Auburn University
Southern Forest
Nursery Management
Cooperative

RESEARCH REPORT 00-6

SEEDLING PRODUCTION BY ALTERNATIVE FUMIGANTS, APPLICATION TECHNIQUES AND EPTC AT THE GLENVILLE REGENERATION CENTER IN 1999

by
Bill Carey

INTRODUCTION

Auburn Cooperative trials have recently evaluated most of the registered soil fumigants and combinations of fumigants. At the Flint River Nursery in 1997 and at trials near Glenville, GA. and near Beauregard, LA in 1998 (Research Report 99-2) combinations of chloropicrin plus metham sodium (CMS) produced pine seedlings as well as plots fumigated with methyl bromide (MBr). CMS treatments were all applied without tarps, and with current application technology, tarping CMS requires an addition pass across treated beds. However, since tarping normally increases the efficacy and should increase safety we compared our tested rate of CMS (250 lbs of chloropicrin plus 250 lbs of metham sodium per acre) with a tarped application in which the chloropicrin was reduced an amount (100 lbs/ac) estimated to approximately equal the cost of the tarp. Therefore, the tarped and not tarped CMS treatments in this study should cost approximately the same once equipment to apply and tarp the treatment simultaneously is developed. In addition, an unregistered fumigant (coded here as MBR-200 at the request of the potential registrant) and the preemergent herbicide EPTC (Eptam) were included in the trial. *These treatment combination were also tested at Pearl River in a different but comparable design (See Research Report 00- 5).*

METHODOLOGY

Four fumigation treatments and a control were evaluated at the Glenville Regeneration Center in 1999. Irrigation pipe was not installed and beds had not been pulled when fumigation treatments were applied on March 3, 2000. The study area (roughly 500' on each side) would contain nine riser-line-sections when ready for sowing and was divided, where the riser lines would be, into

three blocks of three riser-line-sections each. Within each block, the three treatments composed of registered fumigants (MBr, and CMS with and without tarp) were each assigned to a complete riser-line-section except, less any subplot for a control or the MBR-200 treatment (see Figure 1 for a typical plot with sub-plot). One subplot was randomly assigned to each of two sections in each block and the control and the MBR-200 was each randomly assigned to one these subplots. Subplots (50ft by 25ft) covered the east-most 50ft of the four beds next to the north riser. Before fumigation, EPTC (6 lbs ai/ac) was applied and rotovated through a depth of six inches across a 25ft wide continuous strip (four passes with a six-foot-wide applicator) at right angle to the east/west bed axis and between 25 and 50ft of the eastern edge. In plots with subplots this crossed both the four-bed-wide subplot and the five beds beside them with the main-plot treatment. The fumigation treatments were therefore a RCB with three blocks of three riser-line sections each, five fumigation treatments per block, and each fumigation at two levels of EPTC.

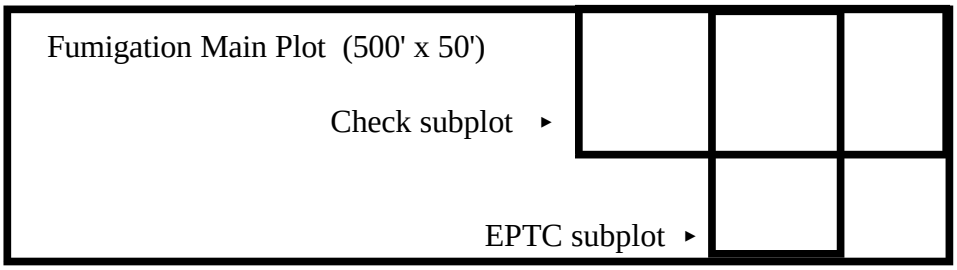

Figure 1. A riser-line-plot (Main Plot) with subplot and EPTC strip.

The MC2 (Methyl Bromide plus 2% chloropicrin) treatment was applied at 350 lbs/ac using standard shank injection and tarped. The CMS treatments were applied by shank injecting the chloropicrin and spraying then rotovating the metham sodium through six inches of soil followed by drum roller compaction of the soil surface. The metham sodium was applied at 250 lbs/ac for both tarped and not tarped CMS treatments (from 80 gal Sectagon®). Chloropicrin was applied at 150 lbs/ac for tarped and at 250 lbs/ac for the not tarped CMS treatments. The MBR-200 (coded designation) was applied at 400 lbs/ac, rotovated and plastic tarped.

Loblolly pine (*Pinus taeda*) seed were sown in beds 1,2,8 and slash pine (*P. elliottii*) seed were sown in beds 4 through 7 in all riser line plots on April 7, 1999. Seedling development and weed abundance was assessed for loblolly in beds 2 and 8 and for slash in beds 5 and 7 on May 7 and again October 7, 1999 for 4 ft^2 plots east, west and in the middle of the 20-foot-wide EPTC treated area. Seedling parameters were converted to units per square foot of bed for analysis. Seedling masses were determined after oven drying for five days at 50°C. All post fumigation seedling culture was carried out by Glenville management using the same schedule as that for the rest of the nursery.

RESULTS AND DISCUSSION

The affects of soil fumigation and pre-sow application of EPTC on the survival and growth of loblolly and slash pine seedlings are presented in Table 1. The EPTC did not affect (P=0.5) either numbers or sizes of either pine species and only the number of grade-1 seedlings differed between

lob and slash seedlings. Therefore, an appropriate analysis is that which compares fumigation affects at both levels of EPTC for both species. Inferences for the affects of treatments at both levels of EPTC for both species. Inferences for the affects of treatments on

Table 1. Seedling development by fumigant and EPTC treatment for loblolly and slash pine seedlings at the Glenville Regeneration Center in 1999.

1.a. For fumigation averaged over EPTC and pine species

Fumigant Treatment‡	Seedling Count May†	October	Ones	Plants	Seedling Size RCD	Shoot	Root
		(No./ft^2)			(mm)	(gms/ft^2)	
Mbr	15.1	15.9 a	3.3	13.5 a	4.3	45 a	8.5 a
CMS(Tarp)	21.1	22.9 b	6.4	18.7 b	4.5	57 c	11.0 b
CMS	18.1	18.8 ab	6.4	17.7 b	4.4	54 bc	10.5 b
MBr-200	19.0	19.8 ab	4.5	17.3 b	4.2	47 abc	9.5 ab
None	18.4	19.9 ab	5.9	17.3 b	4.4	52 ab	10.0 ab
lsd	3.6	3.9	2.9	3.6	0.4	7.4	1.8

1b. For EPTC§ treatment averaged over fumigation and species

Fumigant Treatment	Seedling Count May	October	Ones	Plants	Seedling Size RCD	Shoot	Root
		(No./ ft^2)			(mm)	(gms/ft^2)	
With EPTC	18.4	19.4	5.0	16.1	4.3	52.2	09.4
No EPTC	18.3	19.6	5.5	17.5	4.4	48.7	10.1
lsd	2.3	2.4	1.9	2.4	0.2	4.7	1.1

1c. For pine species averaged over fumigation and EPTC

Species	Seedling Count May	October	Ones	Plants	Seedling Size RCD	Shoot	Root
		(No./ft^2)			(mm)	(gms/ft^2)	
Loblolly	18.1	19.1	4.3 a	16.6	4.2	52.0	10.1
Slash	18.5	18.6	6.3 b	17.4	4.5	49.1	09.7
lsd	2.4	2.5	1.8	2.5	0.3	4.6	1.1

† For May and October data, n=60. Other seedling data (n=50).

‡ MBr = 350 lbs/ac of MC2 tarped, MBR-200 = coded product applied at 400 lbs/ac, tarped, CMS(Tarp) = 150 lbs/ac chloropicrin plus 250 lbs metham sodium under tarp, CMS = 250 lbs chloropicrin plus 250 lbs metham sodium not tarped.

§ EPTC at 6 lbs ai per acre rotovated through 6" of soil.

weeds are not presented. Although control plots were not randomly located (all are near bed ends and this could have been a problem) meaningful inference was precluded more by the fact that almost no weeds survived regular postemergent herbicides.

The primary objective of the current study was to compare the proven effectiveness of a tested rate of CMS applied without a tarp (see Research Report 99-2) to a tarped application in which the chloropicrin was reduced enough (by 100 lbs/ac) to roughly equal the cost of tarping. In fact, although no fumigation treatment differed (P=0.05) from the control, mean numbers and sizes of seedlings were best (that is largest) in tarped CMS plots. The MBr treatment contained the fewest and smallest seedling and for most variables in Table 1 were significantly less than the tarped CMS treatment.

The poor relative performance of the MBr treatment is difficult to understand. Although it is unusual for MBr to differ from the best treatment in any trial, attempts to attribute differences in the current trial to sampling error (by analyzing different subsets of data) all produced roughly the same inferences as those for the complete data set presented in Table 1.

MANAGEMENT IMPLICATIONS

The equivalent efficacy of these two CMS applications (both here and at Pearl River trial) is good news for our efforts to find workable, safe, alternative to MBr. However, cost effective utilization of this treatment requires the development of equipment that will both apply the CMS (which requires rotovation for effective distribution) and tarp in one pass over the soil. Questions about the efficacy of tarping CMS applications became more important after this study was implemented when seedlings in beds around non-tarped CMS applications in Louisiana and in Texas were damaged.

ACKNOWLEDGEMENTS

Hendrix and Dail, Inc. supplied the fumigants and did the applications. The Glenville Regeneration Center personnel maintained the study area, sowing and maintaining the beds using standard management practices for the nursery.