Auburn University Southern Forest Nursery Management Cooperative

RESEARCH REPORT 98-7

COMPARISON OF FUMIGANTS AND HERBICIDES FOR THE CONTROL OF PURPLE NUTSEDGE AT THE FLINT RIVER NURSERY

by
Bill Carey and David South

INTRODUCTION

Soil fumigation with methyl bromide (MBr) is very effective in suppressing purple (*Cyperus rotundus* L.) and yellow nutsedge (*C. esculentus* L.). Although chloropicrin is an effective alternative to MBr, it is inferior as a herbicide (South and others, 1997). However, some recent studies have shown that nutsedge control can be increased to approximate that of MBr by adding certain herbicides to the chloropicrin treatment (Carey 1997). In the Flint River Nursery trial, seedling growth and nutsedge control were compared among plots fumigated with chloropicrin or chloropicrin plus Vapam® (metham). In addition, preplant applications of Eptam® (EPTC) or Tillam® (pebulate) were tested as were postemergent applications of Manage® (halosulfuron-methyl). The trial was at the Georgia Forestry Commission's Flint River Nursery in Macon Co., GA.

METHODOLOGY

The study area (740 by 40 feet) was heavily infested with purple nutsedge. It was divided into three equal blocks and six pre-sow treatments were replicated in each block.

The study area contained two experiments. The main fumigation study included five beds of loblolly pine (*Pinus taeda*) and one bed of slash pine (*P. elliottii*). Fumigation treatments spanned all beds and seed were sown on May 5, 1997. A smaller experiment involved two seedbeds of loblolly and one of slash. This study contained a series of split-plots that involved a broadcast treatment with the herbicide Manage. On June 15, (41 days after sowing) the herbicide Manage was sprayed over the top of seedlings at a rate of either 0.5, or 1.0 oz ai/ac. Manage treatments (and check plots) were assigned within each block.

Table 1. Chloropicrin and herbicide treatments prior to sowing.

CODE	Chloropicrin	EPTC	Pebulate	Metham	Comments
			-------lbs ai/acre------		
Check	0	0	0	0	no fumigants or herbicides
CPN	300	0	0	0	shank injected; tarped on March 19
CPN+T	300	0	6	0	Tillam rototilled to 6"; then CPN injected/tarped on March 19
CPN+E	300	6	0	0	Eptam rototilled to 6"; then CPN injected/tarped on April 11
CPN+V	300	0	0	254*	CPN injected on April 11; then Vapam rototilled and drum rolled on April 11 (no tarp)
CPN+E+V	300	6	0	254*	Eptam rototilled to 6"; CPN injected on April 11; Vapam rototilled and drum rolled on April 11 (no tarp)

*Vapam applied at 80 gal/acre

Treatment effects were assessed November 5th, 185 days after sowing. Seedbed densities were assessed by counting all seedlings within a 1-foot-wide plot across beds (4 ft^2) at the center of each treatment replicate. Seedlings in the center 6 drills of each seedbed density plot were harvested and 25 seedlings were randomly selected from each plot sample to determine heights, root collar diameters (RCD's) and dry weights. Nutsedge tubers were collected from the top 6 inches of a 2 ft^2 section in the center of each harvested plot. After diameter measurement, seedling tops were separated from roots, oven dried at 50E C and weighed. Treatment effects were analyzed using a completely randomized design.

RESULTS AND DISCUSSION

Table 1 presents means by pre-sow treatment for loblolly plots not treated with Manage (n=44 plots), and Table 2 presents these means for plots in the Manage treated beds. The trends in Tables 1 and 2 are similar, but there is less separation between treatment means where the two species and the Manage treatments are included. In plots not treated with Manage, chloropicrin fumigation increased seedling height, total and plantable seedlings per square foot and reduced numbers of nutsedge tubers compared to controls. Tillam improved no measured variable compared to chloropicrin alone but the other additions each improved at least one parameter (**"** =0.05).

Chloropicrin fumigation typically increases seed efficiency and seedling growth (South and others 1997). However, the reduction in nutsedge tubers is somewhat surprising because chloropicrin is not normally considered an effective herbicide. Tillam was not a superior alternative for the chemically similar (and already registered) EPTC. Therefore, Tillam can be omitted from further consideration for control in pine seedbeds. The other three treatment combinations (EPTC, Vapam, and EPTC plus Vapam) performed similarly and should probably

be tested at additional sites. In terms of nutsedge suppression, substantial savings would result if 6 lbs ai of EPTC could be substituted for 80 gal of Vapam.

Manage (applied 41 days after sowing) reduced seedling growth of both pine species when applied at 1 oz ai/acre. However, the 0.5 oz ai/acre rate did not significantly affect growth of loblolly pine (Table 3). Perhaps seedlings should be older to avoid injury with this herbicide. Studies in Georgia in 1993 (South 1997)reported no injury when seedlings were treated 8 weeks after sowing (0.36 oz ai/acre). The single application of Manage did not significantly reduce the number of nutsedge tubers in November (Table 4).

Fumigation with chloropicrin and Eptam reduced the number of nutsedge plants to less than 2 tubers per square foot. Even though this was a significant reduction in nutsedge population, this level provides a high initial level for subsequent development of nutsedge. Therefore, subsequent actions would be required to keep the population of tubers suppressed. Unfortunately, even when adding an application of Manage to fumigated soil, there was still 1 live tuber per square foot.

MANAGEMENT IMPLICATIONS

These results indicate chloropicrin is an effective alternative to MBr for enhancing the nursery development of pine seedlings. Adding Eptam or Vapam to the chloropicrin as pre-sow treatments enhanced both seedling production and seedling size. Applying the herbicide Manage six weeks after sowing reduced seedling growth without significantly reducing the production of nutsedge tubers. Effective control of nutsedge will likely require several years of concentrated effort at suppressing tuber population.

LITERATURE CITED

Carey, W. A. 1997. Increasing weed control of methyl bromide alternatives. AUSFNMC Newsletter. Spring 1997.

South, D. B., W. A. Carey, and S. A. Enebak. 1997. Chloropicrin as a soil fumigant in forest nurseries. The Forestry Chronicle 73-4: 489-494.

South, D.B. 1997. Halosulfuron-methyl: A herbicide with activity on nutsedge. Auburn University Southern Forest Nursery Management Cooperative, Technical Note 97-1.

Table 2. Effects of fumigants and pre-sow-herbicides on loblolly production and numbers of nutsedge tubers/2 sq. ft.

	Seedling Parameters			Stem/ft^2			Nutsedge
Treatment	height	RCD	weight	all	>2.8 (mm)	>4.7 (mm)	tubers
	(cm)	(mm)	(gms)				
Check	28 c	3.5 c	2.9 c	26 b	18 c	0.6 c	17 a
CPN	31 b	3.6 bc	3.3 ab	29 a	22 ab	1.8 bc	8 b
CPN+T	32 ab	3.6 bc	3.1 bc	29 a	21 bc	1.8 bc	3 bc
CPN+E	34 a	3.8 ab	3.4 ab	29 a	23 ab	3.1 ab	3 bc
CPN+V	34 ab	3.9 a	3.5 a	28 ab	22 ab	4.2 a	1 c
CPN+E+V	33 ab	4.0 a	3.6 a	29 a	24 a	3.8 ab	3 bc
lsd	*2.5*	*0.2*	*0.36*	*2*	*3*	*2.1*	*7*

Table 3. Effects of fumigants and pre-sow-herbicides on loblolly and slash pine seedlings and numbers of nutsedge tubers (/2 sq. ft.) In beds treated with Manage.

	Seedling Parameters			Stem/ft^2			Nutsedge
Treatment	height	RCD	weight	all	>2.8 (mm)	>4.7 (mm)	tubers
	(cm)	(mm)	(gms)				
Check	26 b	3.7 b	2.9 b	26 b	19 a	2.2 b	12 a
CPN	28 ab	3.8 ab	3.3 ab	26 b	21 a	3.3 ab	1 b
CPN+T	28 ab	3.8 ab	3.1 ab	28 ab	21 a	3.7 ab	1 b
CPN+E	30 a	4.0 a	3.5 a	27 ab	22 a	4.6 a	1 b
CPN+V	30 a	3.8 a	3.4 ab	29 a	22 a	4.4 ab	4 b
CPN+E+V	31 a	4.0 a	3.4 ab	28 ab	22 a	4.9 a	1 b
lsd	*2.6*	*0.2*	*0.44*	*2.5*	*3*	*2.1*	*4*

Table 4. Effects of Manage treatment at 41 days after sowing on loblolly and slash pine seedling development in November.

Pine	Manage	Seedling Parameters			Stem/ft^2		
Species	Rate	height	RCD	weight	all	>2.8 (mm)	>4.7 (mm)
	(oz ai/ac)	(cm)	(mm)	(gms)			
Slash	0.0	32 a	4.1 a	4.0 a	28 a	22 a	7.7 a
"	0.5	24 b	4.1 a	3.2 ab	22 b	19 a	3.6 a
"	1.0	25 b	3.8 a	2.9 b	26 a	20 a	3.6 a
	lsd	*3*	*0.5*	*0.8*	*3.7*	*6*	*4.5*
Loblolly	0.0	31 a	3.8 a	3.2 a	30 a	23 a	2.8 a
"	0.5	29 ab	3.7 a	3.0 a	28 ab	21 ab	2.9 a
"	1.0	28 b	3.8 a	3.0 a	26 b	20 b	2.6 a
	lsd	*2*	*0.2*	*0.3*	*2.2*	*3*	*1.5*

Table 5. Effects of Manage treatment in June (41 days after sowing) on nutsedge tubers per square foot in November (all chloropicrin plots excluded).

Treatment	Rate	Nutsedege tubers
	(oz ai/ac)	(#/sq. ft.)
Control	0.0	7.6 a
Manage	0.5	9.3 a
Manage	1.0	3.6 a
	lsd	*7.5*