1958

OHIO AGRICULTURAL EXPERIMENT STATION

RECOMMENDATIONS FOR

NURSERY STOCK, TREES, SHRUBS

AND TURF

Prepared by:

Department of Horticulture
Department of Agronomy
Department of Botany and Plant Pathology
Department of Zoology and Entomology

Mimeograph Publication No. 161
Forward

This publication is prepared in connection with the 29th Annual Short Course for Arborists, Landscape Gardeners, and Nurserymen. It contains brief recommendations on (1) Insect and Disease Control, (2) Chemical Control of Weeds in Nursery Areas, (3) Some Turf Problems, (4) Production of Nursery Stock in Containers, and (5) Foliar Analysis as a Means of Determining the Nutritional Requirements of Trees.

The information presented here must, of necessity, be brief. Additional information may be obtained by contacting the various research workers indicated.

Pest Control

At the end of each year the nursery insect and disease inspectors of the State Department of Agriculture prepare a list of the most frequently-found troubles. The insects and diseases mentioned below are those found most frequently in nurseries in Ohio during 1957.

Insect Pests

Dr. R. B. Neiswander, Department of Zoology and Entomology, Ohio Agricultural Experiment Station, Wooster, Ohio.

The Spruce Spider Mite is the "red spider" that commonly occurs on spruce, arborvitae, and juniper. It can be controlled with one of the following miticides which remain effective for a relatively long period of time. They can be applied whenever the mites appear, but are most often needed in May or September.

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Quantity in 100 gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ovex (Ovotran)</td>
<td>2 pounds</td>
</tr>
<tr>
<td>Kelthane, 18.5%</td>
<td>1.5 pints</td>
</tr>
<tr>
<td>Trithion, 37%</td>
<td>1 pint</td>
</tr>
<tr>
<td>Delnav, 30%</td>
<td>1 pint</td>
</tr>
<tr>
<td>Chlorobenzilate, 25%</td>
<td>3 pounds</td>
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The Two Spotted Spider Mite is the common red spider that occurs on roses and many other deciduous ornamentals. Malathion has been widely used for the control of this pest, but seems to be losing its effectiveness in some localities. Other effective materials are Kelthane, Aramite, and Chlorobenzilate. Ovex may cause leaf drop if used on roses.

The Taxus Moalybug continues to be one of the most troublesome insect pests in Ohio nurseries, and attacks all types of yews. Its presence is indicated by the conspicuous masses of white fibers on the branches where eggs are deposited. Parathion at the rate of 3 pounds of 15% powder per 100 gallons is perhaps the most effective material readily available for the control of this pest, but it must be used with caution. Malathion at one quart of 50% emulsion or 4 pounds of 25% powder may also be used. Two applications with an interval of 10 days may be needed to control heavy infestations. Sprays are most effective in late May and early June.

Bagworms were troublesome only in southern Ohio for many years but now may occur anywhere in the state. They cause most damage on arborvitae and juniper. Sprays for the control of bagworms should be applied in late June or early July when the larvae are small. Dieldrin at the rate of 2 pounds of 50% powder per 100 gallons is very effective at that time. Malathion at the rate of one quart of 50% emulsion is more effective in control of larvae that are fully grown.
The European Pine Shoot Moth is a severe pest of red pine in northern Ohio. The brown larvae burrow into the new shoots during April and May and either kill or distort them. A liberal application of DDT at the rate of 4 pounds of 50% powder in 100 gallons will control this pest. The spray should be applied in mid-April when the buds are swelling or between June 25 and July 5 when the eggs are hatching.

The Juniper Scale is responsible for much of the brown discoloration on Pfitzer juniper. Only five other pests were found more often in Ohio nurseries during 1957. The materials suggested for the control of mealybugs will control this pest. Because eggs continue to hatch through June and part of July the optimum time for a spray application is late July or August.

Borers in Shade Trees can be controlled by maintaining a deposit of DDT or parathion on the trunks during the period of egg deposition. One gallon of 25% DDT or 2 pints of parathion emulsion per 100 gallons may be used. Three applications at 20-day intervals beginning May 20 will control most borers.
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Insect. Pests  
Dr. Ralph H. Davidson, Department of Zoology and Entomology, Ohio State University, Columbus, Ohio.

<table>
<thead>
<tr>
<th>Pest</th>
<th>Use one of the following per 100 gallons H₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oyster Shell Scale</td>
<td>2 lbs. 50% W.P. malathion; 1 qt. 50% EM. malathion; 1 lb. 25% W.P. parathion; 1 qt. 25% EM. parathion; 2 lbs. 50% W.P. parathion; 2 lbs. 50% W.P. DDT; 2 qts. 25% EM. DDT.</td>
</tr>
<tr>
<td>NOTE: All these materials are more effective if applied just as the overwintering eggs are hatching (about June 1). DDT alone is effective only if applied during this period. Combination sprays of DDT with parathion or malathion have been employed with success.</td>
<td></td>
</tr>
<tr>
<td>Buonymus Scale</td>
<td>Use malathion and parathion, as suggested for oyster shell scale, with the dosage of W.P. increased by 1/2 lb. and of EM by 1 pint. Systox at 1 to 1 1/2 qts. 50% EM. has given good control. A delayed dormant spray of 4 to 5% summer oil emulsion followed by a 2% oil emulsion in May is also of value in control.</td>
</tr>
<tr>
<td>Golden Oak Scale</td>
<td>Apply highly refined summer oil emulsion at the rate of 3 to 4 gals./100 gals. water before the buds swell in the spring.</td>
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<tr>
<td>Maple Bladder Gall Mite</td>
<td>Apply one of the following early in April before the buds swell: liquid lime-sulfur, 1 part to 9 parts water; malathion, 2 lbs. 50% W.P.; parathion, 1 1/2 lbs. 25% W.P.;</td>
</tr>
<tr>
<td>NOTE: lime-sulfur discolors painted surfaces and parathion is highly toxic to all animal life.</td>
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</tr>
<tr>
<td>Azalea Mite</td>
<td>Malathion, 2 lbs. 50% W.P.; apply thoroughly beginning late June through August.</td>
</tr>
<tr>
<td>Spruce Gall Aphids</td>
<td>Liquid lime-sulfur, 1 part to 9 parts water; dry lime-sulfur, 16 lbs./100 gals. water; nicotine sulfate, 1 pt./100 gals. water plus 3 lbs. of soap powder. Apply in the spring (usually April) before new growth begins.</td>
</tr>
<tr>
<td>Pine Sawflies</td>
<td>2 lbs. 50% W.P. DDT; 5% DDT dust; 4 lbs. lead arsenate plus 2 lbs. wheat flour as a sticker. Make applications when larvae appear.</td>
</tr>
<tr>
<td>Tip Dwarf Mite</td>
<td>Dry lime-sulfur, 1 lb./10 gals. water applied thoroughly in April before new growth starts.</td>
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Juniper Webworm
Apply one of the following as soon as overwintering larvae begin to feed:
3 lbs. lead arsenate plus 2 lbs. wheat flour;
2 lbs. 50% W.P. DDT plus 2 lbs. 50% W.P. oxen;
1 1/2 lbs. 15% W.P. parathion.

Pale Juniper Webworm
Control same as for the Juniper webworm but make applications in the fall (Aug. 15 to Oct. 15).

Plant Diseases
Dr. C. Wayne Ellett, Department of Botany and Plant Pathology, Ohio State University, Columbus, Ohio.

Flowering Crab and Hawthorn

Rust. There are three of these rusts -- cedar-hawthorn, cedar-apple, and cedar-quince rust. The first two result in orange leaf spots. Cedar-quince rust is a disease of fruits and stems. The alternate hosts of all these rusts are species and varieties of juniper (red-cedar). Spray ferbam plus wettable sulfur 1/2-3 - 100 or ferbam 1 1/2 to 2 - 100. Apply two to four times at 7 to 10-day intervals; begin when the orange spore masses appear on junipers. This is usually about the pink stage of apple flower buds.

Rose

Black Spot. Captain or ferbam 2 - 100 plus sticker spreader or ferbam-sulfur dust 10-90. Apply at weekly intervals, often during rain periods early in season when plants are growing rapidly. Less frequent spraying during dry periods. Manet or zineb at 1 1/2 to 2 lbs. per 100 gal. may be tried. If powdery mildew is a problem, wettable sulfur or Karathone (Miller) may be used with either ferbam or captain.

Juniper

Twig Blight. When feasible prune and destroy affected twigs and branches. Spray with 8-9-100 bordeaux or fixed copper (5%) hydrated lime 4-8-100 or ferbam 2-100 or try organic mercury (Puratized Agr. Spray or Tag 331) 1 pint in 100 gal. A sticker spreader should be used. Begin with new growth and at 10-day intervals for five applications.

Mertbam and Kromad have been promising in some recent experimental tests in Rhode Island.

Rusts. Two kinds cause reddish-brown galls and a third swollen stem cankers. Conspicuous orange, soft spore masses form on these galls and cankers in late April and early May. Rusts get started on Junipers by spores from apple and hawthorn during July and August. Use ferbam plus wettable sulfur 1-4-100. Begin by mid-July and at 21-day intervals for three applications.

Iris

Leaf Spot. Zineb or Captain 2 - 100 plus sticker spreader. Applications at 7 to 10-day intervals through the season may be necessary depending upon frequency of rain.

Chrysanthemum

Leaf Spots (Septoria) and Rust. Captain or ferbam or zineb 2 - 100 plus sticker spreader at weekly intervals during rain periods -- less often during dry periods. Propagate only from disease-free stock.
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Other Diseases

Verticillium Wilt. Maples, Elms, Redbud, Barberry, Catalpa, and many other hosts - both woody and herbaceous. Sprays or dusts are of no value. May be spread by pruning - so take proper precautions. Do not propagate from affected plants.

Virus Diseases - Mosaic, Stunt, etc. on many different hosts. Avoid vegetative propagation from diseased plants. Follow entomologists recommendations for insect control.
CHEMICAL CONTROL OF WEEDS

General Statement
Dr. E. K. Alban, Department of Horticulture, Ohio Agricultural Experiment Station, Wooster, Ohio

WEED CONTROL IN NURSERY PLANTINGS

A successful weed control program for nursery plantings should start with a relatively weed-free field prior to lining out nursery stock. The control of weeds before planting can be achieved through cultural and/or chemical methods. Particular effort should be made to eliminate noxious and difficult to control perennial weeds such as quackgrass. Many perennial weeds can be controlled with minimum difficulty through proper use of chemicals before planting and yet may be very costly or almost impossible to control after the crop is planted. For instance, Dalapon, Amino triazole, or Sodium TCA have all been used to control quackgrass and are all far safer and more effective when used before crop planting.

The control of many annual broadleaf and grassy weeds in established nursery plantings has been accomplished with several chemicals. Perhaps the two most important chemicals have been monuron (Karmex) and Crag Herbicide 1 (Sesone). At the normal rates used these two chemicals must be applied on the soil before weed seedlings emerge and neither is effective against established weeds.

The great number of ornamental plant species grown by the nurseryman and the variable tolerance of these species to herbicides poses a real problem in making recommendations. It is essential that any nurseryman who plans a program with herbicides obtain the best information available on species tolerance to a given chemical as well as rate per acre, method and time of application, and also how best to fit this chemical weeding program into the regular cultural procedures.

CHEMICAL CONTROL OF WEEDS IN NURSERY AND PLANT BED AREAS

Dr. L. C. Chadwick, Department of Horticulture, Ohio Agricultural Experiment Station, Wooster, Ohio
W.D. Chambers and Bryson James, Department of Horticulture, Ohio State University

SEED AND TRANSPLANT BED AREAS

Satisfactory weed control in seed and transplant bed areas can be obtained by steam sterilization, or the use of such materials as Methyl bromide, Nylone and Vapam. Other than by steam sterilization, Methyl bromide at the rate of 2 pounds per 100 sq. ft., has given the best degree of weed elimination. Nylone at 3/4 pound per 100 square feet of bed area and Vapam at 1 quart per 100 square feet should greatly reduce weed population for a period of 5 to 8 weeks.

GENERAL NURSERY WEED CONTROL

Ornamental plants vary in the degree of tolerance to herbicides. Many herbicides, however, should prove useful and non-toxic to nursery stock if used correctly. Most of the work on the chemical control of weeds in nursery and plant bed areas conducted by the above staff members has been done in a taxus nursery. How readily these data can be applied to other plant areas is not known at present, although there is considerable evidence of the tolerance of many kinds of
herbaceous perennial and woody ornamental plants to SES (Crag Herbicide) when properly applied.

On the basis of the work done during the past 5 years, a combination of SES, 4 pounds per acre and Karmex (CMW), 1/2 pound per acre, has given the best degree of weed reduction and elimination in a taxus nursery. When the herbicide is applied to weed-free areas previous to weed seed germination, the treatment will be effective in weed control for 5 to 8 weeks. Soil temperature and moisture are influencing factors.

**DELAYING EARLY SPRING GROWTH OF WEEDS**

A directed spray of Maleic hydrazide (MH-30), applied March 30, to young weeds in a nursery containing Taxus, Pfitzer juniper, Thuja, Cotoneasters and Euonymus alatus compacta at the rate of 0.5 per cent, severely retarded growth of weeds for a period of 6 weeks. The chemical was especially effective for controlling chickweed, rye, common pimpernel and Downy brome. Quack grass, 3 to 4 inches high when treated was only 4 to 6 inches high after 6 weeks compared to 12 inches in untreated areas. There was no apparent injury to the nursery stock.

**CONTROL OF BROADLEAF WEEDS AND GRASSES IN SHADE TREE BLOCKS**

One application of Amino triazole (Amizol) at the rate of 4 pounds or 6 pounds per acre reduced the prevalence of several broadleaf weeds in shade tree blocks 70 to 80 percent for a period of 3 weeks following the application of the herbicide. Where a second application was applied 6 weeks after the initial application, weed prevalence was reduced 40 to 50% for a period of 8 weeks. Many of the broadleaf weeds were eradicated and the grasses were severely stunted.

**CANADA THISTLE**

Two applications of Amino triazole (Amizol) at 4 pounds per acre completely eliminated Canada thistle growing abundantly in a block of Taxus cuspidata intermedia without causing serious injury to the Taxus. The first application was applied June 25 to rank growth of thistle in the blossom stage. On July 12 the plots were cleaned by hand hoeing and machine cultivation. A second application was made on September 7 when some regrowth of the thistle had reached 6 to 8 inches in height. Amizol treated plots were practically free of thistle for the remainder of the fall and the following spring and summer seasons.
Some Thoughts on Timely Lawn Questions

R. R. Davis
Ohio Agricultural Experiment Station


I. What is a good lawn mixture?

If mixtures are used at all they should be kept very simple. The grass should be selected to fit the purpose for which it is intended.

a. Bent grass for a short cut "professional" lawn. Should not be used unless the owner is willing and able to give it the care it needs or hire a professional.

b. Merion bluegrass for a better than average lawn that needs more fertilizer and more mowing than common bluegrass. Should not be used unless it is to receive 3 to 6 pounds of nitrogen per 1000 sq. ft. per year.

c. Common Kentucky bluegrass for a utility lawn that can be kept "decent" with less effort than Merion bluegrass requires.

d. Red fescue for a "minimum maintenance" lawn or shaded lawn.

Never use bentgrass in a mixture where you wish some other grass to dominate.

A small amount of bent (10% or less) in a mixture will eventually be all bent.

Bluegrass and red fescue work well in a mixture. Which grass dominates depends on the treatment it receives and whether shaded or not.

There are only two good reasons for using a quick growing "nurse" grass in a mixture if lawn is seeded properly at right time:

(a) To satisfy the ignorant customer who expects to see a green lawn a week after it is seeded.

(b) To help solve a bad erosion problem.

Never use small amounts of timothy or tall fescue in a lawn mixture.

II. Should other grasses be mixed with Merion bluegrass?

In most cases Merion should be used alone except where shaded and then with red fescue. A mixture of 40% or more Merion with
red fescue has worked well in sunny areas if there is a reason to speed up the rate of ground cover. The sod is essentially all Merion after a year if the nitrogen that Merion needs is applied. There appears to be little need for mixing Merion and common Ky. bluegrass. Never seed bentgrass with Merion.

III. What mixture for heavy use recreational areas?

All the grasses under (I) except bentgrass are very wear-resistant. Never use bentgrass on athletic fields or similar areas. Where soil condition is particularly bad, tall fescue (Ky. 31) has some advantages. If used, tall fescue should compose most of the mixture and a heavy seeding rate used. This is to avoid clumping of the fescues. About 90% tall fescue and 10% bluegrass at 4-5 lb. per 1000 sq. ft. is suggested. Fescue should be mowed at least 2" high.

IV. What about Urea-form nitrogen for fertilizing sod areas?

Ammonium nitrate (and other inorganics), sewerage sludge (and other organics) or urea-form will all do a good job of supplying nitrogen to grass if properly used. Urea-form is not likely to burn grass but there is enough free urea in it to burn if overdone. Urea-form is slowly available and apparently takes about twice as much total nitrogen to do the job as when using a more readily available source. Grasses having a high requirement for nitrogen such as bentgrass and Merion bluegrass seem to need more than one application of urea-form per year.

V. What's the best crabgrass control chemical?

Bentgrass and Merion bluegrass make a dense sod that keeps out crabgrass. Crabgrass will not be a serious problem in common bluegrass and red fescue if mowed 2" high or higher and fertilized moderately. When crabgrass is a problem, early post emergence treatment with PMA (Phenyl mercuric acetate) or DSMA (Disodium methyl arsonate), or late post emergence with DSMA have been satisfactory. Pre-emergence chemicals have been erratic.

Not for publication
Production of Nursery Stock in Containers

Dr. Kenneth W. Reisch, Department of Horticulture, Ohio Agricultural Experiment Station, Wooster, Ohio, and Robert Setzer, Department of Horticulture, Ohio State University, Columbus, Ohio.

Work has been conducted at the Ohio Agricultural Experiment Station for the past seven years on the production of nursery plants grown in metal containers. This past year, problems in fertilization, watering, pinching, and winter protection were studied. From these and past results, the following recommendations are made.

A canning media of 1 part loam soil, 1 part sand, and 1 part peat moss has proven very satisfactory for most types of nursery stock. Some adjustment should be made in this proportion in the case of Taxus where excellent drainage is necessary. Ericaceous plants such as Pieris and Azaleas should be grown in a media higher in peat moss than the 1-1-1. Where shipping weight is a factor, some light weight substitute for the sand and soil components can be used.

A higher quality plant resulted when hand watering was used. However, the cost of labor makes it economically desirable to use one of the many types of automatic watering systems.

Fertilization of plants with a water soluble fertilizer applied through a hose has been used and is satisfactory. A complete fertilizer with nitrogen in the urea form was incorporated into the soil mix before canning and results thus far are good. This practice should not be followed, however, when hardwood cuttings are to be stuck directly into the can.

Pinching of some of the more vigorously growing plant types develops a more compact plant. Good results were obtained with 2-3 pinches of terminal growth throughout the growing season.

Results from winter protection studies carried on at the University indicates during the winters '55-56 and '56-57 that with some plant types the only protection necessary is to set the cans close together. Other plants will require mulching through the winter. A list of some of the plants studied and recommended protection follows.

Plants which should be mulched in over winter.
Abelia grandiflora
Berberis thumbergii atropurpurea
Cornus florida
Cotoneaster apiculata
Ilex creata & Roundleaf *
Liquidambar styraciflua
Mahonia aquifolium
Pyracantha coccinea & Inland
Pyracantha coccinea & Runyon
Syringa vulgaris
Thuja orientalis aurea rana

* Plants should be mulched in before any hard freeze.
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Plants which can be handled by setting cans together (no mulch required).

Chaenomeles lagenaria
Cotoneaster adpressa
Crataegus mollis
Deutzia gracilis
Forsythia intermedia spectabilis
Gleditsia triacanthos C Moraine
Ligustrum obtusifolium C Vicary
Lonicera japonica chinensis
Juniperus chinensis C Armstrong
Juniperus chinensis C Hetz
Kerria japonica
Malus purpurea C Eley
Peach, Flowering
Pinus sylvestris
Taxus cuspidata

Corn cobs have proven to be a good mulch, however, further studies are being carried on using pea gravel and a polyethylene cover as possible substitutes.

Snowfence or half shades set tepee style over the plants has given good protection to the tops against wind and sun damage during the winter months. A shield of kraft paper stapled at the base of the lath and extending up 18" - 24" on the south or west side gives additional protection to plants on the edge of the bed.
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Foliar Analysis as a Means of Determining the Nutritional Requirements of Trees

Dr. Kenneth W. Reisch, Department of Horticulture, Ohio Agricultural Experiment Station, Wooster, Ohio, and Thomas Cannon, Department of Horticulture, Ohio State University, Columbus, Ohio.

Foliar analysis is a relatively new procedure which has been developed by the fruit and vegetable research workers to aid them in determining fertilizer requirements of their various crops. Briefly, this procedure consists of collecting leaf samples from the plants and chemically analyzing these samples for the mineral elements which are essential to plant growth. The results of the analyses are compared with previously established "standards" to determine the existence of deficiencies or excesses of the various elements. This procedure has been developed to such an extent for some crops that it is possible to obtain a fair estimate of yield and quality of those crops many months before harvest. If deficiencies of some of the elements are found, they can often be corrected in time to prevent loss of yield or quality of the crop.

Foliar analysis should also be beneficial to arborists and nurserymen in determining fertilizer requirements of shade trees and nursery stock. However, before this procedure can be used for ornamental plants, "standards" must be established. With this in mind, an experiment was started at the Ohio Agricultural Experiment Station in 1955 under the sponsorship of the National Shade Conference. This work was directed at establishing "standards" for some ornamental trees. Included in the experiment were trees of Washington Hawthorn, Pin Oak, Thornless Honeylocust and Moraine Honeylocust. The results of the work indicate that to obtain desirable growth, the July leaf content of the various elements should be as high or higher than the following:

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>Fe</th>
<th>Mn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington Hawthorn</td>
<td>1.67</td>
<td>0.10</td>
<td>0.57</td>
<td>2.29</td>
<td>0.23</td>
<td>137</td>
<td>20</td>
</tr>
<tr>
<td>Pin Oak</td>
<td>2.23</td>
<td>0.11</td>
<td>0.69</td>
<td>0.83</td>
<td>0.15</td>
<td>81</td>
<td>88</td>
</tr>
<tr>
<td>Thornless Honeylocust</td>
<td>2.34</td>
<td>0.16</td>
<td>1.10</td>
<td>1.38</td>
<td>0.01</td>
<td>---</td>
<td>13</td>
</tr>
<tr>
<td>Moraine Honeylocust</td>
<td>2.41</td>
<td>0.12</td>
<td>0.77</td>
<td>1.39</td>
<td>0.19</td>
<td>100</td>
<td>20</td>
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These results are tentative values and can only be used as a guide in future experimental work. More research is required before the data will have practical value. It is hoped that in the not too distant future, arborists and nurserymen will have this procedure available as an aid in solving their fertilizer problems.
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