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SCREENING AND EVALUATION OF NEW ROOTSTOCKS WITH RESISTANCE TO *PHYTOPHTHORA CINNAMOMI*

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PROJECT OBJECTIVE: To collect, select, breed and develop avocado germ plasm which exhibits resistance to Phytophthora root rot of avocado.

1. Collection and selection of germ plasm

New collections for the year include two *Persea americana* from the Canary Islands and two *Persea americana* from Israel which are reported to be very resistant to avocado root rot. We also investigated several *Litsea graciae* from Brunei. This *Litsea* species apparently becomes incompatible with avocado after a few years.

We are still trying to locate one last avocado species, the Aguacate de Anise from Costa Rica, to test its resistance to avocado root rot.

Attempts are still being mad to force budwood from the Rocky tree in San Diego County. It shows excellent field resistance.

2. Breeding program

We have screened 8085 seeds from the Witney, Bergh and Martin breeding program for resistance to *Phytophthora cinnamomi*. The number of available seeds is increasing each year and their may be up to 12,000 seed for next year. While we believe we can handle large numbers of seed, but we may begin to reduce the numbers of seed tested from certain trees which are providing the bulk of the seed at this time. Gray Martin is currently taking data on the flowering times of our different varieties in the breeding blocks. He is also implementing girdling and pruning to induce crossing between varieties which flower at different times. From the material screened this year we retained 29 seedlings which showed excellent resistance to P. *cinnamomi* in the initial screening. These resistant plants included 19 from D9 parentage, 9 from Thomas parentage and *1* from G6 parentage. Thomas and D9 are most often represented in *P. cinnamomi-resistant* seedlings. In order to reduce the time between identification of resistant rootstocks and field testing, we are now grafting promising material onto sucker shoots from cut stumps in the field to rapidly increase budwood for testing. We are now preparing some of first breeding material for testing. The breeding plots are now made up of G755A, Thomas, G1033, Toro Canyon, Barr Duke, UC2001, CR1-71, Duke 7, G6, D9, UC2011, and P. *steyermarkii*.

3.Screening and greenhouse evaluation of rootstocks

Extensive greenhouse evaluations were done on clonals of Evstro (Australian), Velvick (Australian), and Aguacate de Mico (Guatemalan) rootstocks. Thomas served as a resistant control and Borchard was the susceptible control. When grown without *P. cinnamomi,* Velvick, Borchard and Aguacate de Mico all gave plants of similar size and health. Thomas and Evstro produced smaller healthy plants. However, when grown with P. *cinnamomi* Velvick produced the largest and healthiest plants. Both Aguacate de Mico and Borchard plants were significantly larger than Thomas or Evstro plants. Plant weight of Velvick was not reduced by P. *cinnamomi.* Weight of Evstro was reduced only 19% by P. *cinnamomi* while weights of Thomas, Aguacate de Mico, and Borchard were reduced by 24%, 43% and 50% respectively. In the presence of P. *cinnamomi* Velvick had 51% healthy roots while Thomas, Evstro, Aguacate de Mico and Borchard had 30%, 27%, 20% and 15% healthy roots respectively. Velvick appears to be an excellent rootstock with considerable resistance to *P. cinnamomi.* Although a slow grower, Evstro also may be a useful rootstock and should be tested further. Aguacate de Mico does not appear to warrant further testing. During the past four years the following rootstocks have undergone extensive greenhouse testing: Velvick, Spencer, Krupp, UC 2011, Evstro, Rollie, Thomas, D9, Aguacate de Mico, CRI-80, Borchard, UC 2002, Peru #1, UC 2003, Hibbard. Of these rootstocks only Velvick, Spencer and UC 2011 appear to possess the characteristics which could make them an outstanding rootstock with excellent resistance to P. *cinnamomi.* Under greenhouse conditions, they appear to perform better than Thomas. Rootstocks selected for intensive testing in 1995 include G755A, Latas (So. Africa), Kidd Duke (Australia), Kidd (Australia), Talalt (So, Africa).

4. Field Evaluations

In a field plot in Santa Barbara Co., trees were damaged by the freeze in addition to root rot. Thomas, UC2001, and Toro Canyon performed similarly and all were better than G755B.

In a one year old plot at South Coast under fairly heavy pressure by *P. cinnamomi,* Hibbard and CRI-80 are not performing well. Thomas is performing best followed by UC2011, Queretaro, D9 and Duke 7 in that order.

In a second trial at South Coast some trees are now showing symptoms of avocado root rot, but damage is still relatively light. Only CRI-71 is growing poorly. Ranking the trees based on canopy volumes indicates Spencer is performing the best followed by Duke 7, UC2003, Dusa, Borchard, Thomas, D9, Queretaro, UC 2011 and CRI-71.

In a third four year old trial at South Coast damage due to *P. cinnamomi* is very light despite the plot being inoculated with *P. cinnamomi* three times. Based on yield Parida and UC2009 (Jovo) are the best with Toro Canyon and UC 2002 intermediate and UC2001 and Thomas yielding the least. Parida exhibits periodic chlorosis, but all of the other rootstocks appear to be performing well.

A new plot was established in a heavy, *P. cinnamomi* infested soil in Ventura Co. in 1994. Rootstocks established in that plot included Velvick (Australia), Evstro (Australia), Golden (Duke 6 seedling) , Aguacate de Mico (Guatemala) , Thomas, Duke 7 and Topa Topa.

Two other plots were established in 1994 in cooperation with H. Ohr, B. Faber and J. Downer. They included such standard varieties as Duke 7, Thomas, Toro Canyon, and UC 2011 under mulched conditions.

Percent Healthy Roots of Resistant Avocado Rootstocks Grown in Root Rot-Infested Soil