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CONTROL OF TRUNK CANKER CAUSED BY *PHYTOPHTHORA* *CITRICOLA*

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Project Objectives: The project is designed to 1) Study the factors which influence bark infection by *Phytophthora citricola* and; 2) Implement control measures for bark canker of avocado caused by *P. citricola*.

1. Description of the disease cycle

Field surveys indicate that the avocado canker disease is present in all avocado areas. *Phytophthora citricola* is present on the feeder roots of many trees that do not exhibit symptoms of avocado canker. *P. citricola* also does not cause disease in the same manner as *P. cinnamomi*. *P. citricola* causes a very mild root rot. Both in greenhouse experiments and in the field, *P. citricola* infected trees usually have only minor damage to feeder roots. *P. citricola* disease becomes serious only when cankers are found on major roots or at the root crown. These cankers are very slow growing and field investigations indicate that cankers may exhibit many cycles of healing and spread. *P. citricola* can inhabit the crown bark for many years without causing serious damage. Under some circumstances, however these cankers can girdle and kill trees. There is no evidence that cankers result from feeder root infection which spreads upward through the cambium until it girdles the trunk. Instead feeder roots probably provide the inoculum in the form of zoospores which somehow infect the crown or large woody roots. The following infection courts were investigated:

a. Root and crown lenticels - small plastic containers were attached around lenticels and to lenticel-free areas of the bark and fungal inoculum was added for 15 days. No lenticel or lenticel-free areas of the bark were

infected by *P. citricola*. Furthermore the lenticels proved impermeable to water-soluble stains.

- b. Adventitious roots - were investigated in the same manner as described above. The adventitious roots were killed by the inoculum but *P. citricola* remained in a localized area around the base of these roots.
- c. Wounding - placing inoculum over wounds or injecting inoculum under the bark with a syringe resulted in canker development in 100% of the cases. The disease can be spread by cutting a canker and then cutting healthy tissue. Field investigations indicate that the avocado canker disease in many cases can be traced back to wounds caused by sucker removal.

As a result of these field and greenhouse studies the following recommendations for avocado canker control can be made:

- a. Avoid wounding the trunk, crown or large roots. Apply a protective material such as Bordeaux paste to sucker wounds.
- b. Do not make cuts of any kind into *P. citricola* cankers. The disease can be spread on tools.

2. Resistance

Studies into the inherent resistance of clonal rootstock to *P. citricola* canker shows that there is no immunity in any rootstock yet tested. However, there are great differences in susceptibility. Young plants are more susceptible than old (2-3 year old). Evidence indicates that rootstocks could be placed in the following order of greatest resistance to least resistance. Toro Canyon, Duke 7, D9, G6, Topa Topa, G755, Barr Duke, Borchard, UC2011, UC2003, Rollie, UC2002, Thomas. Thomas, our best rootstock against *P. cinnamomi*, is especially susceptible to *P. citricola* canker.

In a field trial at South coast established in 1989 by Dr. Coffey, none of the trees has yet contracted avocado canker and *P. citricola* was recovered from roots of only 10% of the trees.

The following rootstocks will be screened for resistance to *P. citricola* during the coming year: Anaheim, Duke parent, Scott, G3-71, Queretaro, G166, G335, G592, Duke 201, Peru #1, Dusa Crl-80, Gordon, UC2001, UC2003, D9.

3. Chemical

Chemical Greenhouse trials with two-year-old G755 indicate that adequate chemical control of *P. citricola* canker is difficult to achieve. Results so far indicate that fosetyl-al (Aliette) is superior to metalaxyl (Ridomil) against *P. citricola*. Pretreatment is better than posttreatment and foliar sprays are superior to trunk applications. Increased rates are probably necessary to achieve adequate control. Several sites have been selected for the establishment of chemical field trials.

4. Cultural control

Factors which affect infection and disease progression by *P. citricola* are being

studied. It appears that cankers caused by *P. citricola* do not establish well during the winter months. Further studies on canker development will take place in the spring, summer and fall. These studies will be correlated with the soluble carbohydrate present in the bark at these times.

It appears that spraying water on infection sites, wounding above and below the infection site, and increased stress all appear to increase canker development.