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Chemical Weed Control in Christmas Tree Plantings

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Grass is the top competitor for nutrients and moisture in Christmas tree plantations. This competition becomes critical in planted and cultivated fields. Weeds compete to a lesser extent, but are a nuisance in plantation management. Grass competition in some western Oregon fields has been so severe as to actually cause drastic annual setback in vigor and growth, and in extreme cases, death to trees four feet or more in height. A triazine herbicide, Atrazine, has reversed this trend in old plantations and is used to great advantage in new plantings.

Atrazine is a triazine herbicide containing 2-chloro-4-ethyl-amino-6-iso-propylamino-5-triazine as its active ingredients. It is of moderate solubility, making it useful in a wide range of industrial applications. Atrazine is recommended for either pre-emergence or early postemergence use. It is relatively non-toxic to humans and animals, noncorrosive to spraying equipment, and nonflammable. It is easily removed from spray tanks and lines by thorough flushing with water.

How Atrazine works

When applied before weed emergence Atrazine acts through the roots of germinating weeds. It is more valuable in areas receiving low rainfall because it is more soluble than other herbicides and less moisture is required to activate it and to move it into the soil. Applied soon after weed emergence, Atrazine acts through foliage contact, as well as through root action. This "foliage plus root action" controls broad leaf weeds and grasses more rapidly, and continues to control later germinating weeds. Young, actively growing weeds are most susceptible to the full-year contact.

How to apply Atrazine

Chemicals may be applied with a wide variety of equipments. Newly planted fields can be sprayed with the tractor-drawn boom sprayer or by helicopter or airplane. These three methods in the order stated, have proved effective if uniform application. 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 or hydraulic jet agitation 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. Some growers use the smaller size sprayers for row treatment or spot spraying around trees to reduce competition. This is less costly than the broadcast application and can be used to advantage where grass competition is not a factor but where color is missing. True firs can restore color readily because of their ability to metabolize atrazine. There are, however, serious disadvantages to row or spot spray systems. Consider the following: (1) They leave heavy weed cover within range of competing roots. (2) they provide a tremendous seed and rhizome source for reinvansion of weeds by the second year, and (3) weed cover provides excellent cover for rodents.

Airplane spraying is a rapid and low cost method of Atrazine application. In order to obtain a reasonable spray pattern, flights should be made only when wind velocities are as close to zero as possible. At least one flagman should provide the pilot with necessary alignment. When rows are over 1,000 feet long, use two flagmen. Flights should be parallel with rather than across the rows. Before flights are made, the Christmas tree manager and the pilot should discuss details of allowing an unsprayed safety margin on sides of the plantation which border neighbors' fields.

Using Atrazine on new plantings

Atrazine should be applied either before weeds emerge or soon after they appear above the ground. Time of application should be keyed to precede rainfall during the period of most active weed growth.

For areas west of the Cascade range, in both Washington and Oregon, where plantations are established in late March or early April, a mid-April application of Atrazine is not too late, providing there is a rain of one half inch or more. One heavy rain is more effective than several lighter rains of equal total rainfall.



Five-year-old plantation shows results of continuous weed and grass control.

During some years, February may be an ideal time for final ground preparation, planting, and Atrazine application. This would permit maximum root development during early spring and allow seedlings to become "established" before terminal growth starts.

Growers in the Medford area should make every effort to complete their herbicide application by the end of February. Plantation managers in the Grants Pass-Roseburg area should consider the third week in March as their cutoff date.

Best possible results are obtained from Atrazine when fields are summer fallowed, roughly disked after the first fall rains, then double disked and harrowed just prior to planting. After planting, firm the ground around individual seedlings or harrow the whole planted area to level ridges and fill furrows left by the planting machines. This will keep the Atrazine in the upper one or two inches of soil. With leveling or firming completed, apply Atrazine by boom sprayer, helicopter, or airplane at the rate of four pounds per acre, 80% active product. Usually a network of roads are left around and



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through the plantation; these should not be overlooked. It may be well to double spray these roads, thus creating A-1 firebreaks.

One year after plantation establishment, generally in early February, determine if a second application of Atrazine is needed. 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 justify skipping the second spray. With this one exception, Atrazine application should be an annual practice. The recommended annual rate is three pounds per acre.

Restoration of old plantings

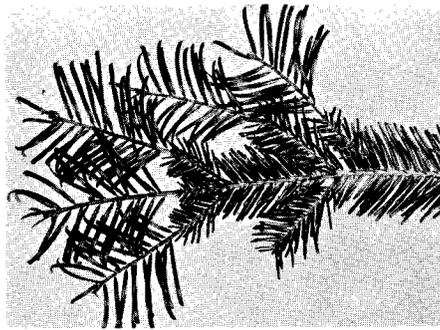
Grass control with Atrazine is practiced on many new Christmas tree plantations. Where this practice is continuous over the rotation of the tree crop, there should be no problem of maintaining good vigor, growth, and color of the trees, providing fertility levels are adequate. But what about "grassed-in" 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 other plantations, however, adequate nutrient levels do a proper job of maintaining the trees and moisture is not as critical.



Trees on left received two consecutive years of Atrazine and show striking difference in color and vigor. Trees on right were not treated. Plantation is seven years old.

Many of the older plantings, however, suffer in varying degrees. Just how badly trees are suffering depends upon the species. The true fir, 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 a metamorphic response to elimination of grass, the toughest competitor. 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 over grass-suppressed true firs in February or early March, a definite color response will be evident by September of the same year. Yel-



Grand fir showed marked increase in growth rate, needle size, and color during six months following Atrazine treatment.

low nobles will turn into dark green nobles, 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. This increase in needle length is most readily noticed on grand fir. During the second growing season, true fir terminals often will stretch out two to four times longer than the previous season's growth. This extra growth, along with the color and general vigor, starts falling off the third year unless there is reapplication of Atrazine. A rate of four to six pounds per acre of Atrazine should be applied as the annual application to be followed by annual applications of three pounds per acre. Another procedure is to apply four pounds per acre every two years after the initial application of four to six pounds.

Douglas-fir and pine showing some winter yellowing or dieback symptoms may or may not enjoy full recovery if permitted to live out their rotations in an atrazine environment. Where fields are only slightly nutrient deficient, trees may recover fully from their nutrient deficiencies and become a useful commodity. In other instances trees brought along in an atrazine environment, especially Douglas-fir, may stay green during harvesting and shipping. But later, at the retail lot they may shed needles.

In all other instances where Douglas-fir is growing in a substantially nutrient-deficient field, Atrazine will keep the trees growing and fairly vigorous, but with considerable yellowing occurring each winter. (Yellowing usually is a progressive malady, extending from October to early April.) In the last two instances, killing the grass, changing the environment, and transfer of available nutrients will bring trees only so far along on the road to recovery and no further. At this point a fertilization program should be added to bring required nutrients to adequate levels.

Experiments are being conducted by OSU researchers to determine adequate nutrient levels in old fields. Temporary minimum rates recommended are:

Potassium (K)	400 lbs./A (actual)
Phosphorus (P)	5 lbs./A (actual)
Calcium (Ca)	400 lbs./A (actual)
Magnesium (Mg) ..	120 lbs./A (actual)

Bringing fields up to these nutrient levels, plus the use of Atrazine, will result in adequate growth rate, maximum vigor, and acceptable color for Douglas-fir and other species.

Weed growth after grass kill

Although continuous applications of Atrazine will keep grass under control, conditions are created that allow numerous weeds to grow and spread over the treated areas. Any combination of bracken fern, trailing blackberries, wild carrot, Canada thistle, and so forth will replace the grass. This secondary invasion of weeds does not nearly represent the threat that the former grass cover did. No weed has such a solid, continuous, and constrictive root system as grass. It is the sheer mass of this root system that keeps trees from receiving necessary nutrients and moisture. In some cases very heavy grass cover has actually killed Douglas-fir trees that had struggled past Christmas tree size.

Bracken fern and blackberries are more of a general nuisance in management operations than a threat to the trees themselves. If weeds become too great a hindrance, the plantation manager may be forced to mow. Because heavier applications of Atrazine may discourage only a few additional weeds, they do not represent an economical approach to the problem.

Benefits of grass control

The primary benefit of grass and weed control is the maintenance or restoration of tree vigor, growth, color, and superior bud formation. There are, however, other benefits that will reduce plantation management costs substantially. Consider the following: (1) Deer browsing on succulent fir shoots is at a minimum or completely eliminated. Deer do not browse continuously on fir shoots; they are principally interested in fresh grass with a supplement of fir shoots. If the grass is entirely gone, the young Douglas-fir or true fir plantation offers little in the way of a complete meal. Deer prefer to browse alternately on grass and fir shoots. If a clean field is maintained, the plantation manager needs not spend money on deer repellents. Repellents, plus application time, are costly where large acreages are involved. (2) Mice and gophers need a grass cover for food and protection. If grass is absent, hawks and owls make short work of these rodents. (3) Mowing grass and weeds costs ten times more on a per tree basis than chemical control. If grass and weed control is started early, mowing may not become necessary for many years, if at all. Weeds or fern may invade towards the end of the Christmas tree rotation, and mowing then becomes a matter of choice for the manager. (4) The danger of fire in the plantation is almost nil where grass and weeds are absent. It usually means a great deal to the manager to free his mind of this worry.

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