METHYL BROMIDE ALTERNATIVES FOR PERENNIAL CROP FIELD NURSERIES

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Soil fumigation with methyl bromide has commonly been used prior to planting perennial field nurseries to insure a high quality product and to meet the California Code of Regulations that state that it is "mandatory that nursery stock for farm planting be commercially clean with respect to economically important nematodes" (CDFA, 1996). Historically, methyl bromide has been effectively used to comply with the nursery regulations. Growers of perennial nursery crops, such as trees, vines, and roses, will need alternatives to methyl bromide in order to continue to produce clean planting material and to meet CDFA's requirements.

Tree Field Nursery Trial – Planted 2004. A tree field nursery trial was initiated in fall 2004 in Yuba City, CA. This site did not have natural populations of plant parasitic nematodes, so bags of citrus nematode-infested soil were buried at 6, 12, 24, and 36-inch depths prior to the application of fumigant treatments. Each treatment (Table 1) was replicated 5 times in a randomized complete block design. Nematode bags were recovered 4 weeks after treatment. Nematode samples were processed using the baermann funnel method to recover only live nematodes. All chemical treatments were comparable to methyl bromide at the 6- and 12-inch depths, but the drip-applied treatments were not as effective at the 24 and 36-inch depths (Fig. 1).

Qualitative weed ratings of the total weed population were made Nov. 2004 and quantitative weed measurements of the volunteer wheat crop were made in March 2005. Both data sets showed all chemical treatments were comparable to methyl bromide for weed control at these two sampling dates and had significantly fewer weeds than the untreated control plots.

Almond seeds were planted winter 2004/2005. The number of germinated plants was counted March 2005 (Table 1). All treatments other than drip-applied Midas and the untreated were comparable to methyl bromide in the number of germinated plants.

Microplot Trials. The microplots, 18 inches in diameter and 3.5 ft. deep, were filled with a sandy loam soil taken from a nearby vineyard. In each trial, 10 calla lily bulbs were planted one week prior to treatment to evaluate the alternatives' ability to control bulbs that are volunteers from a previous crop, but are weeds in the current crop. Methyl bromide controls were applied with the Tri-Cal micro-injection rig, and tarped. All other treatments were applied in sufficient water to penetrate 14" deep (1.1 gallons), and microplots were tarped. After 48 hours, tarps were removed from all treatments except methyl bromide, an additional one

gallon water added to each plot, and the tarp replaced. Six days later, tarps were removed, and a final gallon of water added to all plots except those treated with methyl bromide.

Weed control was scored on a 0 (no live weeds) to 5 (no visible weed control) scale 8 and 30 days after treatment (DAT). At eight days after treatment, all treatments had significantly reduced weed populations compared to the untreated control. At 30 days after treatment, most treatments provided weed control comparable to methyl bromide (Table 2). Ninety days after treatment, the number of live calla lily plants was counted (Table 2). Many treatments provided control of calla lily bulbs comparable to methyl bromide. Calla lily control in plots treated with acrolein and low to moderate rates of azide was not significantly different from the untreated controls.

Soil samples were collected in September 2004 to a depth of 24" from each microplot and processed with the sugar flotation/centrifugation method. Although nematode populations were low even in the untreated microplots, some differences between treatments were observed (Table 2).

Conclusions

- MIDAS, Telone, and Telone + chloropicrin, both shank-injected and drip-applied, provided good nematode control at 6 and 12-inch soil depths. Shank-injected treatments provided better control than drip-applied treatments at 24 and 36-inch depths. MIDAS is not yet registered, and use of Telone is restricted in California by township caps.
- Almond seed germination was increased by use of methyl bromide, Midas, Telone, or Telone + chloropicrin combination in a commercial field nursery.
- Several experimental materials provided encouraging results in microplot trials, but nematode pressure was low. Further evaluation is necessary.

References

California Dept. of Food and Agriculture. 1996. Approved treatment and handling procedures to ensure against nematode pest infestation of nursery stock. Nursery Inspection Procedures Manual, Item #12. 18 pp.

Table 1. Germinated plants/bed on March 24, 2005 in tree nursery trial, initiated Fall, 2004.

Treatments	Plants/bed
Untreated	183 c
Methyl Bromide - 600 lb/acre, shanked, tarped	222 a
MIDAS (67% Iodomethane 33% Chloropicrin) - 360 lb/acre, shanked, tarped	230 a
MIDAS (67% Iodomethane 33% Chloropicrin) - 300 lb/acre, dripped, tarped	193 bc
Telone II - 31 gal/acre, shanked, tarped	215 ab
Telone EC – 35 gal/acre, dripped, tarped	212 ab
Telone C35 - 47 gal/acre, shanked, tarped	228 a
Inline – 49 gal/acre, dripped, tarped	227 a

Table 2. Weed control in microplot trials.

Treatment	Weed Control 30 DAT[1]	Calla Lily Control 90 DAT[2]	Rootknot Nematode/ 100 cc Soil
Untreated	4.7 a	3.8 ab	3.1 b
Methyl Bromide, 350 lb/acre	0.4 cd	0.8 cd	0.1 d
Azide, 50 lb/acre	1.0 bcd	4.2 a	1.6 bcd
Azide, 100 lb/acre	0.9 bcd	2.9 ab	0.8 bcd
Azide, 150 lb/acre	0.5 bcd	0.7 cd	1.3 bcd
Azide, 200 lb/acre	0.5 bcd	0.3 cd	0.2 d
Furfural, 300 lb/acre + metam sodium, 60 gal/acre	0.5 bcd	0.0 d	0.0 d
Metam sodium 60 gal/acre	0.2 d	0.0 d	0.7 bcd
Acrolein, 100 lb/acre	1.3 b	3.8 ab	2.8 bc
Acrolein, 200 lb/acre	1.2 bc	3.2 ab	10.3 a
Acrolein, 300 lb/acre	0.5 bcd	2.0 bc	0.4 cd
Propylene oxide, 60 gal/acre	0. 3 cd	0.3 cd	0.7 bcd
Propylene oxide, 60 gal/acre + metam sodium, 60 gal/acre	0. 3 cd	0.0 d	0.8 bcd

[1]Weed control scored on a 0 (no living weeds) to 5 (no effect of treatment) scale.
[2]Number of growing calla lily plants out of the 10 bulbs planted.

Figure 1. Motile citrus nematodes extracted from bags buried at four soil depths, recovered from tree nursery trial, 4 weeks after treatment, Fall 2004.