Solve Tree Production Problems

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COMMERCIAL growers are producing trees today in a wider variety of species, and for more purposes, than ever before. Whether for Christmas trees, ornamentals, or timber, all growers are faced with producing good quality trees at reasonable cost. Mortality, insect damage, slow growth, and many other problems contribute to costs of growing trees or add to the risk factor that must be considered as a cost of doing business.

A great deal has been learned about the basic nature of some problems of tree culture in recent years, and chemicals have been used successfully to solve many of them. The purpose of this paper is to illustrate that many problems of tree production can be solved at low cost, and with little risk if they are analyzed correctly and the proper chemical prescription applied.

Growers' Problems Are Related to Environment

Most technical problems of tree growers are based on environment. Some factors are beyond our control; many are controllable today that were not a few years ago. Virtually all problems related to the action of biological organisms or activated by them can be treated with chemicals at a cost that will ultimately reduce the cost per salable tree, or per unit of sales.

Success depends sometimes on control of an organism that is causing damage actively and sometimes on elimination of either flora or fauna that intensify the action of climate and soil. Inasmuch as the agent causing problems may be microscopic or otherwise obscured, selection of the proper chemical treatment requires very careful diagnosis of the problem.

Weed, Fungus Losses Heavy in Nurseries

Weeds and fungi cause heavy losses in nursery beds. Effects from weeds are easy to confuse with signs of some fungi. Watering regimes are generally adequate in nursery beds to prevent excessive mortality from weed-caused drought, but growth and general condition of seedlings is influenced markedly by heavy competition.

The first few weeks after emergence is the period when much mortality occurs, and the stage of growth in which seedlings are weak and succulent is prolonged substantially by weed competition. It is during this period that damping-off fungi take their toll.

Application of fungicides may cause temporary reduction of activity of harmful fungi. But, failure to provide good control of weeds can prolong the sensitive period until harmful fungi are once more active; hence a combined treatment for fungi and weeds may be justifiable. Recent work with herbicides for weed control in nurseries has indicated that some beneficial physiological response to the herbicide has been exhibited by conifer seedlings. There is evidence that some soil fumigants may produce the same response, together with their potential for control of weeds, fungi, and nematodes.

The likelihood of damage from the above biotic agents may be reduced with chemical treatments. Control measures will be required less frequently if other cultural techniques are applied that will promote growth of large, healthy stock — especially such techniques as applying fer-

New injection system permits accurate placement of systemic herbicides and insecticides at up to 600 trees per hour.

Chemical thinning or cull tree control in saw-timber stands pays handsome dividends. Two examples of this can be seen at left in the last five growth rings after hardwood control in Douglas-fir forest.

tilizers needed to insure a good balance of nutrients, and planting at wide enough spacing to avoid crowding in the nursery beds.

Outplanting Losses Are Far More Costly

Mortality of seedlings and saplings after transplanting is much more costly than mortality in the nursery because of the investment in planting and loss of time in development of the planting. Herein also lies the greatest opportunity for improvement of results with the application of chemicals.

Most losses of trees after outplanting are related to competing vegetation in some way; much of the trouble is from drought alone, caused by depletion of available moisture supply by weeds. Selective chemicals and methods that permit good control of weeds in conifer plantings with no adverse effects are presently in use, and in many instances cause some stimulation of growth. Chemicals of the striazine group have been registered for this use, and have improved vastly the success of plantings in the Pacific Northwest, where weeds and drought are serious problems.

Herbicides may be used to greatest advantage only if the whole operation is considered when selecting procedures. Weed control chemicals are usually most effective if incorporated into the surface soil. Toxicity symptoms may develop if incorporated too deeply, or if the roots of planted stock are too shallow. Heavy soils to be planted with large numbers of trees of resistant species may be pretreated and machine-planted for a minimum cost per tree.

If incorporation is not desired, triazine herbicides may be applied directly over conifer plantations already in the ground. Atrazine is recommended specifically for this use on heavy soils of the Pacific Northwest and has eliminated the need for virtually any other weed control measures during the year of establishment.

Method of application depends on available equipment and the size of the operation. Spot treatments around individual trees are often recommended and have the advantage of ease of application for small-scale plantings. Band treatments provide weed control in the vicinity of individual trees or rows and may be applied with better control of dosage than is possible with spots.

Precision of application may be very important when degree of selectivity is marginal, as on some light soils where complete weed control is not needed. Where possible, broadcast treatment should be used to provide maximum benefits. Broadcast applications permit closest control of application rates, eliminate transpiration losses from peripheral weeds, and reduce habitat for rodents and other browsing and clipping animals. These considerations are especially important in forest and Christmas tree plantations, but also apply to transplant beds in nurseries and other plantations.

In all plantations, first-year survival is of paramount importance. Much of the mortality resulting from the action of biological agents may be avoided by intelligent use of herbicides. Good planning and optimum allocation of resources can accrue benefits for several years as the result of a single application.

Sapling Culture Important When Survival Is Probable

Growth habits, color, and form of trees have always been considered manifestations of inherent genetic characteristics over which there has been little control. These features become of substantial importance after the tree is well enough established that survival is probable, and measures may be sought to improve marketability, appearance, growth rate, etc. Fortunately, desirable form, color, and growth rates usually occur together. Treatments designed to promote one feature will frequently enhance all.

Under circumstances where growth is too rapid for proper form, and where such vigor is necessary to achieve desirable color, trees in good health often respond well to shearing or pruning. Measures taken to reduce growth without shearing frequently result in poor color and reduction of leaf size, and are not generally recommended where tree appearance is of value.

Treatments used to improve general vigor of trees usually involve reduction of competing weeds or brush. These may be combined with fertilization and watering. One of the most common applications of weed control in sapling plantations is in Christmas tree culture, where cultivation has been practiced in the past decade to promote growth and color of trees. More recent has been the adoption by some growers of complete weed control applications.

Atrazine for herbaceous weed control has been applied by aircraft over plantations up to harvest age to improve uniformity and color, and to enhance density of branching and budding. This practice has increased percentage of trees in high market grades, reduced culls, and reduced rotation length by one to several years. Elimination of weed cover has reduced or eliminated need for fertilization for satisfactory Christmas tree growth on many plantations. Phenoxy herbicides may be applied before bursting of buds of conifers other than pines for selective brush control.

Young trees are often subjected to heavy damage from a wide variety of animals. Measures to protect trees are costly, and may cause mechanical injury nearly as severe as injury of some animals from which they are protected. Pure stands of tree seedlings or saplings are seldom complete habitats for animals that cause damage. Small rodents and rabbits depend on herb cover for protection and food; deer will seldom seek trees exclusively if other forage is available.

Complete weed control for two or more years reduces effective animal habitats temporarily without injuring the animals themselves, and at the same time provides for a vigorous spurt of growth that may well place trees out of reach of serious damage. Effects of these treatments may persist for the life of the plantation, because released trees seldom return to their former slow growth. Moreover, trees developing in the uniform environment of a weedless culture are much more even in size and shape.

Chemical Tree Kill Offers Great Promise

Natural forest stands seldom have optimum composition of species and spacing of desirable trees. Until recently, alternatives in management have been limited to doing nothing toward stand regulation, or to doing it mechanically. Chemicals have been developed for tree injection that will kill almost any unwanted trees at low cost, permitting culture of uniformly desirable trees with little investment. If stands are treated in the large sapling stage, there will never be appreciable loss of growth in merchantable trees.

Application of this simple practice in forest management requires only a little professional direction, yet has the potential of bringing to maximum productivity almost any forest where the soil is occupied completely by trees. If this practice alone were applied to all the commercial forests of the United States where it was needed, it is likely that all projected demands for forest products in the foreseeable future could be met,

Trees planted in sod are subjected to severe competition for moisture and nutrients. Heavy cover harbors many rodents.

Mechanical scalping reduces competition briefly. Local cover attracts rabbits, deer and other animals that damage seedlings.

Selective control of trees in mixed stands favors desirable species only. Trees at left are badly suppressed, while released trees on right will need no further treatments.

with great improvement in quality at the same time.

Harvesting trees for sawtimber is an expensive business, and often contributes hazards to adjacent forests from fire and insects. Foresters soon will be seen in the woods marking timber with chemicals that will kill the tree to be harvested, protecting the drying timber from insects and fungal stains, and eliminating the accumulation of trash with dry leaves. Reduction of weight with increase in strength will permit loggers to fell timber with less breakage, and to ship logs at lower cost. As a conservation measure, this practice will permit the handling of marginal timber that has heretofore been left in the woods because of the cost of handling.

Insects and Fungi Are Constant Tree Threats

Throughout the life of a tree or forest, insects and fungi represent constant threats, ready to exploit any weakness or entry. Occasional insect outbreaks in forests have been treated with broadcast applications of insecticides.

The use of insect sprays in forests and on shade trees has become a highly emotional issue, and the subject of much controversy. Actually, the treatments now used are often monitored closely, with the finding that most forms of life are little disturbed. Forest pest control operations eventually will include systemics in sensitive or high-hazard areas.

Systemics may be introduced into trees by injection with no environmental contamination whatsoever, and the tailoring of formulation and season to the target insect will permit the restriction of most of the insecticide to the specific tissue on which the target insect is feeding. Some of these treatments

Decreasing rate of growth indicates heavy competition. Weed or brush control alone may greatly improve sapling vigor.

will ultimately be suitable for insects that feed on phloem tissue, since these are inaccessible to broadcast spray treatments. Considering the importance of sapsucking and bark feeding insects on shade trees and in forests, systemics almost certainly will be used widely as soon as the technological picture is complete.

Chemical Management From Seed to Maturity

To summarize the picture, it is obvious from the few examples cited that a great many problems of tree culture may be solved with chemicals. Nurserymen, foresters, and shade tree specialists have, until now, been growing trees partly or entirely by hand or machine. The discoveries of the past few years have made many hand methods archaic because of their cost and the quality of results.

Safe, effective herbicides are now in use in many nurseries, bringing great savings in weeding labor. Fumigants have been used to solve nursery soil problems that had all but eliminated production of high-quality trees. Site preparation and sustained weed control in outplanting areas have improved survival immensely and have contributed to uniformly vigorous growth and fine appearance of saplings at considerable savings in cost per unit of growth or return. The excellent condition of trees grown under sustained weed control renders them much more resistant to disease and insects, reduces opportunities for animal damage, and lessens the risk that has been such a factor in production of trees.

Cost of removing undesirable trees has dropped to a few cents per tree, or less, for chemicals, and equipment is available that permits application to large numbers of trees at minimum labor cost and with negligible toxic hazard. The same equipment is useful for systemic insecticides, permitting low-cost control of insects that have been previously inaccessible.

There has been, without question, a chemical revolution in the woods. There are few problems of a biological nature that cannot be solved more economically, and in many cases more safely, with chemicals than with existing nonchemical methods. Opportunities for application of this technology are almost limitless, and the values enormous. Jobs will be created, rather than lost, because many jobs can now be done economically that have been left undone in the past.

Chemical industries can and should enter into research and development with an understanding of the objectives of tree growers. Once the liaison is established, the industries can do for tree growers as much or more than has been done in agriculture. On this scale, cooperation (or perhaps it should be called symbiosis) will make the growing of trees a far more attractive enterprise than has ever before been possible.

Use Right Chemical Tool For Weed Control

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Many herbicides require an actively growing plant to absorb and translocate the chemical to a remote site of action. Underground stems, or rhizomes, of certain plants cannot receive direct treatment with herbicides. Summers are usually dry and hot; winters usually wet and cold. Under these conditions, vegetative growth is reduced and the situation is not ideal for application of herbicides.

A high degree of selectivity in a herbicide may, in some situations, be a mixed blessing. Despite its remarkable potency against certain weeds and its favorable margin of safety in lawn grasses, a particular herbicide simply may not be effective against all weed species in a mixed infestation.

In such situations, a combination of two or more herbicides, applied either sequentially during the season or mixed for application, may be indicated. In areas infested with crabgrass and mixed broad-leaved weeds, for example, crabgrass may be best controlled with a preemergence herbicide, but early post-

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