PRODUCING SOUTHERN PINE SEEDLINGS WITH METHYL BROMIDE ALTERNATIVES

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Introduction

Auburn Cooperative trials have recently evaluated many 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 (Carey 2000) combinations of chloropicrin plus metham sodium (CMS) produced pine seedlings as well as plots fumigated with methyl bromide (MBr). Those applications of CMS were all applied without tarps, and with current technology, tarping CMS adds an additional pass across treated beds to an already slow application process. However, since tarping normally increases fumigation efficacy and should increase safety we compared our previously 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, to the CMS treatments, an unregistered fumigant (coded here as MBR-200 at the request of the potential registrant) and the preemergent herbicide EPTC (Eptam) were included in both trials.

Four fumigation treatments and a control were evaluated at Rayonier's Glenville Regeneration Center (Glenville, GA) and at The Timber Company's Pearl River Nursery (Hazelhurst, MS) in 1999. Treatments were applied in GA on March 3 and in MS on March 26, 1999. The plot design with respect to the fumigants was a RCB, with three blocks at both sites. EPTC (6 lbs ai/ac) was applied to part of each fumigation treatment plot and rotovated through a depth of six inches.

The MC2 (methyl bromide plus 2% chloropicrin) treatment was applied at rate for the rest of the host nursery (400 lbs/ac in MS and at 350 lbs/ac in GA) 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 MS on April 17 and both loblolly and slash pine (*P. elliottii*) seed were sown in GA on April 7, 1999. Seedling development was assessed in GA in October and in MS in November 1999 for 4 ft^2 plots. 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 nursery management using the same schedule as that for the rest of the nursery.

Results And Discussion

The affects of soil fumigation and EPTC on the survival and growth of loblolly and slash pine seedlings are presented in Table 1. Because of significant interaction between EPTC and nursery (P=0.5) EPTC data are presented by nursery in Table 1. Most measured variables differed by EPTC treatment at Pearl River but not at Glenville. Pine species did not respond differently and their average response was analyzed in the two nursery analysis. Inferences for the affects of treatments on weeds are not presented because almost no weeds survived regular postemergent herbicide applications.

This study compared the proven effectiveness of a tested rate of CMS applied without a tarp (Carey 2000) to a tarped application in which the chloropicrin was reduced by 100 lbs/ac to roughly equal the cost of tarping. Mean numbers and sizes of seedlings did not differ at either nursery or for the combined analysis of both nurseries. Seedlings developed poorly in the MBr treatments at Glenville but the reason is not known. Attempts to attribute differences 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.

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. The equivalent efficacy of the tarped CMS application is good news in efforts to find a safe alternative to MBr. However, cost effective utilization requires equipment that can apply and tarp the CMS in one pass.

Acknowledgments

Hendrix and Dail, Inc. supplied the fumigants and applications. Nursery personnel maintained the study area, sowing and maintaining the beds using their standard management practices.

Literature Cited

Carey, W. A. 2000. Fumigation with chloropicrin, metham sodium, and EPTC as replacements for methyl bromide in southern pine nurseries. South. J. Appl. For. Vol 24:135-139.

Table 1. Seedling development by fumigant and EPTC treatment for loblolly at MS and for loblolly and slash pine seedlings at GA in 1999.

1 a. By fumigation averaged over EPTC, pine species and nursery

Treatment	Seedlings [a]						
Fumigant[b]	Spring	Fall	RCD	Ones	Plants	Shoot	Root
MBr	20.7	20.0a	4.2	3.3	13.5a	56	10.4
CMS(Tarp)	22.9	22.2ab	4.2	6.4	18.7 b	60	11.9
CMS	23.9	22.8 b	4.2	6.4	17.7 b	62	12.0
MBR-200	22.3	21.5ab	4.1	4.5	17.3 b	58	11.2
None	20.6	21.6ab	4.2	5.9	17.3 b	54	11.7
lsd	2.4	2.3	0.2	2.9	3.6	11	1.8

1 b. By EPTC averaged over fumigation and species in Georgia

EPTC[C]	May	October	RCD	Ones	Plants	Shoot	Root
Yes	18.4	19.4	4.3	5.0	16.1	52.2	9.4
No	18.3	19.6	4.4	5.5	17.5	48.7	10.1
Lsd	*2.3*	*2.4*	*0.2*	*1.9*	*2.4*	*4.7*	*1.1*

1 c. For EPTC treatment averaged over fumigation in Mississippi

EPTC	May	Oct.	RCD	Ones	Plants	Shoot	Root
Yes	25.4	23.8	3.7a	2.3a	15.7	49 a	13.1
No	25.1	23.6	4.4b	7.2b	17.2	87 b	14.0
Lsd	*1.3*	*1.4*	*2.0*	*2.0*	*2.4*	*11*	*1.6*

[A]. Seedling variables except RCD are calculated per square foot. Data in columns May and October are seedlings/ft^2 in those months and n=60. Because all plots were not harvested, other seedling data are for fewer plots (n=50).

[B]. 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.

[C]. EPTC at 6 lbs ai per acre rotovated through 6"of soil, presented by nursery due to significant interaction by site.