# ALTERNATIVES TO METHYL BROMIDE SOIL FUMIGATION FOR VINEYARD REPLANT

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Until 2005, methyl bromide was often used to fumigate vineyard soils because of its effectiveness in controlling a wide range of pests, including nematodes, fungi, insects and weeds. Currently, many grape growers use Telone C35 (active ingredients are 1,3-dichloropropene or 1,3-D and chloropicrin) to control soilborne pests, especially plant parasitic nematodes, during vineyard replant. The usage of 1,3-D also faces environmental regulations because of its potential contribution to VOC emissions. The objective of this project was to determine alternatives to methyl bromide soil fumigation for controlling plant pathogens and parasitic nematodes, low emission losses, and responses in vine growth. The project is part of the USDA-ARS Pacific Area-Wide Pest Management Program for Methyl Bromide Alternatives.

Field experiments were carried out at the USDA-ARS San Joaquin Valley Agricultural Sciences Center (SJVASC) facility located near Parlier, CA in Oct. 2007 and Oct. 2008 and a commercial grape grower's field near Fresno, CA in Nov. 2008. The treatments at the SJVASC location are summarized in Table 1.

Table 1. Experimental treatments at SJVASC, Parlier, CA†

| **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, Telone® C35 contains 61.1% 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.

Grape seedlings (*Vitis vinifera* var. Cabernet Sauvignon) were planted on March 18, 2008 in the first trial at SJVASC. Vine pruning biomass was measured in January 2009 when the vines reach dormancy. The experiment was repeated in

the second year and the same grape variety was replanted in spring 2009 on an adjacent field.

Demonstration trial at the grower's field was initiated in fall 2008. The field is about 3.5 ac in size and was previously cropped with Thompson seedless grapes for > 70 years. The experimental design was a randomized block with three replications for each treatment (Table 2). The field was planted with "Selma Pete" grape in spring 2009.

Table 2. Experimental treatments at grower field (October 24, 2008), Fresno, CA†

| **Treatment no.** | **Chemical** | **Rate** (kg/ha) | **Application** | **Surface Cover** |
|---|---|---|---|---|
| 1 | Methyl bromide | 448 | Shank | HDPE |
| 2 | Telone C35 | 305 | Shank | VIF |
| 3 | Telone C35 | 153 | Shank | VIF |

† HDPE represents high density polyethylene film, VIF is virtually impermeable film, Telone® C35 contains 61.1% 1,3-D, 34.7% CP, and 4.2% inert ingredients, Methyl bromide (MB) = 422 lbs/ac, for Telone C35, 305 kg/ha=24.8 gal/ac, 153 kg/ha = 12.4 gal/ac.

Preliminary results indicated that control in total *Pythium* spp. was achieved in all fumigated plots except the InLine bare soil treatment. For total *Fusarium*, only the MB treatment exhibited a significant treatment effect. Live citrus nematodes were found only in the non-fumigated field plots in both the native soil and buried bags. The 100% citrus nematode mortality achieved in all fumigation treatments indicated the effectiveness of nematode control with both MB and Telone C35 and potential for lower (than 305 kg/ha) dosages with Telone C35. Also, no other species of live nematodes were found in any fumigated plots. At the SJVASC site, higher pruning dry weight was found in the MB, Telone C35 high dosage and low dosage with VIF or InLine with VIF treatment plots (Figure 1). The VIF tarp also significantly reduced fumigant emissions.

Crop responses will be monitored for the replanted grapes in pruning biomass and cane diameter in winter 2009. Grape yield will be measured when there is sufficient growth. Annual soil sampling will be carried out to monitor nematode and pathogen population under different treatments.

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Figure 1. Pruning weight of 2008 replanted vines under different soil fumigation treatments at the USDA-ARS SJVASC field site. Measurements were made on 16 January 2009. Treatments descriptions can be found in Table 1. Different letters indicated significant differences according to Tukey's grouping at $P = 0.05$ level.