NURSERY DISEASE WORKSHOP

WESTERN SESSION - MOBILE, ALABAMA

C. E. Cordell[1], T. H. Filer, Jr.[2], W. D. Kelley[3], and C. E. Affeltranger[4]

Introduction

The South presently leads the nation in nursery seedling production and reforestation. During the past 4 decades throughout the South there have been over 15.3 million acres of forest tree plantations established. In the next 14 years, it is estimated that another 34 million acres of conifers and hardwoods will be planted or converted to produce the necessary wood fibre for use by the year 2000. Seedling capacity in our southern nurseries is 1.2 billion, with an annual production of 750 million conifer and hardwood seedlings being produced in 57 state, industry, and federal nurseries.

The greatest variety of nursery seedling species are also produced in the South on the widest variety of soil sites and

---

1/ Nursery, Seed Orchard, and Regeneration Disease Specialist, Forest Insect and Disease Mgt., SA, S&PF, Asheville, N. C.

2/ Plant Pathologist, Forestry Sciences Laboratory, Southern Forest Exp. Station, Stoneville, Miss.

3/ Assistant Professor, Botany and Microbiology Dept., Auburn University Agr. Exp. Station, Auburn, Ala.

4/ Plant Pathologist, Forest Insect and Disease Mgt., SA, S&PF, Alexandria, La.

environmental exposures. Annual seedling production includes over six species of pines, five to six related conifers, and over a dozen species of hardwoods. For example, one state nursery in Virginia produces some 30 species of conifers and hardwoods annually. Nursery sites and environmental exposures range from the mountains of western North Carolina, western Virginia, and eastern Kentucky to the subtropics of southern Florida, and Puerto Rico.

Accelerating operational costs and corresponding high-value products presently realized in our southern nurseries have significantly increased the impact of a variety of disease problems on both conifers and hardwoods. For example, seedling values presently range from $8 to over $200/m seedlings. Nursery pest control costs such as soil fumigation have also nearly doubled during the past 5 years.

Consequently, some of our highest forest resource values are at stake, demanding the utmost in disease protection and affording control action that is uneconomical and/or impractical on other forest resources.

Objectives

The objectives of our workshop today are to review and discuss the major disease problems presently occurring in our southern forest tree nurseries, along with some new control possibilities to reduce their impact. Full participation from all workshop attendees is encouraged throughout our

informal discussions.

Nursery Disease Status and Control

Fusiform rust and soil-borne diseases continue to be the most serious and economically-important problems in southern forest tree nurseries. Root rot and damping-off diseases, caused by a variety of soil-borne pathogenic fungi, have caused significant losses to both conifer and hardwood seedlings in widespread nursery locations.

Hardwood Seedling Disease Problems - T. H. Filer, Jr.

Sweetgum, green ash, yellow-poplar, sycamore, black locust, black walnut, cherrybark oak, and sawtoothed oak are the primary hardwood seedling species being grown in large numbers in nurseries. The most important disease is pre-emergence and post-emergence damping-off. This results in low and unequal seedling density, non-uniform size of existing seedlings, and high production cost. Soil fumigation reduces losses from damping-off but does not give complete control. Results of previous studies show that several systemic and non-systemic chemical seed treatments appear promising for damping-off control.

Cylindrocladium root rot is a major problem in some nurseries. Yellow-poplar, black walnut, and sweetgum are the most susceptible. Nursery beds must be fumigated to prevent losses.

Leaf blotch caused by Gloeosporium is a serious problem of yellow-poplar. The fungus causes leaf loss and mortality of seedlings throughout the growing season, but most mortality occurs during May, June, and July. Defoliation results in death because the seedlings probably do not have enough root reserves to produce new leaves.

Septoria leaf spot and Melampsora rust cause economic losses in cottonwood nurseries by reduction in number and size of plantable cuttings. Rust can be controlled with Benlate®, Kocideand Plantvax® at 10- to 14-day intervals. Disease resistant planting stock is being developed at Stoneville but will be several years before clones will be released for commercial use.

Sodium Azide as a Fumigant in Forest Tree Nurseries - W. D. Kelley

Sodium azide, incorporated pre-plant at rates of 20, 60, and 120 pounds active ingredient per acre, was evaluated over a 3-year period as a fumigant in forest tree nursery beds. During the first year, fungal populations in treated plots were decreased proportional to the amount of azide added; the same was true for the second and third years but the magnitude of differences between treated and control plots decreased each year such that by the third year little difference was observed for total populations of fungi between treated and control plots. Concurrently, populations of Trichoderma spp. tolerant to sodium azide increased with each succeeding year of treatment; the same was true for species of Mucorales, but Penicillium spp. were

little affected by sodium azide. Rapid buildup of antagonistic fungi such as Trichoderma spp. following application of sodium azide may be beneficial in reducing losses of pine seedlings to damping-off diseases.

Bacterial populations also were decreased proportional to the amount of sodium azide added; however, recovery after treatment was inversely proportional to the amount of azide added, with greatest populations 2 weeks after treatment occurring in plots treated with 120 pounds of sodium azide. Tolerance to azide also was observed for bacteria and, as for Trichoderma spp., the number of tolerant colonies increased with each succeeding year of treatment.

Sodium azide applied at the 120 lb/acre rate was comparable to methyl bromide (MC-2)at 580 lb/acre in decreasing populations of nutsedge (Cyperus rotundus). Neither sodium azide nor methyl bromide (MC-2),however, significantly affected development of mycorrhizal roots on the pine seedlings. A subjective evaluation of the seedlings within plots indicated that methyl bromide (MC-2^{e})or sodium azide at all rates significantly improved appearance of the seedlings; for sodium azide, seedling appearance was improved proportional to the treatment rate, with the best seedlings being observed in plots treated with 120 lb/acre of sodium azide. In contrast to methyl bromide, however, sodium azide was not observed to be an effective nematicide in these studies.

Forest Nursery Diseases - C. E. Affeltranger

Anthracnose caused by the fungus Glomerella cingulata (St.) S. & v.S., was associated with the mortality of 31,000 1-0 yellow-poplar (Liriodendron tulipifera) seedlings or 20 percent of the 1975 crop at a Mississippi state nursery. Foliage symptoms included brown stippling, brown blotching, discoloration, and defoliation prior to mortality. Preventive foliage sprays using such chemical fungicides as Berate ®, Decide®, and Difolatae® are now being tested for control efficacy by the Southern Forest Experiment Station.

Two state nurseries in Louisiana and Arkansas are apparently experiencing mortality from phytophthora root rot on 1-0 black walnut (Juglans nigra) seedlings. Nursery beds adjacent to water lines are primarily affected. Disease symptoms involve lesions on lateral roots that are adjacent to the taproot. The disease incidence may be reduced with a combination Turban®fungicide drench applied in the water riser line along with MC-33® soil fumigation of the planting beds--both applied prior to seeding. Similar disease symptoms have also been observed on oak (Quercus sp.) seedlings in the Arkansas nursery.

Based on results obtained from a U. S. Forest Service study, the incidence of fusiform rust has been relatively low at federal, state, and industry nurseries in Alabama, Mississippi, and Louisiana during recent years. The highest rust incidence, which averaged approximately 7 percent, was observed during 1975 on un-

sprayed check plots. A rust incidence of 17 percent, however, was observed in unsprayed check plots in an industrial nursery in Alabama during 1975.

Experimental studies presently being conducted in two nurseries in Alabama and Georgia may produce a more effective and practical control for fusiform rust using a new systemic fungicide. Finally, a cooperative fusiform rust nursery spray study has been conducted by Forest Insect and Disease Management, SA, S&PF and the Southeastern Forest Experiment Station during the past 5 years in 10 nurseries in seven southern states. The objectives of this study are to determine rust impact, ferbam spray efficacy, and control costs for slash and loblolly pine seedlings in high rust-hazard nurseries. Final field data collections will be obtained during the winter of 1976-77 and the results should be available during the spring or summer of 1977.

Cylindrocladium Root Rot - C. E. Cordell

Cylindrocladium root rot, caused by the soil pathogenic fungi *Cylindrocladium scoparium* and C. *floridanum,* has been associated with widespread severe damage to several species of southern hardwood seedlings during recent years. Seedling species damaged most severely and consistently have been black walnut *(Juglans nigra)* and yellow-poplar *(Liriodendron tulipifera)* where 50 percent or more losses have been realized in at least six southern nurseries during the past 5 years. Root rot and damping-off fungus inoculations in the greenhouse

have demonstrated variable disease susceptibility on several commercially-grown species of both hardwood and conifer seedlings.

Root rot symptoms on hardwood seedlings such as black walnut and yellow-poplar involve a highly conspicuous blackening of the tap and lateral roots (particularly on yellow-poplar) frequently associated with a longitudinal cracking of the root cortex. Foliage symptoms and mortality usually occur earlier in the growing season and are much more severe on black walnut than on yellow-poplar.

Cylindrocladium root rot is now known in 15 nurseries in nine southern states. In addition, the disease has been found in one yellow-poplar plantation and one sweetgum (Liquidambar styraciflua) natural stand near Athens, Georgia. More recently. the disease has been found on Caribbean pine (Pines caribea) containerized seedlings in a Puerto Rico nursery and in nurseries and field plantings of several species of both pines and hardwoods (Eucalyptus spp.) in Brazil.

Field plantings of black walnut and yellow-poplar in North Carolina and Tennessee, respectively, showed variable cylindrocladium root rot mortality over a 5-year period. Approximately 75 percent mortality was observed on diseased black walnuts in an eastern North Carolina field planting. Mortality on diseased yellow-poplar in a western Tennessee field planting, however, was ory approximately 25 percent.

Results obtained from cylindrocladium root rot control studies in two North Carolina nurseries showed that the preplant soil fumigant MC-33°(methyl bromide - 67 percent; chloropicrin - 33 percent) was most effective in controlling the disease in nursery seedbeds. MC-33® currently registered for use as a preplant soil fumigant in southern forest tree nurseries. In addition, for the deeper-rooted hardwood seedling species such as black walnut, yellow-poplar, and sweetgum, the soil fumigant was most effective when applied at deeper soil depths (12+ in.) and at higher dosage rates (600-700 lb./ac.).

Consequently, cylindrocladium root rot is presently considered as a very serious disease problem and potential threat in both hardwood tree nurseries and field plantings. Therefore, nurserymen and field foresters should be alerted to the disease and become familiar with disease field diagnosis characteristics, host species involved, and practical control applications.