TOBACCO SEED BED FUMIGATION ALTERNATIVES

Alex Csinos*, Don Sumner, Carroll Johnson, Bill Johnson,
Robert McPherson, and Clyde Dowler

Tobacco seedlings are produced in methyl bromide fumigated soil beds. Tobacco is a relatively small seeded crop and about 12 weeks are required to produce a transplant from seed. This demands a long pest-free period for seedlings to develop into healthy, vigorous transplants.

The plot area was planted to peanut in 1995. The land was deep turned, disc harrowed, rototilled and beds formed prior to test initiation. All treatments except methyl bromide were applied on 31 Oct. 1995. Methyl bromide was injected under plastic at the rate of 580 lb/A on 1 Nov. 1995. Telone II (10 gal/A), Telone C-17 (10 gal/A) and chloropicrin (6 gal/A) were applied by chiesel injection at depth of 6-9 inches. Metam sodium (37.3 gal/A, 42%) was applied by spraying on the soil surface and incorporating with a power operated rototiller. Combinations of metam sodium + Telone II, metam sodium + chloropicrin and metam sodium + Telone C-17 were applied by power equipment as described above. An untreated plot was sprayed with Enide 90W at 8 lb/A at seeding. Plastic covers were applied over the treated areas immediately after treatment. Plastic covers were removed on 27 Nov. 1995. Tobacco cultivar K-326 was seeded on 12 Dec. 1995. Oats infested with Rhizoctonia solani AG-4 was placed in plastic mesh bags, and buried in plots at a depth of 1-2 inches at the time of treatment and retrieved from the soil as the covers were removed on 27 Nov. 1995 and tested for viability. Twenty soil samples were collected as cores (2.5 cm diameter x 15 cm deep) from plots before fumigation and as the plastic covers were removed. Visual estimates of weed control were made on 28 Nov. 1995, 22 Feb. 1996 and 25 April 1996. Weeds evaluated were Carolina geranium (Geranium carolinianum L.), purple cudweed (Gnaphalium purpureum L.), common chickweed [Stellaria meclia (L.) Vill./cyr.], Oldfield toadflax [Tinaria canadensis (L.) Dum.], volunteer peanut (Arachis hypogaea L.), cutleaf eveningprimrose (Oenthera laciniata Hill) and dog fennel [Eupatorium capellefolium (Lam.) Small]. Stand counts on 1 meter of two center rows were made 8 Feb. 1996, vigor ratings made 22 Feb. 1996 and 23 April 1996 and height measurements made 30 April 96. Roots were evaluated for root galling caused by Meloidogyne spp. of nematode on 30 April 1996. Galling on individual plants was rated on a scale of 1-5 (1 = 0, 2 = 1-25%, 3 = 26-50%, 4 = 51-75%, and 5 = 76-100% of the root system galled).

Metam sodium, methyl bromide, a mixture of chloropicrin + metam sodium, a mixture of Telone II + metam sodium and a mixture of Telone C-17 plus metam sodium reduced the viability of oat infested Rhizoctonia solani AG-4 to zero. All the above treatments except Telone II + metam sodium reduced soil populations of Pythium species to zero. Stand counts were higher for plots treated with chloropicrin + metam sodium than the untreated and Enide treated plots. No differences occurred between

Enide treated plots and other treatments in height. However metam sodium, Telone II, methyl bromide, chloropicrin + metam sodium, and Telone C-17 and metam sodium treated plots had taller plants than the untreated plots. On Feb. 22 1996, vigor ratings were highest in untreated weed controlled plots, and none of the treatments were significantly different except untreated plots which was lower. Plots treated with metam sodium, Telone C-17 + metam sodium, Telone II + metam sodium, chloropicrin + metam sodium and methyl bromide had significantly higher vigor ratings than the Enide plots.

Nematode populations were low, but all treatments reduced root knot galling below the level found in the untreated plots, but not below the Enide treated plots. All treatments, except Enide, controlled volunteer peanut, purple cudweed, and common chickweed. Chloropicrin and Telone II controlled Carolina geranium, cutleaf eveningprimrose, and late season purple cudweed very poorly. Only Enide controlled dog fennel well.

Plots were evaluated for insect damage on 22 Feb. 96. All treatments except metam sodium reduced mole cricket activity over the untreated control and Enide treated plots.

Metam sodium, metam sodium + chloropicrin and metam sodium + Telone C-17 treatments compared well with methyl bromide treatment. Although individual materials controlled some pests well, the combination treatments tended to be more consistent in pest control.

Table 1. Tobacco seed bed fumigation, soil fungal counts and fungal viability (peanut area 1995-1996)

Treatment[1]	R. solani (AG-4) (cfu/100 g)	Pythium spp. (cfu/g)	R. solani Viability[3] (%)	Mole Cricket Activity (Tunnels/plot)	Height (cm)[5]	Stand[6]	Late vigor ratings[7]
Chloropicrin 6 gal/A	0	24 b[4]	11.0 c	0.8 cd	21.0 ab[3]	65.0 ab	5.0 c
Metam Sodium 37.3 gal/A (42%)	0	0 c	0.0 c	2.0 bc	25.0 a	65.0 ab	7.0 ab
Telone C-17 10 gal/A	0	14 bc	33.0 b	0.8 cd	23.0 a	58.0 abc	6.0 bc
Telone II 10 gal/A	0	320 a	4.0 c	1.3 cd	21.0 ab	50.0 bc	5.0 c
Methyl Bromide 580 lb/A	0	0 c	0.0 c	1.0 cd	27.0 a	56.0 abc	8.0 a
Chloropicrin 6 gal/A + Metam Sodium 37.3 gal/A	0	0 c	0.0 c	1.0 cd	26.3 a	51.0 bc	8.0 a
Telone II 10 gal/A + Metam Sodium 37.3 gal/A	0	10 bc	0.0 c	0.2 d	21.0 ab	66.0 a	7.0 ab
Telone C-17 10 gal/A + Metam Sodium 37.3 gal/A	0	0 c	0.0 c	1.3 cd	26.0 a	57.0 abc	8.0 a
Enide 90W 8 lb/A	0	480 a	48.0 ab	4.2 a	18.1 ab	46.0 c	5.0 c
Untreated	1.4	637 a	56.0 a	3.3 ab	11.0 b	23.0 d	2.0 d

[1]Plots were fumigated on 31 Oct. 1995. Methyl bromide injected under plastic 1 Nov. 1995. Plastic covers removed on 27 Nov. 1995. Samples were taken 27 Oct. 1995 as pre-treatment samples, and on 29 Nov. 1995 as post-treatment samples.
[2]CFU = colony forming units; g = grams.
[3]Rhizoctonia solani AG-4 infested oats were placed in nylon mesh bags and placed in plots at time of fumigation, and removed 27 Nov. 1995.
[4]Means followed by the same letter are not significantly different according to Duncan's Multiple Range Test ($P = 0.05$).
[5]Two five-foot long sections of row (total 10 feet) were uprooted and length of plants from soil surface to tip of longest leaf were measured in cm on 30 April 1996.
[6]Numbers are total of plants from 2 meters of row, 1 meter from each of the 2 center rows on 8 Feb. 1996.
[7]Vigor ratings are based on a scale of 1-10, where 1 = poor and 10 = excellent on 22 Feb. and 23 April 1996.

Table 2. Tobacco seed bed fumigation, weed control efficacy ratings (peanut area 1995-1996)

Treatment[1]	Peanut[2] 28 Nov. 1995	Purple cudweed 28 Nov. 1995	Chickweed 28 Nov. 1995	Oldfield toadflax 22 Feb. 1996	Purple cudweed 22 Feb. 1996	Carolina geranium 22 Feb. 1996	Evening-primrose 25 April 1996	Oldfield toadflax 25 April 1996	Purple cudweed 25 April 1996	Dog fennel 25 April 1996
Chloropicrin 6 gal/A	100.0[3]	100.0	100.0	90.0	66.3	85.8	64.7	90.0	40.0	84.2
Metam sodium 37.3 gal/A (42%)	100.0	100.0	100.0	94.5	93.7	82.0	83.3	91.7	85.3	81.7
Telone C-17 10 gal	100.0	100.0	100.0	92.0	74.5	86.2	85.0	84.2	59.2	83.3
Telone II 10 gal/A	100.0	100.0	100.0	85.8	68.3	88.3	75.5	83.8	68.3	85.0
Methyl Bromide 580 lbs/A	100.0	100.0	100.0	95.0	92.0	86.7	91.7	95.0	89.5	83.3
Chloropicrin 6 gal/A + Metam sodium 37.3 gal/A	100.0	100.0	100.0	94.5	93.8	86.0	93.8	94.2	94.2	80.0
Telone II 10 gal/A + Metam sodium 37.3 gal/A	100.0	100.0	100.0	95.0	92.8	88.3	95.0	94.5	90.0	84.2
Telone C-17 10 gal/A + Metam sodium 37.3 gal/A	100.0	100.0	100.0	94.5	94.0	85.0	95.0	95.0	94.2	82.5
Enide 90W 8 lb/A	0.0	0.0	0.0	93.0	78.0	95.0	90.8	70.0	87.8	95.0
Nontreated Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1]Tobacco cultivar was K-326. Plots were fumigated on 31 Oct. 1995, methyl bromide injected under plastic 1 Nov. 1995, plastic removed on 27 Nov. 1995, and tobacco seeded on 13 Dec. 1995.

[2]Numbers are % control as compared to nontreated control. Weeds evaluated were Carolina geranium (Geranium carolianum L.), Purple cudweed (Gnaphalium purpureum L.), common chickweed [Stellaria media (L.) Vill./Cyr.], Oldfield toadflax [Linaria canadensis (L.) Dum.], volunteer peanut (Arachis hypogaea L.), cutleaf eveningprimrose (Oenothera laciniata Hill), and dog fennel (Eupatorium capillifolium (Lam.) Small].

[3]Means followed by the same letter are not significantly different according to Duncan's Multiple Range Test, ($P = 0.05$).