

Publication 450-033

Reprinted December 1983

CHEMICAL SITE PREPARATION AND WEED
CONTROL FOR CHRISTMAS TREES

by

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Many new Christmas tree growers do not realize the importance of carefully planning their endeavor, and underestimate the time and work involved in growing quality Christmas trees. Good site preparation and proper weed control after planting are two operations that are essential for successfully growing Christmas trees. Initial site preparation and weed control can be done either mechanically, such as with tractors and mowers, chemically, with sprayers and approved herbicides, or a combination of the two methods.

Used correctly and safely, herbicides offer the Christmas tree grower fairly flexible, fast, efficient and effective means to prepare planting sites and control unwanted vegetation in established plantations. To correctly use herbicides, the grower must select the proper herbicides for his particular objectives, use them effectively, know when to apply them and know the effects a particular herbicide can have on the planted Christmas trees.

SITE PREPARATION

Selecting a planting site is one of the most important steps for the grower. The most desirable sites are open, level to rolling land containing a light to medium cover of annual and perennial grasses and herbaceous plants. Cutover woodlands may be one of the least desirable sites because of the large amount of undesirable vegetation which must be controlled. Normally, choice sites for planting are limited, therefore proper site preparation will determine the survival and subsequent growth of the trees as well as the labor and financial inputs required to maintain a desirable plantation. Since there are fewer chemical or

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mechanical options for removing unwanted vegetation after Christmas trees are planted, it is essential that woody vines and brush are completely controlled prior to planting. The amount of effort required to prepare the site is determined by the type of vegetation present.

Woody Perennials

Where it is necessary to control woody shrubs, brush or stump sprouts, foliage treatment should be applied in late spring or early summer. There are several herbicides available for treating brush during the season prior to Christmas tree establishment. These may be applied using several different methods as described on the label of the herbicide container.

FOLIAR applications are made when plants are in full leaf. Control depends on complete coverage so the herbicide can translocate readily throughout the plant. Since active plant growth promotes foliar absorption and translocation, applications made in late summer or when plants are moisture stressed may reduce the effectiveness of some foliar treatments which are applied using a water carrier (Roundup, Garlon 3A, dichlorprop + 2,4-D and Krenite).

BASAL, BARK, STEM, STUMP and DORMANT SPRAYS do not rely on foliar coverage to effect control. Oil (diesel oil, No. 1, or No. 2 fuel oil) is included in the spray mixture to facilitate absorption of the herbicide through the bark. This type of treatment may be made any time of the year, but there is less injury potential to sensitive plants as a result of drift when applications are made during fall and winter months.

Annual Broadleaf Weeds and Perennial Grasses

Areas to be planted which are or have been in pasture or row crops normally present fewer weed problems than former woodlands.

HERBICIDES RECOMMENDED FOR SITE PREPARATION

Glyphosate (Roundup)

Roundup is an excellent herbicide for controlling most types of undesirable vegetation prior to the planting of trees. However, the time and rate of application are critical for effective control of all species.

To control woody perennials, Roundup should be applied to actively growing plants which are in full foliage but are not under moisture stress. To facilitate the translocation of Roundup from the leaves to the root systems applications should be made after woody perennials have mature foliage (shrubs and bushes), set flowers (multiflora rose, kudzu, honeysuckle) or formed fruit (brambles, poison ivy, poison oak, trumpet creeper), but before frost, color development or leaf-drop in the fall.

If woody shrubs, brambles or vines are not a serious problem at the proposed site, Roundup can be applied in a 30-inch band in rows to kill perennials such as quackgrass, fescue and orchardgrass. This treatment should be applied in the early fall while these cool season grasses are actively growing but before a hard freeze. Christmas tree seedlings would be planted in the treated bands early in the following spring.

Normally, symptoms (yellowing of leaves) are noticeable 7 to 10 days after application but may take longer to develop under cool and cloudy conditions. Injury symptoms may develop very slowly when Roundup is applied to woody plants in early fall, but these plants will not resume growth in the spring. Roundup does not have any residual activity in the soil; but to enhance complete translocation within the plant, treated vegetation should not be disturbed until the appearance of visual symptoms.

Triclopyr (Garlon)

Garlon is a relatively new product which is effective for controlling woody broadleaf perennials prior to planting Christmas trees. An amine salt or ester

formulation is available. The choice of formulation should be made according to the type of application desired.

The amine formulation of Garlon 3A should be used solely for foliar applications when woody plants are actively growing. Mix 2 to 3 gallons of Garlon 3A and 1/4 to 1 pint of agricultural surfactant to enough water to make 50 to 100 gallons of total spray per acre. In all cases use sufficient spray mixture to give uniform and complete coverage of the plants to be controlled.

The ester formulation of Garlon 4 may be used as a foliar application or as a dormant spray. For the foliar treatment mix 1 to 2 gallons of Garlon 4 with 50 to 100 gallons of water plus 1 to 2 quarts of a standard agricultural surfactant. The mixture should be kept under mild agitation. The total application volume should be sufficient to obtain uniform and complete coverage of all vegetation.

To prepare a mixture to treat dormant brush, mix 3 to 6 quarts of Garlon 4 in oil (diesel oil, No. 1 or No. 2 fuel oil) to make 100 gallons of spray. Use a low pressure sprayer to treat brush after the **foliage has dropped**. Thoroughly wet the upper parts of the stems and soak the lower 12 to 15 inches above ground level.

A basal bark mixture also employs the oil mixture spray and is suitable for application to clumps of brush or scattered small trees during the dormant season. The spray should be directed toward the basal portion of brush or tree trunks to thoroughly wet the trunks to a height of 12 to 15 inches above the ground line and sprayed until runoff is noticeable at the ground line.

To reduce the drift hazard, application should not be made under windy conditions or near susceptible crops. Conifer seedlings should not be planted until at least 6 months after Garlon applications.

Fosamine (Krenite)

Krenite is a brush control agent that is recommended for use on noncroplands

such as rights-of-way, storage, industrial areas and reforestation sites prior to planting. Krenite will control most woody plants when applied during the 2 month period prior to fall leaf coloration, but late spring and early summer applications will not give satisfactory control. Effective control depends on thorough, uniform plant coverage, without drenching. The necessary water output will depend on the density and height of the brush to be controlled. Partial coverage of plants will give only partial control since Krenite is absorbed through the foliage and stems but not through the roots of plants.

Plants treated with Krenite do not exhibit any characteristic foliar symptoms, and a response cannot be observed until spring when the plants fail to break dormancy and subsequently die. Because of this unusual response pattern, treated vegetation should not be removed during the winter after Krenite treatments in the fall. If perennial grasses need to be controlled on the planting site, other herbicides should be considered since Krenite does not have activity on grasses.

2,4-D plus dichlorprop (Weedone 170, Weedone DP, others)

A mixture of 2,4-D and dichlorprop is suitable for controlling many perennial broadleaf shrubs and vines on uncropped land. It can be applied as a water mixture to plants with fully developed foliage until late summer as plants begin to go dormant; however, this type of treatment will often require a second application on less susceptible woody species.

A 'hotter' mixture can be made by mixing 1 to 2 gallons of herbicide with 10 gallons diesel fuel and adding 89 gallons of water. Probably the most effective use of these herbicides is for treating scattered clumps of brush using a straight herbicide-oil mix to drench the lower 4/5 of the brush stems and foliage. The 2,4-D plus dichlorprop and oil mixture is effective for treating freshly cut stumps 3 to 4 inches in diameter or larger to prevent sprouting. For small volumes, mix 1 1/2 cups of the herbicide with 3 gallons of oil and saturate the

stump and any exposed roots.

These treatments will result in a 'brown-out' of treated vegetation within 2 to 4 weeks but the vegetation should not be removed until fall or winter. Extreme care should be exercised in using these herbicides since minute quantities could result in serious injury to sensitive species such as ornamentals, grapes, tomatoes, tobacco and other succulent broadleaf crops.

WEED CONTROL AFTER PLANTING

After Christmas trees have been planted on the prepared site, it will be necessary to control grasses and other vegetation that will grow on the site. During the first growing season the small slow-growing seedlings cannot compete successfully with vigorously growing annual weeds. A period of prolonged moisture stress could result in a high rate of seedling mortality. Competition from undesirable vegetation can stunt the growth of established trees while the presence of perennial vines and shrubs can reduce marketability of trees by altering normal limb development and foliage distribution on individual trees.

When possible, mow around established trees several times a year to reduce competition from any of the broadleaf weeds and grasses. Mowing does not provide satisfactory control of weeds around newly planted seedlings since a tractor mower normally cannot cut closer than 1 foot from the seedling without risking mechanical injury. Herbicides can be used to reduce weed competition and increase seedling survival as well as increasing the growth rate of established trees. An effective weed control program will permit the timely use of labor for shearing or other practices rather than for time-consuming hand-weeding or mowing.

Herbicide applications to control weeds after Christmas trees have been planted can be grouped into two categories according to the growth stage of the weeds; the two designations are: 1) PREEMERGENCE and 2) POSTEMERGENCE. Preemergence treatments are applied to the soil before weed seeds have germinated or emerged

through the soil surface. Postemergence applications of herbicides are made to weed species which have emerged or become established in the soil. Because of the sensitivity of germinating seeds and the highly selective nature of the herbicides used for preemergence weed control, preemergence control of weeds is considered to be more efficient and considerably safer to trees than postemergence weed control efforts.

Similarly, herbicides may be applied as either OVERTOP or DIRECTED sprays; the choice of these two methods will be determined by the (1) type of herbicide, (2) size of the trees, or (3) kind of equipment available. OVERTOP applications are commonly used when applying preemergence herbicides to trees less than 2 feet in height. As trees grow taller and the foliage becomes more dense, an overtop treatment may not provide uniform coverage around the shadeline, and may result in sporadic control of weeds around the tree borders. At this stage it is necessary to begin the directed spray method to apply the preemergence materials. Since trees are tolerant to most herbicides used for preemergence applications, the primary concern is to obtain uniform ground coverage with little regard to overspray of the basal portions of the tree.

Conversely, Christmas trees have very little tolerance to postemergent herbicides used to kill established weeds in the plantation; therefore, extreme caution must be used in the application of these herbicides. The herbicide solution must be directed to the weeds to avoid contact with the tree foliage. After trees attain heights of 3 to 4 feet, injury from postemergence sprays may be limited to discoloration or needle-drop from affected limbs, but direct contact on 1 to 2 year old trees may result in death of the tree.

PREEMERGENCE WEED CONTROL

An effective preemergence weed control program may depend on several considerations. Most herbicides used for preemergence weed control must be applied

before weed seeds germinate and emerge (Goal 2E and Kerb are exceptions). The herbicides should be applied to create a uniform barrier over the soil surface. Poor weed control can be expected if matted grasses or leaves cover the soil prior to application. Some sparse vegetation can be tolerated without detrimental results, but the gallonage per acre should be increased to ensure penetration of this vegetation by the spray. An output of 30 to 40 gallons per acre (gpa) is sufficient for most situations, but 40 to 60 gpa may be necessary for fields where standing vegetation is present. Rain, melting snow, or irrigation is necessary to move the herbicide into the soil for optimum preemergence weed control. Applications should not be made during extended periods of dry weather or when there is little chance of rainfall.

Oryzalin (Surflan)

Surflan is a safe herbicide for overtop applications to newly transplanted Christmas trees. When applied to weed-free soil, Surflan effectively prevents germination and establishment of most grasses and some broadleaf weeds for 3 to 6 months, depending on the use rate. Surflan should be applied in early spring to take advantage of frequent rainfall necessary for activation.

After trees have been established for at least one growing season Princep may be tank-mixed with Surflan to control a wider range of annual broadleaf weeds. Another tank-mix including Surflan, Princep, and Roundup could be applied as a directed spray to kill all existing vegetation as well as preventing regrowth of weeds from seed. However, care must be taken with this mixture to avoid spray contact with the tree foliage.

Napropamide, Propionamide (Devrinol)

Devrinol provides preemergence control of a wide variety of early season grasses and broadleaf weeds. Newly transplanted Christmas trees have excellent tolerance to overtop applications of Devrinol, but it must be applied before weeds seeds germinate in the spring. Since Devrinol must be incorporated into

the soil by mechanical means or by rainfall, it is important that it be applied when rainfall or snow is likely within a few days (2-3) or weed control will be poor. Fall, winter and early spring applications appear to provide weed control through the following spring into early summer.

Oxyfluorfen (Goal 2E)

Goal 2E is a new selective herbicide used for preemergence and early postemergence control of many grasses and broadleaf weeds in Christmas tree plantations. An overtop application of Goal 2E may be made immediately after transplanting conifer seedlings. The application should be made prior to bud break or after new growth has hardened off to prevent injury to new growth. An application of Goal 2E will kill some weed seedlings (less than 4 inches in height) and prevent other weed seed from germinating. However, many different kinds of weeds normally present under field conditions vary considerably in their susceptibility to postemergence treatments, which reduces the effectiveness of Goal as a postemergence treatment. Lower rates of Goal 2E are required for preemergence control which reduces the cost per treated acre.

Pronamide (Kerb)

Kerb provides preemergence control of a wide range of grasses and broadleaf weeds in Christmas tree plantations but must be applied only to trees which have been established for at least one year to prevent tree injury. As with several other herbicides which provide preemergence weed control, Kerb should be incorporated or watered into the soil soon after application; this is especially critical under warm conditions.

The most effective time of application is in the fall or winter before the soil freezes. Application under these conditions reduces the necessity of immediate incorporation and it facilitates more effective control of some of the cool season weeds.

Unlike many other preemergence herbicides, Kerb will control several

established cool season annual and perennial grasses such as bluegrass, cheat, volunteer small grains, orchardgrass and quackgrass. Since Kerb is absorbed through plant roots, control of established weeds will depend on rainfall or melting snow to move the herbicide into the rooting zone of weeds. Do not expect a fall application to provide satisfactory control of all weeds throughout the following

Simazine (Princep)

Princep is another herbicide that should be applied before the emergence of weeds or after existing weeds have been killed with one of the herbicides recommended for postemergence weed control. Princep will provide excellent control of a broad spectrum of grasses and broadleaf weeds, and Christmas trees are very tolerant to overtop applications providing that the trees have been established at least one growing season. Although Princep does not depend on immediate rainfall for activation, applications made during extended dry periods may result in less than optimum weed control.

Princep may be tank-mixed with Paraquat or Roundup to kill existing vegetation or mixed with Surflan to obtain greater grass control. In fields where row-cropping has been practiced, fall panicum may become a problem weed in late summer after a single application of Princep was made in the spring.

POSTEMERGENCE WEED CONTROL

Certain postemergence herbicides may be used in Christmas tree plantations to kill annual weeds which were not controlled by preemergence treatments or to control bothersome perennial weeds which have become established after the trees were planted.

Since herbicides used for postemergence weed control are not as selective as preemergence herbicides, they must be applied as directed sprays. Extreme caution must be exercised in the application of these non-selective chemicals around

young trees, because even small amounts of these herbicides may kill or severely injure the trees. It is difficult to apply postemergence chemicals even with hand-held sprayers to large weeds around trees less than 12 to 15 inches in height, thus an effective preemergence weed control program at this time is important.

When early spring preemergence treatments have been delayed, it is a common practice to include an herbicide for preemergence weed control with the post-emergencetreatment to prevent the re-establishment of annual weeds. Frequently, woody perennials such as brambles, poison ivy, honeysuckle, sumac or sassafras become established where annual weeds do not present a serious problem. In this situation a SPOT TREATMENT of individual plants or groups of plants would be feasible.

In the following discussion of herbicides suitable for postemergence control of weeds in established plantations, several chemicals will be discussed which have been discussed under the site preparation section; therefore, the same precautions and considerations for their use would apply in this section also.

Amitrole, Amitrole-T (Amitrol-T, Cytrol Amitrole-T, Others)

Amitrole is a very useful chemical for spot-treating poison ivy, honeysuckle, blackberry and small brush. It can be used also as a directed spray in early summer for small weeds under Fraser fir, Norway spruce, Scotch pine and junipers. It should be applied in early summer after the foliage has fully developed and actively growing; all foliage of woody perennials should be thoroughly wet to the ground line. Regrowth should be retreated after leaf development.

Commercial formulations of a mixture of amitrole plus simazine are available for use in Christmas trees also. The amitrole would kill emerged weeds and the simazine would prevent reinfestation of weeds through its preemergence activity. This mixture is particularly useful around individual trees and as a spot treatment to kill weeds which escaped earlier preemergence treatments.

Amitrole acts slowly on treated plants and symptoms may not appear for 5 to 10

days on annual weeds or 7 to 14 days on woody perennials. The initial signs of activity appear as yellowing of new growth followed by a bleached appearance of the leaves and eventually a complete brown-out of the treated plants.

Glyphosate (Roundup)

The discussion of Roundup found in the section on site preparation is adequate to understand the principles involving the use of Roundup for total vegetation control; however, a directed spray should be utilized when applying Roundup around established Christmas trees. This is necessary to minimize contact with the tree foliage which may result in tree injury.

The lower rate range of 2 to 3 quarts per acre is suitable for annual weed control, and trees are generally very tolerant of this lower rate. Although weeds should be actively growing at the time of treatment, the size of annual weeds will not significantly influence the degree of control. Also, complete coverage is not essential since Roundup translocates readily within the treated plant.

Roundup has no soil activity; therefore, a preemergence herbicide should be included in the spray mix if extended weed control is desired. Roundup is very safe for humans and its oral toxicity is less than that of table salt.

Paraquat (Paraquat CL)

Paraquat is a non-selective herbicide for postemergence weed control which can be applied selectively under Christmas trees. Unlike the systemic herbicides for postemergence use described in previous sections, Paraquat controls vegetation through contact activity and results in rapid tissue destruction. Since Paraquat does not translocate within treated plants, thorough coverage is necessary for complete control of herbaceous annual weeds. Although Paraquat will desiccate the foliage and young green stem tissue of woody perennials, it is immobile in the plant and control of perennials should not be expected. Christmas tree foliage hit by the herbicide spray will be killed; therefore, precise application is

necessary to prevent damage to the tree foliage. Because of the rapid and complete disruptive nature of Paraquat, its use is not recommended around small trees or where vigorous weed growth does not permit accurate herbicide placement beneath the tree foliage.

Paraquat is particularly effective for killing young succulent annual weeds at the relatively low rate of 1 quart per sprayed acre. Large weeds will require higher rates and a higher sprayer output (gpa). The addition of a non-ionic spreader sticker such as Ortho X-77 is necessary to facilitate thorough wetting of the weed foliage.

Since Paraquat is inactivated upon contact with the soil and will not have any effect on germinating seeds, a residual herbicide could be included in a tank-mix to prevent the establishment of new annual weeds.

CAUTION! Paraquat is a highly toxic pesticide and one swallow can kill! Do not pour from original container except for immediate use.

CALIBRATION

Although the selection of an herbicide for a specific weed problem is important, calibration of the sprayer is of equal importance.

The output of the sprayer should be determined before any chemicals or additives are placed in the spray tank. To determine the output of a power sprayer using a handgun, measure an area 21 by 21 feet (about 1/100 acre) which includes typical vegetation. Fill the spray tank with water and spray the brush or weeds thoroughly as if spraying for control. Then measure the quantity of water required to refill the tank. Multiply that amount by 100 to get the output on a per acre basis.

The calibration of a small hand-carried sprayer with a single nozzle is similar to that of a powered sprayer. Mark a 5 by 20 (100 square feet) area and fill the sprayer with water to the 2 or 3 gallon level. Spray the area uniformly using the same speed and pressure that will be used to apply the herbicide.

Measure accurately the amount of water needed to refill the sprayer to the original level. For each 8 oz (1/2 pint) of water used on the 100 square feet, the discharge is equivalent to 27 gallons per acre.

After the output of the sprayer has been calculated, mix the herbicide with the water or oil according to the directions on the herbicide container.

SAFETY PRECAUTIONS

Drift of Herbicides

Herbicide drift is the most commonly encountered cause of pesticide damage to susceptible crops. Spray drift is influenced by air movement and droplet size. Applications should be made when air movement is minimal using nozzles which do not produce fine droplets.

Herbicides such as the volatile esters of 2,4-D are capable of causing injury to adjacent crops by movement in the vapor phase after the herbicide has dried on the soil or plant surface. The use of low-volatile esters, oil soluble amines, and dormant applications greatly reduce the hazard of injury to adjacent crops.

Proper Handling of Herbicides

Herbicides vary greatly in their toxicity to man and other animals, so all herbicides should be handled with care. Before mixing or using pesticides, always READ ALL THE DIRECTIONS ON THE LABEL and follow them. Read warnings and cautions before opening the container. The relative toxicities of all herbicides mentioned in this paper are listed in Table 1.

STORE PESTICIDES WISELY. All herbicides should be stored under lock and key, outside the house, in a dry place, away from food, children, pets, feed, seed, fertilizers and other pesticides.

If herbicides are spilled on the skin, wash the contaminated area thoroughly with soap and water. Never smoke, eat or chew while handling or applying herbicides.

Weeds can effectively compete with Christmas tree seedlings for light, moisture and nutrients. Weed competition increases Christmas tree mortality as well as reduces the growth of newly planted trees. An effective weed control program is a sound investment which can reduce the production time and labor input required for Christmas trees. A successful weed control program is a result of thorough planning, correct weed identification, proper herbicide selection and accurate application of a suitable herbicide.

Table 1. Relative toxicities of various herbicides used for weed control in Christmas trees^{1/}.

Herbicide	Formulation	Use	TOXICITY		
			Rating ^{2/}	Oral ^{3/} LD ₅₀ mg/kg	Amount of ^{4/} product/ 150 lb person
Amitrole (various trade names)	2S	postemergence	1	24,600	1.8 gal
Amitrole-T (various trade names)	2S	postemergence	3	750	7 fl oz
Devrinol	10G 50WP	preemergence preemergence	2	5000 ⁺	7.5 lbs 1.5 lbs
Dichlorprop (various names)	2EC	site prep	3	800	8 fl oz
Garlon	3A	site prep	3	2140	14 fl oz
Goal	2E	preemergence	2	5000 ⁺	1.5 qts
Kerb	50WP	preemergence	2	5620-8630	6.8-1.3 lbs
Krenite	4S	site prep	1	24,400	3.6 qts
Paraquat CL	2S	postemergence	4	120	1.2 fl oz
Princep	4L 80WP	preemergence preemergence	2	5000 ⁺	1.5 pts ⁺ 1.0 lbs
Roundup	4S	site prep/postemergence	3	4320	1.3 pts
Surflan	4AS 75WP	preemergence preemergence	2	10,000 ⁺	1.5 qts 2.0 lbs
Aspirin	-	(for comparison)	3	750	68 tablets
Table Salt	-	(for comparison)	3	3320	0.5 lbs

^{1/} Information obtained from HERBICIDE HANDBOOK of the Weed Science Society of America, 4th Ed. 1979.

^{2/} The higher the number, the greater the toxicity.

^{3/} LD₅₀ is the dose (quantity) of a chemical calculated to be lethal to 50% of the organisms in a specific test situation. It is expressed in weight of the chemical (mg) per unit of body weight (kg).

^{4/} The amount of formulated product required per 150 pound person to be equivalent to the corresponding LD₅₀.