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Persea Explorations in Honduras

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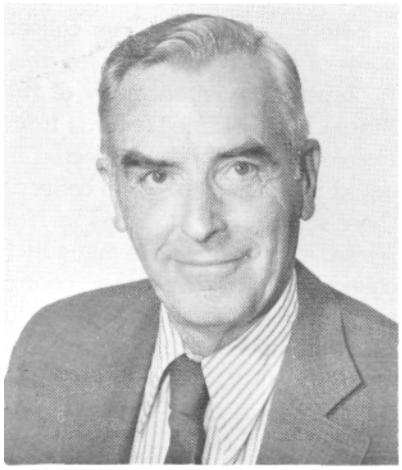

George A. Zentmyer

Honduras is the largest country in size (112,088 square kilometers) of the five countries in Central America, but has a population of only 3,773,000, about half the size of that of the much smaller country of Guatemala. Honduras has considerable timber (primarily pine trees), and some cloud forests that are of interest in regard to collections of species of *Persea.* Also in contrast to Guatemala and El Salvador, there are no volcanos in Honduras.

Early Explorations

Our collections in Honduras for root-rot resistant rootstocks began in 1952 when the senior author (G.A.Z.) first visited the Escuela Agricola Panamericana in the El Zamorano Valley, about 25 miles east of the capital of the country, Tegucigalpa. The Escuela Agricola Panamericana is a noted and excellent agricultural school with students from many Latin American countries, financed by the United Fruit Company. The first Director and organizer of the Escuela was Dr. Wilson Popenoe, distinguished and renowned tropical horticulturist and avocado explorer, who was the beloved Director from 1943 to 1957.

An excellent herbarium, emphasizing plants from Central America and Panama, is a feature of the Escuela. Several eminent botanists have been involved in organizing the herbarium and collecting plants for it, including Dr. Paul Standley and Dr. Louis

Williams. Today, a young botanist, Antonio Molina, carries on the work in the Herbarium which now bears the name "Standley Herbarium".

Before beginning these collecting trips in Latin America, the native home of the avocado (*Persea americana*) and related species of *Persea,* G. A. Zentmyer visited many of the major botanical gardens in the United States, and obtained records from their herbarium collections of species of *Persea* that had been collected in Latin America. Specific locations were noted from the herbarium collection records. Several records were found in these searches of locations in Honduras, for example, where collections of *Persea* species had been made by botanists. The same thing is true of early collections made in other countries in Central and South America — records from the various herbarium collections were the original basis for many of our collecting trips throughout Latin America. The 1952 trip to Honduras (6, 7) and a number of subsequent trips to Latin America by the senior author, as well as later collections starting in 1970 by the junior author, were based on these herbarium records (2, 9).

During the 1952 trip, I (G.A.Z.) had opportunity to use the excellent herbarium at the Escuela Agricola Panamericana to find other locations in Honduras and other Central American countries worth visiting to look for avocados and other species of *Persea.* Also I was fortunate to be able to have discussions with Dr. Paul Standley, who had retired but was still working in the herbarium. Dr. Louis Williams, who replaced Dr. Standley, also is a taxonomic botanist who had been at the Chicago Natural History Museum for many years before taking charge of the herbarium in Honduras.

Dr. Wilson Popenoe and Dr. Williams were very helpful in my early visits to Honduras, as also was plant pathologist Dr. A. S. Muller, Assistant Director of the Escuela. A number of interesting collections were made in the 1950's (6, 7, 8) with their assistance, including:

Persea skutchii — this was my first collection of a small-fruited species of *Persea.* The collection was made about a mile down the Rio de la Orilla from the Escuela Agricola Panamericana, in July, 1952; additional collections from the same area were made in several other trips by G. A. Zentmyer in the 1950's. A number of large trees of this species were found growing along the banks of the river. The fruit were very abundant, greenish to purple when ripe, spherical, and only about 1/4 inch or slightly more in diameter. This species was found, after the seeds were sent to Riverside, to have very high resistance to *Phytophthora cinnamomi,* but unfortunately was soon found (in tests by Ted Frolich at U.C.L.A.) to be non-graft-compatible with the avocado, so that it could not be used directly as a rootstock. *Persea skutchii* was later reclassified, in the monograph on *Persea* by Dr. Lucille Kopp of the New York Botanical Garden (1), as *P. caerulea.*

Persea gigantea — on one side of the valley of El Zamorano is a mountain, Mt. Uyuca, that appears to be an old extinct volcano. The Escuela Agricola Panamericana has an experimental planting of deciduous fruits, avocados, and other fruit trees several thousand feet up the mountain. Near the summit of Mt. Uyuca grows a unique species of *Persea,* described by Dr. Williams in 1953 as *P. gigantea* (5). The first trip to collect this species for our rootstock resistant tests was made with Dr. Wilson Popenoe in 1952, when we hiked to the top of Mt. Uyuca in a drizzling rain to find huge trees of this

species growing in a beautiful, dense cloud forest. Trees of *P. gigantea* growing near the summit of Mt. Uyuca were from 50 to 75 feet in height, with large, oblate leaves, and small spherical fruit like a primitive avocado about 1½ to 2 inches in diameter. I sent seeds of this new and fascinating collection to Riverside under the quarantine arrangements with the U.S. Department of Agriculture. Unfortunately our tests there subsequently showed that this species has little or no resistance to *Phytophthora.*

Dr. Williams had classified this as a new species, *P. gigantea,* but Dr. Kopp combined it with *P. nubigena* in her monograph, as *P. americana* var. *nubigena.* There appear to be, however, some significant differences between the original *P. gigantea* collections and typical *P. nubigena* that is found in Guatemala, Mexico, and Nicaragua.

Persea Donnell-Smithii— this is another of the small-fruited species of *Persea,* similar to *P. skutchii* but with somewhat larger fruit (three-eighths to ½ inch in diameter). In the first trip to Honduras in 1952, several small trees of this species were found, with Dr. Williams' help, growing in a swampy meadow on the side of Mt. Uyuca. Trees of this species have large coarse ovate leaves with brownish pubescence on the underside, and are seldom over 20 feet in height. On the same trip to Central America in 1952, more trees of this species were found in a large swamp near the town of Tactic in north central Guatemala.

Persea Popenoei (now reclassified as *P. uesticula*) — this species was found in 1952 on a collecting trip with Dr. Louis Williams to the San Juancito mountains, northeast of Tegucigalpa. We found several huge trees of this species (50 to 70 feet tall, with trunks two to three feet in diameter) in that area. This is another small-fruited species of *Persea,* with green fruit slightly larger than those of *P. caerulea.* On this collecting trip, unfortunately all of the fruit were found to be invaded by a seed weevil, so that it was not possible to ship the seeds to Texas for fumigation and on to California. In one of the areas of our first collections we startled an adder, a very poisonous tropical snake, which escaped into the dense vegetation of the beautiful cloud forest.

Other Collections — several other visits to Honduras in the 1950's and early 1960's yielded additional interesting collections. One was the Aguacate de Anis, a wild avocado with very strong anise odor in the leaves but with thick-skinned fruit similar to a Guatemalan avocado. This was growing in the mountains above Lancetilla, the United Fruit Company's beautiful and extensive tropical garden and experimental plantings along the Caribbean coast of Honduras. The trees did not have mature fruit at the time of this trip, and budwood did not survive the shipment toCalifornia. Later, Antonio Molina, botanist at the Escuela Agrícola Panamericana, collected seed and budwood of this same unusual tree from another part of Honduras, and sent it to us at Riverside. This was found to be very susceptible to *Phytophthora cinnamomi.*

On the occasion of the visits in the 1950's to Honduras, Dr. Wilson Popenoe showed me the severe damage that was occurring on many avocado trees in their experimental avocado groves at the Escuela Agricola Panamericana, Cultures showed that *P. cinnamomi* was present in abundance, and that this was typical avocado root rot (10). The fungus spread rapidly in the heavy soil of that valley, and with the high rainfall of the area. On later visits in the 1950's and 1960's, root rot was found to have invaded and killed a very substantial part of the avocado plantings at the Escuela. *P. cinnamomi*

was also isolated from roots of declining avocado trees in the Lancetilla tropical plantings.

Recent Explorations

Early in 1982, another exploration for *Per sea* was made in Honduras by junior author E. Schieber. The trip was made by flying from Guatemala city to Tegucigalpa, the capital of Honduras, then exploring the different regions by jeep, provided by the Coffee Institute of Honduras. Also during this trip, the fine Herbarium (Standley Herbarium) of the Agricultural school at El Zamorano was visited. The following regions were visited.

San Juancito and cloud forest "La Tigra"

With a four-wheel drive jeep the rugged cloud forest of "La Tigra" was surveyed for *Persea,* passing through San Juancito first. San Juancito is north-east of Tegucigalpa (Fig. 1). With my (E. Schieber's) driver and guide (from the Coffee Institute) Antonio, we needed several hours to reach the "La Tigra" cloud forest, driving over a very dangerous abandoned road. Antonio knew the interesting cloud forest of "La Tigra" (the tigress), since he was born here in that region. His father died on one of the canyons after his car slid in the mud on a dangerous curve some years ago.

The plan was to search for *P. vesticula,* reported from this area by Williams and Molina, and by Zentmyer. During this exploration, in addition to *P. vesticula,* I detected a tree of *P. nubigena* in "La Tigra," as well as several trees of *P. caerulea* in the area of San Juancito below the cloud forest.

Starting toward the town of San Juancito from Tegucigalpa, we reached first the town "Valle de los Angeles." Here several "Antillanos" (West Indian trees) were detected in bloom. Between Valle de los Angeles and San Juancito, the first young trees of what here are known as "Aguacate de Monte" and are *P. caerulea* were detected. Just before San Juancito many young trees of this species were found in small canyons. Trees had no fruit nor flowers at the time of this visit. According to guide Marco Antonio the trees bear fruit in May-June. In the town of San Juancito, many "Antillanos" were seen in full bloom.

In the climb toward the cloud forest of "La Tigra" in the area where years ago mining activity for silver and gold was carried out (around 1913), a Guatemalan criollo tree was detected, with no anise scent as in the Sta. Barbara region (see next section). Then the interesting cloud forest was reached after three hours of driving up a volcanic road. Here in a place known as Rancho Quemada in La Tigra, a *P. nubigena* tree about 30 years old was found. There were no flowers nor fruit, however. I took branches to El Zamorano to the Herbarium for further study, where with A. Molina we agreed it is *P. nubigena* not *P. gigantea* as found by Williams on Mt. Uyuca (5).

Figure 1. Map of Honduras showing areas where collections have been made on this project.

In the cloud forest near "El Portillo" (the top of this mountain range) we found a very tall tree of *P. vesticula.* A. Molina informed me that he and Williams have seen in this region only very tall and old trees. Leaves (no fruits found at this time) checked with herbarium specimens at El Zamorano. The tree was so tall (above 30 m, that was not possible to collect larger branches). From El Portillo we drove down to Jutiapa. Around this town several "Antillanos" were in full bloom. Large numbers of these West Indian trees in bloom were also seen in Lo de Ponce and Hatillo, driving toward El Picacho near Tegucigalpa.

That *P. steyermarkii* is found in this La Tigra cloud forest, I (E. S.) firmly believe. A collection misidentified from this region as *P. nubigena* is actually *P. steyermarkii.* The leaves and inflorescence are identical to our collections from Guatemala. This would be then the first report of *P. steyermarkii* for Honduras, based on my observations of the specimen registered as No. 12774 at the Standley Herbarium.

Santa Barbara Region

The Santa Barbara Department is in the western part of Honduras toward Guatemala. In 1978, E. Schieber detected trees of "Aguacate de Anis" or "Aguacate Conchudo" in this region. In this trip in 1982, the area of "Pena Blanca" near lake Yojoa was explored. It is a warm area (elev. 700 m) and is a good coffee region.

Within the coffee plantations, trees of "Aguacate Conchudo" (hard-shelled avocado) as the Honduraneans call it, grow wild; trees were left as shade trees when cutting the wild forest before planting coffee. Many of these trees were found here in full bloom.

The trees look like a variant of "Aguacate de Mico" or a primitive Guatemalan Criollo, however, with *strong anise scent* of vegetative parts. The fruit is round to oblate, like an "Aguacate de Mico" in all its characters. I would suggest that this "Aguacate Conchudo" be placed as a "variant" of our Aguacate de Mico group in Central America.

At the Coffee Institute, they informed me also that in the Dept. de Olancho, this tree abounds. Olancho Department is in north-eastern Honduras and has much timber and natural forest.

Copan

In far western Honduras, and close to the Mayan ruins of "Copan," in recent years, Schieber and his Mayan guide Martincito had detected trees of "Aguacate de Mico" (3). The climate in this region is warm, so that it provides the higher temperatures needed by this *Persea.* The Aguacate de Mico in this region has the same characters as the one detected recently in the Quetzaltepeque region in eastern Guatemala (4).

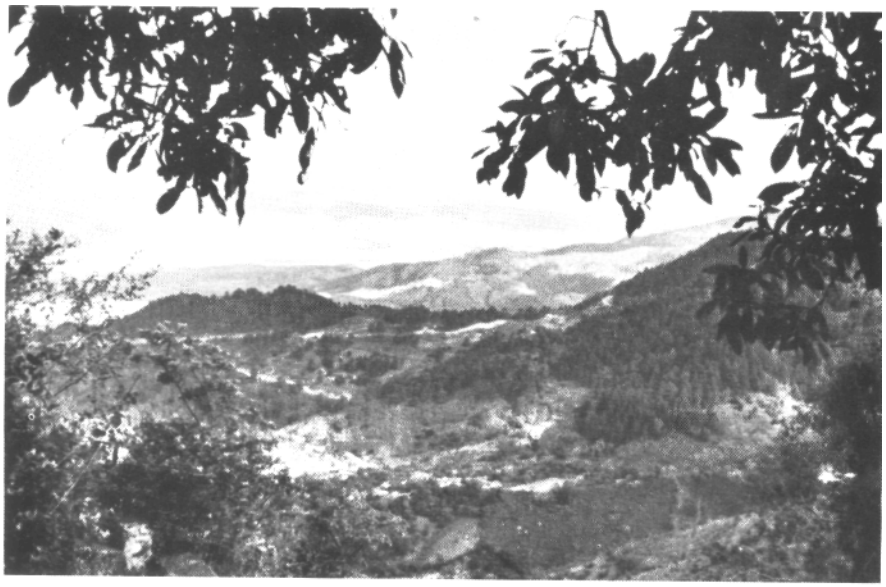

Figure 2. San Juancito region of Honduras. Several species of Persea grow in the forests of this mountain range.

Figure 3. Driver and guide, Marco Antonio, with branch of Persea nubigena found for the first time in La Tigra cloud forest in 1982 trip.

Figure 4. Branch from young tree of Persea caerulea; many trees of this species, known locally as "Aguacate de Monte" were found near the town of San Juancito in 1982 trip.

Figure 5. Dr. Simon Malo, Director of the Escuela Agricola Panamericana, and avocado tree with root rot, in experimental planting at the EAP in Honduras, in the Valley of El Zamorano. Phytophthora cinnamomi was first isolated from diseased avocado trees in this area by Zentmyer in 1951 (6).

Literature Cited

1. Kopp, L. E. 1966. A taxonomic revision of the genus *Persea* in the Western Hemisphere *(Persea-Lauraceae).* Memoirs of the New York Botanical Garden 14: 1-117.
2. Schieber, E., and G. A. Zentmyer. 1973. Collecting *Perseas* in Central America and Mexico. Calif. Avocado Society Yearbook 56: 94-101
3. Schieber, E., andG. A. Zentmyer. 1981. Exploring for "Aguacate de Mico" in Central America. Calif. Avocado Society Yearbook 65: 49-55.
4. Schieber, E., and G. A. Zentmyer. 1981. Exploring for *Persea* on volcano Quetzaltepeque, Guatemala. Calif. Avocado Society Yearbook 65: 57-63.
5. Williams, L. 0.1953. New Central American Plants. Ceiba4: 38-47.
6. Zentmyer, G.A. 1952. Collecting avocados in Central America for disease resistance tests. Calif. Avocado Society Yearbook 32: 107-111.
7. Zentmyer, G. A. 1953. Collections of *Persea* in Central America and Mexico for disease resistance tests. Ceiba 4: 47-61.
8. Zentmyer, G. A. 1957. The search for resistant rootstocks in Latin America. Calif. Avocado Society Yearbook 41: 101-106.
9. Zentmyer, G. A. 1961. Collections for *Phytophthora* root rot resistance in Mexico and the Caribbean. Calif. Avocado Society Yearbook 45: 59-62.
10. Zentmyer, G. A., and Wilson Popenoe. 1951. *Phytophthora cinnamomi* on avocado in Honduras. Plant Disease Reporter 35:25.