REPLANTING VINEYARDS WITHOUT SOIL FUMIGATION

M. V. McKenry*, T. Buzo and S. Kaku, UC Riverside, Dept of Nematology

We have previously described procedures for replanting stone fruits without soil fumigation (McKenry et al., 2006). Our procedures involved a five-step program of killing roots of the previous crop, waiting one full year and then replanting on a rootstock of different parentage plus attention to prevailing soil pests and the nutrient needs of young rootings. We recently simplified our procedures by referring to these five separate steps as: "*starve the old soil ecosystem then replant with different rootstock parentage*". Root leachates are the primary energy source for the old soil ecosystem. Successful trunk treatment with a systemic herbicide can kill entire root systems in 60 days if the plant is *Prunus* or *Juglans* but such treatments have not been effective with vineyards of *Vitis*.

In 2006-07 we established a microplot experiment to evaluate applications of glyphosate to cut trunks of *Vitis* during winter months. This timing is something we had never before attempted but we observed almost complete root kill following such a treatment in adjacent Ruby Seedless and Thompson Seedless vineyards. This success prompted more definitive testing. In our test site we treated 100 five-year-old pinot noir vines on freedom and 420A rootstocks in a completely randomized block. In February 2007, 20 vines were left untreated and 80 received a trunk painting of 25 ml glyphosate plus 25 ml of MorAct spreader. Sixty of the treated trunks had been cut above the graft union while 20 were cut below the graft union leaving trunks that had been disbudded at the time of bench-grafting. By August 2007 re-growth had occurred with all vines that did not receive glyphosate. Re-growth from disbudded trunks was completely absent. Re-growth from the 60 vines having a partial scion occurred in 2 vines compared to 58 that showed no new growth. After a dozen years of searching we believe we finally have a procedure for starving old soil ecosystems in vineyards. Our procedure will be to apply glyphosate to cut trunks in February-March. As needed, we will then drench low VOC nematicidal agents including fosthiazate, NatureCur, Enzone or metam sodium applied via drip in summer. In spring of the following year we will replant on rootstocks having broad nematode resistance plus tolerance to the rejection component of the replant problem where available (McKenry, 2006).

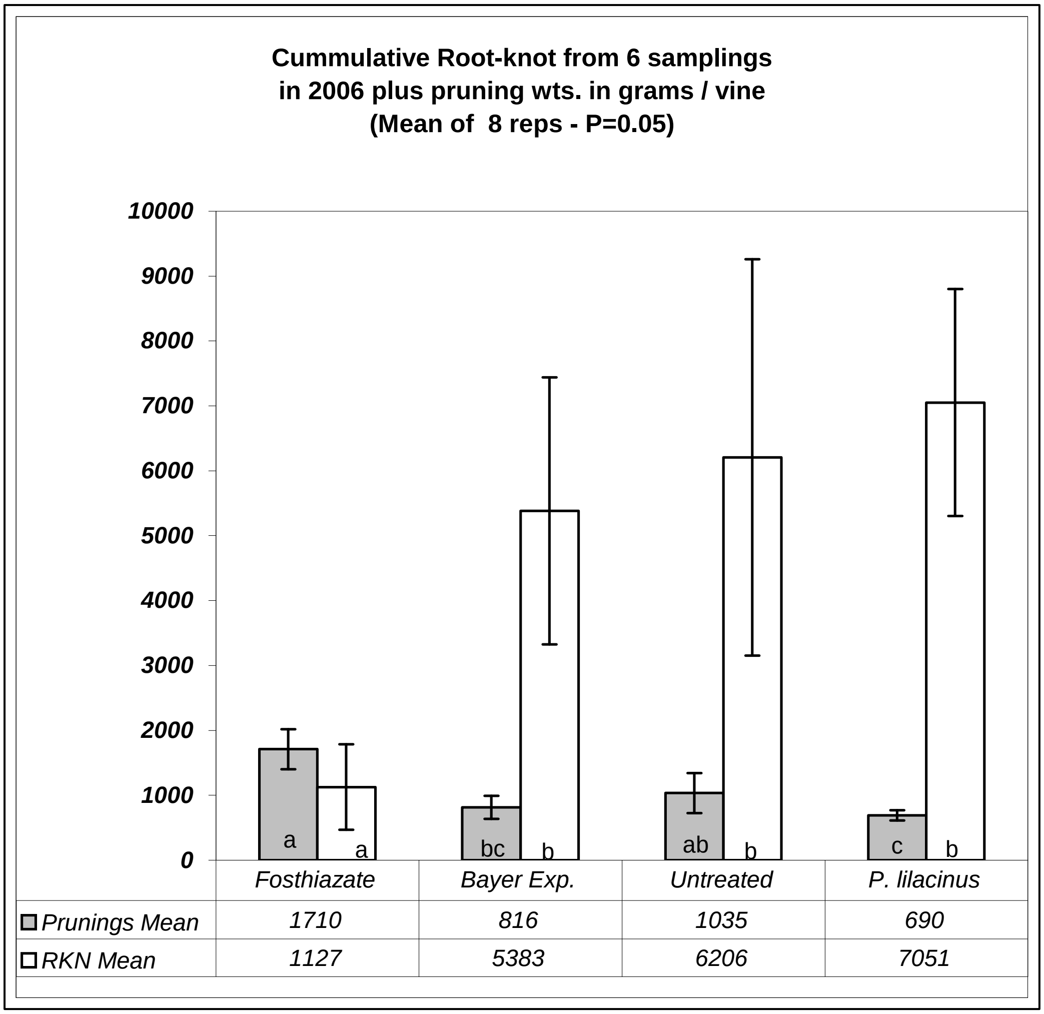
In an adjacent experiment involving 170 Ruby Seedless vines only 3 vines succumbed to a July 2004 application of 4% glyphosate followed by 2 years of leaf/cane removal and non-irrigation. In this experiment the population of *Meloidogyne incognita* juveniles had declined from 800 to <2 / 250 cm^3 soil during the two-year clean fallow period. In May 2006 all vines received irrigation in an attempt to rejuvenate their growth plus nematicides to kill nematode eggs and maintain a low incidence of *M. incognita* within the new root system. The most striking nematicidal treatment was two applications of 1 kg/ha fosthiazate that maintained population levels at 18% of those that were not treated. Reductions of infective juveniles due to lack of feeding plus reduction of egg stages with a nematicide can conserve nematode resistance mechanisms within nematode resistant rootstocks. Nematode reductions are imperative in those field settings having high nematode incidence.

We now have a *"starve the old soil ecosystem then switch rootstock parentage"* example that is worthy of evaluation in commercial vineyards. Specifically we will trunk-treat with glyphosate in late winter, apply a nematicide such as fosthiazate via drip to the new planting sites and then replant the following spring on 10-17A, RS-3 or RS-9 rootstocks depending on prevailing soil conditions. This program is suggested as an alternative to use of soil fumigants, including methyl bromide, but any such evaluations should be conducted in replicated trials with a fumigant comparison to identify any inadequacies associated with the proposed treatment.

These findings coupled with earlier findings in grapes (McKenry, 2006) plus similar findings with stone fruits (McKenry et al., 2006) lead us to the conclusion that the replant problem can be mitigated without a fumigant. Key to its mitigation is recognition that there can be four components to the replant problem and the "rejection component" involves kill or starvation of the remnant soil ecosystem. The rejection component of the replant problem occurs among various perennial crops but exhibits differing intensity levels depending on the region and the cultivars replanted. The intensity of the rejection component likely depends on the extent of root leakage. We need to know more about the entire soil ecosystem and any differences from plant to plant down each planting row (McKenry, 1999). In many cases the impact of individual pathogens has already been carefully measured in greenhouse and field settings. Root and above-ground biomass differences in the first year of growth can commonly be 7-fold when compared to planting into fumigated soil. The intensity of the rejection component then declines to nothing sometime during the second year after replanting (McKenry, 1999). Inadequate root system development in the first-year can magnify the importance of any additional damage attributable to known root pests including nematodes.

In the attached chart (Fig. 1) we depict the impact of fosthiazate on growth of Ruby Seedless, and nematode control. Ten years ago the senior author notified the EPA of our need for registration of this organophosphate. We now know that the needed rate is 4 lb/acre applied over 1–2 years as a pre-plant or as an application to non-bearing acreage.

Figure 1. First-year performance of three nematicides applied to Ruby Seedless vines during the first year of their rejuvenation process.



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