AUBURN UNIVERSITY
SOUTHERN FOREST NURSERY MANAGEMENT COOPERATIVE

RESEARCH NOTE 95-1

Testing Alternatives to Methyl Bromide Fumigation at New Kent Nursery

by

Bill Carey

INTRODUCTION:

The improved seed efficiency and seedling quality attributable to methyl bromide (MBr) fumigation has appeared to be independent of region, soil type, or tree species (Carey, 1994). Unfortunately, recent trials indicate that efficiencies of potential replacements for MBr will be more site specific. This makes preliminary screenings advisable at each nursery.

The effects of four soil fumigants on seed efficiency and seedling development of loblolly pine and on the abundance of selected soil fungi were evaluated at the New Kent nursery in Virginia. Non-fumigated plots were compared with plots fumigated with chloropicrin, MC33 or 1,3-dichloropropene plus chloropicrin. Dazomet treated beds were compared with non-fumigated beds in a non-replicated trial. Seedlings from the replicated study did not differ among fumigants for seedbed density or root or shoot weights. Numbers of colonies of *Fusarium* but not *Trichoderma* isolated from soil differed significantly 35 and 243 days after fumigation.

METHODOLOGY:

Fumigation Treatments:

Three fumigation treatments were compared:

MC 33	(350 lbs/ac 67% methyl bromide plus 33% chloropicrin)
Triform®	(300 lbs/ac 70% 1,3 dichloropropenes plus 30% chloropicrin)
HDPic®	(300 lbs/ac chloropicrin at 96.5% ai).
Basamid®	(275 lbs/ac dazomet at 99% ai)

Each was applied to plots nine beds wide (60 ft) by 500 feet long (see Figure 1). Fumigants were injected into the soil April 14, 1994 and covered immediately by plastic tarp. The Basamid® was applied April 19 and immediately rototilled into freshly irrigated soil but not tarped.

Seedlings:

A mixed lot of loblolly pine seed collected 1993 was sown in all study plots. All plots except those treated with dazomet were sown May 3, 1994 (18 days after fumigation). The dazomet treated beds were sown May 10 (21 days post treatment) when lettuce seed

sown in those beds May 2 to test residual phytotoxicity had germinated and appeared healthy.

Seedlings within two-square-feet were counted at four systematically located points within the fumigated portion and four points within the not fumigated portion of each treatment plot. Seedlings were counted 43 and 243 days after sowing (June 15 and December 12, 1994). When the December counts were made, more than 25 seedlings were removed from each counted subplot for determination of size and mass.

Soil Fungi:

Soil samples were collected from each replicate plot two days before fumigation (4/12/94) and during seedbed density counts. Soil-agar suspensions were prepared from the soil samples and placed on petri dishes of media selective for *Fusarium*, *Trichoderma*, and *Rhizoctonia*. Fungal colonies (colony forming units—CFUs) were counted in each dish after incubation for one week.

RESULTS:

Differences in seedbed densities were not significant among replicated treatments and controls (Table 1). This could be attributable to environmental conditions unfavorable for diseases controlled by fumigation or just the chance "escape" of the study area from sporadic pest problems. The recent fumigation history undoubtedly reduces probable response range for the 1994 fumigation treatments. The suppression of chronic, soil born, diseases by MBr for more than two years is strongly indicated by past studies. Nevertheless, two more plantable seedling per square foot, among MC33 and Triform® treatments would increase production by about 60,000 seedlings per acre.

Trichoderma increased soon after fumigation with MC33, chloropicrin or Triform® at New Kent and this has occurred at other nurseries as has a slower rebound after dazomet treatment. The reduction in cfu's isolated on Herr's medium indicates that the dosage of Triform® was effective for many species but the decrease in *Fusarium* was non-significant 35 days after Triform® fumigation. This is difficult to understand. *Fusarium* has not been hard to control in the past. *Fusarium* control by Triform® needs careful evaluation. Although all genera were suppressed among the first post-treatment samples numbers rebounded for December samples and were not significantly different from not treated soils.

No statistical confidence can be attributed to any discussion for the dazomet treatment. Effects could be due to the unique plot location or sampling error and not the fumigant. Nevertheless, the dazomet treated plot performed poorly compared to the simultaneously sown control plot. A seven seedling per square foot decline in seedbed density between May and December, that did not occur in the adjoining control cannot be explained by collected data. December mean seedbed densities and the lsd of 3.8 seedlings/ft^2 applicable to the replicated treatments indicate no similar declines among those 12 plots. A (unlikely but possible) localized, post emergent damping-off due to disease or chemical, residual, phytotoxicity could cause the reduced bed density. Six fewer plantible seedlings than control beds per square foot (9 compared to Triform® of MC33) could reduce per acre production by about 172,000 seedlings. Dazomet should not be considered for this nursery before additional trials prove that a rare, or controllable, event occurred in 1994.

MANAGEMENT IMPLICATIONS:

Basamid® should not be used without testing at the specific nursery using large plot trials to compare alternatives. Triform® and chloropicrin continue to look promising as eventual substitutes for Methyl-bromide.

Table 1. Seedling data by fumigation treatment and sowing date.

		Number/ft^2			Seedling Grade*			Weight**	
Fumigant	Date Sow	5/15	12/12	Dia.	1's	culls	1's+2's	total	root
None	5/3	29.6	31.1	3.8 a	1.7 a	4.4 a	26.7	71.7	18.0
MC33	5/3	31.2	30.9	4.0 ab	3.4 ab	2.1 ab	28.7	77.5	18.3
Triform®	5/3	29.6	30.6	4.2 b	4.9 ab	1.6 b	29.0	85.5	19.6
HDPic	5/3	30.0	30.0	4.2 b	5.8 b	2.4 ab	27.6	79.8	18.9
	lsd+	3.0	3.8	0.3	3.1	2.5	4.9	20.0	3.3
None	5/10	28.8	31.6	3.8	1.2	5.2	26.4	81.2	18.2
Dazomet	5/10	29.0	22.5	4.1	3.7	2.3	20.1	62.9	14.7

* Seedling grades of 1's, culls and 1's+2's, respectively, refer to root collar diameters > 4.75mm, < 3.2mm, and > 3.2mm. The numbers reported for grade and for weight are for square foot of bed.

** Weight in grams per ft^2 of nursery bed.

+ lsd is for SAS ANOVA and refers only to the 5/3 sowing date.