

# Recommendations for preventing the introduction of root rot organisms in new avocado grove plantings

Prepared for the information of growers by the Production Research Advisory Committee of the California Avocado Advisory Board in cooperation with the Cooperative Extension Service and Experiment Station of the University of California at Riverside

The causative organism of avocado root rot - the fungus *Phytophthora cinnamomi* - has never been found or identified in true virgin Southern California soil; it must be physically introduced (land that has previously been used for any type of farm production is not, of course, virgin soil and may already contain a population of *Phytophthora cinnamomi*).

It is important for growers to realize that this introduction can readily take place when planting a new grove. All that is required is a source of infection and the existence of a wet soil condition to further the spread of this fungus infection.

New trees - infected prior to planting with *Phytophthora cinnamomi* - can, unfortunately, be a source of introduction for this causative organism of root rot infection in new groves.

This infection of trees prior to transplanting can take place at either nurseries or tree holding sites. It is important for growers to realize that only a few trees need to receive this prior infection to effectively introduce *Phytophthora cinnamomi* fungi into a new grove planting, thus paving the way for an early appearance of root rot.

Nurserymen, University of California researchers, farm advisors, and other interested parties are all working hard to prevent this introduction of *Phytophthora cinnamomi* into new groves. But the ultimate responsibility lies with the individual grower - regardless of whether he is doing the planting himself or is relying upon the services of a grove management firm.

Prevention is still the best cure for root rot control in California avocado groves. Despite the potential development of chemical and root stock control measures, specialists in subtropical horticulture and plant pathology at the University of California at Riverside point out that when it comes to root rot control, prevention is still the best cure. Further, the best prevention method is careful examination and evaluation of both the planting site and trees prior to actually making a new planting.

Avocado trees are a 35 year investment. Yet, unfortunately, much of the current

introduction of root rot organisms in new grove plantings is being caused by growers unwilling to wait just six months to follow proper tree purchasing and planting recommendations.

### **Possible infect at holding site**

In an effort to satisfy the urgent demands for trees by new growers, it has become increasingly common to accumulate nursery stock from several different nursery sources and then hold these trees in a common holding site in their bottomless containers until new sites are ready for planting.

If *Phytophthora cinnamomi* is already present in the ground at these holding sites, the first watering of newly delivered nursery trees allows *Phytophthora cinnamomi* zoospores to "swim" up into their containers, quickly infecting one or more of the nursery trees in this holding site with the *Phytophthora cinnamomi* organism.

When these nursery trees are transplanted into new groves, just one tree previously infected at either the nursery or the holding site can effectively feed zoospores into the newly planted ground. Then - under proper slope and water movement conditions - the zoospores from this one tree have the ability move through soil, water and mud to surrounding trees, infecting them as well with *Phytophthora cinnamomi*.

Workers can further speed this rate of spread in new groves, by carrying the organism on their boots and vehicle tires to other parts of the grove.

Within a matter of months, this one infected tree can spread the root rot causing *Phytophthora cinnamomi* organism throughout the new grove planting.

As one means of preventing the occurrence of this situation, the University of California suggests that growers buy trees directly from reliable nurseries, and then transfer these trees directly from the nursery to the new grove planting site.

However, where the size of the planting requires that trees be purchased from several different nurseries and accumulated in a common holding site, the University recommends that individual nursery tree lots be kept separate.

### **Know your nursery**

The University further recommends that every grower familiarize himself with the growing practices of individual nurseries before purchasing trees by visiting nurseries under consideration for these purchases.

This recommendation holds true for investor-type growers who are relying upon the services of grove management firms to purchase and plant trees for them. These absentee growers should also familiarize themselves with the tree holding and handling procedures of their management firms and the extent of supervision of workers at their tree holding sites.

Under no circumstances, the University emphasizes, should any grower be in a rush to purchase and plant new trees; independent of the concern for root rot introduction, the purchase of good, healthy trees remains primary to a successful avocado grove investment.

Reliable nurseries are equally interested in supplying trees free of *Phytophthora cinnamomi* and with a long, productive life potential.

To guard against the introduction of *Phytophthora cinnamomi* at nurseries, the California Department of Food and Agriculture supervises a voluntary tree certification program for avocado nurseries. This program "certifies" avocado nursery stock, when grown in accordance with the following general procedures, for protection against infection with *Phytophthora cinnamomi*.

#### **Four certification steps**

**First**, under this certification program, the nursery is responsible for maintaining the identity of all trees entered in this program. Each nursery planting and storage location is subject to State approval, and must be in an area having minimal risks for the spread of *Phytophthora cinnamomi* by drainage, flooding, irrigation, or other means. Certified blocks must be separate plantings, sufficiently apart from other nursery stock plantings to maintain an individual identity.

**Second**, this program requires that avocado nursery stock for certification must be grown in soil treated with fumigant dosages as prescribed by the Department of Food and Agriculture. Other vegetation is not permitted to be grown within 25 feet of a certified block of nursery trees. In addition to this isolation barrier, each certified block must be enclosed by an approved fence.

**Third**, under this program, avocado seed for certified nursery stock must be immersed in hot water at a temperature of 120 to 122 degrees F. for 30 minutes in a suitable dipping vat under State standards, before planting.

**Fourth**, participation in this program requires that avocado nursery stock for certification be inspected for the detection of *Phytophthora cinnamomi* by using approved laboratory methods.

Some nurseries are unable to participate in this certification program because of their physical inability to satisfy the fencing requirement, although they do voluntarily follow all other aspects of this program.

This certification program - or at least compliance with the steps leading to certification guards the avocado tree purchaser against the introduction of root rot organisms into a new planting. However, it does not imply any warranty on the part of either the State or the participating nursery.

It has proved a very valuable tool in preventing the further spread of root rot since its enactment in 1970.

### **Examine planting site**

Despite the best efforts of nurseries, custom tree planters, and individual growers, the fungus *Phytophthora cinnamomi* can still be introduced into new plantings from joining groves.

To guard against this possibility, the University recommends that new growers check avocado groves uphill from their planting sites for evidence of trees infected with root rot, as well as for general vigor of trees in this planting. Also, the University recommends that growers examine the water drainage of existing, uphill groves prior to planting.

Following the best of planting procedures still does not eliminate the possible future introduction of *Phytophthora cinnamomi* into a new avocado planting. Rather, this requires a constant effort to hold grove traffic to a minimum; a continuous program of cleaning and disinfecting shoes and equipment prior to entering groves; the construction of water tight drains; control of gophers; and prevention of soil water-logging.

If suspicion of *Phytophthora cinnamomi* introduction arises, it is important that growers quickly control or remove infected trees, rather than leaving these trees in the ground with the hope that they will recover. These trees are a primary source of spread for *Phytophthora cinnamomi* to healthy trees.

### **Check symptoms with soil sample**

Trees infected with this organism either at the nursery or at a holding site often show probable symptoms of infection well within the first year of planting. These symptoms include lack of vigor, poor or no growth, loss of some foliage, and droopy leaves.

Once these symptoms appear, growers should immediately get a root rot test.

County Farm Advisors can provide the names of reputable testing laboratories with the equipment and experience to quickly make positive tests for the presence or absence of root rot organisms in avocado groves, from representative soil and root samples.

If these tests prove positive, growers should immediately contact their county farm advisor for recommendations of treatment and control methods - including the important new control procedures being developed at the University of California at Riverside through financial support of the Production Research Advisory Committee of the California Avocado Advisory Board.

Short of the complete elimination of the root rot problem in avocado groves, both new and existing growers must realize that while every responsible party is trying to do right in preventing the appearance and spread of this disease, the ultimate responsibility lies with the individual grower in preventing the introduction of *Phytophthora cinnamomi* in their grove through step-by-step evaluation and control of tree selection and planting procedures.