

Results of Fumigation Trial

We have finished our fourth season comparing pre-plant fumigants in combination with various post-plant treatments in Norman Kline's peach orchard on Patterson Road. While we have not yet seen any bacterial canker in the plot, fumigation effects on tree growth, nematodes, yield and fruit quality are obvious. Across the board, trees in methyl bromide fumigated areas are much larger, have bigger fruit and more than twice the yields of unfumigated trees. Trees in Telone II fumigated ground are also much better than unfumigated trees but are not as large and yields are lower than methyl bromide treated areas. While Vapam-treated areas are better than the unfumigated areas, these trees are not uniform in size and many are beginning to struggle.

The table below shows fruit size, yield and calculated gross income for the four fumigant treatments in 2004. Average yield in the methyl bromide fumigated areas were more than double the yields in the unfumigated areas. At \$280 per ton for Loadel cling peaches with less than 4% rejects, methyl bromide areas made \$2268 per acre more in gross income than unfumigated areas this season (fourth-leaf). Telone II had a gross income of \$1052 per acre more than the unfumigated areas.

Fumigation Effects on Yield and Gross Income of 4th-Leaf Loadel Cling Peach Trees Patterson Road, 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	63.2	39.2	7.3	\$2044	--
Vapam	63.7	56.5	10.5	\$2945	\$901
Telone II	66.4	59.4	11.1	\$3096	\$1052
Methyl bromide	67.1	82.9	15.4	\$4312	\$2268

* Per acre yield calculated by multiplying pounds of fruit per tree times 372 trees per acre.

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

All three fumigants initially eliminated more than 98% of the ring, root lesion and root knot nematodes from the top five feet of soil and kept them low for the first two years. However, nematodes are now higher in the fumigated areas than the 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. The question now is whether regular applications of a nematicide can maintain lower nematode numbers and keep the fumigated trees healthy.

Post-plant treatments. We have applied several post-plant treatments over a four year period in fumigated and unfumigated areas. These treatments include nematicides (Enzone, NemaCur & DiTera), supplemental fertilizers (a blend of foliar micronutrients and foliar and drip-applied calcium and nitrogen), black plastic soil covering, compost, and microbiological and kelp-based soil additives. We have seen no effects of any post-plant treatment in fumigated areas. However, the foliar micronutrient sprays and the black plastic mulch increased tree size and yield in unfumigated areas. NemaCur and Enzone reduced nematodes initially after each application but nematode numbers always rebounded. Curiously, trees have not responded to the annual nematicide applications with more growth or higher yields. We have seen no effects on growth or yield from the microbiological soil treatments at all. In fact, soil tests showed that microbiological soil additives and kelp-based materials have not influenced the soil microbial community or increased microbial “activity” at all, despite multiple applications through the drip system each year.

I think we have learned several things from this trial. First, even though fumigation is expensive, increased yields and reduced costs (reduced weed control, fertilizer, replants, etc.) can more than cover fumigation costs early in the life of an orchard. There is no substitute for pre-plant fumigation. DO NOT think you can skip fumigation and then fix things later with compost and microbiological soil additives. Also, we have shown that the replant problem is more than just nematodes. Even though we have applied effective nematicides to unfumigated trees (starting first-leaf) and we have reduced nematodes, the trees are still struggling. This means we really can't just take a simple nematode test prior to planting in a replant site and make an informed fumigation decision. I have seen several second generation orchards with poor growth because they were not fumigated, even though pre-plant nematode levels were low. In my experience, if you are replanting an orchard into sandy or sandy loam soil, it is a huge gamble not to fumigate prior to planting.