Proc. of Second World Avocado Congress 1992 pp. 133-137

# A Unique Trunk Canker of Avocado in Guatemala Caused by *Phytophthora heveae*

**George A. Zentmyer**
University of California, Riverside, CA 92521, USA

**Wilson Popenoe**
Deceased

**Eugenio Schieber**
Antigua, Guatemala, Central America

***Abstract.*** **A unique trunk canker was first observed by Wilson Popenoe and called to our attention in January, 1973, on trunks of avocado trees in a Ministry of Agriculture Nursery variety planting at Los Aposentos, near Chimaltenango, Guatemala. Cultures from bark samples yielded a homothallic species of *Phytophthora* that we identified as *P. heveae.* This is the first report of this pathogen on avocado, and the first occurrence in Guatemala of this fungus. The canker caused considerable damage on the young (three- to four-year-old) trees; some were girdled and killed. The trees were on Guatemalan criollo seedling rootstocks, with scions from Guatemala, Honduras, and Hawaii.**

The occurrence of a new pathogen causing trunk cankers on avocado was reported briefly in the California Avocado Society Yearbook in 1975 (Zentmyer *et al.),* and in the Plant Disease Reporter in 1978 (Zentmyer *et al.).* This paper provides more detail on this uncommon species of *Phytophthora* in Latin America, and on the disease progress since the original observation by Dr. Wilson Popenoe in 1973.

## Materials and Methods

This new disease problem was reported to us by Dr. Popenoe in January, 1973, and we visited the nursery that month and collected samples in the course of one of G.A. Zentmyer's trips to Latin America in connection with the University of California, Riverside, project on the search for avocado rootstocks resistant to *Phytophthora cinnamomi* root rot. Affected trees were 3 to 4 years old when the first cultures were made, and had cracked and bleeding cankers on the lower trunk and upper part of the rootstock (Fig. 1). Excision of the cankers revealed definite reddish-brown margins leading into healthy tissue. Lesions were generally in the bark, but occasionally extended into the outer xylem. Diseased trees were off-color, and where the cankers had nearly or completely girdled the lower trunk the tops were severely wilted, and some trees had died by 1974.

Isolations were made by the senior author using small pieces of bark from the active margins of the lesion on the lower trunks of the small trees. Bark pieces were plated on media selective for *Phytophthora* in an improvised hotel room laboratory in Antigua the day of collection. Isolations were made again from the same planting in 1974 and 1977.

Figure 1. Typical canker caused by *Phytophthora heveae* on young avocado tree in Guatemala. Photo by Schieber.

**Results**

An obvious species of *Phytophthora* grew readily from a high proportion of the bark pieces cultured within two to three days. Cultures were examined a few days later on my return to Riverside, California. This turned out to be a homothallic species of *Phytophthora* that produced abundant oospores in a few days at 24C on V8 agar.

As we had previously isolated a homothallic species of *Phytophthora* from trunk cankers in southern California in the 1960's and identified this as *P. citricola* (Zentmyer *et al*., 1974), there was a good possibility that this was the same fungus. Further microscopic study revealed that the Guatemalan isolate was a different species of *Phytophthora, P. heveae* Thompson.

*Phytophthora heveae* is distinguished by the unique form of the antheridium and oogonium, with an elongate antheridium and a balloon-shaped oogonium. This is quite different from the antheridium and oogonium in *P. citricola,* and also *P. cactorum,* the other homothallic species that was reported on avocado many years ago. The antheridia are amphigynous, thus distinct from *P. cactorum* which has paragynous antheridia. Sporangia were formed readily on V8 agar and other agar media, and are somewhat irregular in shape, with the sporangiophore sometimes attached laterally. More details on the fungus mycelium, sporangia and oospores are given in our 1978 paper (Zentmyer *et al*.).

Waterhouse (1956) describes *P. heveae* as follows: "Range of sporangia 27-66 x 20.5-48 $\mu$m, average size of 400:45.9 29.62. Mean ratio of length to width = 1.55. Oogonia and oospores freely formed on potato dextrose agar media and also in water. Oogonia broadly funnel shaped with amphigynous antheridia. Oospores round, smooth, and thick walled, not always colored distinctly. Range of 200 oogonia = 17-32 $\mu$m, mean = 25.9, range of 250 oospores = 15-26.8 $\mu$m, mean = 21.46."

Inoculations of stems of young avocado seedlings (cv. Topa Topa) with two Guatemalan isolates of *P. heveae* in the greenhouse resulted in rapid development of lesions with growth similar to cankers formed by *P. cinnamomi* (Fig. 2). Cankers produced by *P. heveae* averaged 6.2 cm in 8 days; *P. cinnamomi* cankers averaged 4.7 cm.

The original description of *P. heveae* was in 1929 by Thompson in Malaysia. He reported the fungus as parasitic on bark and fruit of *Heveae brasiliensis* (H.B.K.) Muell. *P. heveae* has been described on additional hosts since 1929, including cacao *(Theobroma cacao* L.) in Malaysia, Brazil (Luz *et al.,* 1989), and Mexico (Lozano-Trevino and Romero-Cova, 1984); rhododendron in North Carolina (D.M. Benson, personal communication), pine soil in the southeastern United States (Campbell and Gallegly, 1965), *Eucalyptus* soil in Australia (Gerrettson-Cornell, 1976), a forest tree *(Agathis australis)* in New Zealand (Gadgil, 1974), and Brazil nut trees in Brazil (Albuquerque *eta/.,* 1974). The fungus is a common pathogen on rubber in Malaysia.

*P. heveae* is not a common pathogen in Latin America; this is the first report on avocado, and the first report of the fungus on any host in Guatemala.

The nursery in Guatemala was visited again in 1974 and 1977. At the time of the original isolations there was considerable damage on the avocado trees; several trees were girdled and had died. When additional notes were taken in 1977, 30 percent of the 223 trees in the nursery variety plantings had either been removed or were very

severely diseased. The trees in the plantings were all on local Guatemalan "criollo" seedling rootstocks, with scions from Guatemala, Honduras, and Hawaii including 'Siquinala', 'Chocola 5', 'Rinconada', 'Zamorano 10', and 'Haankuu Hawaii'. The planting did not make good growth overall, and was removed in the mid-1980's.

This canker has not been observed on any other avocado trees in Guatemala, or on any other host in that country. To date this pathogen has not been found in California on avocado, nor reported from any other country on avocado. There are few records of the species in Latin America, in Mexico and Brazil.

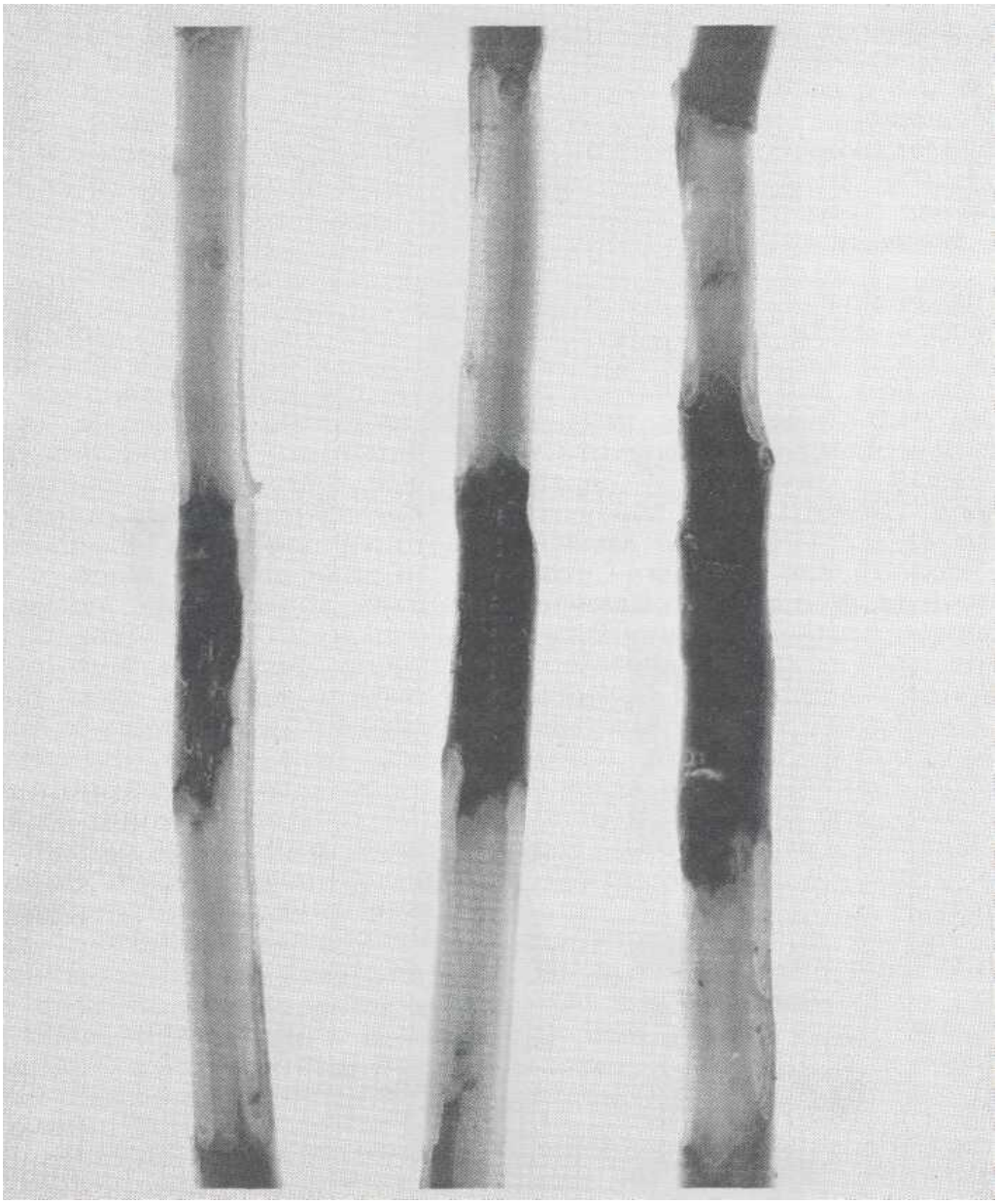

Figure 2. Lesions caused on stems of *Persea indica* by inoculation with *P. cinnamomi* (left) and *P. heveae* culture from Guatemala (center and left).

## Discussion

The reason for this curious isolated occurrence of a new pathogen on the small nursery planting in Los Aposentos, Guatemala, is difficult to determine. At the time of our first visit there were a number of young nursery trees still in nursery rows prior to planting in the field there or moving to other groves. None of these small trees showed any indication of the canker. There were a number of young deciduous fruit trees in the nursery and in a small field planting adjacent to the avocado field planting, with no evidence of disease development. The cankers were primarily on the rootstock portion of the grafted trees, with lesions spreading from the ground level upward, so the infection must have come from the soil or from the original seedlings.

## Literature Cited


Albuquerque, F.C., M.L.R. Duarte, G.R. Manco, and H.M. Silva. 1974. [Leafblight of Brazil nut (*Bertholletia excelsa*) caused by *Phytophthora heveae.].* Requeima das folhas da castanheira do Para (*Bertholletia excelsa*) casuada por *Phytophthora heveae.* Pesqui. Agropecu. Bras., Ser. Agron. 9:101-105.

Campbell, W.A. and M.E. Gallegly. 1965. *Phytophthora heveae* from eastern Tennessee and western North Carolina. Plant Dis. Reptr. 49:233-234.

Gadgil, P.D. 1974. *Phytophthora heveae, a* pathogen of kauri. N. Z. J. for Sci. 4:59-63.

Gerrettson-Cornell, L 1976. *Phytophthora heveae* and *P. boehmeriae* in a *Eucalyptus pilularis* plantation in New South Wales. Austral. Plant Pathol. Soc. Newsl. 5:8-9.

Lozano-Trevino, Z.E. and S. Romero-Cova. 1984. Estudio taxonmico de aislamiento de *Phytophthora* patogenos de cacao. Agrociencia 56:175-182.

Luz, E.D.M.H., S D.V.M. Silva, and DJ. Mitchell. 1989. *Phytophthora heveae:* outra especie causando podridao pardado cacaueirona Bahia. Fitopatologia Bras. 14:160 (Abstr.).

Thompson, A. 1929. *Phytophthora* species in Malaysia. Malaysian Agric. 17:55-100.

Waterhouse, G.M. 1956. The Genus *Phytophthora.* Commonwealth Mycological Institute Misc. Publication 12, 120pp.

Zentmyer, G.A., L. Jefferson, C.J. Hickman, and Y. Chang-Ho. 1974. Studies of *Phytophthora citricola,* isolated from *Persea americana.* Mycologia 66:830-845.

Zentmyer, G.A., LJ. Klure, and E.G. Pond. 1978. A new canker disease of avocado caused by *Phytophthora heveae.* PI. Dis. Reporter 62:918-922.

Zentmyer, G.A., E. Schieber, and W. Popenoe. 1975. *Phytophthora* canker of avocado trees in Guatemala. Calif. Avocado Soc. Yrbk. 58:136-137.