

Chemical Weed Control in Christmas Tree Plantations



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Chemical Weed Control in Christmas Tree Plantations

Growing Christmas trees can be an exacting business. It can also be costly. A productive plantation must have the proper spacing of optimum varieties of trees, growing on fertile soil. In order to be successful in establishing these trees, and in focusing all the soil resources into their growth, it is mandatory that weed growth be kept to a minimum during the growing season.

Weed control is a complex subject. Weeds affect moisture supplies, nutrient availability, erosion, and suitability of the area for animals. Chemical control involves matching of chemicals to combinations of weeds and trees to favor the trees, and to do this within the limits of the law, soil stability, and wishes of the neighbors.

A given application of herbicide is merely part of a program of vegetation management. It is always wise to work out a plan for managing ground cover for the life of the plantation, and to prescribe for weed control with the most suitable tools currently available. Such a plan generally considers: 1) total weed control is usually necessary for first-year establishment of nursery seedlings; 2) weeds resistant to the first year's applications will make up a large proportion of the subsequent years' weed problems; 3) complete weed control will result in surface soil movement in the third and subsequent years of management unless stabilization measures are taken (these problems may be more severe where site preparation for the initial planting has included plowing and disking); 4) in the third and subsequent years, animal populations, especially gophers, will be attracted to plantations with residual weed growth.

The first criterion of a successful program is high survival of the initial plantation. This requires virtually total weed control at the time when seedlings are most vulnerable to chemical damage. Weed control must eliminate weeds without harming trees or setting up an invasion of resistant species for the coming year. After the first year of operation, it may be necessary to establish a soil-protective cover at the end of a season of weed control; herbicides with short residual life may be needed. Throughout the program, one must be constantly alert for signs of troublesome animals being favored by particular weed species that can be controlled. It is easier and more humane to

avoid the animal problems than to solve them. In other words, weed control is a never-ending consideration, and is fully as much involved with resource conservation as with killing of plants.

Weed problems

Grasses are the most important group of plants among the weeds of Christmas trees. Their primary effect is one of exhausting stored moisture after spring rains cease. Except in the fog zone of the coastal area, a grass cover invariably means poor initial survival of a plantation; survivors grow poorly for many years, often with poor color and inadequate ability to improve with cultural treatments (shearing, etc.).

For practical purposes, it is useful to group grasses according to their sensitivity to atrazine (2-chloro - 4-ethylamino - 6-isopropylamino - S-triazine) herbicide. Very resistant are orchardgrass and tall fescues; resistant are perennial ryegrass, bluegrasses, and perhaps some annual ryegrasses. Intermediate are some ryegrasses and velvetgrass; most other perennial and annual grasses are sensitive. Virtually all are incompatible with Christmas tree production.



Seedlings grown in a sod cover have a bleak outlook. The few survivors generally make poor Christmas trees.

Broadleaf weeds are also substantial users of moisture, but do not focus their demands in the root zones of tree seedlings as do grasses. These weeds also are sometimes very attractive feed, especially for deer above ground and gophers, below. Many broadleaves are sensitive to 2,4-D (2,4-dichlorophenoxy acetic acid), or to combinations of 2,4-D and atrazine. These treatments cannot be used broadcast with some species of Christmas trees, especially pines, without injury. So many become increasingly serious problems when grass is killed. This often leads to gopher problems which are virtually insoluble without eliminating preferred food species. False dandelion and Canada thistle are especially serious in this regard.

Woody and viney plants, such as blackberries, are minor in extent but serious in spots. Blackberries of both tall and trailing species grow rapidly when released by weed control. The combination of rapid spread, spiny habit, and difficulty of control justifies attention before problems become widespread.

Chemicals and application

Atrazine is the most widely used herbicide in Christmas tree management. It has moderate water solubility, and is recommended for either pre-

emergence or early post-emergence control of grasses and weeds. It is relatively non-toxic to humans and animals, noncorrosive to spray equipment, and nonflammable. It is easily removed from spray tanks and lines by thorough flushing with water.

When applied before weed emergence, atrazine acts through the roots of newly germinated weeds. Applied after weed emergence, atrazine acts through foliage contact, as well as through root action. This "foliage plus root action" rapidly controls sensitive broadleaf weeds and grasses. The herbicide, when applied in an adequate amount, continues to control germinating weeds throughout the growing season. Young, actively growing weeds are most susceptible to the full-year control.

Some weed species are resistant to atrazine, and require other herbicides. Broadleaf weeds are generally treated with 2,4-D. This may be mixed with atrazine in the spring or fall; it also may be applied separately during the growing season, but only as a directed spray *at that time*. Low-volatile esters are preferred. Mixtures of atrazine and 2,4-D are not registered specifically for conifers. They are safe and effective when used on Douglas-fir in March, but the user assumes liability for damage



A mixture of 3 pounds atrazine and 5 pounds dalapon gave adequate weed control for these shore pines and noble fir. The low rate of atrazine permits establishment of a winter cover crop to restrict soil movement.



This plantation is off to a good start with intensive ground preparation and an application of 4 pounds of atrazine per acre.

on account of registration status. Dalapon (sodium 2,2 dichloropropionate, sold only under the trade name of Dowpon) is useful for controlling many atrazine-resistant perennial grasses, and is currently registered only for use prior to planting. It may be combined with 2,4-D. Amitrole (3-amino-1,2,4-triazole) is also registered for perennial weed control and for control of certain blackberry species. It may be combined with certain herbicides in keeping with label registration. The most notable combination is known as Amizine, a mixture of 15% amitrol and 45% simazine (2-chloro-4,6-diethyl-amino-5-triazine). Combinations containing amitrole have a broad spectrum of activity, and should not be sprayed over the top of conifers, because amitrole produces severe whitening of foliage. Amitrole works very well on tall blackberries late in summer.

Another good herbicide for brush only is 2,4,5-T (2,4,5 trichlorophenoxy acetic acid). Mixed in either oil or water, it is especially effective on blackberries in late summer; the oil solution applied to the base of canes or sprout clumps is very effective. Do not apply 2,4,5-T over conifers except during the spring dormant season, and then only with professional advice.

Methods of application

Herbicides may be applied with a wide variety of equipment. Newly planted fields can be sprayed with the tractor-drawn boom sprayer or by helicopter or airplane. The boom sprayer will probably give the most uniform application and this is the

key to satisfactory grass and weed control. Equipment should be calibrated properly. If there is any doubt about the cleanliness of the water, filter it through a 100-mesh screen. All screens throughout the spray system (nozzles, in-line strainer, suction strainer) should be 50 mesh or coarser. Use mechanical agitation for wettable powder and mechanical or hydraulic jet agitation for liquid formulations, such as flowable atrazine or 2,4-D, to keep the herbicide in suspension during application. If containers or holding tanks are used, keep the mixture agitated while awaiting transfer into the spray tank.

Other equipment used for spraying small acreages includes knapsack sprayers, motor-driven mist blowers, and an array of portable sprayers with 3 to 300 gallon capacities and mechanical agitation. Some growers use the smaller size sprayers for row treatment or spot spraying around trees to reduce competition. This is less costly in materials than the broadcast application and can be used to advantage where grass competition is causing stress-induced discoloration. There are, however, serious disadvantages to row or spot spray systems. Consider the following: (1) heavy weed cover must be kept beyond the zone of seedling roots, (2) these weeds provide a tremendous seed and rhizome source for reinvasion the second year, and (3) weed cover provides excellent cover for rodents.

Aircraft spraying is a rapid and low-cost method of application. In order to obtain a reasonable spray pattern, flights should be made only when

wind velocity is less than 5 miles per hour. At least one flagman should provide the pilot with necessary alignment. Where rows are over 1,000 feet long, use two flagmen. Bright red or orange paper panels will readily be seen by the pilot. The flagmen should move these panels from one predetermined location to another and at the same time avoid getting hit by the chemical by keeping upwind from the spray strip. This will take timing and coordination. Flights should be parallel with, rather than across, the rows. Before flights are made, the Christmas tree manager and the pilot should identify nearby sensitive areas and discuss details of allowing an unsprayed safety margin on sides of the plantation which border neighbors' fields. The use of foam or other drift control methods is recommended near sensitive areas. Information on specific methods for controlling drift may be obtained from applicators or chemical company representatives. They are changing rapidly.

Time of application

Atrazine should be applied between early February and mid-March in western Oregon and Washington. Spraying should be completed early enough to precede the final heavy spring rains, but late enough to catch the period of active weed growth. Moisture is needed to move the atrazine into the grass root zone. A half-inch rain is usually adequate on moist soil.

Growers in the southwest Oregon area should complete application of atrazine by the end of February. Plantation managers in the Roseburg area should consider early March as their cutoff date, since adequate rainfall after application is necessary for best results. In eastern Oregon and Washington, and northern Idaho, fall application is effective, but a spring application is satisfactory provided at least one watering of at least one-half inch occurs after treatment.

Maximum weed kill is obtained from atrazine when fields are summer fallowed, roughly disked after the first fall rains, then double disked and harrowed just prior to planting and spraying. After planting, the ground should be firmed around individual seedlings or the planted area should be dragged to level ridges and fill the furrows left by the planting machines. Firming the soil will help keep the atrazine in the upper two inches of soil. With leveling or firming completed, apply atrazine by boom sprayer, helicopter, or airplane at the rate of 5 pounds of 80% active material per acre on loam or clay-loam soils. In subsequent years, under average conditions, use 4 pounds per acre annually. On sandy or gravelly soils apply 2.5 pounds per

acre. Atrazine is not recommended on sands or other light, porous soils, but simazine may be substituted. Usually a network of roads is left around and through the plantation; these should not be overlooked. It may be well to double spray these roads, thus creating firebreaks.

One year after plantation establishment, and before application time, evaluate second-year weed control needs. If thorough field preparation was made prior to planting, weeds may show up in such small numbers in late winter of the following year to apparently justify skipping the second spray. This can be misleading. Some weed control is necessary annually, in general, to prevent the development of spray-resistant problems.

Restoration of old plantings

Grass control with atrazine is practiced on many new Christmas tree plantations. Where this practice is continuous over the rotation of the tree crop, there should be no problem of maintaining good vigor, growth, and color of the trees, providing fertility levels are adequate. But what about "grassed-in" plantations that were established years ago? Is mowing the answer? Usually not, if it is done to remove competing vegetation. Mowing does not appreciably decrease transpiration rates. In some plantations, adequate nutrient levels do a proper job of maintaining the trees where moisture is not as critical.

Many of the older plantings, however, suffer in varying degrees. Just how badly trees are suffering depends upon the species. The true firs, noble, Shasta, concolor, and grand will be most severely affected. Pines will show the least amount of strain in a grass environment, with Douglas-fir somewhere in the middle. The trees that suffer most of all, the true firs will also show an immediate response to elimination of grass. True firs may have been so severely suppressed that they grew only three feet or less in a 10-year period. Yet, the same trees will show substantial increase in vigor, color, and growth during the first years after release.

As an example, if atrazine is applied, for the first time, over grass-suppressed true firs in February or early March, a definite color response will be evident by September of the same year. Yellow nobles will turn dark green, and yellow concolors have been observed to turn a powdery-blue color. Other changes in the first year are the development of substantially larger buds and a dramatic increase in needle length. During the second growing season, true fir terminals will often grow two to four times longer than the previous season's growth. This extra growth, along with the color



Grass can suppress true firs severely. Chemical control rather than mowing is the answer. Mowing does not significantly reduce transpiration. These 6-year-old firs completely recovered after chemical control of grass.

and general vigor, starts falling off the third year unless there is a reapplication of atrazine. A rate of 3 to 5 pounds per acre of atrazine, depending on the grass and weed species present, should be applied as the initial application, to be followed by annual applications of three to four pounds. Rotation with other herbicides may be needed if atrazine-resistant weeds prevail.

Nutrient balance

Douglas-fir and pine showing some winter yellowing or nutrient deficiencies may or may not enjoy full recovery if permitted to live out their rotations in a weed-free environment that is deficient in essential nutrients. What happens depends a great deal on soil nutrient levels. Where the soil is only slightly nutrient deficient, trees may recover fully and become merchantable Christmas trees. On the other hand, they may stay green during harvesting and shipping, but develop needle reten-

tion problems when in use. Atrazine alone can not sustain the trees. An adequate quantity and balance of soil nutrients are also essential.

Bringing fields up to adequate nutrient levels, plus proper weed control, should result in good growth rate, maximum vigor, and acceptable color for Douglas-fir and other species.

Control of hard-to-kill grasses and weeds

Although continuous applications of atrazine will keep bent grass and many annuals under control, others will hardly be fazed. Some weeds may be controlled, but others like trailing blackberries, Canada thistle, and fern will grow more luxurious than ever. Maximum control of these grasses and weeds can be achieved only through repeated, directed sprays of amitrole and 2,4,5-T, avoiding contact with the trees particularly during the growing season. An exception to this has been an experimental aerial spray combination of atrazine

and dalapon using a mixture of three pounds and five pounds, respectively. Dalapon can cause needle injury if used after mid March, or during the year of harvest. This combination has proved to be quite successful on hard-to-kill grasses. Applicators should check with chemical distributors on current regulations on mixing atrazine and dalapon.

Other chemical combinations that may prove effective in controlling such grasses as alta-fescue, perennial rye, and orchard and blue grasses are as follows, active ingredient basis:

- 1) 4 pounds amitrole* + up to 100 gallons of water per acre. (Non-selective as to vegetation controlled.)
- 2) 2 pounds amitrole + up to 10 pounds dalapon + water** per acre. (Non-selective.)
- 3) 4 pounds amitrole + 12½ pounds simazine + water** per acre. (Non-selective.)
- 4) 4 pounds 2,4-D + 10 pounds dalapon + water** per acre. (Moderate selectivity on Douglas-fir.)
- 5) Kerb, 1 to 2 pounds per acre Oregon registration only.

* Amitrole is available as amitrole-T, Weedazol and Amizol from the Amchem Products Co. Amitrole is available as Cytrol from the American Cyanamid Co.

** Use enough water to function as a satisfactory vehicle. Commercial formulations are of different strengths—read labels carefully.

All of the above combinations should be applied as directed sprays. The rates listed are generally above recommended use levels, but are the maximum permitted by their registrations. Applications in both the fall, after the first rains, and in the spring may be necessary to achieve the desired results. Since the above rates are maximum, cut them in half on light soils such as sandy loam.

Pines are especially sensitive to 2,4-D. Douglas-fir can tolerate to four pounds per acre or more and true firs, one pound per acre of 2,4-D during the spring dormant season. Trailing blackberries can be kept under control by using a directed spray of a mixture of 8 pounds of 2,4,5-T low volatile ester + 100 gallons diesel oil as a basal or foliage spot spray or 4 pounds amitrole to 100 gallons water as a spot spray. Ferns and Canada thistle can also be kept under control with repeated applications of amitrole-T.

Hazards

Grass control increases erosion when combined with tillage on > 2% slopes. Aerial spray causes neighbor problems. Removing grass without suppressing broadleaf weeds creates excellent gopher habitat. Good management is needed throughout. Weed control is a great tool, but not a panacea.

NOTE: This publication contains recommendations for certain uses of herbicides. Forestry uses must be listed on the label in order to be legally sold for Christmas tree operations. It is the user's responsibility to insure that each product purchased is registered for its intended use, and that such use conforms to the law. These laws are changing rapidly, and users are urged to keep current on the regulations, both state and federal, regarding their pesticide needs.