IPM -Based Guidelines for Replanting Prunus Orchards in 2002 without Methyl Bromide

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In California 85% of almond, peach, plum, and nectarine orchards are replanted on Nemaguard rootstock. There is only a 35 to 50% occurrence of soil pests/diseases across California prunus orchards. Nemaguard rootstock is, however, quite sensitive to the "rejection component" of the replant problem. Methyl bromide (MB) as a single treatment served the purpose of controlling soil pests and diseases while correcting most of the rejection component of the replant problem and stimulating initial plant growth. The IPM strategy for replacement of MB is as follows: Use an auger or backhoe to diagnose soil physical or chemical problems while assessing for nematodes, oak root fungus, etc. > kill root systems > wait 18 months before replanting > during the wait correct soil physical, chemical and biological problems > replant with addition of macro and micronutrients. The database for this guideline emanates from small field trials but the commercial need for answers is now. As large field trials are established we are assessing results and updating. Where additional field data are needed the statements below have been underlined.

Nemaguard replanted to Nemaguard:

1. Determine if root lesion nematode, *Pratylenchus vulnus* and/or ring nematode, *Mesocriconema xenoplax,* are present in the orchard site. Avoid replanting of orchards if *Armillaria mellea* is present, but if present and ring nematode is not expected to be a problem there, plan to use Marianna 2624 rootstock.

2. Harvest fruit and as soon as possible, but before mid October, > irrigate deep> cut off old trees at trunk level and paint a solution of 50 ml Roundup plus 100 ml MorAct to the cambium. Be careful with bordering plantings. At this time we are unsure how much root grafting may occur with Nemaguard rootstock, but it is expected to be minimal. This treatment plus 18 months of wait will minimize by 85% the intensity of the rejection component of the replant problem where the soil pest and disease component of the replant problem is absent. Without this root killing treatment the intensity of the rejection component alone is reduced by 50% for each year of waiting. A four-year fallow results in almost no rejection component. This herbicide treatment will not reduce populations of root lesion nematode within roots or soil. If one full year of land idling does not occur expect the full intensity of the rejection component.

3. Wait at least 60 days before removal of old tree trunks.

4. To minimize the "soil physical and chemical component" of the replant problem may require deep and shallow movement of the soil profile. Use of a backhoe to accomplish this at each tree site has proven worthy only in the sandiest of soils. In sandy loam and finer-textured soils ripper shanks can provide adequate soil profile modification where needed. Displace salt build-up and residues of previous herbicides by stirring and moving the surface soil. All these practices and land leveling should be employed as needed and planned for completion prior to any biocidal treatments.

5. Adequate control of soil pests diagnosed to be present in Step 1 is accomplished by treatment of the surface five feet of soil profile with a biocidal agent. **Spot** treatments at tree sites or **strip** treatments of 8 to 12 feet wide will only provide one year of nematode relief. If root lesion or ring nematodes are considered to be a future problem these biocidal treatments should be **broadcast** applied or expect to treat the new orchard annually with post-plant nematicides.

6A. To well-dried soils, Telone II is applied most years before mid-November at 330 pounds (33.7 gallons) per acre rate. This is the standard alternative to MB. This treatment will perform adequately in sands and coarse sandy loam soils if the soil profile has been passively dried to five foot deep during summer months. If the soil is sandy loam or finer there should not be greater than 12% moisture within the soil profile at time of treatment. In these finer-textured soils a spring-summer cropping of sudan grass may be necessary to remove deep soil moisture. Use of Telone C35 at 490 pounds per acre rate will provide increased tree growth during the first year but will not generally increase the degree of nematode control. Chloropicrin applied at 330 pounds per acre can provide nematode control and notable benefits in first-year tree growth. Chloropicrin is not known to be a good root penetrant but where soils hold more than 12% moisture it can be expected to move better than Telone throughout the soil profile. These shank-applied treatments will all tend to miss nematodes located in the surface three to four inches of soil. Control at the field surface is achieved where a tarp is used or where products containing approximately 110 pounds per acre metam sodium (MS) are also applied at the field surface. Telone applications are complicated by the need for surface moisture prior to treatment. Incidence of more than 2 inches of irrigation or rainfall prior to treatment will detract from fumigant movement. Where soils are clay loam or high in silt content the treatment rate of 330 pounds is inadequate. For such soils the only option is strip treatments at higher rates; up to 660 pounds of Telone per acre applied to half the field surface area. A buffer zone of 100 feet is required for Telone.

6B. A drench of MS (Vapam or Sectagon) can be an excellent alternative to Telone II. The treatment rate is 330 pounds per acre and its delivery to five feet of depth will require uniform mixing of 75 gallons Vapam HL or Sectagon into 6 to 8 acre-inches of water as a carrier. Treatments are best applied when the soil is already moist, usually March through May. Where early harvested stone fruits have been removed this MS treatment may be best applied in the first fall. Do not attempt to drench just following soil ripping unless the soil has been adequately resettled with pre-irrigation. If the soil will not infiltrate 6 to 8 acre-inches of water in 8 hours or less without ripping MS should not be expected to perform. It is suggested that sudan grass be grown after a treatment of MS to enable revitalization of the soil. Additionally, Nemaguard peach does not grow well if planted within a year of a MS drench unless the orchard has been out of peaches for at least two years (see attached photo). A buffer zone of 500 feet is required for sprinkler-applied MS products but no buffer zone exists when MS is delivered as a drench to basins (see photos of Portable Soil Drenching Devices located elsewhere in this web site). The size of each basin is determined by the flow rate of water available to the field. Where only 500 gpm is available do not exceed a basin size of 100 feet by 50 feet (approximately 10 basins per acre) for sand or loamy sand soils and no more than 100 ft by 250 feet (approximately 2 basins per acre) for fine sandy loam soil. The soil in the berm that forms these basins must also receive treatment.

7. Replant trees the following spring applying very small quantities of diverse micro and macronutrients. The starter treatment we have used is 75 grams (1/6 pound) of Peters 20-20-20 plus 8.3 ml of SuperMicro stirred into 2 gallons of water and placed at each tree hole at planting time. Other starter fertilizers may be just as useful for bare root trees.

Nematode control comparable to a tarped, methyl bromide treatment can be achieved by drench applying metam sodium (Vapam, etc.) at 250 ppm MS in 2 acre-inches of water (25 gallons per acre Vapam HL in 54,000 gallons of water) prior to or following the Telone II treatment.

In highly porous soils where Bacterial Canker Complex is anticipated a low volume irrigation system should be installed with an effective post-plant nematicide applied to the affected area each October for the first seven years.

Compared to Nemaguard rootstock, Marianna 2624 rootstock is less sensitive to the rejection component of the replant problem. It is, however, a better host for ring nematode, more sensitive to Bacterial Canker Complex and produces suckers.

Hansen's 536 peach x almond hybrid exhibits little sensitivity to the rejection component of the replant problem but is more sensitive to Phytophthora root rot.

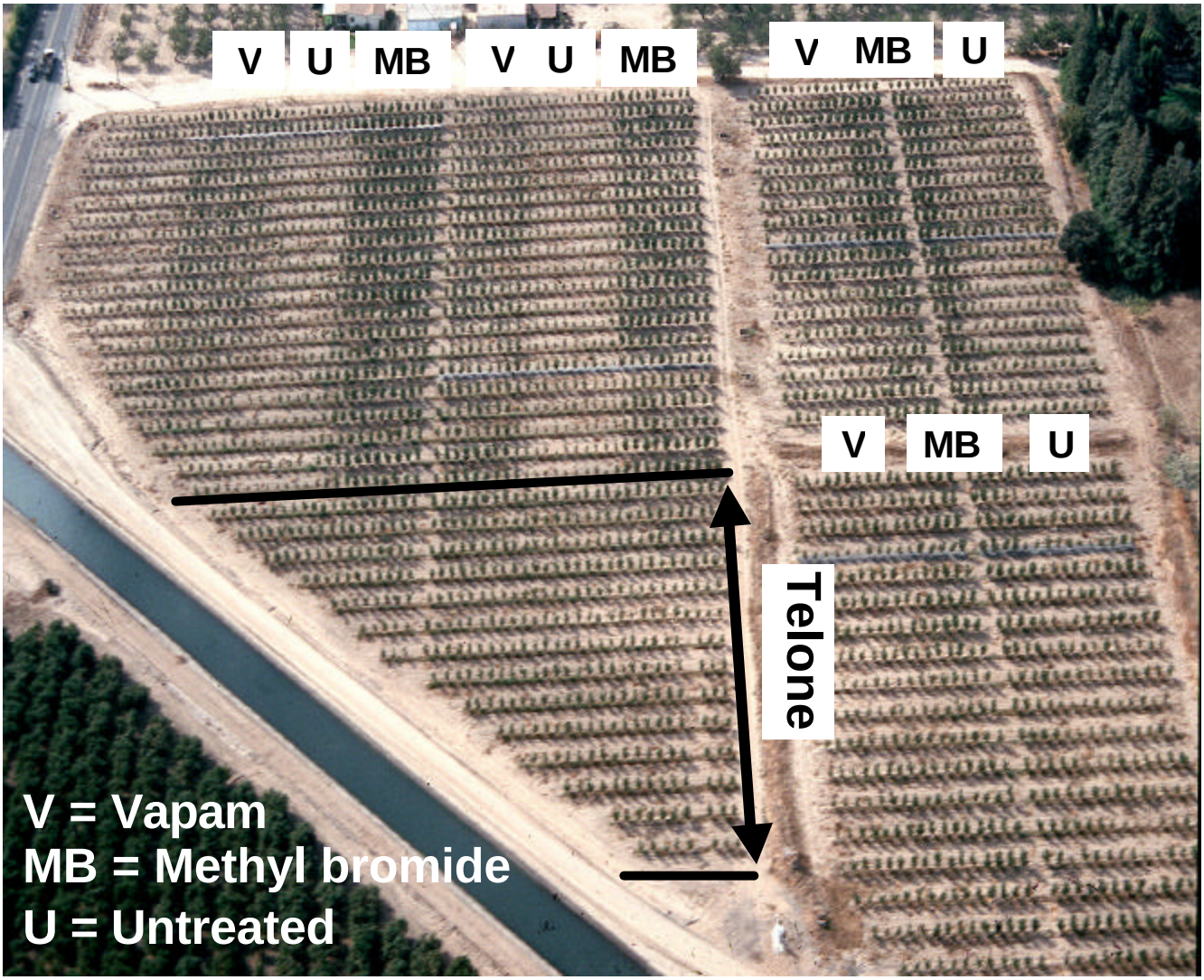
Peach rootstocks replanted in the Sacramento Valley do not exhibit the first-year tree decline that we associate with the rejection component of the replant problem. Additionally, Roundup applied to peach and plum trunks does not reduce population levels of root lesion nematode in any region. As a consequence there appears to be no reason for stump applications of Roundup to Prunus in the Sacramento Valley.

Poor growth of sudan grass can indicate the need for additional soil profile modification because of residual herbicides or soil stratification but does not indicate the intensity of the rejection component of the replant problem.

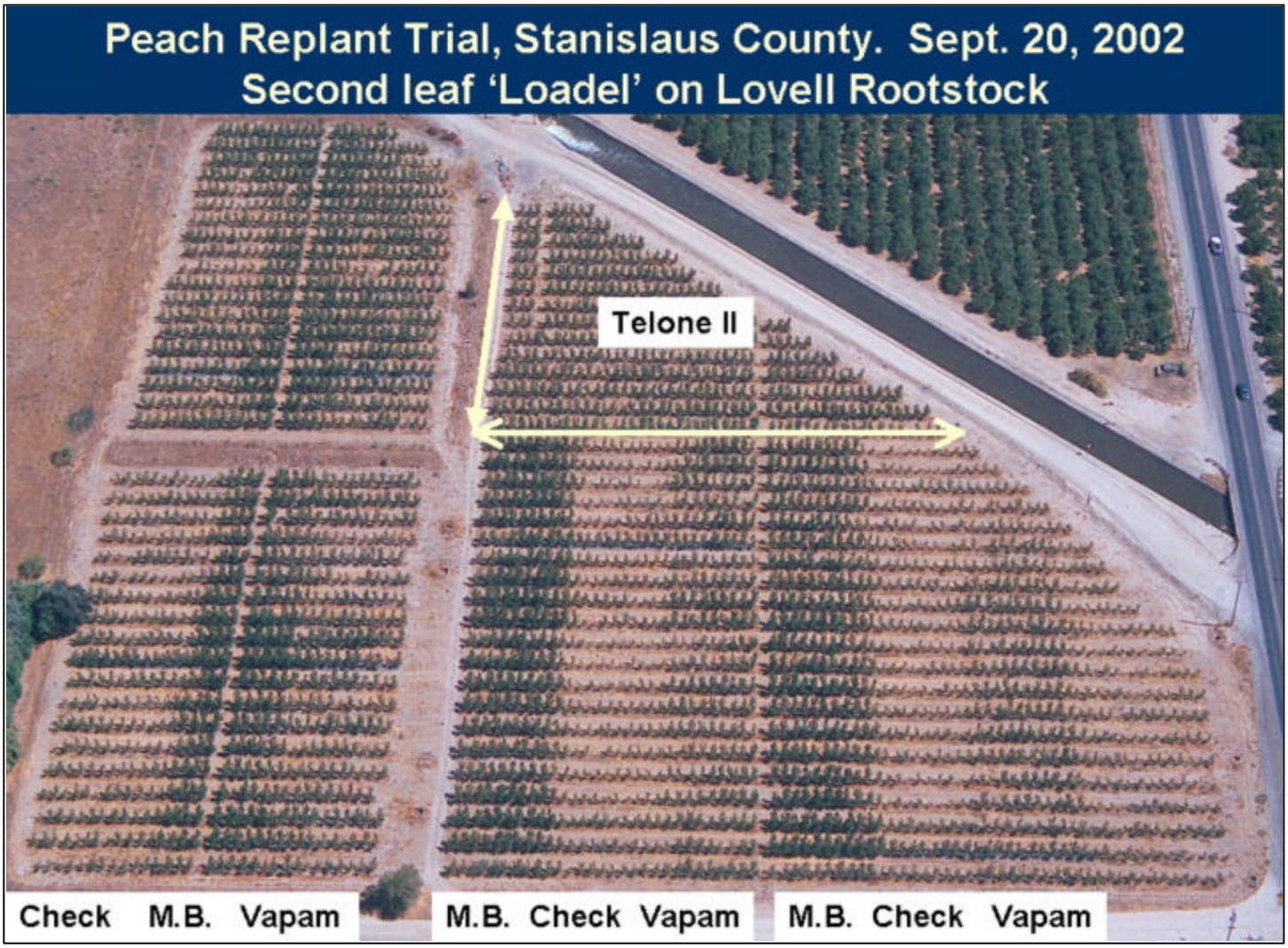
For organic growers: Remove trees and plant a California selection of alfalfa. Keep it relatively weed-free at least the first two years. After three years the root lesion nematode present is not *Pratylenchus vulnus*. The ring nematode, if prevalent in a potential Bacterial Canker site, can be reduced in number without causing a biological vacuum by growing sorghum x sudan for one full year. Replant Nemaguard with addition of small amounts of macro and micronutrients at planting time. Organic growers without damaging nematodes wishing to replant within one or two years of tree removal appear to aggravate the rejection component of the replant problem with addition of organic matter (compost, manure, seaweed) at or before planting time. More data are needed relative to addition of organic matter into a replant setting, however it should not be applied before the first fall after replanting.

For more information refer to "The Replant Problem and Its Management" at:
http://www.uckac.edu/nematode

Kline Peach Replant Trial – First-leaf trees
October 15, 2001



This photo depicts growth of first-leaf peaches replanted after two years fallow. In the replicate depicted on the lower right most of the old peach trees were removed several years prior to the rest of the orchard. Treatments included: V= a Vapam drench; U= untreated check; MB=tarped methyl bromide and Telone=a single replicate of shanked Telone located 300 feet from the closest dwelling. All treatments made in fall of 2000. This photo provided by Roger Duncan from his field trial in Stanislaus County.



This aerial photo was taken almost two years exactly after fumigation treatments were applied. Photo provided by Roger Duncan.