

# Pre-Plant Fumigation is Worth the Money

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The orchard replant problem is a result of nematode, microbiological and chemical interactions within the soil. Many orchard growers in Stanislaus County have seen our replant / fumigation trial sponsored by the California Cling Peach Board on Patterson Road in Modesto. It is a comparison of four pre-plant fumigation treatments and several post-plant treatments for managing the replant problem in a third generation peach orchard. The experimental site is very sandy and harbors ring, root lesion and rootknot nematodes. The following is a summary of results to date.

Fumigation treatments shown below were applied with commercial equipment in October 2000:

- 98% methyl bromide at 400 lb. per acre, tarped.
- Vapam @ 250 ppm in a drench application.
- Telone II @ 35 gallons per acre.
- Unfumigated control.

Loadel cling peach trees on Lovell rootstock were planted February 2, 2001 at 372 trees per acre. Below is a list of several post-plant treatments that have been applied to trees in fumigated and unfumigated areas for the past three years through the drip irrigation system or as foliar sprays. Post-plant treatments are an attempt to maintain low nematode numbers and tree vigor through the orchard establishment period.

- Black plastic applied down the herbicide strip after planting.
- Enzone (a nematicide) applied through the drip system at 1000 ppm each October.
- Nematicur 3 (a nematicide) applied through the drip system at 1 gallon per acre each October.
- DiTera (an experimental nematicide) applied through the drip system at 10 lb per acre each April and October.
- Foliar low-biuret urea (100 lb / acre; equivalent to 50 lb of nitrogen) in late October.
- In-season foliar micronutrient sprays + an October urea spray.
- Oyster shell flour at planting + composted green waste and manure + foliar and drip-applied calcium periodically through the season.
- Oyster shell flour and compost + periodic applications of microbiological soil additives (Tilth<sup>®</sup> or Evenmore Classic Soil<sup>®</sup> + Iota<sup>®</sup>; Fusion 360, Turlock, CA).
- Oyster shell and compost + periodic applications of kelp extract (Shurcrop Supra<sup>®</sup>), humic acid and microbiological additives (Spectrum<sup>®</sup> or Bio Genesis<sup>®</sup>).

**Nematode control.** Despite being fallow for two seasons, the soil still harbored high numbers of ring and root lesion nematodes at the beginning of the trial. Although nematode numbers were low in the top 12 inches of soil (where most of us normally sample), large populations were present between two and four feet deep where the soil retained moisture and old peach roots survived. Methyl bromide, Vapam and Telone II preplant fumigation treatments essentially eliminated all pathogenic nematode species down to a depth of at least 5 feet in this trial. However, three years after fumigation we are now seeing pathogenic nematodes reappearing in fumigated areas.

Black plastic placed down the herbicide strip shortly after trees were planted heated the soil and almost eliminated ring and root lesion nematodes in the top 18 inches of soil for two years. After three seasons, the plastic is now in shade most of the day and is in disrepair, thus nematode effects are lessened. Annual Enzone and Nematicur treatments have reduced but not eliminated nematodes. DiTera, kelp extract and humic acid, microbiological soil additives and other post-plant treatments have had no effect on nematode numbers.

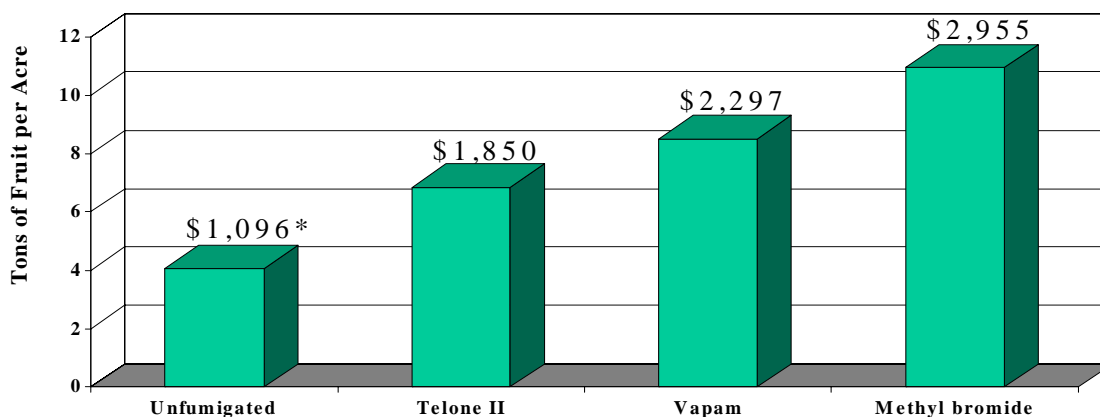
**Tree Growth and Yield.** Trees in fumigated areas have grown much larger and are more uniform in size than trees in unfumigated areas. Methyl bromide-treated trees are the largest. Telone II and Vapam-treated trees are similar in size even though Telone trees got off to a slow start.

Effects of post-plant amendments, fertilizers and nematicides are less obvious than pre-plant fumigation treatments. Effects are most significant in unfumigated areas. Although nematicides have reduced pathogenic nematodes on unfumigated trees, we have not yet seen a measurable growth response. We know nematodes are only a portion of the replant problem and this is why nematicides alone will not solve it. Trees treated with compost and biological soil additives have not grown differently than untreated trees. Trees receiving extra nitrogen had a little more growth than those that did not. Trees treated with extra nitrogen and, in addition, received multiple micronutrient foliar sprays had even more growth. Black plastic stimulated tree growth for the first two seasons but effects are less obvious now.

Fumigation has had a very significant effect on yield and gross revenue. This season (third leaf), we harvested the equivalent of 4.1 tons per acre in unfumigated areas, 6.9 tons in Telone II treated areas, 8.5 tons in Vapam treated areas and 11.0 tons in methyl bromide areas. Based on an estimated price of \$270 per ton for Loadel cling peaches, this represents a gross revenue increase of about \$1900 per acre (minus extra harvest costs) in methyl bromide areas compared to untreated areas. Telone II and Vapam increased per acre revenue by \$750 and \$1200, respectively. The increase in yield of the third-leaf harvest more than covered the fumigation costs. The only post-plant treatments to increase yield were the black plastic and the foliar micronutrients + fall foliar nitrogen: and these only made a difference in the unfumigated areas.

### Effect of Pre-plant Fumigation on Yield and Gross Income from 3rd-leaf Loadel Peach Trees.

Peach replant trial - Patterson Rd., July 2003



\*Gross revenues based on 372.3 trees per acre and a price of \$270 per ton

**Conclusion:** Even though fumigation is expensive, the grower in this case could not have afforded NOT to fumigate. Trees in unfumigated areas will probably never produce as much as fumigated trees. They are also more susceptible to bacterial canker and there are increased costs due to weed control. Even if unfumigated trees eventually catch up, substantial income will be lost during the early years of production.

There is no substitute for good pre-plant orchard preparation, including ripping, backhoeing or slip plowing to mix the soil and then following with an effective fumigation. Almost every peach or almond orchard replanted into a site previously occupied by an old peach or almond orchard in our area will benefit from pre-plant fumigation. The recent fad of trying to “biologically stimulate the soil” is no substitute. Over the past few years, many orchards have been planted without fumigation because the cost of methyl bromide has gotten so high. Although many of these orchards look OK, a trained eye can spot them because growth is just “OK” and the orchards tend to lack uniformity. The question is how much better would they have grown if they were fumigated?