QUALITY AND FIELD PERFORMANCE OF SLASH AND LOBLOLLY PINE SEEDLINGS GROWN IN NURSERY SEEDBEDS WITH AND WITHOUT METHYL BROMIDE OR ORGANIC SOIL AMENDMENTS

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The use of methyl bromide fumigation has been standard operational practice in forest tree nurseries to control soilborne plant pathogens and other pests. The planned elimination of the use of methyl bromide has emphasized the need to evaluate other potential strategies for pest management. The purpose of this Technology Development Project, funded by the U. S. Forest Service, is to evaluate the quality, health and field performance of pine seedlings produced in the nursery without the use of fumigants. Because certain organic amendments have been shown to have suppressive effects on diseases caused by soilborne plant pathogens, organic amendments also are being evaluated.

Field studies with slash pine seedlings were initiated in the spring of 1993 at the Florida Division of Forestry Andrews Nursery in Chiefland, FL and with loblolly pine seedlings in 1994 at the International Paper Company Supertree Nursery in Blenheim, SC. At both sites the nursery plots were in areas that had been used previously for pine production and had not been fumigated for at least 2 years prior to the initiation of the studies. Fumigated study plots and borders received standard operational treatment with methyl bromide prior to the sowing of each seedling crop. Organic residue-amended plots received annual applications of either pine bark or composted organic materials. Composted organic residues consisted of composted yard waste at Andrews Nursery in 1993 and 1994, aged hardwood bark at International Paper Company Supertree Nursery in 1994, and a commercially available composted municipal waste from Tennessee (Bedminster, Inc.) in both nurseries in 1995 and 1996. These materials were applied as a 2.5- or 5-cm layer and mechanically incorporated into seedbed soils to a depth of 15-20 cm prior to the sowing of each seedling crop. Check plots received no treatment other than routine soil tillage and seedbed preparation which was standard across all treatments. Each treatment was replicated four times. All plots were irrigated, fertilized, and treated with topically applied herbicides as routinely practiced at the particular nursery.

Seedling stands were counted periodically in three permanent subplots in the center of each treatment plot. In addition, seedlings from each treatment plot were sampled shortly after emergence, at mid-season, and at the time that seedlings were dug for transplanting. Plant morphology measurements and tissue analyses were made on seedling samples. Roots from seedlings were plated on potato dextrose agar amended with 0.1 ml Tergitol NPX, 0.25 g ampicillin and 0.01 g rifampicin per liter to determine the fungi associated with plants from various treatments. Soil samples collected at the same times were assayed for nematodes and subjected to chemical soil analyses.

At the end of each nursery year, 50 seedlings from each treatment plot were planted at an operational reforestation site in each of three replicate plots. Survival and growth of seedlings were monitored and measurements were taken at the end of the first growing season following outplanting.

The study in Florida is currently in its fourth year and the study in South Carolina is in the third year. Although pathogenic fungi, including species of *Fusarium*, *Macrophomina*, *Pythium*, and *Rhizoctonia*, and plant pathogenic nematodes (*Mesocriconema*, *Paratrichodorus*, and *Tylenchorenchus* spp.) have been detected at one or both sites, no significant disease development has been observed. Slash pine seedlings grown in methyl bromide treated plots were usually taller than plants from other treatments at the time of transplant. However, at the end of the first growing seasons in the reforestation sites, sizes of seedlings and survival rates were similar in all treatments. Some differences in size of loblolly seedlings have been observed but cannot be attributed as yet to a specific treatment effect. The survival rates of loblolly transplants are the same for all treatments.

The nursery plots were established in areas that had been used for pine production previously without fumigation in order to increase the likelihood of detection of diseases caused by increased populations of soilborne pathogens. The study was continued on the same nursery sites for a number of years to simulate what may happen over time without fumigation and to assess the long-term effects of organic amendments. Because of a lack of root disease development, the evaluation of the effects of organic amendments on disease suppression has not been possible. The lack of disease and failure of seedlings in fumigated soils to develop or perform better than those in unfumigated soils indicates that, under the conditions employed in this study, pine seedlings can be produced without fumigation of soil with methyl bromide.