Excerpts (1913 – 1919) from PLANT IMMIGRANTS

Office of Foreign Seed and Plant Introductions. Bureau of Plant Industry, Dept. of Agriculture

Descriptive notes furnished mainly by Agricultural Explorers and Foreign Correspondents relative to such newly introduced plants as have arrived during the month at the Office of Foreign Seed and Plant Introduction, of the Bureau of Plant Indsutry, of the Department of Agriculture. These descriptions are revised and published later in the Inventory of Plants Imported.

Plant Immigrants. No. 87. July 1913. *Page 674.*

Persea americana. (Lauraceae.) 35673-676. Seeds of avocado from San Jose, Costa Rica. Presented by Mr. Otion Jiminez L., Chief, Department of Botany, National Museum. Two varieties, one described as having fruit "30 cm. (12 inches) in length and 10 cm. (4 inches) in width at its widest part. It is one of the largest varieties in Costa Rica. It is of delicious flavor and is called butter avocado (aguacate de mantequilla.)" The other is smaller, ovoid, and about 10-12 cm. in diameter. For distribution later.

Plant Immigrants. No. 98. June 1914. *Page 782.*

Persea americana. (Lauraceae.) 38400-402, 38477, 38549- 564, 38578, 38581, 38583, 38587, 38638-640. Scions and seeds of avocados from Coban, Antigua, and Guatemala City, Guatemala. Collected by Mr. O. F. Cook, of this Bureau. "The avocado season is much too far along now (in May and June) to do satisfactory work. In most places the season is completely over but at the higher altitudes a few fruits are still in the market, as yet none of a quality to particularly recommend them. It is the late varieties of these countries that we want. The early varieties ripen in August and September, the others in December, etc., and as the colder places are reached the crop goes around into the spring months." (Cook.) Twenty-seven varieties of hard-shelled avocados.

Plant Immigrants. No. 101. September 1914. *Page 809.*

Persea americana. (Lauraceae.) 39173. Seeds of an avocado from Lumija, Chiapas, Mexico. Presented by Mrs. H. H. Markley. "These are slightly pear-shaped, 5-6 inches long, and 10 inches in circumference at the largest point. The skin is very thin, the tree a prolific bearer, growing 40 or more feet high, symmetrical in shape, like a well formed oak. Our temperature ranges from 70 to 100° F." (Markley.)

Plant Immigrants. No. 111-2. July-August 1915. *Pages 910-912.*

Persea americana Miller. (Lauraceae.) From Cuba. Budwood collected by Mr. Wilson Popenoe, of this Bureau.

40912. "Jovellanos, Matanzas Province. *Luisa avocado.* The parent tree of this variety

is growing in the garden at the Casa Vivienda, on the Nueva Luisa sugar estate. It is a large seedling, apparently 25 years old at least. Its particular value lies in the fact that the fruit is said to ripen in October, after nearly all the avocados are gone. The fruits, which are only about three inches long at present, are broadly obovate in form, with no indication of a neck, the skin light green when ripe and very thick. Judging from the immature fruit, the seed cavity is not large and the seed fits in it snugly. According to the gardener who was in charge of the place, the fruit is of excellent quality, with a rich flavor and no fiber. The tree, which stands among a lot of others beside a small stream which trickles through the garden, is bearing a good crop of fruit. The only late avocado at present grown commercially in south Florida is the *Trapp.* It seems worth while to try out other varieties which ripen late in the season, and *Luisa* has been obtained with this view. The season is earlier here than in Florida, generally speaking, and an avocado which ripens here in October may hang on the tree in Florida until even later than this, because of the cool autumn weather." (Popenoe.)

40978. "Placetas, Santa Clara Province. *Bartlett avocado.* A rather remarkable variety growing in the garden of Dr. Alberto Bartlett of this town. It is said to bear two crops a year; the first crop is early, and is now ripening, the second crop commences in December and the last fruit was eaten this year on May 8th. In form this fruit is broadly pyriform, and in size about four inches long by three inches in thickness. The color is bright green, the surface smooth. The skin is rather thin, scarcely over one mm. in thickness. The flesh is creamy yellow near the seed, changing to pale green near the skin, of good texture and said to be of good quality, though not excellent. The seed is about the average size, but not objectionably large; the seed coats are rather thick and loose, but I found no specimens in which the seed rattled in the cavity. The tree is evidently very productive, judging by the present crop. It is growing in a very favorable situation, however, and receives a good deal of fertilizer. The fruit is attractive in appearance, and seems well worthy of a trial in south Florida." (Popenoe.)

40979. "Placetas, Santa Clara Province. *Don Carlos avocado.* A small variety, said to be of exceptionally choice quality, from the Quinta Aguas Azules of Dona Serafina Wilson, Viuda de Bartlett, near Guadalupe, about 15 miles from Placetas. This fruit is almost perfectly round in form, and of light yellowish green color. The skin is thick, the flesh of fine, oily texture, and the seed very small in comparison to the size of the fruit. The tree is bearing an excellent crop and can probably be considered productive. It ripens its fruit from August to October, and is not, therefore, a very late variety, but because of its good quality it is considered worthy of a trial in south Florida. It was the favorite fruit of Don Carlos Bartlett, the former owner of the Quinta Aguas Azules, and has been named after him." (Popenoe.)

40980. "Placetas, Santa Clara Province. *Guadalupe avocado.* A late variety from the Quinta of Joaquin Wilson at Guadalupe, about 15 miles from Placetas. This is a broadly pyriform fruit, narrowed at the base but not noticeably 'necked' and somewhat oblique at the apex. It will probably weigh 12 to 14 ounces when ripe. The color is green, sometimes mottled with maroon; the skin is rather thin, about one mm. in thickness. The flesh, which seems to be entirely free from fiber, is said to be of good flavor. The seed is of about the average size, not objectionably large, and apparently tight in the cavity. This tree produces the latest fruits of any on the Wilson farm, but the crop does not all

ripen late, and only a few fruits hang on until February. At the present time there are fruits in various stages of growth upon the tree, some almost fully grown, others still quite small. Joaquin Wilson claims that he has picked ripe fruit from this tree during a large portion of the year. It does not appear to be a very heavy bearer, however. For trial at Miami, Florida." (Popenoe.)

40981. "Placetas, Santa Clara Province. *Merced avocado.* The latest variety growing in the Quinta Aguas Azules of Dona Serafina Wilson, Viuda de Bartlett, at Guadalupe, about 15 miles from Placetas. The fruit is said to remain on the tree until February. It is broadly pyriform, very similar to *Pollock* in shape, but probably not over one pound in weight, judging by its present size. The color when ripe is said to be green, and the quality excellent. The tree is old and in poor condition; it is not bearing a good crop this season, but might fruit more heavily under favorable conditions. For trial in south Florida." (Popenoe.)

40982. "Placetas, Santa Clara Province. *Wilson avocado.* A late variety, said to be of unusually good quality, from the Quinta of Sr. Joaquin Wilson at Guadalupe, about 15 miles from Placetas. This is a rather small fruit, probably not over 8 to 10 ounces in weight, round to very broadly oval in form, usually somewhat oblique at the apical end. The color, when ripe, is said to be very light green. The skin is two mm. in thickness. The flesh is perfectly free from fiber, and said to be of unusually fine texture and rich flavor. The seed is very small in proportion to the size of the fruit. According to Sr. Wilson, after whom the variety is named, it ripens about Christmas. The tree is carrying an excellent crop and seems to be all that could be desired in regard to productiveness. While rather small in size, this seems to be a valuable fruit, and should be tried in southern Florida." (Popenoe.)

The site of the new Plant Introduction Field Station at Miami (Buena Vista), Florida before any improvements whatever had been made upon it. A complete list of the native flowering plants to be found upon the site has been made by Prof. Chas. T. Simpson and a small area has been set aside on which will be maintained as long as feasible a sample of the original flora. The most conspicuous plants in the photograph are the Cuban Pine (*Pinus caribaea*) and the Palmetto (*Inocles* (*Sabal) etonia*) . Mr. Fairchild and Mr. Simmonds are standing at the left.

Plate from **Plant Immigrants. No. 111-2. July-August 1915.**

The Miami oolite rock formation, which underlies the new Miami Plant Introduction Field Station. When these large holes in the rock are filled with good soil and a sufficient layer of humus is maintained over the rock surface tree roots seem to find very congenial conditions for growth there.

Plate from **Plant Immigrants. No. 111-2. July-August 1915.**

Plant Immigrants. No. 116. December 1915. *Page 949.*

Persea americana Miller. (Lauraceae.) 41578-41580, 41629. Seeds of four varieties of avocado from Guatemala City, Guatemala. Presented by Mr. William Owen, American Vice-Consul In Charge. No. 41629. "Seeds from a very large aguacate, which I consider the finest product of Guatemala in that line. They are high grown, which will enable the tree to better thrive in a northern climate. Aguacate, trees are not numerous in immediate neighborhood of this city. I am compelled to depend almost entirely upon the goodness of distant friends." (Owen.)

Plant Immigrants. No. 120. April 1916. *Pages 988-991.*

AVOCADOS. .

During the past two years the winter-bearing Guatemalan type of avocado has been attracting an increasing amount of attention in Florida. Interest in this type was first awakened by the fruiting of several seedlings at the Miami Plant Introduction Garden, which served to demonstrate that this remarkable type would mature its fruits in Florida at the precise season of the year when avocados are most desired. Heretofore the avocado crop has commenced in July or August and lasted until December, with a few late fruits occasionally hanging on the trees until the end of January or February. Trapp, the latest commercial variety, matures its fruit in late fall, and frequently carries some of the crop until the first of January, but after this time the quantity of avocados marketed from south Florida has been negligible. With the Guatemalan type it will be possible to supply the markets abundantly from December to April, the season of the year when fresh fruits are scarce and when, consequently, there should be an excellent demand for avocados. In the past it has always been the latest avocado which brought the highest prices. The Guatemalan type has an additional advantage in its thick, hard skin, which makes the fruit an excellent shipper. In quality some of the varieties of this type are splendid excelling, in all probability, most of the summer-fruiting varieties which are grown in Florida. The first trees of this type which came into bearing at Miami were grown from seeds sent in by G. N. Collins from Guatemala in 1901. None of these seems likely to become of importance as a commercial variety, but they have served to point out the value and possibilities of this type for Florida. Another seedling (S.P.I.No. 26710) of the same type, grown at the Miami Garden from a seed sent from Los Angeles, Calif., in 1908, has proved to be a first-class fruit, and has been considered worthy of propagation as a named variety. This fruit, which is now called Taylor, has been in bearing at Miami for 3 years. Its origin and history are as follows: In 1908 J. H. Walker of Hollywood, Calif., sent fruits of two seedlings growing on his place to W.A. Taylor, pomologist of the Department at Washington. These varieties, though unnamed at that time, have since been called "Challenge" and "Royal". Mr. Taylor transmitted one of the seeds to the Office of Foreign Seed and Plant Introduction, and it was sent to Miami to be grown. It is not known whether this seed was from the Challenge or Royal. The variety is now being propagated and disseminated at the Miami Garden. Another promising avocado which has recently been propagated rather extensively at the Miami Garden is Butler, S.P.I. No. 26690. This is a summer-ripening fruit of the West Indian type, and hence scarcely so interesting at the present time as a variety of the winter-

bearing Guatemalan type. However, a medium sized, prolific summer variety of good quality has not yet become established commercially in south Florida, and it would seem that in Butler we have a fruit of considerable merit. Butler originated as a seedling at the Miami Garden, the seed having been received from C. W. Butler, of St. Petersburg, Fla., in 1904. The tree came into bearing in 1909, and has proved to be unusually prolific. The fruit weighs about a pound, is oblong to obovate in form, light green, with flesh of excellent flavor and quality. Attention is now being centred on the Guatemalan type at the Miami Garden. A variety introduced from Guatemala two years ago by O. P. Cook of the Bureau (S.P.I. No. 38549) is being propagated, and should come into bearing within another year or two. The variety Nutmeg, (S.P.I. No. 36604) from Honolulu, came into bearing last year, but has not yet had sufficient trial to permit an accurate estimate of its value.

Plant Immigrants. No. 121. May 1916. *Page 1009.*

Mr. Wilson Popenoe, Agricultural Explorer of the Office, is now in Guatemala investigating the wild plant possibilities of the uplands of that interesting region where many new fruit species and varieties are yet to be discovered which should be brought into culture throughout the tropics. Such fruits and vegetables as the Sapote, Avocado, Annona, Chayote, and many others will be studied by Mr. Popenoe.

Plant Immigrants. No. 124. August 1916. *Pages 1041-1042.*

Mr. Wilson Popenoe writes from Guatemala City Nov. 8, 1916: "As to early maturing varieties of the chayóte; I presume you mean by this those which will come into fruit within a few months from planting. Apparently they have chayotes here all the year round, and consequently it is hard to tell which are the early and which are the late varieties, but I will look into the matter and see what I can find out. It is hard to get real information on such a subject, but by watching for plants in the gardens as I go round, I can probably get some ideas as to the habits of the different varieties. I am glad you liked the large white *perulero.* This still looks to me like the best variety here, and I have asked several of the natives about it, and they have expressed the same opinion. It is rare, and I have seen none of the fruit in the market since I bought the last lot I sent you. There is no end to the varieties of the chayote here, but the choice varieties are very few. I must say, although I do it with hesitation, that my appetite for chayotes is on the wane. This is no reflection on the chayote, which is a meritorious vegetable per se, but we get them every day, and nearly always cooked in the same way,-just boiled and served without anything on them. I want to tell you, however, that you Americans are making a great mistake in not familiarizing yourselves with the *ichinta.* No, this is not a new vegetable, it is merely the root of the chayote, and I believe it is just about as good as the chayote itself. It reminds me greatly of sweet cassava, which we used to get in Brazil. It is starchy, and not unlike an Irish potato in texture and appearance. They cut it in slices and fry it in batter, and it is good. In the markets here it is extremely common. I have also eaten the tender shoots of the chayote,- I did not know what I was eating until I had finished,-and they are not bad, but I do not consider them any improvement over the various kinds of greens we already have in the states. I believe that large white

perulero, if grown under good culture, would be a cracking good chayote, and I hope it will be given a thorough trial. As yet I have not hunted for any chayote diseases, but the vines I have seen have seemed to be healthy, and I have noticed nothing which seemed to be interfering with their growth seriously. No doubt there are diseases, but so far I have run across nothing which seemed to be wiping out the vines. You expect to find a disease, or several of them, on everything in the tropics, and you are rarely disappointed, though it is surprising how little harm many of them do down here. The trouble is, they might not be so harmless in another climate, and in any event, we don't want to try them to find out. That red-fleshed papaya was a surprise to me. I am generally skeptical about red-fleshed fruits, the term 'red[1] is so commonly used for brown that you can't trust it, but I am willing to say that the papaya I sent in has a very decided reddish tint, and the flesh is deep reddish salmon in color, quite distinct from the color of the varieties we are now growing in Florida. It is striking and attractive, but the quality of the fruit may not be equal to some of the best we already have. You know the papayas vary greatly in sweetness. Probably you noted my photographs of the *anay* growing in the forest at Mazatenango. Your idea of getting photos of the aguacate in the wild is a good one, and if I can find wild trees in the Alta Verapaz, -where people here seem to think they exist, I will try for some photographs. I hope the *anay mili* turn out to-be a new species. I am on the track of another species of Persea which grows down about Zacapa, and I saw in Amatitlan a single young tree which seems to be a Persea but is apparently not an avocado. I am going to get budwood of it."

Plant Immigrants. No. 125. September 1916. *Pages 1050-1052.*

Notes from Correspondent abroad.

Mr. Wilson Popenoe writes from Guatemala City, January 18, 1917, as follows:

"I am just back from a successful trip through the Highlands. I went in company with a young American from Boston, who is here in the interests of the Babson Statistical Organization. Our route was as follows: From Guatemala City to Chimaltenango the first day, stopping there over night, and riding the second day to Tecpan. Here we spent a day, and then rode to Panajachel, where we spent another day and rode to Solola, thence to Totonicapan. Here we spent a day and then rode to Quezaltenango, where we spent two days, and then walked to San Felipe, whence we took the railroad to Mazatenango, stopped there a day, and came on back to Guatemala City. It was a very interesting trip but one of the coldest propositions I have met in a long time. Between Solola and Totonicapan we rode at midday for several miles over a plateau just below 10,000 feet in elevation, where the ice had not yet melted in the puddles beside the road, And this in the Tropics! For about a week we were above 7000 feet nearly all the time, and of course I was on the lookout for avocados. What I have been trying to ascertain is, How high can the avocados be grown in Guatemala? Previously I had never seen it above 7000 feet, which is about the extreme limit of the orange zone. But on this trip, I found avocados at Tecpan (7500 ft.) and most remarkable of all, at Totonicapan (8500 ft.) On looking carefully over the town, I found that most of the trees in the gardens were peaches, apples, the wild cherries which occur in this part of Guatemala, and a few other hardy things,- strictly temperate in character. The

matasano *(Casimiroa edulis)* was seen here and there. I found three or four young avocado trees in protected situations which had escaped the frost and looked pretty well and then found two large trees which had been frozen badly. They had the limbs killed back to the trunk, and scarcely a leaf on them. So far it did not look very promising. But finally I ran across a large tree growing in a patio (practically all of them were in patios) which had escaped practically uninjured, stood 40 feet high, and was carrying quite a little fruit. On examination the fruit proved to be of first-class quality. The idea of growing avocados 1000 feet or more above the zone in which oranges can be grown strikes me as rather surprising. Aside from the avocados, there was scarcely anything of interest in Los Altos, as that region is called. The wild cherry was in bloom and I will see it again in fruit, probably, when I go back to Totonicapan. That is a remarkable region, sure enough; wheat and oats, principally wheat, with some apples and peaches in the towns, but practically all seedlings, of course. On the way back we spent a day at Mazatenango, and I went out to look up the *anay.* I found that the tree had bloomed recently and was full of young fruit; it was also carrying a lot of ripe fruit which I did not see when I was there before. It looks as though it must bloom twice a year, as I was told it bloomed in April and had not expected to find it in bloom as yet. I obtained 150 fruits and am taking the seeds down to Quirigua to plant. I plan to go down to Amatitlan in a couple of days and cut some more budwood to put in this week's mail. When I said that one of the varieties from San Cristobal was the best avocado I had seen, I did it deliberately. It is really a magnificent fruit. If course I cannot forecast its behavior in the States, but as a fruit it is certainly splendid. As to the *coyo,* I did not intend you to understand that I consider it a superior fruit to avocado. I think I said, or at least I intended to say, that I thought its flavor was really superior to that of the avocado. It has some weak spots, of course, but I am strongly impressed with its remarkably rich and nutty flavor. Kensett Champney considers that its flavor is superior to that of the avocado. He seems to think it "wears well" but of course I can not state my own experience. I will admit that I am somewhat enthusiastic over it. As you know, I have a habit of getting enthusiastic over these new things. After my second trip to the Verapaz, I will write up an account of the *coyo,* tempered with as generous an amount of conservatism as I can muster, and send it up to you. I want to get a little more data than I now have. As it grows wild up to 5000 feet or above, it must be about as hardy as the Guatemalan avocado. Many thanks for Dr. Galloway's notes re the condition of my shipment of budwood from the Verapaz. They were a great help to me, because of their clearness and comprehensiveness. I regret that I cannot enthuse over the *Pacaya.* I have eaten it several times, under protest, and unless the inflorescences are very young they are bitter. When very young they form an excellent matrix for salad dressing. The palm is a beauty, however, and fairly hardy. It ought to be given a wide trial in Florida and California. The work here remains fascinating. There is a great deal to be done yet before I will feel satisfied to end the search for the best avocados, but I am pushing things as best I can, and I hope nothing will happen to knock us out. I am in the pink of condition. I neglected to mention in this letter that I have found the first serious injury done to avocado fruits which I have seen in Guatemala. At Panajachel that larva which bores in the seeds, and which seems to be the same as the one Mr. Sasscer found in some of the seeds I sent up, is causing tremendous damage. I have some photos of fruits cut open, showing the injury, which I will send up soon and which will make the

matter much stronger than I can do it with words. A large percentage of the fruits I examined were infested, and many were so badly so that they were not fit to eat. This is unquestionably a serious thing, and one we must guard against carefully. I have some infested seeds in an improvised breeding cage and am going to see if I can breed out some of the adult insects."

Plant Immigrants. No. 126. October 1916. *Pages 1064-1067.*

Persea americana Miller. (Lauraceae.) 43476. Cuttings of **Avocado** from Amatitlan, Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer. "A fruit of good size, averaging about one pound in weight, of very desirable shape, regularly oval, with a seed rather small in comparison to the size of the fruit. The surface is smooth, deep green in color; the quality is said to be very good, and the tree is productive. Taken all around, it looks like a very excellent quality. The parent tree is young, probably 5 or 6 years old, and stands about 20 feet in height, with an erect crown, extending almost to the ground, about 10 feet broad, and well branched. The trunk is 6 inches thick at the base. The tree is producing over 100 fruits this year. At this time they do not appear to be quite mature. They are said to ripen in November, at the same time the flowers for the next year's crop make their appearance. Doubtless they would be much better in quality if left on the tree several months longer, but it is the usual thing here to pick the fruits as soon as they reach maturity. A description of the fruit follows: Form uniformly oval; size above medium to large, weight 14 to 18 ozs., length 4½ inches, greatest diameter 3½ inches, base rounded, with the stem inserted obliquely without depression; stem stout, about 6 inches long; apex rounded, with the stigmatic point to one side and slightly raised; surface nearly smooth, slightly undulating and sometimes obscurely ribbed, deep green in color, almost glossy, with a few scattering large yellow dots; skin thick, slightly over 1/16 inch at base, nearly ⅛ inch at apex, coarsely granular, brittle; flesh cream color, pale green near the skin, free from fiber; flavor said to be rich; quality probably very good; seed rather small in comparison to size of fruit, almost spherical, If inches long and broad, with both seed coats adhering closely, and tight in the seed cavity." (Popenoe.)

Persea sp. (Lauraceae.) 43432. Seeds of **Anay** from Mazatenango, Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer, "An interesting species of Persea which occurs in this region as a large forest tree, and is called *anay* by the natives. It so closely resembles an avocado of the Mexican type in the external appearance of the fruit as to lead one to suspect at first that it must be a form of *Persea americana,* but on a closer examination of the tree and fruit, one finds numerous characters which indicate that it must be an entirely distinct species of *Persea,* but just what species it may be I am unable to say. In clearing the forest for planting coffee, some large trees are left to provide shade for the coffee plants, and it was due to this fact that we found the *anay.* Two large trees are standing close to the entrance of the finca 'El Compromiso', about one-half mile from Mazatenango. Others are said to occur in the forest, and are known to the natives, who eat the fruits in the same way as avocados, and consider them a variety of avocado, 'tipo de aguacate', as they say. The *anay* is a tall, rather slender tree, reaching to a great height in the forest, the two which were seen being, probably, between 60 and 70 feet in height. The bark is nearly

smooth, and of a rich red-brown color, grayish in places. The young branchlets are light brown, and finely pubescent. The leaf blades are broadly elliptic to oblong-lanceolate in outline, 8 to 13 inches long, 3 to 6 inches broad, acut to shortly acuminate at the apex, rounded to broadly acute at the base, rigidly chartaceous, bright green and glabrous above, with the exception of the costa and primary transverse veins, which are sparsely hairy, the lower surface slightly lighter in color and glabrate. The young leaves are softly pubescent below, sparsely hairy above. Petiole 1½ to 2½ inches long, terete, slender, but swollen just below the point of union with the lamina. The foliage, when crushed, has no aromatic odor as does the Mexican type of *P. americana.* The flowers are said by the natives to be produced in May. The fruits ripen in August and September. In form they are slender pyriform, sometimes curved, and sometimes pointed at the apex. Often the neck is long and sharply defined. The body of the fruit is slightly compressed on two sides. In length the fruit varies from 4 to 6 inches. The surface is smooth, glossy, and purplish black in color. The epicarp is exceedingly thin and membranous, and adheres closely to the firm, oily flesh, which is divided into two zones of color, the outer being pale green, and the inner, which is of the same thickness as the outer, greenish cream color. The two zones are more sharply defined , than they ordinarily are in the cultivated avocados. The flavor of the flesh is rich and bland, like that of a very good avocado, but having a faint suggestion of sweetness. The outer seed coat is developed into a thick husk which may be practically be considered an endocarp. Within lies the seed, which is long and pointed, with the inner seed coat, thin and membranous, surrounding the cotyledons closely. While the outer seed coat is extended clear to the base of the fruit, the inner does not always reach the apices of the cotyledons. The embryo lies immediately at the base of the cotyledons, while the avocado has the embryo located some distance above this point. From a practical standpoint, the *anay* cannot be considered of great value, inasmuch as the flesh is scanty in quantity. If it were more abundant, its excellent flavor would make the fruit of great value. The fruit falls to the ground while still hard, and requires two or three days to soften and be in condition for eating. The seeds germinate on the ground beneath the trees, and the young plants start off lustily. The larva of some insects, presumably a beetle, attacks the fallen fruits, and tunnels through the seeds. Very few fruits were found on the ground which had not been attacked in this manner. The remarkable similarity which this species bears to the cultivated avocado, and the fact that its fruit is edible and is used by the natives, makes it a subject of particular interest in connection with the study of the cultivated avocados. It is to be hoped that specimens can be reared and fruited in the United States. The region where the tree is found lies at an elevation of about 1200 feet, and is quite moist. On this account, it seems doubtful if the *anay* will succeed in California. It might be tried in the most projected localities. In south Florida its chances of success seem good." (Popenoe.)

Plant Immigrants. No. 127. November 1916. *Pages 1079-1083.*

Persea americana Miller. (Lauraceae.) 43486. Budwood **of avocado** from Santa Maria de Jesus, Depto. Sacatepequez, Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer. "From the garden of an Indian, who refused to divulge his name. The garden is in the center of the village, toward the Volcan de Agua from the central

plaza. Santa Maria de Jesus is a small village located upon the upper slopes of the Volcan de Agua, at an elevation (according to my barometer) of 6700 feet. It is about 10 kilometers from Antigua. As one climbs up the broad slope of the volcano the character of the vegetation changes considerably, and many of the plants common in gardens at Antigua are not grown here because of the cold. Among the plants which are conspicuous by their absence are the banana, the orange (and other citrus fruits), and the tender ornamental plants, such as the royal palm. In their stead, the gardens of the Indians at Santa Maria are filled with peach trees, chayote vines, granadilla vines *(Passiflora ligularis),* and vegetables such as peas. The hardy Abyssinian banana is a common ornamental plant. Among the plants of the lower elevations which persist are the cherimoya, the avocado, and the matasano *(Casimiora)*, though I only saw one tree of the latter. *Grevillea robusta* is one of the commonest ornamental trees. It can thus be seen that the vegetation is not at all tropical in character, and it must get quite cold in winter. The Commandant assures me that it goes below freezing, but figures are lacking. This avocado has been obtained in the hope that it may prove hardier than those from lower elevations, and thus of value farther north in Florida than the majority of varieties can be grown. In California it may succeed in regions which are a trifle too cold for the average Guatemalan variety. It should at least be given a test with this in view. The fruit is not yet fully grown, so it cannot be fully described. The tree is about 25 feet high, and is carrying a fair crop of fruit. It has good large wood and seems to be a stronger grower than some I have seen. The fruits are almost round, tending toward broadly obovoid, and obscurely ribbed. The surface is very light green, almost glossy, with numerous large yellowish dots. The skin is slightly over one-sixteenth inch thick, and the seed is very small in comparison with the size of the fruit. It looks like a good avocado. The season of ripening could not be ascertained, but probably is not earlier than April."

43487. "From the garden of an Indian, near the center of the village, to the west of the church. This village is situated on the road between Guatemala City and Antigua, at an elevation of 6850 feet, (according to my barometer.) The principal fruit trees in the garden of the Indians are peaches, cherimoyas, avocados, quinces, manzanillas *(hawthorns),* and pomegranates. There are no bananas here, and I only saw two or three orange trees. The tropical fruits do not succeed at this elevation. The variety like 43486 has been selected because of its possible hardiness. Coming from an elevation about 1750 feet above Antigua, it may prove to be more frost resistant than varieties from the latter place, and it should be given a trial in localities in California and Florida which are thought to be slightly too cold for the average variety of this type. The tree is about 20 feet high, with a good crown. According to the owner, it bears over 200 fruits in good seasons, but sometimes the crop is partly destroyed by frost. The last of the fruits of this year's crop are now being picked. It seems to ripen later than most of the trees in Antigua, but this may be due to the difference in elevation. The fruit is of good size and quality, oblong-oval, weighing up to a pound, deep green in color, with flesh of good flavor and a seed slightly large in size, tight in the cavity. Form truncate oval; size medium to above medium, weight 10 to 16 ounces, length 3⅜ to 3⅞ inches, greatest breadth 3 to 3⅝ inches; base obliquely flattened, the stem inserted to one side in a shallow cavity; stem very stout, about 4 inches long; apex truncate to rounded, the stigmatic point slightly raised; surface pebbled or slightly rough, dull deep green in color,

with few yellowish dots and numerous rough russet scars; skin one-sixteenth inch thick at base, slightly thicker at apex of fruit, coarsely granular, separating readily, brittle; flesh firm, oily, rich yellow near the seed, changing to pale green near the skin, very slightly discolored around the base of the seed with fiber traces; flavor very rich, nutty; quality very good; seed medium to rather large in size, oblate-conic in form, if to 2 inches broad, tight in the cavity, with both seed coats adhering closely."

43560. "From the garden of Victor Garcia, who keeps a small cantina on the road from Antigua to San Antonia Aguas Calientes, just above the church at San Lorenzo del Cubo. After two weeks search in the Antigua region, this is the best early variety I have been able to find. There are practically no avocados in the Antigua market at the present time; here and there one finds a tree which ripens its fruits this early, but most of them are large-seeded. At lower elevations than this there are more trees which ripen their fruits in October, but here at 5000 feet there are exceedingly few. This variety is small, but I believe it will be found that the size is amply large enough where it is desired to serve a half fruit as a portion. The seed is very small in proportion to the size of the fruit, rather a rare thing in an avocado of round or oblate form, for as a rule fruits of this shape have large seeds. The skin is thick, and the flesh clear, of good color and texture and the quality is good for an early fruit. An early variety of the Guatemalan type is much needed for California, since none of the varieties so far tested in that state ripen in time for the holiday season. The tree from which this budwood was taken stands on a rather steep hillside, the soil being a loose sandy loam. The trunk of the tree is about a foot and a half thick, and the crown spreading, 35 feet in diameter and about the same in height. The foliage is rather scanty, especially so at the present time, as the tree is coming into flower. The crop of fruit is enormous; it is impossible to make an accurate count, but the number of fruits is certainly well above 1000 and may be nearer 2000. Next year it will probably bear a comparatively small crop, for according to the avocado growers of the Antigua region, practically all of the trees bear a heavy crop one season followed by a very light one the next. With good culture the fruits would probably be larger than they are on this tree; it seems reasonable to expect that they will weigh 12 ounces. Fruit roundish oblate, size below medium, weight 8 to 10 ozs., length 2¾ to 3 inches, greatest breadth 3 to 3¼ inches, base truncate, the stem inserted squarely without depression; stem fairly stout, 4 inches long; apex flattened, sometimes slightly oblique; surface pebbled dull purple in color, with numerous small yellowish dots, skin one sixteenth inch thick at basal end of fruit, about one eighth inch at apex, separating readily from the flesh, rather finely granular, brittle; flesh deep cream yellow near seed, changing to very pale green near skin, quite free from fiber discoloration, firm in texture and moderately rich in flavor; seed small in comparison to size of fruit, oblate, 1⅝ inch broad, 1¼ inch long, tight in the seed cavity with both seed coats adhering closely. Season at San Lorenzo del Cubo commencing about the middle of October, but not all the fruits are mature until several weeks later. This variety is particularly recommended for trial in the avocado districts of California, where a variety which will mature early in the winter is much needed. It may not ripen quite so early in California as it does in Guatemala, due to the difference in climatic conditions."

43602. "From the patio in the rear of the Masonic building, 7a Avenida Norte No. 4, Guatemala City, Guatemala. The altitude here is approximately 4900 feet. This tree has been mentioned by several people as producing the finest fruit which they have ever

eaten. Don Pedro Bruni, who has lived in Guatemala many years, and is thoroughly familiar with avocados, tells me that he has never eaten a fruit of better quality than this. The tree is very large, standing at least 50 feet high, with a trunk about two feet in diameter. Its age is unknown, but it is probably 50 or 75 years at least. It has a dense crown, and seems to be in vigorous condition. As is commonly the case with avocados of the Guatemalan type, the tree does not appear to produce a large crop of fruit every season. It bore well last year, but is not fruiting at all this year, hence it has not been possible to examine the fruit. The caretaker on the property described it as being pear-shaped, medium sized (probably about a pound in weight or perhaps a trifle more), and deep purple in color when ripe. The seed is said to be small or medium sized, and the flesh rich yellow in color, of unusually rich flavor. It is difficult to ascertain the length of the season, but the fruit is said to be at its best from May to July. The tree is said to bear heavy crops in some seasons, and the fact that it is not bearing this year is not against the variety, since this is the habit of a great many trees of this type; it seems, in fact, to be the rule. Although I have not been able to examine this fruit personally, it seems well worthy of trial In California and Florida on the strength of the recommendation given it by the people here." (Popenoe.)

Plant Immigrants. No. 128. December 1916. *Pages 1094-1097.*

Persea americana Miller. (Lauraceae.) 43932. Cuttings of **avocado** from Coban, Depto. de Alta Verapez, Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer for this Department, "From the yard of Filadelfo Pineda, called de San Marcos. A fruit of medium size, obovoid to pyriform in shape, green, with a rather small seed and flesh of exceptionally rich flavor and good quality. My attention was called to this tree by Mr. R. W. Hempstead, who recommended it as the finest avocado he had eaten in Coban. The tree is said to be a heavy bearer, but this is an off year in Coban and it is not bearing a large crop. Form obovoid, tending to become pyriform, slightly oblique; size about medium, weight 15 ozs., greatest length 4⅝ inches, breadth 3⅜ inches; base rounded, the stem inserted obliquely without depression; apex rounded; surface slightly rough, deep green in color with few small yellowish dots; skin moderately granular, woody, and brittle; flesh abundant, deep yellow in color, changing to pale green near the skin, said to be of unusually rich flavor; quality probably very good to excellent; seed rather small in comparison to the size of the fruit, roundish oblate in form, 1½ inches long, 1¾ inches broad, with both seed coats adhering closely, and fitting tightly in the cavity. Season at Coban said to be January to April. At the time of my visit the fruits were not quite ripe. The parent tree is 30 years old, with a trunk 18 inches in diameter at the base, and a dense spreading crown 40 feet aroad." (Popenoe.)

Persea americana Miller. (Lauraceae.) 43933-43935. Cuttings of **Avocado** from San Cristobal Verapaz, Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer of this Department. 43933. "From the door-yard of an Indian in the southwest quarter of the village of San Cristobal. A very attractive small fruit, selected first for its earliness in ripening, and secondly for its productiveness and good quality. It is more or less pear-shaped, weighs about half a pound, is nearly smooth externally and of a bright green color, while the seed is unusually small and the flesh is of good quality for an early ripening variety. It is noteworthy that nearly all the early varieties I have found in

Guatemala are inferior in richness of flavor to those which ripen later, and it also seems that a great many of them have large seeds. This was especially notable in the fruits examined around Antigua. Form elliptic pyriform, not distinctly necked; size below medium, weight 8 to 9 ozs., length 3¾ inches, breadth 2¾ inches; base narrowly pointed, the stem inserted almost squarely without depression; apex obliquely flattened though not conspicuously so; surface nearly smooth, bright green in color, with numerous minute yellowish dots; skin 1/16 to nearly ⅛ inch thick, coarsely granular and woody, brittle; flesh cream color, tinged with pale green near the skin, free from fiber and of smooth, firm texture; flavor nutty, pleasant, not so oily as in some of the later varieties; quality good; seed small in comparison with the size of the fruit, broadly elliptic to spherical in form, weight 1 oz., both the seed coats rather thin and adhering closely to the smooth cotyledons. The parent, tree is about 45 feet high, with a spread about equal to its height. The trunk is two feet thick at the base. Apparently the fruits must commence to ripen in October or November, since a great many have already fallen, as indicated by the quantity of fresh seeds on the ground beneath the tree. A large proportion of the fruits left on the trees seem still to be immature, so that this variety can probably be considered to have a very long season. The tree is carrying an enormous crop, as may be expected of one whose fruits are of this size. It is probably safe to say that it will produce more than 2000 fruits this season. This has every appearance of being a very desirable variety."

43934. "From the dooryard of Francisco Muus, in the southwest part of the village of San Cristobal. Taken all around, this seems to me to be much the finest variety of avocado which I have yet seen in Guatemala. Its fine large size, good form, and exceedingly rich flesh, coupled with the fact that the seed is unusually small in proportion to the size of the fruit, make it of great interest to those desirous of obtaining the best varieties of the avocado for cultivation in California and Florida. The fruit is broadly oval, slightly oblique, and weighs 20 to 22 ounces. It is green in color, has a hard brittle skin, and the flesh is smooth, free from fiber, deep yellow in color, and of excellent quality. The extraordinarily small seed is tight in the cavity, as it is in every variety of the Guatemalan type which I have examined up to the present time. The tree seems to be a good bearer, and ripens its fruits in January and February at San Cristobal, which is 4550 feet above sea level. Form broadly oval, slightly oblique; size very large, weight 20 to 22 ozs., length 4½ inches, breadth 4 inches; base obliquely flattened, the stem inserted without depression; apex obliquely flattened, slightly depressed around the stigmatic point; surface pebbled to rather rough, deep green in color, with numerous rather large yellowish dots; skin 1/16 inch thick, slightly thicker over some portions of the fruit, coarsely granular, brittle; flesh of an unusually rich yellow color, changing to pale green near the skin, free from fiber and of fine smooth texture; flavor very rich and pleasant; quality excellent; seed very small in proportion to the size of the fruit, oblate, weighing 2 ozs., tight in the cavity with both seed coats adhering closely to the cotyledons, which are slightly rough for this type. Season January to March at San Cristobal Verapaz. The parent tree is about 30 feet high, the trunk 8 inches thick at the base, and the crown slender, as it is crowded in among other trees. It is bearing a good crop of fruit this season."

43935. "From the cafetal of Don Miguel Gomez, south of the plaza, in the village of San Cristobal Verapaz. This is a fine large fruit almost identical inform and size with the

Trapp variety in Florida. It has a smaller seed than the Trapp, however, and the size of the fruit will perhaps average somewhat larger. It is of excellent quality, and the tree is a heavy bearer, so that it looks like a very promising variety. Form spherical to somewhat oblate; size large, weight 18 ozs., length 3⅞ inches, breadth 3¾ inches; base rounded, the stem inserted without depression; apex rounded or almost imperceptibly flattened; surface slightly pebbled, deep green, with a somewhat glossy character, and numerous rather large yellowish dots; skin more than 1/16 inch thick, not quite ⅛ inch, coarsely granular, woody, brittle; flesh creamy yellow, tinged with pale green near the skin, free from fiber and of fine, firm texture; flavor rich and pleasant, not watery; quality excellent; seed medium sized, oblate, weighing nearly 3 ozs., tight in cavity, with both seed coats rather thin and adhering closely to the lightly wrinkled cotyledons. Season January to March at San Cristobal Verapaz, elevation 4550 feet. The parent tree is about 50 feet high, with a spread of 60 feet, the trunk 3 feet in diameter at the base. It is carrying a heavy crop of fruit." (Popenoe.)

Plant Immigrants. No. 128. December 1916. *Pages 1101-1103.*

Notes from Correspondents abroad.

THE COYO OR SHUCTE

Mr. Wilson Popenoe, Agricultural Explorer, writes from Guatemala City, February 10, 1917:

"In the mountains of northern and eastern Guatemala there grows a fruit closely resembling the avocado, yet sufficiently different in foliage and flower to indicate that it is a distinct species, propably as yet undescribed botanically. For the time being it must, therefore, be termed *Persea sp.* In eastern Guatemala, around Zacapa, Gualan, Chiquimula, and El Rancho it is called shucte, chucte or sometimes chaucte, while in the northern part of the Republic,--immediately across the great Sierra de las Minas,--it is known under the names coyo and coyocté. These latter names have been thought by some to indicate two distinct fruits, perhaps distinct species, but an examination of several trees in the Alta Verapaz shows that they are in reality the same. Apparently the Indians call the cultivated fruit (for it is often grown in their gardens and around their huts) coyo, and the wild tree, which is abundant in the mountains, coyocté. The suffix té in the Quekchi language is said to mean tree; coyocté would therefore mean nothing more than coyo tree.

"In some sections of the Alta Verapaz the coyo is fully as common as the avocado, and seems to be held by the Indians in practically the same high esteem. An American coffee planter who lives in this region tells me that he considers the coyo even superior to the avocado in flavor, and after testing it I am inclined to agree with him.

"The coyo must be considered, then, an unusually interesting new fruit, but it has certain defects which make it seem, on the whole, inferior to the avocado. It has, for example, a large seed in most cases, and the flesh is sometimes disagreeably fibrous. But it is quite variable, like its relative the avocado, and some coyos are much superior to others.

"The coyo tree looks, at first glance, much like an avocado tree, and usually reaches

about the same size. It is distinguishable from the avocado by the character of its leaves, which, upon close examination, are seen to differ from those of the avocado in form, to be larger, and to have more or less brownish pubescence on the lower surface, especially along the midrib. The flowers, when seen from a distance, look like those of the avocado, I have not yet examined them closely.

"The fruits are remarkably similar in general appearance to avocados of the West Indian type, such as are grown in Florida. Like avocados, they vary greatly in form. Most commonly they are pyriform, with a well defined neck, but they are sometimes obovoid, sometimes broadly pyriform, and sometimes long and slender. In size they are also quite variable, but the majority seem to be from three quarters of a pound to a pound and a half in weight. I have heard of coyos weighing two to three pounds, but I have not seen them. The surface is about as smooth as that of a West Indian avocado, and often of similar color,--yellowish green,--but sometimes it is purplish or bronze. The skin is thicker than that of any avocados except those of the Guatemalan type. It is not hard, however, as in the latter, but leathery and pliable. Frequently it adheres to the flesh, which is of a peculiar brownish white color, gives off a milk-like juice when squeezed, and is of fine, oily texture, like the flesh of an avocado. Commonly there are numerous fibers running through the flesh. There are said to be coyos practically free from fiber, but I have not as yet seen them. The flavor is strongly suggestive of the avocado, being of the same rich, nutty character, but is nevertheless distinct; it has a richness and nuttiness of its own, which suggest to me the flavor of a ripe coconut. The seed is larger in comparison to the size of the fruit than it is in the best of our budded varieties of the avocado, but it is no larger than in many seedling avocados. In general appearance it resembles an avocado seed, but the cotyledons, when cut, are seen to be of a dull rose-pink color instead of whitish. The flesh often adheres closely to the seed, making it difficult to prepare the coyo for eating. I have seen some fruits, however, in which the two halves could be separated as in the avocado, the seed coming out readily and leaving a cavity in which seasoning can be placed.

"The coyo is used by the Indians of Guatemala in the same manner as the avocado, which is to say that it is eaten out of hand, without the addition of seasoning of any sort, and frequently to the accompaniment of tortillas,--thin, round cakes, made from Indian corn, which are a staple article of diet throughout this part of America. I have not yet experimented to see how the coyo tastes when prepared in salads or seasoned with vinegar, salt and pepper, but I have found it excellent when diced and eaten in bouillon, as is often done with the avocado by Guatemalans of the upper classes. To me its flavor is decidedly agreeable, and a good coyo, free from fiber and with a seed not too large in proportion to the size of the fruit, would impress me as a worthy rival of the avocado.

"The tree grows under a variety of conditions. In the valley of the Motagua river, near Zacapa and El Rancho, it is found near the banks of streams. The air in these regions is exceedingly hot and dry during a large part of the year, the hillsides being covered with typical desert vegetation,--cacti, euphorbiads, and thorny leguminous shrubs and small trees. Contrasted with these conditions, the upper Polochic valley, in the Alta Verapaz, where the coyo is exceedingly abundant, is a very moist region, with rainfall,--as the inhabitants state,--thirteen months in the year. In this part of Guatemala I have seen

coyos at elevations well above 5000 feet. Like the Guatemalan type of avocado, it is very abundant from 4000 to 5000 feet, but unlike the latter it seems also to do very well at lower elevations, being found around Zacapa at elevations of 500 feet above the sea, where the Guatemalan type of avocado is usually replaced by the West Indian.

"Judging from its behavior in Guatemala, the coyo ought to be successful in both California and Florida. During the coming summer I hope to make a search for superior trees and obtain budwood for introduction, into the United States. The season of ripening is from June to August in the lowlands, and in August to October or even November in the highlands. There are thousands of trees in the Verapaz, and it should certainly be possible to find among them a few superior ones, well worthy of propagation.

"In the coyo we have a fruit new to North American horticulture,--so new, in fact, that it does not even have a botanical name,--yet one which is grown by the Indians of northern Guatemala as extensively as the avocado, and apparently looked upon by them as almost its equal. When good varieties have been obtained, and propagated by budding, it seems reasonable to expect that the coyo will find a place in the orchards of the United States, throughout approximately the same belt in which the avocado is grown."

THE ANAY, A WILD RELATIVE OF THE AVOCADO.

(PERSEA SP., S. P. I. NO. 43433.)

An as yet undescribed species of Persea which is closely related to the cultivated avocado, occurring as a wild forest tree at an altitude of 1,200 feet in the rainy forest region of Guatemala. It is a tall, slender tree, attaining 70 to 80 feet in height, and is left as a shade tree in coffee plantations. Unlike the Mexican avocado, its leaves are not anise scented. It flowers in May, and its fruits ripen in August and September. In the development of the avocado industry this species may prove valuable for stock purposes in regions of heavy rainfall. (Photographed by Wilson Popenoe at Mazatenango, Guatemala, September 23, 1916; P16797FS.)

A FRUIT AND SEED OF THE ANAY.

(PERSEA SP., S. P. I. NO. 43432.)

A wild relative of the avocado, with smooth, glossy black fruits, 4 to 6 inches long, having a very thin, membranous skin which adheres closely to the firm, oily flesh. The latter has a rich, bland flavor like that of a good avocado, but with a suggestion of sweetness. If the flesh of the anay was more abundant, its flavor would make it of great value. The fruits do not ripen on the tree, but fall to the ground while still hard and require two or three days to soften. This may prove of value for breeding purposes. (Photographed by Wilson Popenoe at Mazatenango, Guatemala, September 23, 1916; P16806FS.) Natural size.

Plates 217 and 218 from **Plant Immigrants. No. 133. May 1917.**

Plant Immigrants. No. 133. May 1917. *Pages 1171-1172.*

Notes from Correspondents abroad.

Mr. Wilson Popenoe writes from Guatemala City, Guatemala, November 6, 1917:

"I am forwarding this week, via the pouch, my number 195, being 100 scions and budsticks of avocado No. 32, from the property of Eulogia Duarte, near Amatitlan, and my number 196, cuttings of *Malpighia sp.* the "azerola" from Amatitlan.

"This avocado, No. 32, (named **Akbal)** is a variety which I have had under observation for several months, and which I have been counting upon to complete my set. It is a very early variety. Previous to obtaining this number the set has included no very early forms, the best probably being No. 6, from Antigua, which is two to three months earlier than the majority of varieties in that region. No. 32 appears to be an aberrant type which ripens at Amatitlan in September, while the majority of varieties in the same region do not ripen until January or February. I have found several other trees which seem, like 32, to bloom and ripen entirely out of the main season, but 32 is the only one whose fruit is up to standard. This variety is of excellent quality. The fruit is long and slender, which may be a slight defect from our point of view, but so far as I can see this is the only defect that it has, and if it ripens as far out of the main season in California and Florida as it does here, it will be so valuable that the slender form will not matter. It remains to be seen whether or not the variety will retain its habit of flowering out of season in California and Florida.

"Replying to your letter of the 18th ult., re papaya seed, it seems to me that there are much better regions than Guatemala in which to obtain this. The papaya is not very abundant here, and there are very few superior varieties. To obtain large quantities of seed of the latter, such as you desire, would be a very slow job, and I do not believe more than two or three pounds could be obtained within the next month. I believe it would be much more satisfactory to obtain seed from Hawaii, where better varieties are available in abundance.

"I will try to get specimens of chayote roots and the soil around them, so that Dr. Cobb can make an examination. I expect to go to Antigua this week, and while in that region will see if I can get any more information re chayote culture. In the .Indian villages around Antigua there are a great many chayotes grown.

"I expect to ship 4000 avocado seeds within a couple of weeks, but they will probably not reach you until a week later than this letter."

Plant Immigrants. No. 134. June 1917. *Pages 1185-1186.*

Persea americana Miller. (Lauraceae.) 44856. **Avocado** budsticks from Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer for this Bureau. "No. 146. Avocado No. 30. **Tertoh.** A famous avocado from Mixco, noted for its large size (3 pounds) and excellent quality. Unfortunately, the ripe fruit has not been seen by me, hence it is introduced on the recommendation of several Americans who are familiar with it. The parent tree is growing in the sitio of Leandro Castillo, in the town of Mixco, near Guatemala City. The elevation is about 5700 feet. The tree is said by the owner to

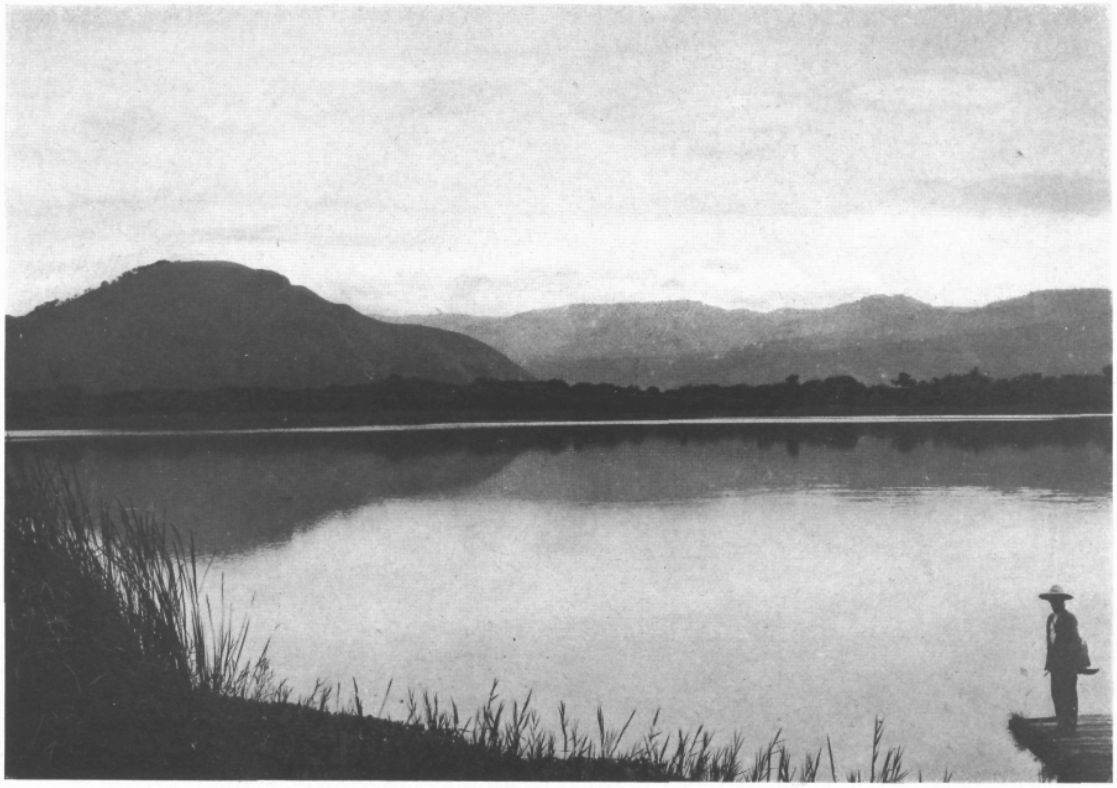
be about 20 years old. It is about 25 feet high, broad and spreading in habit, with a trunk 15 inches thick at the base, branching *7* feet from the ground to form the dense crown 30 or more feet broad. A peculiarity of the tree is its very brittle wood. This may be against the variety in California and Florida, where strong winds occasionally do much damage. The budwood is good. The climate of Mixco is cool, but not cold enough to test the hardiness of the variety. This can be determined only by a test in California or Florida. The tree flowers in March. It is said by its owner to bear at least .a few fruits every season. It produced very few from the 1916 bloom, .but set a good crop in 1917, and there should be a fine lot of fruits to ripen next year (1918). Judging from accounts given me, the tree usually does not carry a great many fruits, but this would be expected of a variety of such large size. The season of ripening is said by the owner to be from February to April, most of the crop being picked in March. The fruits, as indicated by young ones now on the tree (June 12, 1917), are long and slender,—best termed slender pyriform, perhaps, but not markedly swollen at the lower end. The surface is nearly smooth, and the skin rather thin for this race. When ripe the color is said to be deep purple, and the flesh is said to be of excellent flavor. An American who has known the variety for some time tells me he has weighed specimens which tipped the beam at 3 pounds. This is a larger fruit than any other included in the collection and, so far as I am aware, the largest yet seen in Guatemala. Since it has not been possible for me to examine the mature fruit, it is recommended that budded plants be distributed with the understanding that the variety is a very large-fruited one highly recommended by several people who are familiar with it, but not tested by me." (Popenoe.)

Plant Immigrants. No. 135. July 1917. *Pages 1205-1207.*

Persea sp. (Lauraceae.) 44996. Seeds from Guatemala. Collected by Mr. Wilson Popenoe, of this Bureau. "(No. 152a. Prom the Chuacús mountains, near Rincon Grande, about 5 miles from Salamá, at an approximate elevation of 3000 feet. July 9, 1917.) I do not know what this species may be; possibly it is as yet undescribed. Only one tree has been seen up to the present, and this was erect, rather slender in habit, 30 feet in height. The foliage strongly resembles that of *P. americana,* but is more heavily pubescent beneath than is common in that species. In form and size the leaves could not be distinguished from some of the cultivated avocados. The young leaves and branchlets are covered with a velvety tomentum. The fruits, which ripen in June, are oval or oblong-oval in outline, about an inch and a half in length, shining black in color, with a membranous skin and a very small amount of greenish pulp having a strongly resinous taste. The seed is quite large in comparison with the size of the fruit, elliptical in outline, with the seed coats thin, brownish and brittle, and adhering closely. The cotyledons are whitish, with the embryo at the base of the seed. The fruit is distinct from that of the avocado in having a large, fleshy, bluntly-toothed calyx, pinkish or whitish in color, which remains on the tree when the fruit falls. This species is introduced in connection with the experiments now being carried on with a view to determining the best stock on which to bud the avocado." (Popenoe.)

Persea sp. (Lauraceae.) 44999. **Coyo** budsticks from Guatemala. Collected by Mr. Wilson Popenoe, of this Bureau. "(No. 161. Prom the sitio of Don David Pierri, San Cristobal, Verapaz. July 3, 1917.) The **coyo, chucte, shucte,** or, as it is sometimes

called, **chaucte,** is a species of Persea which is undoubtedly indigenous in this region. It is reported also from Zacapa and Chiquimula, but I have only seen it here up to the present. The tree grows on the banks of streams, where the soil is moist and rich. The hills in this region are dry, rocky, and covered with a scanty vegetation of cacti, Pereskia, thorny leguminous shrubs and small trees, and a few other plants. As well as being indigenous to this region, the **coyo** must be classed as a cultivated fruit tree, since it is occasionally, but not often, planted in gardens. At the present time the **coyo** is neither in flower nor in fruit. It is said to bloom in February and to ripen its fruit in May and June, continuing until August. One of the two trees which I have seen, (this one standing on the north bank of the Rio Motagua a short distance above El Rancho) was about 60 feet in height. The other one was not more than 45 feet high. The general appearance of the tree, its habit of growth, size, character of bark and foliage, are remarkably suggestive of an avocado of the West Indian type; but on closer examination it is seen that the leaves are larger than is common with the avocado, the venation is impressed on the upper surface of the leaf, and, most conspicuous of all, the ends of the young branchlets and the petioles are covered with a ferrugineous tomentum. The foliage is said to fall just before the tree comes into bloom: the flowers making their appearance with the new leaves. The leaves are clustered at the ends of the branchlets, though not crowded. The leaf-blades are oblong-elliptic, truncate at the base, sharply acute to shortly acuminate at the apex, 8 to 12 inches long, 4 to 7 inches broad, bright green and glabrous above, glaucous and rather heavily pubescent below; the pubescence ferrugineous on the midrib and to a less degree on some of the larger transverse veins. The venation is slightly impressed on the upper surface, very prominent below. The petioles are 1 to 1¾ inches long, narrowly canaliculate toward the articulation with the leaf-blade, and ferrugineous-pubescent like the branchlets from which they arise. The fruit is described as long and slender, almost black, with a large and long seed and thin flesh. The flavor is described as rich and bland, similar, but superior, to that of the avocado. It is highly esteemed by the inhabitants, and it is stated that it has even been shipped to the city of Guatemala and sold in the market there." (Quoted from description furnished with Popenoe's No. 72.)



LAKE AMATITLAN, THE HOME OF THE GUATEMALAN AVOCADO.

The first two sets of cuttings of Guatemalan avocado varieties to be sent in by Mr. Wilson Popenoe, Agricultural Explorer of the United States Department of Agriculture, were collected on the opposite shore of this mountain lake, in the section known as Rellew, where numerous coffee fincas or plantations occur. (Photographed by Wilson Popenoe, Laguna, Guatemala, October 9, 1916; P16846FS.)

Plate from **Plant Immigrants. No. 135. July 1917.**

Plant Immigrants. No. 136. August 1917. *Pages 1214-1215.*

Collected by Mr. Wilson Popenoe, Agricultural Explorer for this Department. "No. 171. Avocado No. 31. **Nimah** from Mazatenango, Department of Suchitepequez. Elevation 1148 feet. A variety obtained especially for trial in Florida, since it comes from the hot lowlands and may be better adapted to the conditions which obtain in extreme south Florida than are those from the Guatemalan highlands. The fruit is pear-shaped, sometimes curved, with a well defined neck. It is of medium size, weighing about 11 or 12 ounces, deep green in color, with a rough surface and a thick, tough skin. The flesh is deep yellow in color, free from fiber and of rich flavor. The seed is medium-sized. On the whole the variety is satisfactory in point of flavor and quality, yet it is not good enough to be included in my Guatemalan collection on these characteristics alone." (Popenoe.)

Persea americana Miller. (Lauraceae.) 45083. **Avocado** seeds from Bogota, Colombia. Presented by Sr. Alvaro Uribe. "One of the best Colombian avocados. It grows at elevations of from 3000 to 4500 feet, at temperatures ranging from 20° to 26° C., (36° to 47° F.) and ripens in April. The fruits are well-shaped, and excellent in taste. The trees are very robust, and require only sufficient moisture in the air." (Uribe.)

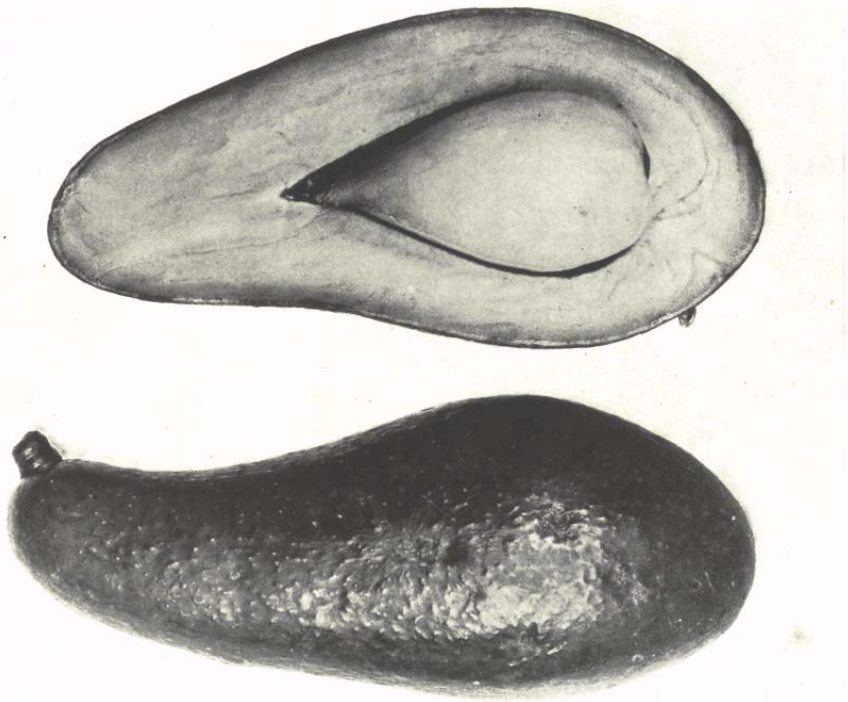
Persea sp. (Lauraceae.) 45081. Seeds from Guatemala. Obtained by Mr. Wilson Popenoe, Agricultural Explorer for this Department. "(No. 170a. July 23, 1917.) **Coyo or shucte.** Seeds of a very large variety of **coyo** from the town of El Rancho, in eastern Guatemala. The fruits from which these seeds were taken weighed from one to two pounds each. They were bright green in color, with very thick skins, and milky white to brownish white flesh of very rich, nutty flavor. They contain a little fiber, but not as much as is commonly found in the **coyo.** These seeds should be planted in California and Florida and fruited as seedlings." (Popenoe.)

Plant Immigrants. No. 139. November 1917. *Pages 1249-1250.*

Persea americana (Lauraceae), 45505. **Avocado.** From Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer for this Department. "(No. 195. Avocado No. 32. **Akbal.** Guatemala, Guatemala. November 6, 1917.) This is a variety noteworthy for earliness, and it has been included in the set primarily for this characteristic. It is, however, of very good quality and has no visible defects except a slightly undesirable shape. Judging by its behavior in Guatemala, it should be the earliest variety in the collection, but it is not safe to depend upon its retaining this characteristic in the United States, since slight local variations in soil or climate sometimes affect the period of ripening very noticeably, and its earliness in Guatemala may not be altogether an inherent characteristic. This is rather a warm region, hence there is nothing to indicate that the variety will be unusually hardy. The crop harvested in the fall of 1917 was a good one. According to the owner, it was 600 fruits, but judging from its appearance while still on the tree it must have been considerably more than that. The bearing habits of the tree were only under observation for one season, but they give promise of being very satisfactory. The flowering season is in November and December, and the fruit ripens from the following August to November. It is fully ripe and in perfect condition for picking by the middle of October, whereas the average variety of the same region is not

mature until January at the earliest. In two characteristics this variety does not seem to agree with the Guatemalan race. It has a very thin skin and the seed coats do not adhere closely to the cotyledons. A few other varieties showing these same characteristics were seen in the same locality, and it is possible that they may not be true Guatemalan avocados, though in most respects they seem to belong to this race. In form this fruit is long and slender, sometimes slightly curved, and sometimes becoming pyriform. It is medium-sized, weighing about twelve ounces. The surface is quite smooth, and green in color. The skin is thin, and surrounds the thin yellow flesh, which is of very good quality and shows no fiber or discoloration. The seed is medium-sized, and while it does not rattle in its cavity, it does not fit as snugly as it does in nearly all other Guatemalan varieties." (Popenoe.)

Persea americana (Lauraceae), 45560. **Avocado.** From Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer for this Department. "(No. *212,* Avocado No. 26. **Manik.** Guatemala, Guatemala. November 13, 1917.) A productive and rather early variety of excellent quality. It is a medium-sized fruit of pleasing form and clear yellow flesh of unusually rich flavor. The parent tree is growing in the Finca La Polvora, in Antigua, Guatemala. The elevation is about 5,100 feet. Antigua does not experience severe frosts, hence it is impossible to determine, in advance of a trial in the United States, whether or not the variety is any hardier than the average of the Guatemalan race. The flowering season is February and March. The tree blooms profusely and some years sets enormous crops of fruit. In 1917 a very heavy crop was ripened. The 1918 crop is much smaller. In general, the bearing habits of the tree give promise of being unusually good, there being a tendency for the fruits to develop in clusters. The season of ripening is properly February to June, but fruits picked early in December developed fairly good flavor upon ripening in the house. The season may be termed early to mid-season. The fruit is more variable in form than that of some varieties. The range is from oval to slender pyriform, the majority of the fruits being of the latter shape, without, however, a well-defined neck. The weight varies from 8 to 12 ounces. The surface is slightly roughened, and green in color. The skin is moderately thick, the flesh rich yellow, quite free from all fiber or discoloration, and of a very rich and pleasant flavor. The seed is a trifle large in some specimens, small in others, being medium-sized or rather small on the average. It is quite tight in the seed cavity." (Popenoe.)



A GUATEMALAN AVOCADO RIPENING IN AUGUST.

(*Persea americana*. See S. P. I. No. 45505.)

The Akbal avocado is a variety from Amatitlan, Guatemala (altitude 3,900 feet), remarkable for its earliness in ripening. As will be observed, its form is rather objectionable, being longer and more slender than is considered ideal by American avocado growers, but its quality is excellent. In Guatemala it ripens in August and September, while most of the varieties in the same region do not commence to ripen before January or February. For this reason it is thought that the Akbal variety may be of value for California, where early-ripening varieties of the Guatemalan race are much desired. (Photographed by Wilson Popenoe, Guatemalan collection No. 32, at Amatitlan, Guatemala, November 8, 1917; P17411FS.)

Plate 227 from **Plant Immigrants. No. 139. November 1917.**

RESISTANCE TO COLD OF THE GUATEMALAN AVOCADO.

(*Persea americana.*)

The freeze of February 3, 1917, at Miami, Fla., subjected the avocados at the Plant Introduction Garden to a temperature of 26.5° F. for a few minutes. This temperature froze the foliage and twigs of the avocado tree of the tender West Indian type but affected those of the Guatemalan type much less severely and did not injure at all those of the Mexican type. In the illustration Admiral Ross is touching the dead brown leaves of a shoot coming from the West Indian seedling stock upon which was budded February 7, 1914, the Grande variety of the Guatemalan type. This bud has produced a good-sized tree in the three years and scarcely a leaf was injured by the freeze. (Photographed by David Fairchild, at the Miami Plant Introduction Field Station, February 12, 1917; P20427FS.)

Plate 230 from **Plant Immigrants. No. 140. December 1917.**

Plant Immigrants. No. 142. February 1918. *Pages 1278-1279.*

Persea americana (Lauraceae), 45562. **Avocado.** From Guatemala. Collected by Mr. Wilson Popenoe, Agricultural Explorer for this Department. "(No.214. Avocado No. 34. **Ishim.** November 20, 1917.) From the terreno of Ignacio Hernandez, at San Lorenzo del Cubo, near Antigua. While most avocados in the Antigua region do not ripen their fruits until February or March, this one matures its entire crop by the end of November. It can be considered, therefore, a very early variety, and as such is worthy of a trial in California, where early varieties of the Guatemalan race are needed. Its only visible defect is its somewhat large seed. The quality is good and the fruit is attractive in appearance. This location is not sufficiently high to experience cold weather, hence the variety must be assumed to be of average hardiness for the Guatemalan race until it can be given a trial in the United States. The productiveness of this variety is somewhat in doubt. The crop harvested in 1917 was not large. The tree bloomed heavily in December and was setting a good crop when last seen. The season of ripening extends from October to the first of December. Probably the fruits would remain on the tree later than December if given an opportunity to do so, but as avocados are very scarce at this season of the year they are picked as soon as mature. The form of the fruits, pear shaped to obovoid, is attractive, as is the deep maroon color which they assume upon ripening. They are of convenient size, about 12 ounces, and the flesh is yellow and of good quality. The seed is larger than in the best late varieties, but not unreasonably large. It is tight in the cavity." (Popenoe.)

Plant Immigrants. No. 149. September 1918. *Page 1355.*

Persea americana (Amygdalaceae), 46337. **Avocado,** Grown at the Plant Introduction Field Station, Miami, Fla. A Mexican avocado, which has proved quite frost-resistant. This variety is a seedling grown from seed received under S. P. I. No. 19094. The fruit ripens at Miami during the months of August, September and October. It is pear-shaped and of a purplish maroon color, weighs 11 to 12 ounces, and is of fair quality.

Plant Immigrants. No. 150. October 1918. *Pages 1364-1365.*

Persea americana (Lauraceae), 46574. **Avocado.** From Mexico. Presented by Mrs. Zelia Nuttall, Coyoacan. "When Mr. Popenoe was here recently, he asked me what variety of **aguacate** I regarded as the best I had ever tasted, either here or in any other country. I told him that I considered a .certain kind grown on my own place, Casa Alvarado, the finest in flavor and creaminess; besides, the skin was so thin that it could be peeled off as easily as that of a ripe peach. He tried the first ripe ones of this year's crop and was delighted with them; he asked me to send him large quantities of seeds." (Nuttall.)

Plant Immigrants. No. 153. January 1919. *Page 1390.*

Persea americana (Lauraceae), 46624. **Avocado.** From Ecuador. Collected by Dr. J. N.

Rose, Associate Curator,' National Herbarium, Washington, D. C. "Avocado from Ambato; fruit brownish to black but sometimes green or red, 2½ to 4 inches long. A fine fruit but small." (Rose.)