

Avocados Grow Better with Chips

In a two-year study and demonstration project begun in 1997, researchers at the University of California, Riverside (UCR) and Cooperative Extension found that use of yard trimmings can suppress avocado root rot.

Research Conclusions

The researchers recommend that growers replanting avocado trees in soil infested with *Phytophthora* should utilize an integrated pest management program. The program should include the use of resistant rootstock, fungicide, and composted or raw yard trimmings.

Other research findings included:

- Mulching with yard trimmings is an effective weed control method. This practice appears more economical for avocado growers than citrus growers because use of yard trimmings helps in the suppression of avocado root rot.
- Citrus trees benefit from the plant nutrients and water savings attributed to mulching. The potential in citrus orchards for reducing tissue boron levels and citrus nematode populations may make mulching economically worthwhile.
- Compost made from yard trimmings performed as well in these trials as raw yard trimmings and may be superior in many ways. However, it is unlikely that many commercial avocado or citrus growers will use compost because of its higher cost.
- Application of mulches using a pneumatic blower is a viable option, especially on hillsides where other means of spreading materials are not feasible.

Project Background

In January 1997, the California Integrated Waste Management Board and UCR staff began working together to complete this multiyear research project. Researchers evaluated the use of raw yard trimmings or composted yard trimmings as mulch on avocado and citrus orchards. Participants included local government, farm

advisors, and commercial avocado and citrus growers.

All of the orchards selected in the four-county project area were infested with *Phytophthora*. *Phytophthora* infestations are normal for citrus orchards and cause only a chronic yield loss. However, about 60 percent of the avocado orchards in California suffer acute tree loss due to *Phytophthora* root rot. The disease is much more serious than in citrus since *Phytophthora* root rot will kill avocado trees if it is not suppressed.

Products and Equipment Tested

Yard trimmings

Composted or raw yard trimmings were applied to the soil surface under trees in four commercial avocado trials and three commercial citrus trials. The avocado trials were in Ventura County (2), San Diego County, and Santa Barbara County. The citrus trials were in Ventura County (2) and the Coachella Valley of Riverside County. Mulched trees were contrasted with nonmulched trees in random, well-replicated experiments.

Project staff analyzed an extensive amount of data related to tree growth, soil nutrients and moisture, microbial activity and associated enzymes, leaf nutrients, crop yield, rodents, nematodes, weed control, and disease suppression in the avocado and citrus trials. The UCR final report, including numerous tables and graphs, is available at www.ciwmb.ca.gov/Publications/default.asp?pubid=762.

Pneumatic Spreader

Since hand labor or adaptability of existing equipment is a major impediment to the use of composted or raw yard trimmings, a pneumatic spreader was purchased for about \$30,000. It featured a unit in which the composted or raw yard trimmings were fed into a bark blower, which deposited the materials as mulch under the trees through a flexible 30-meter long, 10-centimeter wide hose.

The pneumatic spreader was an economical alternative to hand spreading materials.

Application of composted or raw yard trimmings using various pneumatic spreaders is a cost effective option, especially on hillsides where other means of spreading materials is not feasible.

Mulch Trial Observations

Avocado Root Rot Suppression

Avocado trees have very shallow roots, which proliferated abundantly in the mulch and the soil-mulch interface where they were relatively free of avocado root rot. The trees receiving mulch treatments exhibited striking increases in root growth. Two of the four trials exhibited improved growth, crop yield, or appearance. These results were attributed to a reduction of avocado root rot provided by the composted or raw yard trimmings.

This research showed that microbial numbers and activity were greatly increased in the vicinity of the mulches. Wood decay fungi, which proliferated abundantly in the mulches, produced two enzymes: cellulase and laminarinase. These enzymes dissolved the fungal hyphae of *Phytophthora cinnamomi*, the causal agent of avocado root rot. Because the enzymes were found to be abundant in the mulch, root infections due to *P. cinnamomi* as well as populations of *P. cinnamomi* were very low in the vicinity of the mulch.

Unfortunately, neither the effect of the microorganisms nor the enzymes they produce extend deep into the soil. Consequently, the beneficial effect of the mulch on avocado root rot is restricted to the surface layers, suppressing but not eliminating the disease.

When replanting avocado in soil infested with *Phytophthora*, project researchers recommend that growers suppress the disease using an integrated pest management program. The program should include planting root rot-resistant rootstocks; treating trees annually with the fungicide fosetyl-AI; and mulching trees with 1/3 to 1 cubic yard of yard trimmings two or three times during the first eight years after planting to enhance root development and reduce populations of *P. cinnamomi*.

Irrigation Management in Avocado and Citrus

Mulches prevented soil drying and reduced the need for irrigation in young trees as much as 40 percent. Growers must measure soil moisture and

irrigate cautiously when using mulches on either avocado or citrus if *Phytophthora* root rot is evident. Irrigating all trees the same amount will result in mulched trees becoming over watered. Over watering greatly exacerbates *Phytophthora* root rot when it is present in an avocado or citrus orchard.

Weed Suppression in Avocado and Citrus

Mulching to a depth of 7.5 to 15 centimeters greatly inhibits weed growth, making yard trimmings mulch a good substitute for herbicides. The economics of using mulch as a weed suppressant is tied to the frequency of application. Most growers would prefer to put on applications that last for several years. A 15-centimeter layer will suppress weeds for at least three years. Continued weed control will necessitate applying additional mulch in the orchard.

Citrus Benefits of Lesser Significance

Because citrus roots generally reside deeper in the soil than avocado roots, mulching apparently had little effect on *Phytophthora* root rot. Citrus trees did benefit from plant nutrients, water savings, and weed suppression attributed to mulching. These benefits, however, are not unique, and growers can achieve the same results via more traditional farming methods (i.e., fertilization, irrigation, and herbicide treatment).

Preliminary findings that may make mulching more attractive in citrus were the reduction in boron levels from leaf tissue in one trial and the reduction in citrus nematodes associated with mulching in another trial. Additional trials are necessary to verify these two observations.

For More Information

The UCR final report for this project, *Compost Demonstration Project, Southern California: Use of Yard Trimmings and Compost on Citrus and Avocado* (Pub. #443-99-010) is available at www.ciwmb.ca.gov/Organics/Pubs.htm. For more information, please call (916) 341-6620.