



Alternatives to Methyl Bromide Soil Fumigation in Grape

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Project Overview

The project at the Water Management Research Unit (WMRU) at the San Joaquin Valley Agricultural Sciences Center (SJVASC) is focused on testing methyl bromide alternative chemicals, rates, and application technology for controlling soilborne pests, diseases, weeds, and for reducing atmospheric emissions for a number of cropping systems in California, including grapes. The project objectives that pertain specifically to grapes are to develop alternatives to methyl bromide for vineyard replant soil fumigation with effective pest control and minimal environmental impact or emissions, and to find methyl bromide alternative soil fumigation to meet California certification standards for nematode-free production of tree, vine, and rose nurseries.

Shank Injection Fumigation



Replanted Vines



Contact Information

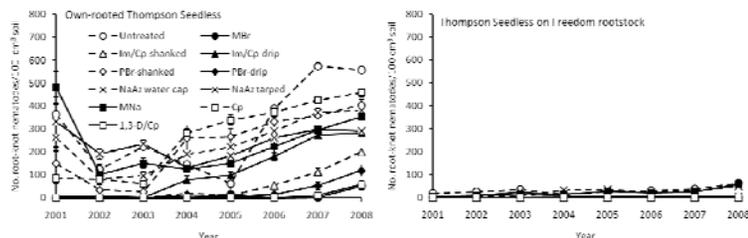
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Major Accomplishments (2007-2010)

Long-term Nematode Control with Methyl Bromide Alternatives

In California, root-knot (*Meloidogyne* spp.) and citrus (*Tylenchulus semipenetrans*) nematodes commonly parasitize grapevines. A field fumigation trial was conducted during 2000-2009 at the USDA-ARS San Joaquin Valley Agricultural Sciences Center, near Parlier, California. An 85-year old grape vineyard (*Vitis vinifera* L. cv. Thompson Seedless) was removed in October 2000, fumigated with several methyl bromide alternative chemicals, and replanted with Thompson Seedless grapes with or without grafted rootstocks. We found that:

- In plots planted with own-rooted Thompson Seedless, populations of root-knot nematodes were controlled by 1,3-D plus chloropicrin, iodomethane plus chloropicrin, and propargyl bromide with effects similar to methyl bromide,
- Use of the root-knot resistant rootstock 'Freedom' kept nematode numbers low regardless of preplant fumigation treatments.



Technology Transfer/Outreach

During the past 3-years, presentations were made to growers/ stakeholders, policymakers, and other researchers for disseminating research findings. Specific example outreach activities are listed below:

- Presentation on "Vineyard soil fumigation – alternatives to methyl bromide" at the 2009 San Joaquin Valley Grape Symposium.
- Presentation on "Soil fumigation for vineyard replanting" at the University of California Grape Day, UC Kearney Agricultural Center.
- Presentations at every Annual International Conference on Methyl bromide Alternatives and Emissions Reductions.
- Presentations on developing field practices to improve fumigation efficacy while reducing emissions were given to Fruit tree, Nut tree, and Grapevine Improvement Advisory Board.
- Presentations on reducing soil fumigant emissions at the American Chemical Society Annual Meetings: Symposium on Air Quality, Washington, DC.



Field day presentations on vineyard replant fumigation research

Crop Response in Methyl Bromide Alternatives Trials

Three grape replant fumigation trials were conducted in 2007-2009, two plot experiments at the SJVASC and one field study in a commercial growers field in Fresno. Fumigation treatments included untreated control, methyl bromide treatment, and a number of alternative fumigation treatments. Vine diameter, pruning weight, and grape yield were monitored following the fumigation treatments. We found that:



Determining grape yield

- Vine diameter readings in the untreated controls were not significantly different from the fumigated treatments in the plot experiments but lower in the commercial field the first year after replanting,
- Pruning dry weights in the untreated controls were significantly lower than that in the fumigated plots, and
- Harvest measurements showed similar yield values between the methyl bromide control and all alternative fumigant treatments for both the wine (Cabernet Sauvignon) and the raisin (Selma Pete) grapes, but lower yields in the untreated controls.

Management Techniques for Reducing Fumigant Emissions

Air quality and human exposure risks are major concerns for soil fumigation. Through a series of field trials, ARS scientists in Parlier, CA found that:

- Surface sealing with standard plastic tarping or sprinkler water seals moderately reduced emissions,
- Low permeable films (e.g., virtually impermeable film or VIF and totally impermeable film or TIF) drastically reduced the emissions to below 2% over a 6-day period,
- Increasing soil water content up to field capacity reduced peak emission flux, delayed its occurrence time, and reduced total emission losses.

Herbicide Crop Safety in Perennial Tree and Vine Nurseries

Weed control is an important concern for production of woody nursery crops in California. Based on repeated multi-year field trials, ARS scientists in Parlier, CA determined that:

- Herbicides pendimethalin, thiazopyr, and dithiopyr were most effective for weed control in tree and vine nurseries with minimal crop damage,
- Herbicide oxyfluorfen showed differential crop safety responses in the nurseries.

External Support and Collaborators:

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