# METHYL BROMIDE ALTERNATIVES FOR VINEYARD REPLANT

D. Wang*[1], S. Gao[1], J. Gerik[1], B. Hanson[1], N. Tharayil[2], R. Qin[3], G. Browne[4], C. Smith[5], K. Klonsky[3], B. Westerdahl[3], S. Vasquez[6], and S. Yates[7]

[1]USDA-ARS, Parlier, CA; [2]University of California, Riverside, CA; [3]University of California, Davis, CA; [4]USDA-ARS, Davis, CA; [5]Winegrape Association, Fresno, CA; [6]University of California Cooperative Extension, Fresno, CA; and [7]USDA-ARS, Riverside, CA

The project is part of the USDA-ARS Pacific Area-Wide Pest Management Program for Methyl Bromide Alternatives. The overall goal of this project was to determine, in grapevine replant situations, the needs and alternatives for soil fumigation with methyl bromide for effectively controlling plant pathogens and parasitic nematodes, low emission losses, and positive responses in vine growth. This is the second year of a three year project.

Methods: Experiments were conducted in a field plot at the USDA-ARS San Joaquin Valley Agricultural Sciences Center (SJVASC) facility located near Parlier, CA. The soil is a Hanford sandy loam with a hard pan located approximately 100 cm from the soil surface. Eight treatments were devised and implemented in a randomized block design with three replications. The treatments are summarized in Table 1.

Table 1. Experimental treatments†

| Treatment no. | Chemical | Rate (kg/ha) | Application | Surface Cover |
|---|---|---|---|---|
| 1 | Control | NA | NA | Bare soil |
| 2 | Cover crop | NA | NA | White mustard |
| 3 | Methyl bromide | 448 | Shank | HDPE |
| 4 | Telone C35 | 610 | Shank | Bare soil |
| 5 | Telone C35 | 305 | Shank | Bare soil |
| 6 | Telone C35 | 305 | Shank | VIF |
| 7 | InLine | 305 | Subsurface drip | Bare soil |
| 8 | InLine | 305 | Subsurface drip | VIF |

† NA = not apply, HDPE represents high density polyethylene film, VIF is virtually impermeable film (Hytibar), Telone® C35 contains 61.1% 1,3-dichloropropene (1,3-D), 34.7% chloropicrin (CP), and 4.2% inert ingredients, and InLine® contains 60.8% 1,3-D, 33.3% CP, and 5.9% inert ingredients.

This research was initiated in summer 2007 with existing grape vines removed in a one-hectare field area. The field was deep tilled to approximately 90 cm. Subsurface drip tubing was installed in Treatment 7 and 8 where the tubing was spaced 91.4 cm apart; emitters were at 76.2 cm spacing and 2.0 liter per hour per

emitter at 103.4 kPa pressure. On October 19, 2007, one set of four nematode bags were buried near the center of each treatment plot. The bags were placed at 15, 30, 60, and 91 cm depths, respectively, and each bag contained approximately 4000 citrus nematodes (*Tylenchulus semipenetrans*).

Shank injection of methyl bromide and Telone C35 in Treatment 3 – 6 was conducted by TriCal on October 23, 2007. The Telone C35 shanks were 51 cm spaced, each shank had two injection outlets one each on the two ends of a winged cross mounted 45.7 cm deep from the soil surface. Each wing tip was 12.7 cm from the center of the shank, so the actual spacing of chemical injection was 25.4 cm. Drip application of InLine was carried out on October 24, 2007 through the subsurface drip system.

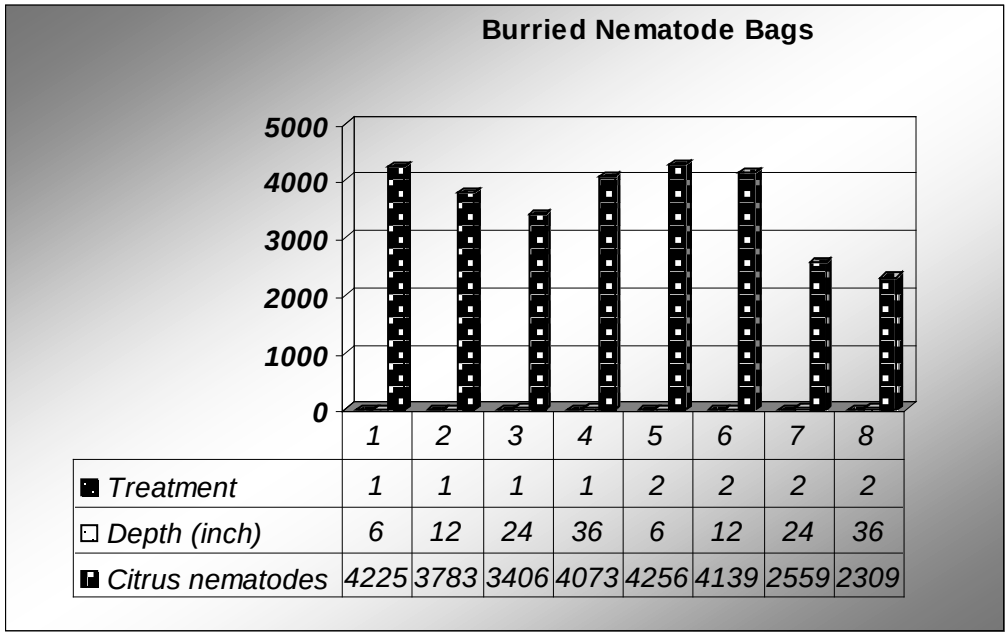
Fumigant emissions were measured with flow-through flux chambers for Treatment 5, 6, 7, 8. Emission samples were collected every 3 hr for the first 3 days after fumigation, and every 6 hr for the next 9 days. With three replications, a total of 720 emission samples were collected. Additional air samples were taken for measurement of possible background fumigant concentrations in the inlet air stream into the flux chambers from 3 m above the soil surface. Eight sets of soil gas sampling probes were installed at two locations (Treatment 5 Rep I and Treatment 6 Rep III; 4 sets at each location). At each location, one set gas probe was installed on the plot, and the remaining three were installed outside the plot at 61, 152, and 305 cm from the edge. Each soil gas set contained 10 sampling depths: 5, 10, 15, 20, 25, 30, 35, 45, 60, 90 cm from the soil surface. Soil gas was collected in 50-ml soil air for each depth at 3, 6, 12, 24, 48, 72, 144 hrs after fumigant application. A total of 560 soil air samples were collected for analyzing fumigant gas concentrations.

During the fumigation experiment, soil moisture and soil temperature were monitored at several depths with an automated datalogger – TDR- and thermocouple system. Mustard seeds were planted in the three plots of Treatment 2 on November 14, 2007. To enhance growth, 116 kg of Hydro Prill 15-15-15 fertilizer was applied.

Preliminary results: Citrus nematodes in the buried bags survived in the non-fumigated plots (treatment 1, 2) (Fig. 1), but no live nematodes were found in any fumigated plots on December 19-20, 2007. Citrus nematodes were also found in the soil in the non-fumigated plots on December 5-7, 2007, but not in the fumigated plots. Effective control was found for *Fusarium* in the surface 15 cm soil only in the methyl bromide treatment. There was no significant difference in *Fusarium* between the control, mustard cover crop, Telone C35 or InLine treatments. For *Pythium*, except for the control and cover crop treatments, effective control was observed in all fumigated plots regardless the chemical type and rate of application. The VIF tarp significantly reduced fumigant emissions in both the shank (treatment 6) and the subsurface drip (treatment 7). Seedlings of Cabernet Sauvignon were planted on March 18, 2008. Crop responses will be

measured in vine pruning biomass and cane diameter in winter 2008 when the vines reach dormancy.

Figure 1. Survival of citrus nematodes in buried bags (1 inch = 2.54 cm)




| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Treatment | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| Depth (inch) | 6 | 12 | 24 | 36 | 6 | 12 | 24 | 36 |
| Citrus nematodes | 4225 | 3783 | 3406 | 4073 | 4256 | 4139 | 2559 | 2309 |

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