

## NOTAS CIENTIFICAS

### REPORT ON AVOCADO DISEASES, CULTURES AND SEED COLLECTIONS IN CHILE - June 1956

Phytophthora root rot of avocado (causal organism: *Phytophthora cinnamomi*) was found to be present in the La Cruz and San Vicente areas. The fungus was cultured from roots collected on four different properties as indicated in the culture list below. Symptoms on trees indicated that the same disease was present in a number of other places. No definite control known for this disease. Caused by combination of the soil fungus *Phytophthora cinnamomi* and wet, poorly draining soil. Very little trouble on well-drained soils, even with the fungus present. Careful irrigation to avoid excess water in soil will retard progress of the disease. Applications of alfalfa meal to top few inches of soil have shown promise in California (approximately 100 to 150 pounds per tree). Work with soil fungicides to control the disease is still in the experimental stages; the soil fungicide Vapam is promising.

Several soil fumigants will kill *P. cinnamomi* if only small areas are infested; methyl bromide at 3 lbs. per 100 sq. ft., D-D at 150 gallons per acre, chloropicrin at 40 gal. per acre, and Vapam at 200 ppm (4 gallons per square foot). These dosages will kill trees and can be used only where replanting is the objective. Methyl bromide and chloropicrin of course are very dangerous to use and must be handled with proper precautions. D-D and Vapam also must be handled with care.

Encouraging results are being obtained with resistant rootstocks in California; there is considerable resistance in a Mexican variety (Duke). Several related species of *Persea* (*P. Skutchii*, *P. Donnell-Smithii*, and *P. borbonia*) are highly resistant to the disease but are not compatible with avocado and hence cannot be used directly as rootstocks. Other types of trees can be used to replant areas where avocados are removed because of root rot. Citrus, cherimoya, macadamia nut, and persimmon are not affected by *Phytophthora cinnamomi*.

Verticillium wilt (causal organism: *Verticillium albo-atrum*) was seen on young Hass trees in the Quillota area. Characteristics include a wilting and rapid death of leaves on one branch, or on one side of the tree, or sometimes the entire tree. Leaves turn brown and remain on the tree for some time. When bark is peeled from branches, brownish streaks are seen in the wood. Sprouting and recovery of trees is common. The disease is accentuated in areas where other susceptible hosts, such as tomato, pepper, etc. have been grown, or are grown between avocados.

Control of Verticillium — not much can be done; prune out dead wood after new growth appears; avoid other susceptible crops; fertilization to increase vigor of new growth may help. Don't take buds from trees that have or have

had the disease. In our experience, Guatemalan rootstocks are more susceptible to this disease than are Mexican rootstocks.

A few cases of what appeared to be *Dothiorella* canker were seen in the Quillota area. Causal fungus is *Botryosphaeria ribis* (imperfect stage: *Dothiorella gregaria*). This fungus usually does not cause serious damage, is more active on Guatemalan than on Mexican varieties, and can often be controlled by scraping or cutting away cankered areas.

I also isolated *Botryosphaeria ribis* from the cankers on loquat (*Eriobotrya japonica*) in Quillota, but am not positive that this is the cause, without doing some inoculation work. This fungus has not been reported as a pathogen of *Eriobotrya* as far as I have been able to determine. *Phytophthora cactorum* causes a trunk canker of this plant; further isolations should be made.

I am not certain of the cause of the root rot of Cherimoya. The fungus isolated from La Cruz looks like a species of *Cylindrocarpon* or *Ramularia*, which is usually not parasitic.

#### Culture Results

- CH 1 — Small avocado roots from dead tree on Sr. Louis Bastidas' Chacra Lourdes, la Cruz. No *Phytophthora cinnamomi*.
- CH 2 — Avocado in advanced stage of root rot on Bastidas' grove. *P. cinnamomi* isolated.
- CH 3 — 30 year old Mexican seedling in advanced stage of root rot, on Carlos Bowers' Fundo Santa Ana de Pocochay, La Cruz, in section of grove below the road. *P. cinnamomi* isolated.
- CH 4 — Young tree (Le Blanc variety?) on Bowers' Fundo, above road; advanced stage of root rot. *P. cinnamomi* isolated.
- CH 5 — Cherimoya tree with root rot and necrosis in rootstock, on Enrique Von Holleben property. Species of *Cylindrocarpon* isolated; doubtful that this is pathogen.
- CH 6 — Large, old Mexican seedling (100 years old?) on property of Sr. Santiago Gandulfo in San Fernando. Tree dying back. *P. cinnamomi* isolated.
- CH 7 — Tree with root rot?, chlorotic foliage in area where many Mexican seedlings have died, on Sr. Augusto Rodríguez' Fundo Viña Vieja, San Vicente. No *P. cinnamomi*.
- CH 8 — Tree in advanced stage of root rot, chlorotic foliage, on Sr. Mario Jiménez' Fundo El Tambo, near San Vicente. *P. cinnamomi* isolated.
- CH 9 — Tree in moderately advanced stage of root rot, in grove of Sr. Manuel Cabanos, Malloa. *P. cinnamomi* isolated.
- CH 10 — Large Mexican tree budded on Mexican rootstock, in grove of Sr. Recaredo Ossa, Hacienda Viña La Rosa, La Rosa. No *P. cinnamomi*.

- CH 11 — Mexican avocado budded on Mexican, in moderate stage of root rot?, in area near large old seedlings, Fundo El Banco, Peumo. No *P. cinnamomi*.
- CH 12 — Large healthy seedling, Fundo El Banco, Peumo. No *P. cinnamomi*.
- CH 13 — Large tree of *Persea lingue*, Granuzo. No *P. cinnamomi*.
- CH 14 — Large tree of *Beilschmedia Miersii* ("Belloto") canyon in hills on Carlos Bowers' Fundo, La Cruz. No *P. cinnamomi*.
- CH 15 — Bark from rootstock and lower trunk of loquat (*Eriobotrya japonica*) affected with rot of rootstock and crown, Magdahl property, Quillota. *Botryosphaeria ribis* (*Dothiorella* imperfect stage) isolated.
- (All above cultures made from small avocado feeder roots, on cornmeal agar, unless otherwise noted).

#### Seed Collections in Chile

- CH 1 — *Persea americana* seedling tree, Chacra Santa Julia, Poniente, owner — Pedro Hargous, La Cruz. 26 seed.
- CH 2 — *Persea americana* seedling tree, same property as CH 1; cuartel N° 7. 25 seed.
- CH 3 — *Persea americana* seedling tree, same property as CH 1; cuartel N° 4. 24 seed.
- CH 4 — *Persea americana* seedling tree, same property as CH 1; cuartel N° 4. 25 seed.
- CH 5 — *Persea americana* seedling tree, Chacra Hitchins, owner — Pedro Hargous, La Cruz. 4 seed.
- CH 6 — *Persea americana* seedling tree, isolated tree about 50 years old, calle Bilbao (Juan Jeria), owner — F. Casas Cordero, La Cruz. 18 seed.
- CH 7 — *Persea americana*, seed from various seedlings from 60 to 90 years old, calle Bilbao, owner — Leonardo Figueroa, La Cruz. 20 seed.
- CH 8 — *Persea americana*, seeds from various seedlings, Quinta Cholula, owner — Gmo. Wiederhold, La Cruz. 27 seed.
- CH 9 — *Persea americana*, var. Cachimba, Chacra Los Tilos, owner — Schwarzenburg Hnos., La Cruz. 25 seed.
- CH 10 — *Persea americana*, var. Cacho de cabra, Chacra Los Tilos, owner — Schwarzenburg Hnos., La Cruz. 25 seed.
- CH 11 — *Persea lingue*, large old native seedling tree on edge of field behind house in Granuzo (near Limache). 380 seed.

- CH 12 — *Beilschmedia Miersii* ("Belloto"), large trees in native vegetation in moist canyon in hills on Fundo Santa Ana de Pocochay, owner — Carlos Bowers. Mature fruit abundant in June, have hard shell similar in appearance to pecan, no flesh, seed similar to avocado, 1½ inches long. 144 seed.
- CH 13 — *Cryptocarya* sp. ("Peumo"), trees in same location as CH 12. Few seed on ground, small, about size of olive. 11 seed.
- CH 14 — *Persea americana*, large, old seedling Mexican tree (about 100 years old), now has some dieback, on Sr. Gandulfo property, town of San Fernando, south of Santiago; 22 seed collected, black, typical Mexican fruit.
- CH 15 — *Persea americana*, seedling Mexican tree 24 inches in diameter, 75 ft. south of CH 17, Fundo Viña Vieja, owner — A. Rodríguez, San Vicente. 17 seed.
- CH 16 — *Persea americana*, seedling Mexican tree located between CH 15 and CH 17. 7 seed.
- CH 17 — *Persea americana*, large old seedling Mexican tree at north end of group of avocados west of seedling orange grove, Fundo Viña Vieja. 25 seed, reddishpurple fruit.
- CH 18 — *Persea americana*, large Mexican seedling, Fundo El Banco, Peumo. 7 seed.
- CH 19 — *Persea americana*, large Mexican seedling, Fundo El Banco, Peumo. 11 seed.
- CH 20 — *Persea americana*, large Mexican seedling, near root rot area, Fundo El Banco, Peumo. 10 seed.
- CH 21 — *Persea lingue*, seedling tree on Carlos Schwarzenburg property, La Cruz. 38 seed.

(Report based on work in Chile from June 19 to June 27, 1956).  
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