Auburn University
Southern **Forest**
Nursery Management
Cooperative

RESEARCH REPORT 01-2

SWEETGUM SEEDLING PRODUCTION BY ALTERNATIVE FUMIGANTS AND EPTC AT THE WESTVACO NURSERY

by
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INTRODUCTION

Most Coop trials evaluating available replacements for Methyl Bromide (MBr) since 1993 have assessed their affects on the production of pine seedlings. Although no fumigant has been as effective as MBr for all its uses, we have demonstrated the short term efficacy of various combinations of fumigants for the production of pine seedlings and for weed control across a range of soil types. Similar research is now needed for southern hardwood species. This trial evaluated the best pine fumigants and application techniques for sweetgum seedlings at the Westvaco Nursery.

These treatment combinations were tested concurrently at the Texas Forest Service Nursery near Alto, TX for two species of oak (See Research Report 01- 3).

METHODOLOGY

Sweetgum (*Liquidambar styraciflua L.*) seedling growth was compared among plots that were not fumigated and plots that received one of four fumigation treatments at the Westvaco Nursery near Summerville, SC during the 2000/2001 season. Treatments were applied to not-bedded ground through a complete riser-line section (58 ft wide) in which nine 400 foot long beds would be sown. Before application, the area was divided into three, 3-bed-wide blocks which were each subdivided into five 3-bed-wide main plots to which fumigation treatments were randomly assigned. This produced a randomized complete block with five treatments. Just before fumigants were applied on November 1, 1999, EPTC was applied to a complete bed in each block at 6 lb ai/ac by spraying on soil surface and rotovation through a depth of six inches. This effectively split plots with respect to EPTC and increased replication for fumigation treatments.

The four fumigation treatments (in lbs/ac) and the application methods are as follows: 1) a standard practice control of 343 lbs of MBr plus 7 lbs of chloropicrin (350 lbs MC2) shank injected and tarped, 2) 500 lbs of Metham Sodium sprayed on the surface and rotovated in plus 200 lbs of shank injected chloropicrin (CMS) not tarped, 3) 250 lbs of chloropicrin alone shank injected and not tarped, and 4) a coded compound (MBR-300) plus 200 lbs of chloropicrin shank injected and tarped.

A single sweetgum family was sown across the study area on April 20, 2000. All post fumigation seedling culture was carried out by Westvaco management using the schedule for the rest of their sweetgum crop. Treatment affects were assessed on October 16, 2000 by harvesting all stems within a 4 ft^2 area in the EPTC treated bed and in a not EPTC treated bed in each fumigation treatment plot. In Auburn, stems were counted, leaves removed, and rcd's measured and stems oven dried and weighed.

Although the weed control aspects of fumigation are presently even more important for hardwood than for pine production, the current study did not evaluate treatment affects on weeds. The study area was managed for seedling production and therefore regularly hand weeded, but these efforts were not assessed with respect to our treatments.

RESULTS

Seedling numbers, rcd's and masses are presented by fumigation and EPTC treatments in Table 1. These seedling parameters did not differ significantly among treatments and there was no apparent interaction between EPTC and the fumigants. Significant differences for seedbed densities between blocks is due to double sowing the non-EPTC treated bed in block 3. However, the affects of double sowing do partition by block and so should not obscure inferences for treatments. Seedbed densities for sweetgum are more variable than those for pine, apparently due to difficulties associated with sowing and germination and not to fumigation treatments.

Seedbed densities were linearly related to RCD's through the range of densities sown (RCD = 9.6 -0.09 seedlings/4 ft^2, $r^2 = 0.82$). Figure 1 presents RCD's by seedlings per plot for all non-EPTC plots. This correlation was significant for all plots (P=0.01), and for non-EPTC treated plots (P=0.01) but not for EPTC treated plots alone (P=0.07) due, at least in part, to the larger range of densities among non-EPTC treated plots, and possibly to affects of EPTC on seedling growth.

Similar studies among pine seedlings usually have demonstrated that effective fumigation controlled weeds and favorably enhanced seedling development so that fumigated plots usually produced significantly more pine biomass than not fumigated plots. The reason that sweetgum biomass was not increased by the treatments in this study is not known. The inference that there was no difference, as presented in Table 1 appears valid (not unusually likely to be type II error) despite large variability in seedbed densities among plots which are most likely due to difficulties of sowing sweetgum. The strong regression between seedbed density and mean RCD among non-EPTC plots across fumigation treatments (Figure 1) indicate those treatments had little affect on the relationship between density and seedling size.

Table 1. Sweetgum seedling development by fumigant, EPTC and Block at the Westvaco Nursery in 2000.

Fumigant†	n	Density #/4 ft^2	Seedling g/4 ft^2	Biomass g/seedling	RCD mm
MC2	6	25.3	162	6.7	7.2
CMS	6	26.8	180	7.2	7.1
MBR-300	6	21.0	165	7.9	7.6
Chloropicrin	6	24.7	171	7.2	7.3
None	6	23.7	164	7.8	7.7
lsd		*8.8*	*28*	*1.9*	*0.9*
EPTC*					
	15	21.9	167	7.8	7.7
No	15	26.7	170	6.9	7.1
lsd		*5.6*	*18*	*1.2*	*0.6*
Block					
	10	24.0 ab	175	7.4	7.5 ab
2	10	20.8 b	162	7.9	7.7 a
3	10	28.1 a	168	6.7	6.9 b
lsd		*6.8*	*22*	*1.4*	*0.7*

† MC2 at 350 lbs/ac tarped, MBR-300 at 400 lbs/ac tarped, CMS is 200 lbs chloropicrin plus 200 lbs metham sodium not tarped. Chloropicrin at 200 lbs/ac not tarped.

* EPTC at 6 lbs ai/ac rotovated through 6" of soil.

MANAGEMENT IMPLICATIONS

These results indicate that sweetgum does not respond to fumigation like pines do. However, sweetgum's obligate requirement for endo-mycorrhizae may influence the fumigation response and is a complex subject. Nursery Managers must be careful about assuming fumigation is not needed based on this one study.

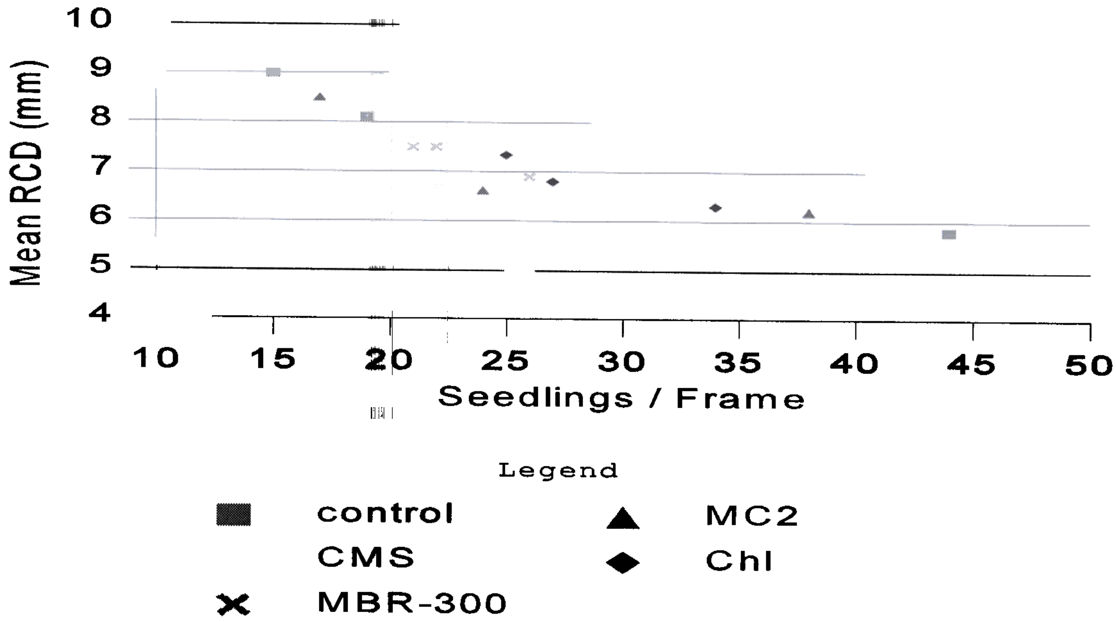

Figure 1. Correlation for seedbed density with RCD's of sweetgum seedlings in non-EPTC treated beds at the Westvaco Nursery in the 2000 - 2001 crop.

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