PEST MANAGEMENT WITHOUT METHYL BROMIDE IN A GEORGIA FOREST-TREE NURSERY[1]

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Production levels of tree seedlings for reforestation of private and public lands in the Southern United States have ranged from 1.1 to 1.65 billion annually. These production levels represent 68-78% of all forest-tree seedlings produced in the United States. For 35 years, nursery managers in this region have relied greatly upon routine soil fumigation with methyl bromide to effectively control soilborne diseases, nematodes, insects, and weeds. Use of this chemical has facilitated meeting the goal of producing large numbers of seedlings that have exceptional quality.

The quality of seedlings and the types of pest problems can vary greatly among nurseries, and would likely be influenced by factors such as management practices, seed quality, soil conditions, and weather. The development of integrated pest management programs for nurseries requires knowledge of the type of pest problems that occur at any particular location and an understanding of the factors that influence the development of these problems.

This project was undertaken to initially determine the incidence and severity of pest problems that will probably occur when methyl bromide is not routinely used. The long-term goal is to develop alternative integrated pest management programs that will ensure the production of high quality seedlings.

Research plots were established at two locations within the Georgia Forestry Commission's Flint River Nursery. One study was established in a field where previous problems had reduced pine seedling production and quality. The field was last fumigated in 1988 and has not been used for production since 1991. In this field, eight plots (each 3 seedbeds wide and 72-m long) were established. Four of the plots were fumigated with methyl bromide; the remaining four plots were not treated. Three plots of each treatment were sown with loblolly pine (*Pinus taeda* L.) seeds; one plot of each treatment was sown with slash pine (*Pinus elliottii* Engel. *elliottii*) seeds.

A second study was initiated in a 4-ha field where operational plantings were established. Six plots (each 3 seedbeds wide and 38-m long) were marked out; three of the plots were fumigated and three were not treated. The entire field was sown with loblolly pine seeds.

In both studies, three permanent subplots (30.5 cm x 122 cm) were established on the center seedbed of each plot to periodically evaluate seedling densities and mortality. Seedlings were measured and evaluated weekly during the first two months following sowing and thereafter monthly. Samples of dead and dying seedlings were collected, examined and plated on various agar media to determine

fungal associations. Soil samples were collected monthly for nematode evaluations. Nematodes were extracted using the centrifugal-flotation technique. Fungal associations with roots were assessed at mid-season and will be evaluated again at the time of lifting.

Seedling densities for loblolly pine have not differed between fumigated and nonfumigated plots in either of the two study areas (Figure 1A and 1B). In the field with a history of past pest problems, the densities of slash pine seedlings have been consistently lower in nonfumigated plots as compared with plots that were fumigated (Figure 1C). However, caution must be used when interpreting the slash pine data because only one plot was planted for each treatment of this species.

Low-level seedling mortality was observed in isolated areas throughout plots and occurred with greater frequency in nonfumigated plots. The mortality was probably caused by insects in some instances; however, in one section of the nursery the mortality appeared to be caused by fungi. *Fusarium* spp. and a Rhizoctonia-like fungus were isolated from roots of diseased seedlings.

Ring nematodes (*Mesocriconema* spp.) were the predominant nematodes extracted from the soil. Monthly population levels of ring nematodes were consistently higher in soil from nonfumigated plots than fumigated plots (Table 1). Average counts in nonfumigated soil were approximately 25 ring nematodes per 100cc of soil; in fumigated plots the average was 1.5 nematodes. Stubby root (*Trichodorus* spp.) and stunt (*Tylenchorhynchus* spp.) nematodes were occasionally extracted from nonfumigated plots.

Poor nutsedge (*Cyperus* spp.) control was a major problem in nonfumigated plots. Reflex^{R} was applied to all plots prior to initiation of the studies. A preplant application of this chemical has provided good nutsedge control in previous years, but in the present study Reflex^{R} was not effective.

In summary, during the first year of this project no major pest problems have been observed, thus far, with the exception of nutsedge. However, this is the first year of a multiyear project, and much remains uncertain about the development of pest problems at the Flint River Nursery. Past experiences at other Georgia nurseries suggest that pest problems in southern forest-tree nurseries may become significant without methyl bromide fumigation. Continued efforts are needed to provide an understanding of the factors that influence seedling losses to pests and to develop alternative strategies for preventing these losses.

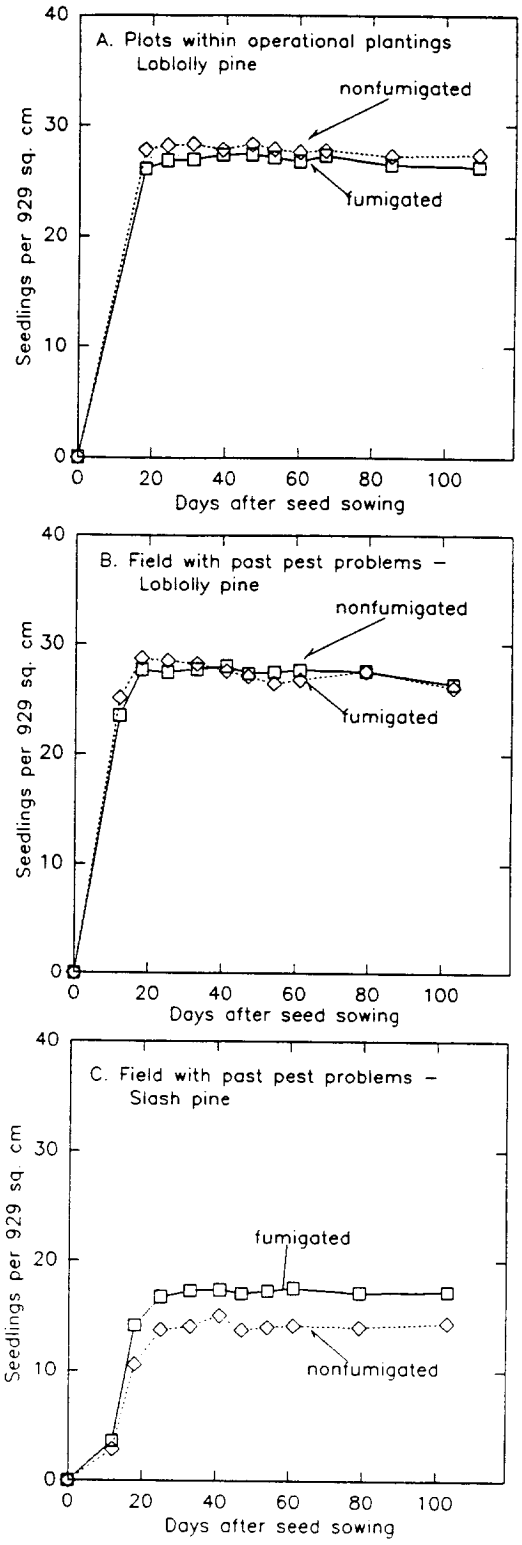

Figure 1. Comparison of the numbers of seedlings per 929 cm^2 (1 ft^2) in fumigated and nonfumigated plots. **A.** Seedling densities in operational field planted with loblolly pine. **B** and **C.** Seedling densities for loblolly and slash pine, respectively, in field that had past pest problems.

Table 1. Ring nematode levels in fumigated and nonfumigated plots in nursery block under operational planting and in nursery block where previous problems were encountered.

Field	Month	Treatment	
		Fumigated	Nonfumigated
Operational	May	0[a]	33[a]
	June	0	29
	July	1	20
	August	3	20
	September	1	27
	Mean	1	26
Problematic	May	0	10
	June	0	23
	July	4	23
	August	3	39
	September	1	23
	Mean	2	24

[a] Ring nematodes per 100 cc soil

[1] The use of trade names or firm names in this publication is for reader information and does not imply endorsement by the U. S. Department of Agriculture of any product or service.

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