
Stomp (Pendimethalin)	2-4 quarts	2-4 lbs.	Most annual grasses and certain broadleaf weeds including barnyardgrass, bluegrass, crabgrass, foxtail goosegrass, johnsongrass, lovegrass, panicum, sanbur, witchgrass, chickweed, cudweed, filaree, henbit, knotweed, lambsquarters, pigweed, purslane, pusley, smartweed, spurge and velvetleaf.	Preemergence control only. Areas should be free of established weeds at time of treatment.	Topical; efficacy is improved if application is followed by 1/2 inch rainfall or equivalent irrigation; some needle damage can occur when applied on high temperature and humidity days; can be tank mixed with colorants and dyes; use spray pressure of 25 to 50 psi; maintain continuous agitation during spraying (American Cyanamid).

Table 2. Herbicides for Postemergence Weed control

Herbicide	Rate per Acre		Primary Target	Timing	Cautions/Remarks
	Formulated Product	Active Ingredient			
Sethoxydim (Poast)	1½-2½ pints For spot treatment add 1.25 oz. Poast and 1.25 oil concentrate to 1 gallon water	.3-.5 lbs.	Many annual and perennial grasses including Johnsongrass, Bermuda grass, and tall fescue; panicum, foxtails; crabgrass; quackgrass.	Apply to actively growing grasses 6 to 12 inches in height.	Topical; Use hollow cone or flat fan nozzles; Use 10-20 gallons of water per acre; always add 2 pints per acre of oil concentrate; Will not control broadleaf weeds; Use higher rates if grasses are near 12 inches high; Poast and Goal tank mix is not listed for Oklahoma. (BASF)
Glyphophate (Roundup)	1-5 quarts	1-5 lbs.	Most annual and perennial broadleaves and grasses	Apply to active, vigorous weed growth, wetting thoroughly without running off, July to October for best results.	Directed; has no soil activity; do not allow spray to contact green stems or needles; do not apply if rain is expected within 6 hours; a non-ionic surfactant may be added to improve wetting; do not exceed 10.6 quarts of this product per acre per year; can be tank mixed with Princep or Surflan. (Monsanto)

Atrazine - see table 1

Goal - see table 1

Velpar - see table 1

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