Project Number: 99-MM-o0

2000 California Almond Board Report
Second and Final Year

May 1, 2000

Project Title: Attempts to make a "compatible" virgin soil as a potential replacement for methyl bromide.

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Objectives:

1) Evaluate various pre-plant treatments and amendments which may duplicate the benefit of "virgin soil."
2) Determine if it is possible to enlarge volumes of "virgin soil" with amendments and reduced fumigant volumes.
3) Identify groups of microorganisms associated with the best growing trees as their roots ramify from virgin soil to treated soil to replant problem soil.
4) Determine if one year of fallowing time can be omitted by growing first-year roots in a highly beneficial zone and determine if a nematode suppressive zone eventually develops (3 years).
5) Conduct a single "tight experiment" that tests last year's findings indicating that root systems which encounter a foreign soil ecosystem have to adjust which can slow tree growth dramatically.

Justification: The realities of fumigant buffer zones, the need for occasional interplanting, and our search for methyl bromide (MB) alternatives prompted a study of the possibility of transporting soil to individual tree sites as a starter medium. We chose a Vermeer spade that transports ½ yard soil depositing an inverted cone 54 inches in diameter at the field surface and reaching the cone point at the 3 ft depth. For this experiment we chose to transport a "virgin soil" that had not been farmed or planted to perennial crops for 24 years. We also attempted two methods for making a virgin soil. One involved fumigating with MB, Telone, or Vapam a year ahead and then adding organic matter to it (broadcast rate of 20 tons/acre compost+20 tons per acre steer manure + spray of seaweed extract). The second involved planting a tree in a fumigated area for one year and then transporting soil adjacent to the growing tree. These soils were transported to our replant site that had also received various fumigations or was non-treated. Once planted the new roots essentially had to grow through the transported soil into a field soil that was fumigated or not.

Results: Butte almond on nemaguard rootstock grew well for the first four to six months when planted to "virgin soil" or soil that had received methyl bromide and organic matter the previous year. After six months the trees growing in this latter treatment uniformly slowed their growth and dramatically lagged in growth through the end of the second year. Trees planted into virgin soil experienced a growth lag but not as dramatic. By the

end of the second year none of the transported soils outgrew the non-treated check. The 3-acre site that was planted to these trees exhibited a severe replant problem in one half and only a moderate replant problem in another half. Results were disappointing and a second trial has been initiated.

About half of the 864 trees planted to this site received a broadcast application rate of five tons compost + five tons manure + sprayed seaweed extract that was incorporated around the trees just after planting. This treatment almost always slowed tree growth, dramatically the first year with the growth lag continuing through the second year.

Of the 34 treatments in this trial there were only two treatments that significantly outperformed the average growth of the non-treated check. The best growing trees were 64 trees of Butte on Hansen's peach x almond hybrid. The second best treatment was methyl bromide pre-plant. As can be seen in Table 1 the peach x almond rootstock outgrew the other treatments by growing best where the replant problem was most severe.

Similar to our previous findings with Marianna 2624, it appears as though Hansen's peach x almond hybrid is more tolerant of the severe replant problem than nemaguard.

Plant growth of the replicates of 14 pre-plant treatments is depicted in Table 1. To evaluate the first-year growth from all the treatments refer to last year's report.

A pre-plant treatment of Telone C-35 produced the fastest growing trees until the second year when growth visibly slowed compared to the methyl bromide treated.

Objective 3 of this work was to identify microbes associated with best growing trees. We continue to have that interest but first we need assurance that we are sampling from the best trees which this experiment did not provide. Using other funds we will attempt such studies in 2000 if growth differences in that experiment are dramatic.

Table 1.

2nd Year Biomass in kg / Tree
1/14/00