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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

Dr. Schieber, our South American avocado collector, passed away during the past year. Dr. Zentmyer and I are attempting to collect and collate all of his records. It may be necessary to go to Guatemala to gather the records. Before he died, Dr. Schieber sent us 81 collections from Guatemala in 1993. The collections included 54 Guatemalan Criollo *(Persea americana),* 4 Mexican Matiel-oj, 15 West Indian *(Persea americana), 6 Persea schiedeana,* 1 *Persea nubigenea* and 1 *Persea steyermarkii.* Most of the collections did not exhibit exceptional resistance to root rot. One Guatemalan Criollo (G1964) did show excellent resistance and was saved for further testing.

Dr. Zentmyer visited the botanical herbarium at St. Louis and has determined that the elusive *Persea rigens,* for which we have been searching for many years, probably does not exist. It is most likely not a *Persea* sp. at all. We will make an effort to locate one last species —the Aguacate de Anise from Costa Rica.

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

2. Breeding program

We have screened 7330 seeds from Dr. Bergh's and Gray Martin's breeding program during the past year. The future is bright for this breeding program. We estimate up to 12,000 seed for next year and even greater numbers in the future as the trees age. We believe we can handle the screening of large numbers of seed. Gray Martin will be implementing girdling and other procedures to induce crossing between varieties which

flower at different times. Because the general resistance of this seed is higher than for most avocados, we are now using *Phytophthora cinnamomi-infected* millet in the initial screening procedure. It gives excellent results but is a more stringent test for resistant varieties. From the material screened this year we retained 52 seedlings which showed excellent resistance to *P. cinnamomi* in the initial screening. These resistant plants included 22 D9 x Thomas, 3 D9 x G6, 21 Thomas X Barr Duke and 6 Thomas x G6. Thomas and D9 parents are most often represented in *P. cinnamomi-resistant* seedlings. Some of our earliest breeding successes are now ready for field testing. However, we still have a sizeable backlog of *P. cinnamomi*-resistant seedlings because they take several years to reach a size to where budwood can be gathered. To shorten this time we are attempting to graft some of the more promising varieties to sucker shoots from trees recently removed at South Coast. This will hasten the development of suitable budwood from these desirable varieties. 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 CR1-80, Peru #1, and Spencer seedings rootstocks. Thomas served as a resistant control and Borchard was the susceptible control. When grown without *P. cinnamomi,* Peru #1 and Spencer seemed to have poorer roots. Borchard gave the best seedling weights without *P. cinnamomi.* In the presence of *P. cinnamomi* Thomas produced the most healthy roots (45%) but Spencer was close behind with 33%. The other rootstocks had less than 10% healthy roots. Thomas and Spencer also produced the greatest root and top weights. Although Spencer does not possess the resistance of Thomas, it does appear to be quite resistant to *P. cinnamomi.* The resistance of Spencer to *P. cinnamomi* is different from that of Thomas. Thomas relies on rapid root regeneration to outgrow *P. cinnamomi.* Root exudation of Rb^{86} from Spencer roots was only 29%, while the other rootstocks exuded more than 44%. Spencer may show increased resistance due to less root exudation which attracts *P. cinnamomi.* CR1-80 and Peru #1 rootstocks do not appear to have useful resistance to *P. cinnamomi.* Rootstocks selected for intensive testing in 1994 include Velvick, Evestro, Aguacate micro, Golden, Borchard and Thomas.

4. Field evaluations

In a field test in Goleta in a heavy soil, trees on mounds were 12 times larger on the average than trees not planted on mounds. G755 gave the best growth in this test. UC2001 and D9 also performed adequately. UC2003 and UC2004 did not perform well.

In a field trial at South Coast CR1-71 is growing very poorly. However, root rot due to *P. cinnamomi* appears light in this trial since Borchard is still growing well. Other rootstocks performing well in this trial to date include UC2003, Duke 7, Dusa and Spencer.

In a second trial at South Coast, Phytophthora root rot also appears light and there is little difference between UC2001, UC2002, UC2009, Parida, Thomas and Toro Canyon.

We have asked that excess water be used on these plots to enhance root rot symptoms.

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.

A recent plot established in 1993, which includes UC2011, Queretaro, Hibbart, G3-71, D9 and Thomas is awaiting examination. New plots will be established this year at South Coast and Santa Barbara Co. These plots will test Velvick (Australian), Evestro (Australian), UC2023, G874, G755A (Guatemalan selection now thought to be different from G755B), and Spencer seedlings (from a tree with high resistance).