Pre-plant and Post-plant Treatments for Replanted Cling Peach Orchards

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Trial Objectives for 2004:

1. To compare various pre-plant and post-plant treatments against methyl bromide and untreated areas for soil disinfestation of parasitic and free-living nematodes.

2. To monitor tree vigor, nutrition, and yield and relate these parameters to treatments, previously determined effects on soil microbial communities and nematode population dynamics.

3. To determine treatment effects on tree susceptibility to natural and inoculated populations of *Pseudomonas syringae*.

Summary of Results from 2004:

- Fumigation with methyl bromide, Vapam and Telone II all but eliminated ring, root lesion and root knot nematodes in this trial. Nematode numbers stayed low in all fumigated areas for the first two years but by the end of the third growing season (2003) they had increased to levels significantly higher than unfumigated areas. Samples from April, 2004 indicated there were about twice as many ring, root lesion and root knot nematodes in areas previously fumigated with methyl bromide compared to unfumigated areas. This is because the few nematodes that survived fumigation were able to rapidly reproduce on healthy roots. Now the healthier, fumigated trees support more nematodes than the weak, unfumigated trees. It is unclear whether the higher nematode numbers on fumigated trees will now make these more susceptible to bacterial canker than unfumigated trees.

- Despite higher nematode numbers, fumigated trees are much more vigorous, had larger fruit and much higher yields in 2004.

- Trees in areas treated with Vapam or Telone II are larger than in unfumigated areas, but are not as large as in methyl bromide areas.

- Yields were increased by 44%, 52%, and 111% in Vapam, Telone II and methyl bromide treated areas, respectively, compared to unfumigated areas. This computes to gross income increases of $901, $1052, and $2268 for Vapam, Telone II and methyl bromide treated areas, respectively, based on 2004 prices for Loadel cling peaches with less than 4% offgrade. In just the first two years of production, gross income was roughly $2000 higher in the Telone and Vapam-treated areas and more than $4000 higher in the methyl bromide-treated areas compared to unfumigated areas.

- Post-plant nematicides applied to unfumigated areas reduced nematode numbers initially after application but nematode numbers rebounded to untreated levels by the next year.

- Nematicides have yet to increase tree size or improve yield parameters.

- Trees in unfumigated areas that previously had black polyethylene mulch covering the herbicide strip continued to have higher yields than trees in other unfumigated areas. The mulch was removed after the third growing season (December, 2003). Post-plant treatments, including the black polyethylene mulch, have had no measurable effect on tree vigor or yield in fumigated areas.

- Trees in methyl bromide-treated areas had significantly reduced lesion size when inoculated with *Pseudomonas syringae* in December 2003, compared to trees in unfumigated areas. Supplemental nitrogen, including a pre-leaf fall foliar spray with 100 lb. of lo-biuret urea, reduced susceptibility in a similar fashion to pre-plant fumigation. In 2004, an attempt was made to confirm these results, as well as test susceptibility of trees treated with other post-plant materials. Unfortunately, bacterial inoculations did not survive in the field after temperatures increase unseasonably in late February.

- Compost, humic acid and microbial amendments did not reduce parasitic nematodes or influence leaf nutrient levels, tree growth, fruit size or yield. Soil sampled in previous years indicated microbial amendments did not influence soil microbial activity. These treatments were discontinued in 2004.

- In July 2004, leaves were sampled from trees in each pre-plant fumigation area as well as from trees treated with post-plant materials. Trees growing in methyl bromide treated areas had higher leaf nitrogen and potassium levels than unfumigated trees. There were no significant differences for other nutrients. No significant nutrient differences were shown for all other pre-plant or post-plant treatments.

Numbers of Plant Parasitic Nematodes in the Rhizosphere of 4th-Leaf Peach Trees as Influenced by Pre-plant Fumigation and Post-plant Treatments. April, 2004

	Nematodes per 250 cc of soil		
	Ring	**Root Lesion**	**Root Knot**
Preplant Fumigation			
Methyl bromide	419 a	226 a	8 n.s.
Unfumigated	276 ab	102 b	4
Vapam	272 ab	190 ab	17
Telone*	87	102	1
Postplant treatments**			
Untreated	276 b	102 n.s.	4 n.s.
Enzone	108 b	50	9
Nemacur	251 b	54	35
DiTera	217 b	209	7
Biologicals	144 b	25	0
Black Polyethylene Mulch	595 a	121	44

*Telone II was included as an observational area only and was not integrated into the replicated part of the trial.

**Post-plant materials were applied annually, beginning first-leaf. The last application before April 2004 sampling was October, 2003.

Influence of Pre-plant fumigation on Trunk Size	
Preplant Fumigation Treatment	**Trunk Circumference (cm) May 2004**
Methyl bromide	30.5 A
Telone II	25.1 B
Vapam	25.1 B
Unfumigated	20.5 C

Fumigation Effects on Yield and Gross Income of 4th-Leaf Loadel Cling Peach Trees. July, 2004

Fumigation Treatment	Avg. Fruit Diameter (mm)	Pounds of Fruit per Tree	Calculated Tons per Acre*	Gross Income per Acre**	Increase in Income Over Unfumigated
Unfumigated	64.2 b	39.2 c	7.3	$2044	--
Vapam	65.4 ab	56.5 b	10.5	$2945	$901
Telone II	66.5 a	59.4 b	11.1	$3096	$1052
Methyl bromide	67.2 a	82.9 a	15.4	$4312	$2268

* Per acre yield calculated by multiplying pounds of fruit per tree times 372 trees per acre.
**Gross income per acre calculated by multiplying tons per acre times $280 per ton for the Loadel variety under 4% offgrade.

When 2-year cumulative yields for each fumigation treatment are compared, differences are even more dramatic. During just the third and fourth-leaf harvests, gross income was more than $4000 higher per acre in methyl bromide fumigated areas than in unfumigated areas.

Cumulative Fumigation Effects on Yield and Gross Income Over Two Years (third and fourth-leaf).

Fumigation Treatment	2003 Tons per Acre	2004 Tons per Acre	Cumulative Yield	Cumulative Gross Income	Increase in Income Over Unfumigated
Unfumigated	4.1	7.3	11.4	$3140	--
Vapam	8.5	10.5	19.0	$5242	$2102
Telone II	6.9	11.1	18.0	$4946	$1806
Methyl bromide	11.0	15.4	26.4	$7267	$4127