2010 METHYL BROMIDE ALTERNATIVES: FOREST TREE NURSERIES IN SOUTHERN USA

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These studies are part of the USDA – ARS Area-wide Pest Management Project for Methyl Bromide Alternatives – South Atlantic Region, and part of a long-term effort by the Auburn University Southern Forest Nursery Management Cooperative (SFNMC) to identify and evaluate alternatives for methyl bromide (MBr). This is the fourth year of a five year project. Each two-year trial is a large-scale demonstration of MBr alternatives managed under standard nursery management practices. Seedling quality, nematodes, weeds and soilborne fungi are monitored throughout each growing season. For the 2010/2011 growing season, one nursery in Alabama and one in Georgia were selected for the USDA Areawide demonstration plots.

<u>Experiments and Measurements:</u> A 4.5 acre trial randomized complete block design was established at the Rayonier Regeneration Center nursery in Glennville, GA, in October 2009 (Table 1) with six treatments replicated four times. The six treatments consisted of three MBr alternatives using two rates under either VIF or LDPE plastic. Treatment plots were 29 ft x 300 linear bed feet (Table 2). The fumigants were applied using a low disturbance rig developed by USDA ARS that required rolled/compacted soil. The fumigants were coulter injected rather than the standard shank injected. The second MBr alternative trial was established on eight acres at the Weyerhaeuser nursery in Camden, AL in March 2010 (Table 1). At this forest-tree nursery three MBr alternatives using two rates were shank injected (Table 3) and covered with TIF (Raven Plastics). At this same nursery, in a separate nursery block Chlor 60 at two different rates was applied under 1mm High Density Polyethylene tarp (Cadillac Plastics Inc.) using the low disturbance coulter injected rig used in Glennville, GA. In the Camden study, the soils were not rolled or compacted but had been tilled/cultivated the previous day. The two studies at Camden had four replications per treatment in a randomized complete block design. Each nursery sowed a single family of loblolly pine (*Pinus taeda*) in mid to late April, 2009. The MBr alternative trials installed at both Glennville, GA and Camden, AL will be followed over a two-year rotation, that will include two pine seedling crops. At the end of each growing season the effects of these MBr alternatives on seedling densities and seedling quality will be determined. In addition to seedling characteristics, the affect of soil fumigants on soil-borne fungi and nematodes will be determined. To that end, soil samples were collected pre-sowing and six weeks post-sowing, and divided into two sub-samples. Half the sample was plated onto media selective for *Trichoderma spp.*, and the remainder of the sample was examined for nematode populations at the Auburn University Nematode Laboratory. Seedling stand densities were counted within the plots at six weeks post sowing, mid-season and again just prior to lifting of the seedlings. Final soil and seedling quality characteristics by treatment, as measured by root collar diameter, height, dry weight, grade and root morphology, will be collected in the fall 2010.

<u>Results and Discussion:</u> Early season seedling densities at both nurseries in May/June 2010 showed no significant differences between treatments. However, the nematode assessments conducted for Glennville, GA, collected at seven weeks post-sowing, indicated elevated levels of stunt nematodes (*Tylenchorhynchus claytoni*) (Table 4). The level of nematodes found seven months post fumigation has never been observed in other fumigation studies conducted by the SFNMC. In nurseries with a history of nematode problems, these levels are somewhat typical of those found at the end of a two year fumigation cycle.

To verify these results, additional samples were taken in early August (Table 4). Due to the extreme heat and dry conditions in the southeastern US this summer, we were not expecting such elevated levels in the second sample. Chlorosis has not been observed at the nursery due to the aggressive fertilization program. As a result of these elevated nematode levels, we have concluded that the soil fumigation process was not adequate. Some possible causes include:

- Low rate of fumigant used for a nursery with a history of nematode problems.
- Fumigant was not injected deep enough by the low disturbance coulter injection rig.
- Compaction (rolling) of soil may have prevented gas movement.
- Soil moisture may have been too high to allow gas (especially Chlor 60) movement through soil.

Elevated nematode levels were not found at the Camden, AL nursery. Historically this nursery has never had a nematode problem.

Table 1. Trial Information for each location

	Glennville, AL	**Camden, AL**
Fumigation	October 22, 2009	March 23, 2010
Fumigation type	Low Disturbance No-till coulter injected Broadcast/flat tarp	Low Disturbance No-till coulter injected & shank injected with beaver tails & hot glue Broad cast/flat tarp
Area in trial	4.6 acres	8 acres
Air temperature range	62 - 81°F	55 - 73°F
Wind speed	0 – 9 mph	0 – 10 mph
Soil moisture	7.8%	7.8%
Soil series	Tifton loamy sand	Lenoir silt loam
Plastic in place	10 days	10 days
Plastic	LDPE & VIF	HDPE & TIF

Table 2. Fumigants & rates in 2010 Glennville, GA Area–wide demonstration plots.

Fumigant	**Rate (lbs/a)**	**Plastic**	**Components**
Pic+	200	LDPE	85% Chloropicrin+15% Solvent A
	100	VIF	
Chloropicrin	200	LDPE	100% Chloropicrin
	100	VIF	
Chlor 60	200	LDPE	60% Chloropicrin + 40% 1,3-D
	100	VIF	

Table 3. Fumigants and rates used in 2010 Camden, AL Area–wide demonstration

Fumigant	**Rate (lbs/a)**	**Plastic**	**Components**
MBr	250	TIF	80% MBr + 20% Chloropicrin
	150		
Pic+	250	TIF	85% Chloropicrin + 15% Solvent
	150		
Chloropicrin	250	TIF	100% Chloropicrin
	150		
Chlor 60	250	TIF	60% Chloropicrin + 40% 1,3-D
		HDPE	
	150	TIF	
		HDPE	

Table 4. Stunt nematode (*Tylenchorhynchus claytoni*) per 100cc soil, reported by replication at Glennville, GA in May and August 2010.

MAY 2010

Treatment	Plastic	Rep 1	Rep 2	Rep 3	Rep 4
Chlor 60 100	VIF	334 (VH)	88 (H)	172 (VH)	66 (M)
Chlor 60 200	LDPE	54 (M)	434 (VH)	24 (L)	242 (VH)
Chloropicrin 100	VIF	174 (VH)	0	112 (H)	136 (H)
Chloropicrin 200	LDPE	58 (M)	0	118 (H)	4 (T)
Pic+ 100	VIF	108 (VH)	4 (T)	132 (H)	152 (VH)
Pic+ 200	LDPE	72 (M)	4 (T)	254 (VH)	394 (VH)

AUGUST 2010

Treatment	Plastic	Rep 1	Rep 2	Rep 3	Rep 4
Chlor 60 100	VIF	534 (VH)	894 (VH)	274 (VH)	488 (VH)
Chlor 60 200	LDPE	1,626 (VH)	1,374 (VH)	1,272 (VH)	620 (VH)
Chloropicrin 100	VIF	406 (VH)	0	260 (VH)	830 (VH)
Chloropicrin 200	LDPE	634 (VH)	8 (T)	1,122 (VH)	114 (H)
Pic+ 100	VIF	1,454(VH)	720 (VH)	994 (VH)	182 (VH)
Pic+ 200	LDPE	486 (VH)	142 (H)	1,060 (VH)	278 (VH)

VH = Very High; H = High; M = Moderate; L = Low; T = Trace