

## EXPLORING GUATEMALA FOR DESIRABLE NEW AVOCADOS

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Ever since G. N. Collins (In Bulletin No. 77 of the Bureau of Plant Industry, U. S. Dept. of Agriculture, Washington, 1905.) pointed out the remarkable commercial characteristics of the Guatemalan avocados, North American horticulturists have had their eyes upon Guatemala as one of the most promising sources of new varieties for cultivation in the avocado growing regions of the

"This article was not read at any meeting of the Association, but because of its general interest at this time, it is printed in the report in accordance with a resolution of the Board of Directors.—Secretary.



Plate III, Figure 4

### **The Guatemalan Avocado at its Best**

This variety, introduced under the name Nimlioh, is one of the largest found during the course of the explorations in Guatemala. It weighs 3 pounds, and is of excellent quality, the flesh being deep yellow in color and of very rich flavor. Such fruits as this are rare even in Guatemala, where good avocados are more numerous than in most other parts of the American tropics.

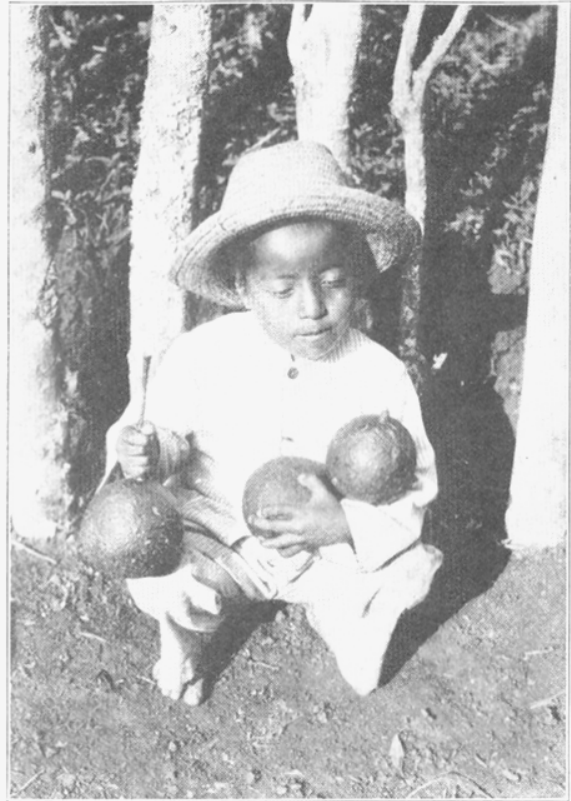


Plate III, Figure 5

### **The Chisoy Avocado**

This variety is almost a counterpart of the Trapp, the size and shape being practically the same. The seed, however, is comparatively smaller. In quality the fruit is excellent.



Plate IV. Figure 6

**Bringing Avocado Budwood Across the Mountains**

The search for good avocados necessitated many trips on horseback across the mountains of northern and western Guatemala, since many of the best trees are in small Indian villages far removed from the railroad. The shipment of budwood shown in this picture was carried from San Cristobal Verapaz to Guatemala City, a distance of about 125 miles.



Plate IV. Figure 7

**Eight Thousand Avocados for Seed**

These fruits were purchased in the markets of Guatemala City at prices varying from 30 to 50 cents a hundred. They are representative of the avocados sold in Guatemala City throughout the year. It will be noted that they are of good size. In quality the majority are only fair, but a few of them are excellent. The seeds from these and many other fruits were forwarded to Washington to grow seedling stocks on which to bud the selected varieties introduced into the United States from Guatemala during the course of our explorations in that country.



Plate V. Figure 8

**The Valley of Antigua**

Not only one of the most picturesque and historic spots in the New World, but one of the greatest avocado regions known. It was formerly the seat of the Spanish viceroy, who governed the territory from Mexico to Panama. At the present time it is a great coffee region, the trees which are seen covering the valley floor being planted for shade in the coffee fincas or plantations. Among these shade trees there are many avocados, some of them producing excellent fruit. The lower peak in the distance is the Volcan de Fuego, active as recently as 1887; the higher peak is Acatenango.



Plate VI. Figure 9

**Examining Avocados in the Expedition Headquarters at Purula,  
Baja Verapaz**

While canvassing some of the remote Indian villages of northern Guatemala, it was sometimes necessary to make use of such shelters as this for several days at a time. As the climate is not cold, protection from rain is all that is necessary, and while the roof of this abandoned house does not appear to be absolutely impervious to rain, the floor always remained dry on one side.



Plate VI. Figure 10

**In the Market at San Cristobal Verapaz**

Avocados are among the principal foodstuffs sold in the markets of Guatemalan towns. The Indians have learned to look upon the avocado as one of their principal articles of diet. To a considerable extent it replaces meat. The price at which avocados are sold in these villages of the highlands is ridiculously low,—rarely as high as a half a cent each.

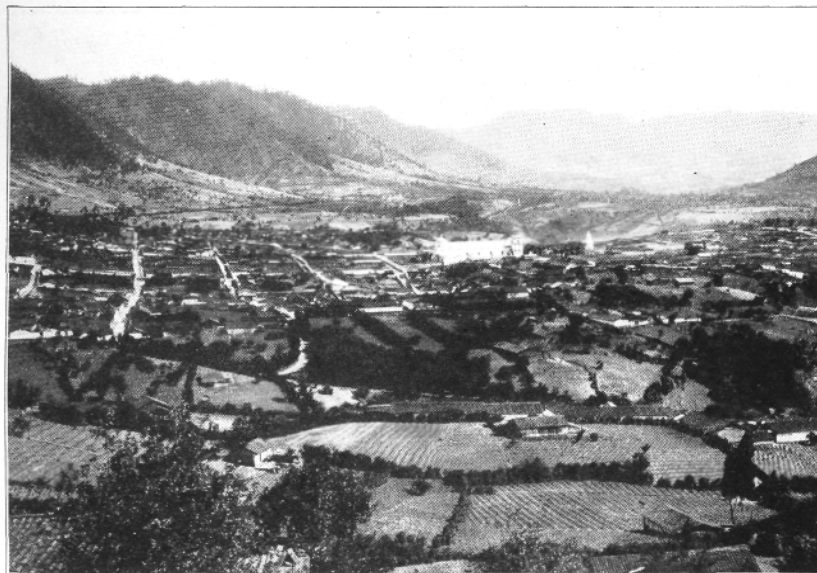


Plate VII. Figure 11

**The Upper Limit of Avocado Culture in Guatemala**

The city of Totonicapan, at 8500 feet elevation, is the highest spot in Guatemala at which avocados were found. Most of the trees here had been killed or badly injured by cold, but a few had escaped practically unharmed. The best variety found here, Pankay, was introduced into the United States for trial, in the hope that it might prove to be hardier than the average.

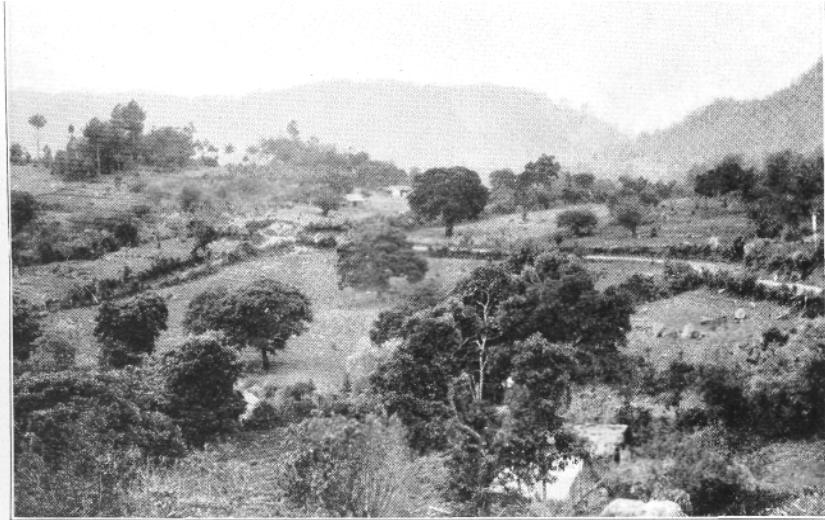


Plate VII. Figure 12

**A Hillside near Solola**

Here may be seen avocado trees growing in the small cornfields of the Indians at an elevation of about 7000 feet. At this elevation the avocado is less abundant than it is at 4000 to 6000 feet, but it does fairly well up to 7500 feet. There are many such scenes as this in the highlands between Guatemala City and Quezaltenango.



Plate VIII. Figure 13

**Primitive Form of the Guatemalan Avocado  
(Natural Size)**

This small, thick-shelled fruit from the Alta Verapaz is probably a close approximation to the wild form of the Guatemalan avocado. It is the most primitive type which was found. When compared with some of the excellent varieties found in Antigua or San Cristobal Verapaz, the improvement which has taken place in the avocado under cultivation seems greater than that which has been produced in many of the temperate fruits.



Plate VIII. Figure 14

**Parent Tree of the Nimloh Avocado**

This tree, growing in a back yard at Antigua, illustrates the form commonly taken by the avocados in Guatemala, and shows also the absence of branches close to the ground. Rarely are the trees allowed to branch low. The crown is nearly always formed 10 or 12 feet above the ground, so that other crops can be planted in the shade below.

**United States.** The success of Guatemalan varieties in California, where many have been tested during the past twenty years, served to increase this interest in the Central American republic from which they get their name.

It was natural, therefore, that efforts should be made to obtain the best varieties which Guatemala could furnish, for the horticulturists of California and Florida would be satisfied with nothing less. Mr. E. E. Knight, long a resident of Central America, and consequently a firm believer in the avocado, went to the expense of making a trip to Guatemala for the sole purpose of obtaining budwood of certain varieties with which he was familiar. Fortune favored him, and he succeeded in introducing the Rey, Linda, Knight, and Queen, all of which are now being tested in the United States.

At the meeting of the California Avocado Association held in Los Angeles in the fall of 1915, Dr. H. J. Webber introduced a motion to the effect that the Association should petition the Secretary of Agriculture to send an explorer to Guatemala for the purpose of conducting a more thorough search than had yet been attempted, not only for the best avocados in the republic, from the point of view of quality, but also for varieties which would extend the ripening season, varieties which would be particularly frost-resistant and so on.

It was my good fortune to be sent on this mission. I remained in Guatemala from the first of September, 1916, to the middle of December, 1917, thus having not only an opportunity to observe the trees during every month in the year, but also sufficient time at my disposal so that I could visit every portion of the country which gave promise of yielding anything of value. It must be understood that travel in Guatemala is tedious, unless one stays close to the railway which traverses the republic from east to west and runs up the west coast to the Mexican frontier. Most of the important avocado regions are not accessible by rail; hence I had recourse to the saddle for a large part of my work.

Who is it that has said, "a year in the saddle is worth a lifetime by the hearthside?" If his year was spent in the Guatemalan highlands, I believe I would be willing to admit the truth of his assertion, for, with the exception of some hard pulls through rain and mud in the Alta Verapaz, and equally hard pulls across the scorched and barren mountains which lie between Zacapa and the Honduran frontier, I have never spent any more enjoyable days than those during which I viewed the Guatemalan landscape from my McClellan, perched upon a white pony, closely followed, Quijote fashion, by my Indian boy upon a diminutive mule. Together we covered nearly three thousand miles of rocky trail and dusty road, and in spite of the rocks and the dust it was thoroughly enjoyable. Camping by the wayside at sundown, up and in the saddle before the first gleam of day was in the sky, halting from time to time as we came upon an interesting avocado tree, and finally stopping for a day or two in an Indian village which gave promise of yielding interesting avocados,—this was our program week after week. Finally, after locating seedlings which appeared worthy of introduction into the United States, budwood was cut, washed, and packed in tin mailing tubes; a forced march made to Guatemala City, sometimes a hundred and twenty-five miles across the mountains, and the precious freight was deposited in the mails, to be opened only upon reaching Washington, where sturdy seedlings were waiting to be budded. Imagine our feelings when, after making one of these trips into the back country, and returning with a shipment of budwood, let

us say of a variety which seemed especially promising, a cablegram arrived from Washington ten days later bluntly stating that the entire shipment was dead upon arrival! Two weeks' work, the last four or five days under pressure, all for nothing! But before the explorations were completed and I made my plans to return to the United States, every variety which I had selected for introduction was safely growing in the greenhouses at Washington or in the Plant Introduction Garden at Miami, Florida.

The successful establishment of these varieties in the United States is due in a large measure to the efforts of Dr. B. T. Galloway and Edward Goucher of the Office of Foreign Seed and Plant Introduction, the former having general charge of the work and the latter doing most of the budding. Mr. Edward Simmonds, of our Miami Station, and J. M. Rankin, of our Yarrow Station, also deserve much credit in the matter. Naturally enough, some of the budwood which came through was in very precarious condition, — scarcely seeming to be alive, yet not to be discarded as dead. But the skill of Mr. Goucher and Mr. Simmonds made it possible to save all of the varieties, when it appeared, at one time, as though it would be necessary to establish a nursery in Guatemala, propagate budded trees there and bring them home when large enough. Two nurseries were, in fact, started with such an object in view, one at Guatemala City, and the other at Quiriguá, but the difficulty in shipping budwood was later overcome and it was not necessary to bud young seedlings and bring home growing trees.

I say the difficulty was overcome; I might better explain that it overcame itself, and in this manner: toward the end of the rainy season, October, and from then until March, the young branchlets suitable for budwood were covered with a heavy growth of sooty mold and other fungi. In shipment the fungi developed vigorously, and the budwood was nearly all dead upon arrival at Washington. Avocado trees in Guatemala make new growth in February and March, a time of the year when there is no rainfall. This growth was sufficiently mature for use by May or June, and had not yet become discolored with sooty mold, but was green and bright. Nearly all shipments during May, June and July reached Washington in splendid condition. I do not say that the absence of sooty mold was solely responsible for the difference; I only state that nearly all of the shipments in May, June and July were successful, while the majority of those from October to March were failures, or at best only a few budsticks were saved out of each shipment.

#### **METHOD OF SHIPMENT**

It may be of interest to explain that our method of packing this budwood was the simplest possible, the budsticks being placed in moist sphagnum moss and wrapped in heavy oiled paper. Sometimes the shipments were forwarded in mailing tubes of tin, sometimes the bundles were wrapped simply in strong brown paper; both were equally successful. Given clean budwood to begin with, the essential point in packing is the amount of moisture added to the sphagnum moss. It is our custom to have the moss bone dry at the time of packing, and then moisten it at the rate of half an ounce of water to an ounce of moss, being careful to have the measurements exact. Many experiments were tried during the course of the work in Guatemala, in order to determine whether a better method of packing could be devised, but nothing was found which gave such satisfactory results as the method just outlined. I believe if avocado budwood can be

obtained clean and free from fungous spores, it can be shipped without the slightest difficulty, but budwood covered with sooty mold, *Colletotrichum*, and other fungi,—my bitter experience in Guatemala makes me prefer to avoid it.

Many thousands of avocado seeds were required at Washington for growing seedling stocks on which to bud these new Guatemalan varieties. We therefore purchased avocados in the markets of Guatemala City, hauled them by cart to our headquarters in the suburbs, and there cleaned and dried the seeds and boxed them for shipment. They were forwarded by freight to New York or New Orleans, and thence to Washington by express. The method of packing employed was the simplest imaginable, the seeds being dried in the shade, with perhaps a few hours in the sun just before they were packed in order to remove all moisture from the parchment-like seed coats, and packed in wooden boxes, with a little hay below and above to act as a cushion and keep them from rattling around. There was practically no loss due to decay in transit; some of the seeds were found upon arrival in Washington to be infested by the broad-nosed grain weevil (*Caulophilus latinasus*), and were thrown out; while some which were taken from slightly immature fruits shrivelled and became useless. But in general the percentage of loss was small. It may be of interest, *en passant*, to note that the fruits purchased for seed in no instance cost us more than 50 cents a hundred, and rarely more than 35 cents. Yet they were not culls or in any way inferior, but were good fruits which would bring 50 cents each in the eastern United States about Christmas time.

## RACES

Before entering upon a consideration of avocado culture in the Guatemalan highlands, it is well to speak of the various races of avocados and their occurrence in Guatemala. It is becoming more and more apparent, as the years go by, that the first question to be asked concerning any avocado is, To what race does it belong? And it is equally important to ask, when considering any particular avocado region, What races are grown there? All three races at present known to horticulture,—the West Indian, the Mexican, and the Guatemalan,—are found in Guatemala, but the first two are far exceeded in importance by the third. It is only the Guatemalan race, in fact, that needs to receive our attention, since other regions possess much better varieties of the West Indian and Mexican races. The Mexican race is scarcely known in Guatemala, only two trees being seen during the entire course of my year's travel in the country. I had reports of others from the Indians in several places, and am inclined to think they may occur wild in some places, but they cannot be abundant. The varieties seen were small and horticulturally inferior, suggesting by their size that they had never been improved and were the product of trees not more than one or two generations removed from the wild. The West Indian race is well known in the lowlands of both coasts, ascending to about 2500 feet. It is nowhere grown very commonly, however, and many of the avocados seen in the markets of lowland towns are fruits of the Guatemalan race produced in the highlands and carried perhaps fifty miles on the backs of Indians.



## CLIMATIC CONDITIONS

There is probably no place where one gains a clearer idea of the different climatic requirements of the various races than in Guatemala. On the coast you meet with practically nothing but the West Indian race. Occasionally a tree of the Guatemalan race will be seen, but it does not seem to be at home, and it is said that they do not fruit well. Ascending toward the central plateau from either side, the West Indian race disappears at approximately 2500 feet, and at 3000 feet or slightly higher the Guatemalan commences to become common. The regions in which this race is most abundant lie between 4000 and 6000 feet. Above the latter elevation it becomes less common, being rare at 7500 and disappearing entirely between 8500 and 9000. The two trees of the Mexican race which I have mentioned were growing at elevations close to 7000 feet, but there is no doubt that they could be successfully cultivated much higher.

The mere mention of these elevations, without an explanation of what they indicate in terms of minimum temperature, will not mean much to North Americans. It is necessary, therefore, to consider in detail the relation between altitude and climate in Guatemala. In this republic, as in Mexico and some other parts of tropical America where high mountains are present, three climatic zones, dependent entirely upon elevation, are generally recognized. These are the *tierra caliente* (as it is called in Spanish) or hot region, extending from sea level to about 2000 feet; the *tierra templada* or temperate region, comprising the territory between 2000 and 6500 feet; and the *tierra fria* or cold region, which extends from 6500 feet to the upper limit of cultivation,—in Guatemala about 10,000 feet.

It has seemed to me that this division of all the territory between sea level and 10,000 feet into three climatic zones,—at best an artificial arrangement, since each zone merges imperceptibly into the next,—would be more useful to horticulturists if based upon the presence of certain well known plants whose climatic requirements, in regard to tolerance of cold, are well known. This is, in fact, practically the only means by which we can form a reasonably accurate idea of these zones, since climatological data are lacking, and there would otherwise be no way of determining, even approximately, the minimum temperatures of any particular region. Many of the well known tropical fruits, such as the mango, the tamarind, and the sapodilla, have been planted in California and Florida, and we have a fairly accurate idea of the minimum temperatures to which they can be subjected without injury. By citing the behavior of some of these fruits at various elevations in Guatemala we can perhaps obtain an idea of the temperatures in the different climatic zones. In discussing these zones, however, I am going to term them *tropical*, *subtropical* and *temperate*, in place of *hot*, *temperate*, and *cold*, as indicating more accurately their horticultural character. In the tropical zone, grow only those fruits which horticulturists term *strictly tropical*; in the subtropical zone, such fruits as the loquat and cherimoya are found; in the temperate zone, the fig thrives and even the temperate fruits are fairly successful.

The tropical zone is characterised by the breadfruit tree (*Artocarpus incisa*), the custard apple (*Annona reticulata*), the sour-sop (*Annona muricata*), the tamarind (*Tamarindus indica*), the star-apple (*Chrysophyllum cainito*), and the sapote (*Achradelpha mammosa*). It is the zone in which all of the commercial banana plantations are found, the zone in which the pineapple is most successful, and in which the mango reaches its

greatest development. It will thus be seen that it is never subjected to low temperatures, the minimum being considerably higher than that of any portion of either Florida or California.

The lower limit of this zone is the level of the sea, and the upper limit I would place between 2500 and 3000 feet. This, it will be noticed, corresponds with the range of the West Indian race of avocados.

The subtropical zone, which may be considered the great horticultural zone of the republic, is characterized by such fruits as the chenmoya (*Annona cherimola*), the jocote (*Spondias mombin*), the white sapote or matasano (*Casimiroa edulis*), and the loquat (*Eriobotrya japonica*). It extends approximately from 3000 feet to 7000 or 7500 feet. This is the zone of the Guatemalan race of avocados.

Toward the upper limit of this zone frosts are fairly common, and at about 7500 feet the citrus fruits disappear. The lower levels, between 4000 and 6000 feet, possess delightful climates, scarcely excelled anywhere in the world.

The temperate zone is characterized by the fig, and by most of the temperate fruits, which have, of course, been introduced into Guatemala since the Conquest. The ones most commonly grown are the peach, the apple, and the pear. The lower limit of this zone is about 7500 feet, the upper limit approximately 10,000, though it might be considered to extend to the summits of the highest peaks.

The amount of rainfall varies greatly in different parts of Guatemala. In some of the principal avocado regions, such as Antigua, it is 30 to 60 inches per annum; in some parts of the Alta Verapaz, it is as great as 130 or 140 inches. The avocado appears to make healthier growth in those regions where the rainfall is not over 75 inches. In most parts of Guatemala the rainfall is not distributed evenly throughout the year, but occurs between the months of May and October. In the Alta Verapaz the rainy season is much longer, March and April being the only dry months.

#### **HARDINESS OF THE GUATEMALAN RACE**

The hardiness of the Guatemalan race of avocados is being determined both in California and Florida, and we will soon have excellent data covering a number of varieties. It has been thought, however, that varieties might occur in Guatemala which were much hardier than any yet known in the United States. Everything tends to indicate, that hardiness, in the avocado, is much more a matter of *race* than of *variety*. No variety of the West Indian race has yet been found which is nearly as hardy as any of the Guatemalan, and no variety of the Guatemalan has been discovered which will withstand as much cold as the Chappelow or other varieties of the Mexican race. Within the race there is a certain amount of variation in regard to hardiness, but it is not so great, expressed in degrees of temperature, as the difference between the Guatemalan and the Mexican or the Guatemalan and the West Indian races in average hardiness.

Severe frosts are not experienced in Guatemala at elevations lower than 7000 feet. As we desired to find the hardiest varieties obtainable for trial in Florida and California, I went to the upper limit of cultivation, and then worked downward until I encountered the first avocado trees, which were at 8500 feet. Here I found a number of trees, most of

them killed back or severely injured by cold. One, however, had not been injured in the slightest degree, and as it was a good fruit,—small seed and flesh of excellent quality,—I secured budwood which is now being propagated in Washington. Whether this variety, which comes from Totonicapan and which we have named Pankay (Fig. 21), will prove to be much hardier than the varieties already growing in the United States, I cannot say. It seems to me it stands a reasonable chance of being distinctly hardier than the average; yet it is impossible to determine what external causes may have been at work to produce the appearance of superior frost resistance.

The avocado is cultivated in Guatemala about a thousand feet above the zone in which citrus fruits are grown. One might assume from this that the avocado is much hardier than the orange. Yet I do not know that this is the case. There are so few trees of either the avocado or the orange above 7500 feet that it is difficult to obtain trustworthy data regarding their comparative hardiness. Both of them are commonly cultivated only in regions free from injurious frosts. The Guatemalans have not carried citrus culture into regions so cold that the trees require protection from frost, and the number of avocado trees in the cold region,—above 7500 feet—is very small.

We know from experience that it takes generations to acclimatize a species so that it will stand a decidedly greater amount of cold. You cannot plant a tree in a climate colder than that to which it has been accustomed, and expect it, with protection for a few winters, to become more hardy. Nature does not work that way. Many trees must be planted, the hardiest ones selected and propagated; then the new generation thus obtained must be selected for hardiness. Continuing this process for many generations, a considerable increase in hardiness may be the result. But it does not appear to me that such a process has been going on at high elevations in Guatemala. I would expect, therefore, that varieties from 8500 feet, such as our Pankay, might withstand a few degrees more frost than the average Guatemalan variety, but I would not dare to hope for them to prove as hardy as the Mexican race. Time only will tell. We must wait and see.

#### **AVOCADO REGIONS**

The principal avocado growing regions of Guatemala are rather widely scattered throughout the highlands of the republic, thus possessing some widely different soil types. Antigua, certainly the most important region in all Guatemala if not one of the most important in the world, lies in a beautiful valley surrounded by volcanoes and high hills. The valley floor is about 5100 feet above sea level; it is planted to coffee, with some patches of alfalfa here and there, and much maize and black beans around the edges. The soil is a loose volcanic loam, almost sandy in texture, black, deep and very fertile. It seems very retentive of moisture, and well suited to the avocado, the trees in this valley being vigorous and healthy in appearance, and producing much fruit.

It is the custom in this valley to plant large trees to shade the coffee bushes; for this purpose the tree called in California the Australian Silk Oak (*Grevillea robusta*) is largely used, often in conjunction with a native species of Inga, a leguminous tree of medium size and spreading habit. Avocados spring up in these coffee plantations, from seeds dropped by the laborers. When one of these seedlings occurs in a spot where it can

develop and become a part of the shade tree system, it is usually left; if its situation is unfavorable it may be pulled up or crowded out by other trees which it happens to be near. In most of the coffee plantations of this valley there are numerous avocado trees scattered here and there. Two hundred was the largest number I counted in any one plantation, and rarely are there more than fifty, but the presence of even fifty avocados in a single plantation of ten or twenty acres is rare in the tropics, for fruit trees are usually scattered and almost never cultivated in regular orchards as they are in the North. Some of the best avocados in all Guatemala are to be found in these coffee *fincas* of Antigua, and I shall always look back on that delightful little valley as one of the pleasantest spots it has ever been my privilege to visit. Its climate is equable and not excelled by that of Southern California; its setting is indescribably beautiful; its historic background is fascinating, with its memories of Alvarado and Bartolomé de las Casas, Protector of the Indians; and its appearance is exceedingly picturesque.

Next to Antigua, I believe the most important avocado region is San Cristóbal Verapaz, far to the north of Guatemala City, and reached only by riding three days across the mountains, or by going down to the coast, taking a boat up the Polochic River to Panzos, the train twenty-eight miles further to Pancajehé, and a horse or mule from there for a long day's ride. I was fortunate in making the acquaintance of an American coffee planter in this region, a man of the type which Guatemalans would describe as *muy simpatico*. Without the assistance of R. W. Hempstead, in fact, I doubt if it would have been possible to obtain the excellent avocados from San Cristóbal which we finally succeeded in shipping to Washington. Twice did I cut budwood from the trees, pack it carefully, and forward it with all haste, only to receive a cablegram that it was dead upon arrival. With Mr. Hempstead's assistance, however, it was finally possible to land budwood of three splendid avocados from San Cristóbal, together with two from nearby Purulá, safely in Washington.

San Cristóbal Verapaz lies at an elevation of about 4500 feet. Consequently it is not subjected to low temperatures. It has a rainfall probably twice that of Antigua, and the soil is a heavy, tenacious clay. The town is filled with little patches of coffee, owned principally by the Indians, and many avocado trees are scattered here and there among the coffee bushes.

The village of Purulá lies southeasterly from San Cristóbal, just about a day's ride. Its elevation is 5100 feet, its climate much cooler than that of San Cristóbal, yet not cold enough to experience severe frosts. One can tell by the character of the cultivated vegetation approximately how much frost these mountain villages experience. In Antigua, for example, the presence of the royal palm (*Roystonea regia*) indicates very definitely that severe frosts are not experienced, though there may be occasional light frosts which scorch the leaves of the coffee bushes. Purulá does not grow royal palms, but has other plants characteristic of mild situations, and in addition one can judge from the altitude that it does not become very cold.

Not far from Antigua, the village of Amatitlán, close to the lake of the same name, possesses excellent avocados, some of them appearing to ripen earlier than would be expected at this elevation,—approximately 4000 feet. As will be explained later on, the ripening season in Guatemala is largely dependent upon altitude.

Westward from Guatemala City, the valley of Panajachél, on the shore of Lake Atitlán (elevation 5400 ft.) is a famous spot for avocados, but from my examination of them I did not think them equal in quality to those of other regions. The soil in this small valley, which opens upon the lake, is clearly alluvial in origin, and like most alluvial soils is excellent.

Momostenango, northward from Quezaltenango one day's ride, is the highest spot at which avocados were found abundantly. Its elevation is approximately 7500 feet. The situation is a protected one, and probably much warmer than most others of the same elevation. The soil here is a mixture of clay and volcanic tufa, very curious in appearance.

It has seemed to me, upon comparing the avocado trees grown upon these various types of soil,—sandy loams to heavy clays,—that the largest trees were found on clay soils. Yet there are some good sized trees upon the volcanic loam of Antigua, and I would personally prefer this soil to any other I saw in Guatemala for avocado culture.

#### **HABIT OF THE GUATEMALAN AVOCADO**

In character of growth, the Guatemalan avocado presents two extremes; the broad and spreading type and the tall and strict. There are intermediate stages, of course. In the Alta Verapaz most of the trees incline toward the tall and strict type; in Antigua the spreading form is perhaps more common. A notable characteristic of nearly all the trees is the absence of branches close to the ground. In coffee plantations especially is this conspicuous, the lower limbs being pruned off to prevent their interfering with the coffee bushes. The crown is rarely formed closer than 10 feet to the ground.

The Guatemalans do not observe closely the behavior of their avocados and rarely are able to give trustworthy accounts concerning the age of the trees, their bearing habits, or similar characteristics. In general, it seems to be the opinion that seedlings come into bearing at the age of six to eight years, which coincides rather closely with the behavior of this race in California. The bearing life of the tree is not definitely known, but it would seem to be at least 50 years, and in many instances considerably more. Some of the growers affirm that a tree does not produce its best fruit until 25 or 30 years old.

#### **CULTURE**

So little cultural attention is given avocados in Guatemala that it is scarcely necessary to touch on this subject. Experience obtained in California and Florida is a better guide than the observed practices of the Guatemalans, because the latter make no systematic effort to meet the tree's cultural requirements. The method followed in cultivating coffee plantations in Antigua has been recommended for avocados in California, but I do not know what success will result from its application. It consists in clearing the ground two or three times a year with a hoe, but never cultivating deeply. The avocado trees which grow among the coffee bushes in Antiguan plantations certainly appear healthy and vigorous, but it does not necessarily follow that this method of cultivation is the best. They might be even more healthy and vigorous under another.

## REGULARITY OF BEARING

I was somewhat surprised to observe the irregularity in bearing which seems to characterize most of the trees in Guatemala. How much of this irregularity is due to faulty culture, and how much is inherent, I do not know. I hope that much of it can be eliminated when the trees are planted in our orchards and their needs carefully studied and supplied. But it was rare to find a tree which bore heavily two years in succession. The Guatemalans usually say that the trees bear a heavy crop one year and a light one the following, but I saw many trees which bore heavy crops one year and nothing the next. This is a point which I do not believe we have emphasized sufficiently in this country, and I would strongly urge all prospective planters of Guatemalan avocados to investigate thoroughly the bearing habits of the varieties they propose to plant. Unfortunately, we do not know a great deal about the bearing habits of many of our varieties, for they have been in cultivation but a short time. But it appeared to me, from my observations of seedling trees in Guatemala (it is, of course, understood by all North Americans that every avocado tree in Guatemala is a seedling) that there was a remarkable difference in this respect, and some varieties I would look upon as likely to be much more regular bearers than others. It is probably more important to have a tree that bears *regularly* than one that bears *abundantly*; by this I mean a variety which will produce a fair crop every year rather than one which will produce an enormous crop one year and nothing the following.

## SEASON

Travelers have returned from Guatemala City with accounts of avocados every month in the year. It is true that there are avocados in the markets of the capital throughout the year, but it is a mistake to infer from this that avocados, in any given section of Guatemala, ripen continuously from January to December. Guatemala City draws upon all the surrounding country for its avocados, and the surrounding country varies in elevation. The ripening season of avocados, is largely dependent upon elevation, hence by bringing in avocados from an altitude of 3000 feet part of the year, from 5000 and 6000 the rest, the market can be supplied continuously. This ideal condition is also maintained in part by the custom, far from ideal, of picking green and immature fruit at seasons of the year, when fully mature fruit is not available. I have purchased hundreds of fruits in the markets of Guatemala City,—fruits calculated to be eaten by the unsuspecting public,—which were so green they shrivelled upon softening, and the seeds within them were so immature they could not be used for planting. This matter is doubly important to us when we remember that a similar crime has sometimes been perpetrated upon the North American public by avocado growers in Florida and California. I know of nothing better calculated to discourage people from eating avocados than this. Except in those varieties which become purple upon reaching maturity, it is next to impossible to distinguish an immature from a mature avocado simply by looking at it. But when it comes to eating it, nothing is easier. A mature avocado can be eaten, and an immature one cannot,—at least no connoisseur will stoop so low as to do it, and the tyro will not do it more than once. I urge upon the consideration of every avocado grower in California and Florida the importance of suppressing this pernicious custom in the United States before it has obtained a

foothold.

In general, I found the variation in ripening season, due to differences in elevation, to be one month for every thousand feet. Where peculiar environmental conditions come into play, such as the protected situation of Panajachél, this rule does not hold good, but in most cases it does. At Senahú, in the Alta Verapaz (3200 ft.) the principal season of ripening is November to February; at Amatitlán (3900 ft.) it is January to April; at San Cristóbal Verapaz (4600 ft.) it is February to May; at Antigua (5100 ft.) it is March to June; at Puralá, Baja Verapaz (5150 ft.) it is March to June; at Panajachél (5300 ft.) it is February to May; at Chimaltenango (6000 ft.) it is April to July, and at Momostenango (7400 ft.) it is May to August.

We have noticed in the United States that the same variety of avocado does not ripen at the same time in Florida and in California. Climatic differences prevent it. Judging from the principal ripening season of Guatemalan avocados in these two states, it seems to me that California corresponds rather closely to an elevation of 6000 to 7000 feet in Guatemala, while South Florida corresponds to an elevation of 3000 to 4000 feet. It might be expected, then, that the average variety growing at 6500 feet in Guatemala would, if transplanted to California, ripen at approximately the same season, while the average variety from 3500 feet transplanted to California would ripen much later than it does in Guatemala, but if planted in Florida would ripen at about the same time.

The majority of avocados in any given section of the Guatemalan highlands ripen at approximately the same season. This would be expected. Considering Antigua, for example, only half a dozen trees were found which commenced to ripen their fruits in October and November, the vast majority not beginning to mature until February. With an occasional exception, the earliest varieties are of inferior quality. They are so scarce that they make no impression whatever upon the market, but from the standpoint of California avocado growers such varieties, if of good quality, are very important, as they may ripen sufficiently early, when planted in that state, to be marketable during the holiday season. This remains to be seen.

Summing up the question of season, it may be said that variation is due to two causes, first, altitude as expressed in its effect upon temperature, and second, the normal difference exhibited by seedlings. The first factor is of little importance to us, but by giving attention to the second we should be able to obtain avocados which will greatly extend the period during which ripe avocados are available.

#### **PICKING AVOCADOS**

The Guatemalans have an interesting rule governing the picking of avocados. I do not know that it will hold good in the United States, but as far as I could observe it was fairly trustworthy in Guatemala. They consider that the fruit is mature and ready for picking when the tree comes into bloom. It is better to allow the fruit to remain on the tree several months longer, as its flavor becomes much richer; but the appearance of flowers is considered to indicate the earliest moment at which the fruit can be picked, if it is to ripen properly, without shrivelling, and possess reasonably rich flavor.

The maturity of certain varieties is indicated by the appearance of purple color upon the

fruit, but fully half of the avocados found in Guatemala are green in color when mature and there is no reliable indication of maturity, unless it be the appearance of flowers upon the tree.

#### THE FRUIT

We now come to a consideration of the fruit itself, and I believe it will interest the horticulturists of California and Florida to know something of the range of variation which occurs in Guatemala in the principal fruit characters. I have made an effort to observe the extreme range, and also to note the average of each character. In the United States we are already familiar with a certain amount of variation in the Guatemalan avocados; it is interesting to compare the variations known to us with those which occur in Guatemala, especially where they concern characters of marked commercial importance, such as the season of ripening and the quality of the fruit.

In northern Guatemala it is a common occurrence to find avocado trees growing in a semi-wild state. One might almost infer that they were truly indigenous, yet after the most careful investigation which I could make I was unable to reach this conclusion. The region in question has been so many centuries under cultivation, and the forest has been cleared away so many times to make room for maize fields, that one hesitates to assume that any tree not common in the most infrequented places is truly indigenous. I have seen avocado trees in the edge of the forest, but the thought has always arisen in my mind that a seed might have been dropped there by some passing Indian. We must consider, then, that the native home of the Guatemalan avocado has not certainly been determined up to the present time; I am strongly inclined to suspect that it may be in extreme northern Guatemala or across the Mexican frontier in the states of Chiapas and Tabasco, but this remains to be proved. But what I started out to say was this: semi-wild avocado trees, those growing in the edge of the forest or in abandoned places throughout the mountains of northern Guatemala, where the most primitive forms of the Guatemalan avocado appear to occur, nearly always produce fruits of round form (Plate VIII, Fig. 13). I believe it almost safe to assume that the primitive form of the Guatemalan avocado is round, and that the pear shaped and elongated forms have arisen in cultivation. In the principal avocado regions of Guatemala, such as Antigua and San Cristóbal Verapaz, round and pear-shaped fruits are about equally common. Extremely slender ones are rare; the broadly pear-shaped fruits are very common. The majority of small fruits are round. Oval and elliptical forms are not rare, but are less common than the round and pyriform. It can thus be seen that we already have, in the United States, practically the entire range which this race exhibits with regard to shape.

In size we also have approximately the same range of variation which is found in Guatemala. There are fruits of smaller size than any of those cultivated in California or Florida, but better cultivation would probably increase the bulk of such fruits and bring them up to six or eight ounces in weight. It is notable that avocado trees growing in unfavorable situations, where the ground is exceedingly poor and hard and there is a severe struggle with surrounding vegetation, usually produce small fruits in which the seed constitutes a large proportion of the entire weight. The smallest variety examined weighed three ounces. In this case, however, the size did not appear to be due to



unfavorable cultural conditions, but was an inherent characteristic. The largest fruits found,—varieties included in our introductions under the names Nimlioh and Tertoh,—weighed about three pounds. The common size is from eight to twelve ounces. Fruits of a pound in weight are also abundant, and there are many which weigh 20 ounces, but above this there are comparatively few.

North American avocado growers have already come to recognize that an avocado need not have a rough skin to be a Guatemalan, though this was at first looked upon as one of the characteristics of the race. Many varieties have rough skins, but many do not. Some are as smooth as the Trapp or other varieties of the West Indian race, yet they are none the less Guatemalan avocados. A rough surface indicates a thick skin, and a smooth surface a comparatively thin skin. No variety was seen in Guatemala in which the skin was very thick, yet smooth on the surface, and conversely none was seen in which the skin was thin yet rough on the surface. In the past we have probably placed too much emphasis in the United States upon the thick skin of the Guatemalan race. True enough, it is commonly thicker than in any other race of avocados at present cultivated, but there are varieties in Guatemala which are in every other respect typical of the Guatemalan race, yet the skin is no thicker than that of the Trapp. One of the varieties in our collection, the Ishim, has a skin thinner than that of the Trapp, yet it would be foolish to say that this fruit does not belong to the Guatemalan race. Some growers have desired to separate the Guatemalan avocados into two groups, the thick skinned and the "hard-shelled." This is perhaps possible, although there is every intermediate stage between the thickest and the thinnest skinned, so that no distinct line can be drawn separating the two groups. The question is, whether anything will be gained by such a classification, based solely upon one character. One might speak of thin-skinned Guatemalans and thick-skinned Guatemalans, but if we go farther and form two groups in our general classificatory system, we may lose sight of the important racial characteristics which are common to the thick skinned and the thin skinned alike.

It has been suggested that some of the thin-skinned Guatemalans might in reality be crosses between the West Indian and the Guatemalan races. This must be admitted as a possibility, yet I have seen no trees whose character strongly suggested such a cross.

In figures, the thickness of the skin varies from a sixteenth to a quarter of an inch. In the Alta Verapaz skins of such thickness and brittleness are found that it is difficult to open the fruits with a knife. They are usually broken in the hands. It has sometimes been thought that thickness of skin was correlated with altitude; that is, the thickest skins should be found at the highest altitudes, because the fruit needs more protection "when grown in a cold climate. This is not the case. There is no relation between altitude and thickness of skin. The thickest skinned varieties were found in the Alta Verapaz at elevations of 3000 to 5000 feet, while the avocados of Momostenango (7500 ft.) and Totonicapan (8500 ft.), the latter at the uppermost limit of avocado culture, had comparatively thin skins.

The two common colors of Guatemalan avocados, green and purple, are found everywhere; I was not able to notice that one was decidedly more frequent than the other in any particular region. Yellowish greens are sometimes seen, and varying shades of purple; of the latter, maroon is the lightest shade, and a brilliant purplish black the deepest. Bright green and deep purple are the two common colors, however. In

some parts of the tropics the natives have a preference for avocados of a certain color, but I was unable to find any well-marked trend in this direction anywhere in Guatemala.

Comparing the Guatemalan avocados at present grown in California with those of Guatemala itself, I feel that California has been fortunate in having received so many fruits of good quality. For I believe many of the best California varieties, such as Sharpless, Dickinson, and Blakeman, are better than the average fruits sold in the markets of Guatemala City. But in a lottery the man who holds five tickets has a better prospect of winning than the man who holds one. The law of chance is inviolable. So it is that among the many thousands of avocados found in Guatemala, a few very superior ones are bound to occur, and these I believe to surpass in quality anything yet known in California. The California varieties apparently had good parentage, and they are as a rule of good quality; but an occasional variety which I have found in Guatemala has impressed me, viewing it as impartially as possible, as far superior to anything which I have ever seen in California. The flesh is of deeper yellow color, smoother, more buttery texture, and richer flavor than in any varieties yet known in the United States.

In many fruits grown in the Guatemalan highlands,—it might almost be said in the majority of fruits,—the flesh is cream colored. In some it is cream-yellow, and in a few it is deep yellow. Rarely is there any objectionable fiber. Fiber seems to be much more characteristic of the Mexican race than it is of the Guatemalan. Even the most primitive forms seen in the Alta Verapaz did not have noticeable fiber in the flesh.

The flavor of nearly all Guatemalan avocados is pleasant if the fruits are fully ripe, but some greatly exceed others in richness.

We have thought, from a study of the Guatemalan varieties cultivated in California, that this race of avocados was characterized by a smaller seed, in comparison to the size of the fruit, than either the West Indian or the Mexican race. It has seemed to me, however, that the California varieties are not typical in this respect of the Guatemalan race, most of them having smaller seeds than the average noted in Guatemala. Many of the fruits purchased in the markets of Guatemala City to furnish seed for planting in the United States,—and there were about 30,000 of them, from many different trees,—had seeds which were so large as to make the variety of no value horticulturally. It takes much searching to bring to light a variety having a desirably small seed, combined at the same time with other desirable characteristics.

Pyriform and elongated fruits are not so likely to have large seeds as round ones; but it is not true, as has sometimes been thought, that all round avocados have large seeds. Quite a few were found in which the seed was comparatively very small. Some such varieties are included in our introductions.

The seed is almost invariably tight in its cavity. I would consider this, in fact, one of the characteristics of the Guatemalan race. In one locality a few trees were found whose fruit had seeds slightly loose in the cavity, but these were the only ones out of thousands examined.

#### **VARIETIES INTRODUCED FOR TRIAL\***

I wish now to present brief descriptions of the twenty-three varieties which we have

introduced from Guatemala for trial generally throughout the avocado growing regions of the United States. More complete descriptions of these fruits will appear in a bulletin on the avocados of Guatemala which the Department of Agriculture expects to publish in the near future, and they will also be sent to growers who receive budwood or trees of these varieties for trial. I will therefore limit myself at this time to a brief mention of the important characteristics and interesting features of each variety.

The names which we have given these avocados are taken from the Maya tongue, which, in some twenty dialectic forms, is the language, spoken by the aboriginal inhabitants of Guatemala and southern Mexico. It has been thought that the use of Maya names might serve to distinguish these varieties of foreign origin from those developed in California.

Following the name of each variety I give the number under which the variety was collected in Guatemala. This series of numbers runs up to 36, but some of the varieties originally included in the set were, upon more detailed examination, found to be defective in some point, and were not introduced. Only 23 out of the original 36 varieties are therefore represented in the collection. Finally, I give the inventory number of the Office; of Foreign Seed and Plant Introduction (S. P. I.), under which the variety is recorded in Washington.

Probably the most important point to be tested in connection with these varieties is the character of growth they will make in the United States. Most of the Guatemalan varieties which have been discarded in California during the past five years have had to be dropped because of some defect in habit of growth; the most common defect has been a tendency on the part of young budded trees of several varieties to die during the first or second year without any apparent cause.

It seems probable that these varieties, when grown under good cultivation in the United States, will in many instances produce fruits considerably larger than those which were borne by the parent trees in Guatemala. The weights here given may not hold when the varieties come into bearing in the United States.

\*I am indebted to Robert N. Jones of the office of Foreign Seed and Plant Introduction for the drawings illustrating these varieties. They are all from photographs or diagrams made by me in Guatemala.

LAMAT (No. Three) S. P. I. 43476. From Amatitlan, Guatemala. Elevation 3872 ft. A very productive variety of good size, attractive shape and appearance, and good quality. It is broadly oval in form, and weighs 14 to 20 ozs. The surface is smooth, bright green, the skin of average thickness, about one-sixteenth inch or slightly more. The flesh is free from fiber, cream colored, and of pleasant flavor. The seed is comparatively small. The season of ripening at Amatitlan is from November or December to March; the variety may therefore be classed as early to midseason. (See Fig. 15)

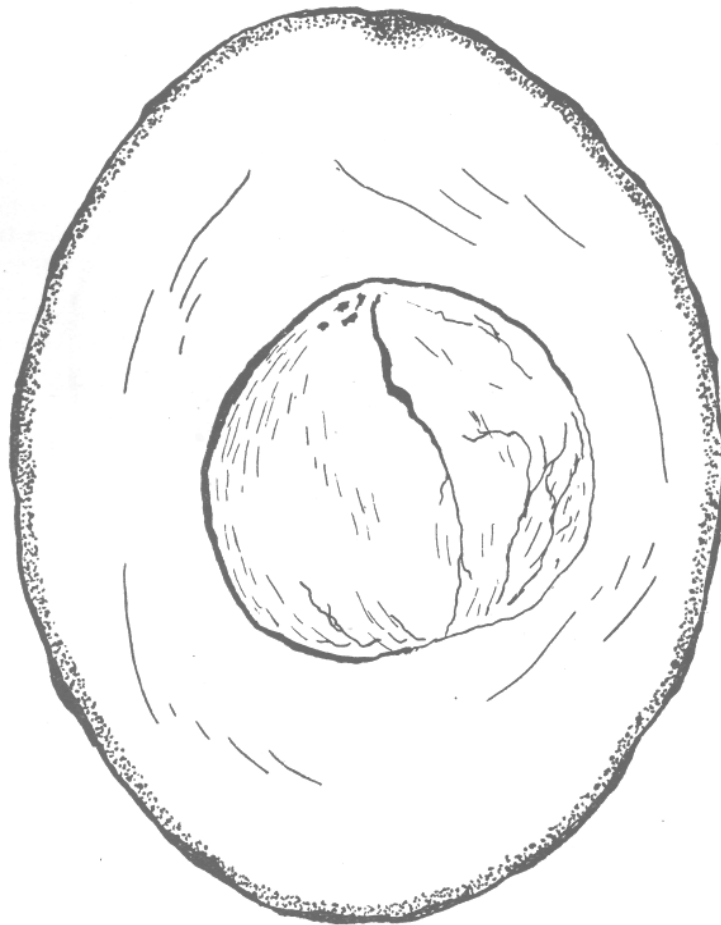


Figure 15  
**LAMAT**  
A smooth, green fruit averaging about a pound in weight. A productive variety ripening early to midseason.

KANOLA (No. Six) S. P. I. 43560. From San Lorenzo el Cubo, near Antigua, Guatemala. Elevation about 5600 feet. Interesting particularly for its earliness. It ripens two or three months ahead of most other varieties of its region. In addition it is a handsome little fruit of round form, and the tree is very productive. The weight is about 8 ounces, the surface almost smooth and deep purple in color. The skin is woody, the flesh yellow, of excellent flavor and quality. The seed is comparatively small. The season at San Lorenzo is October to April. Because of its long season this may be a particularly good variety for the home garden. (Fig. 16)

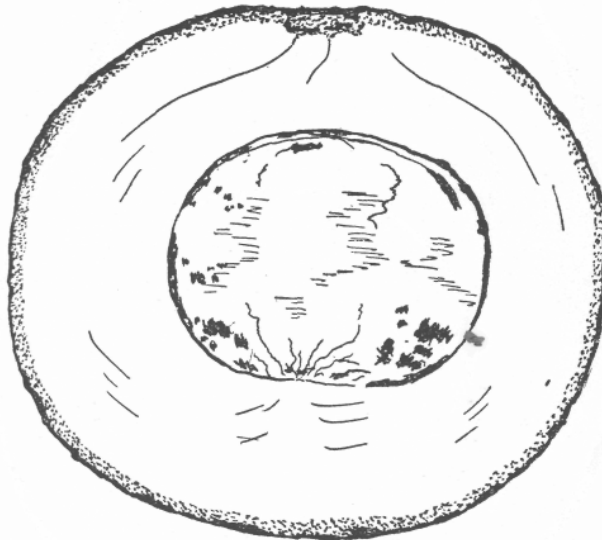


Figure 16  
**KANOLA**  
A very early and productive little fruit of fine quality.  
Slightly rough, deep purple in color, about  
8 ounces in weight.

ISHKAL (No. Seven) S. P. I. 43602. From Guatemala City. Elevation 4900 feet. A variety possessing a considerable reputation locally as a fruit of fine quality. It is spherical to broadly obovoid in form, and weighs about 8 ozs. The surface is somewhat rough, deep purple in color, the flesh deep yellow and of very rich flavor. The seed is medium sized or slightly large. The fruits of this variety which were examined were not up to the usual standard, hence the description here given probably does not do the variety justice.

COBAN (No. Eight) S. P. I. 43932. From Coban. Alta Verapaz, Guatemala. Elevation 4325 ft. A fruit well known in Coban for its excellent quality. In addition it has a small seed and other desirable characteristics. It is pear-shaped or obovoid in form, and weighs about 15 ounces. The surface is slightly rough, deep green in color, the skin moderately thick. The flesh is clear, deep yellow, and of very rich flavor. The seed is rather small. Ripening season February and March at Coban. A midseason sort. (Fig. 17)

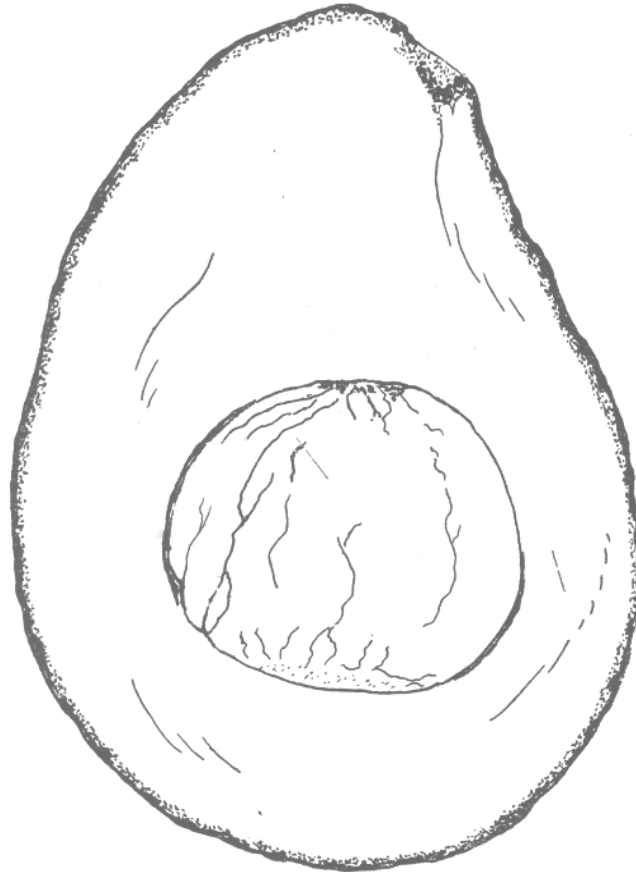


Figure 17 **COBAN**  
Slightly rough, green, about 15 ounces in weight. A fruit of excellent quality, ripening midseason.

KASHLAN (No. Ten) S. P. I. 43934. From San Cristóbal Verapaz, Guatemala. Elevation 4550 ft. A good sized fruit of attractive shape and unusually fine quality. In form it is broadly oval. The weight is about 20 ozs. The surface is almost smooth, green in color, the skin moderately thick. The flesh is deep yellow, free from discoloration of any sort, and of very rich flavor. The seed is unusually small. The ripening season at San Cristóbal is January and February,—early to mid-season. (Fig. 18)

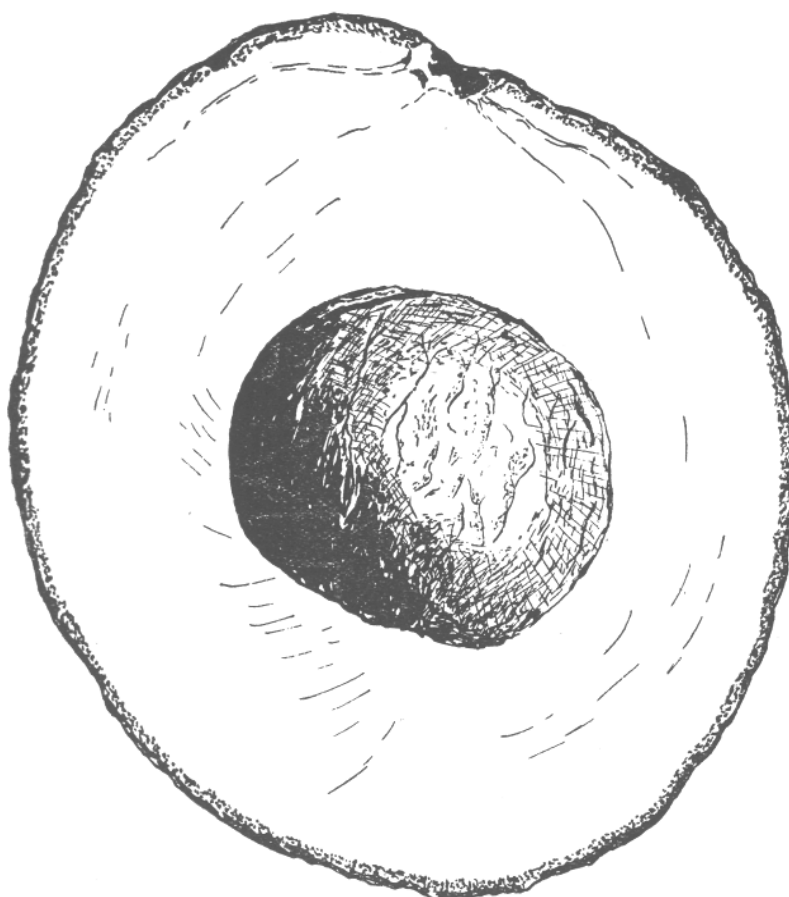


Figure 18  
**KASHLAN**  
An unusually fine fruit, almost smooth, green in color, about 20 ounces  
in weight. Early to midseason.

CHISOY (No. Eleven) S. P. I. 43935. From San Cristóbal Verapaz, Guatemala. Elevation 4550 ft. One of the finest varieties in the collection, almost identical with the Trapp of Florida in form and size. It weighs 20 to 24 ozs. The surface is pebbled, bright green in color, the skin thick and woody. The flesh is deep yellow, of fine, oily texture, and very rich flavor. The seed is small to medium sized. The parent tree is productive. Ripens midseason, February to April at San Cristóbal. (Fig. 19)

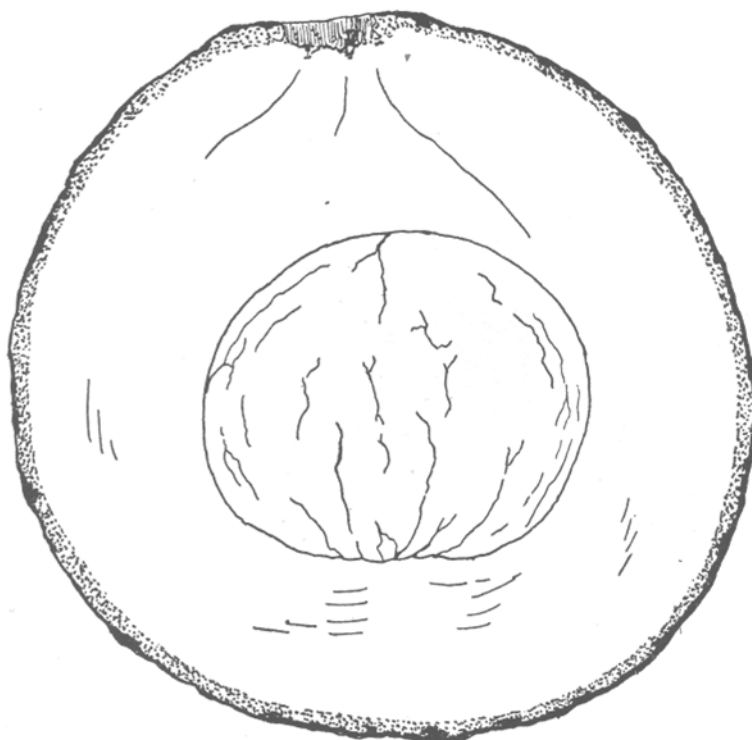


Figure 19 **CHISOY**  
In quality one of the finest in the collection. Slightly rough, green, 20 to 24 ounces in weight. Midseason.



NABAL (No. Fifteen) S. P. I. 44439. From Antigua, Guatemala. Elevation 5100 ft. A very productive little fruit of excellent quality. It is nearly round in form, weighs about 10 ounces, and is green in color, with the surface smooth and the skin moderately thick. The flesh is yellow, free from discoloration, and of rich flavor. The seed is rather small. The ripening season at Antigua is February or March to May. A midseason sort. (Fig. 20)

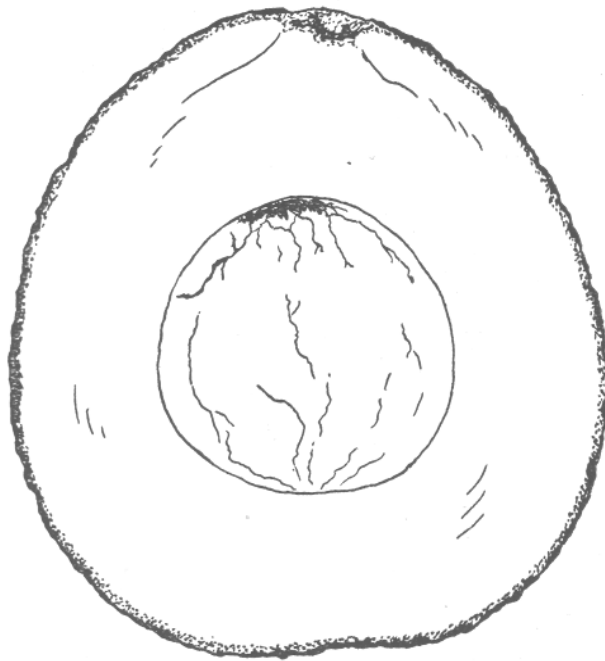


Figure 20 **NABAL**  
Very productive and of excellent quality. Smooth,  
green, about 10 ounces in weight. Midseason.

PANKAY (No. Twelve) S. P. I. 44785. From Totonicapán. Guatemala. Elevation 8500 ft. Obtained chiefly for its probable hardiness. The fruit is pear-shaped, weighs 12 ozs., and is green in color, with the surface smooth. The flesh is cream-yellow, of good flavor, and the seed is medium size. The ripening season at Totonicapán is from September to January. (Fig. 21)

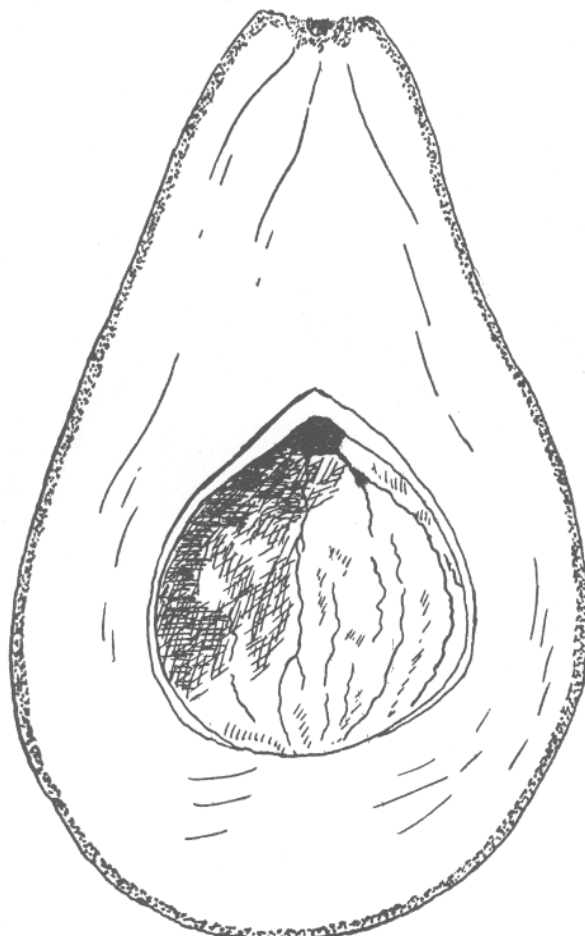


Figure 21 **PANKAY**  
Should be the hardiest variety in the collection.  
Smooth, green, of good quality, about  
12 ounces in weight.

NIMLIOH (No. Seventeen) S. P. I. 44440. From Antigua. Guatemala. Elevation 5100 ft. A large-fruited variety which is at the same time very productive, and of excellent quality. The fruit is broadly oval in form, usually somewhat oblique. It weighs 36 to 45 ozs. The surface is deep green in color, rather rough, the skin thick and woody. The flesh is yellow, free from discoloration, and of excellent texture and very rich flavor. The seed is medium sized. At Antigua the ripening season of this variety is February and March, slightly earlier than that of most others. (Fig. 22)

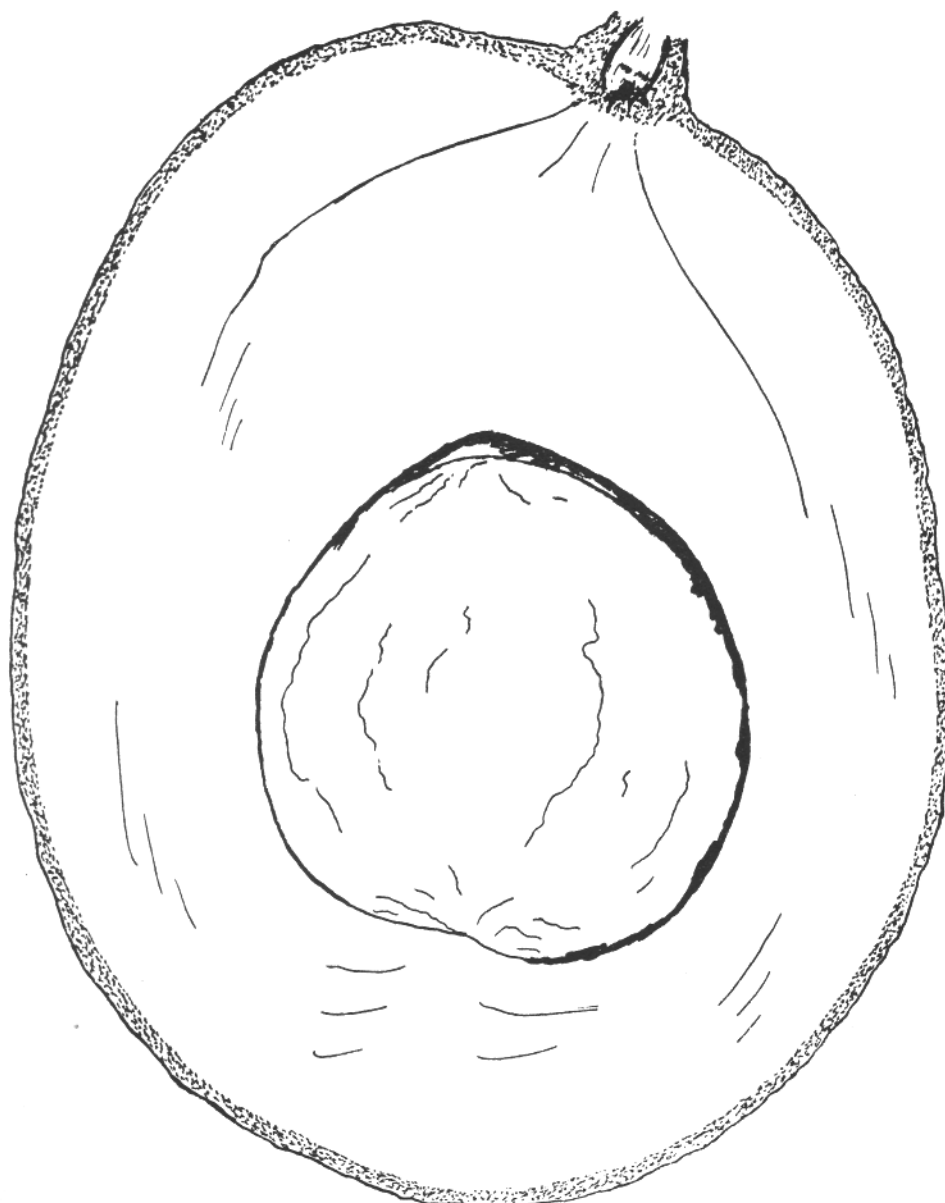


Figure 22 **NIMLIOH**  
One of the largest varieties, and very productive. Rough, green, about 3 pounds in weight. Ripens rather early.

PANCHOY (No. Eighteen) S. P. I. 44625. From Antigua, Guatemala. Elevation 5100 ft. A very thick-skinned fruit of unusually choice quality. In form it is broadly obovoid, in weight about one pound. The surface is rough, green in color, the flesh deep yellow, smooth, of very rich flavor. The seed is rather small. The ripening season at Antigua is January to April. A midseason variety. (Fig. 23)

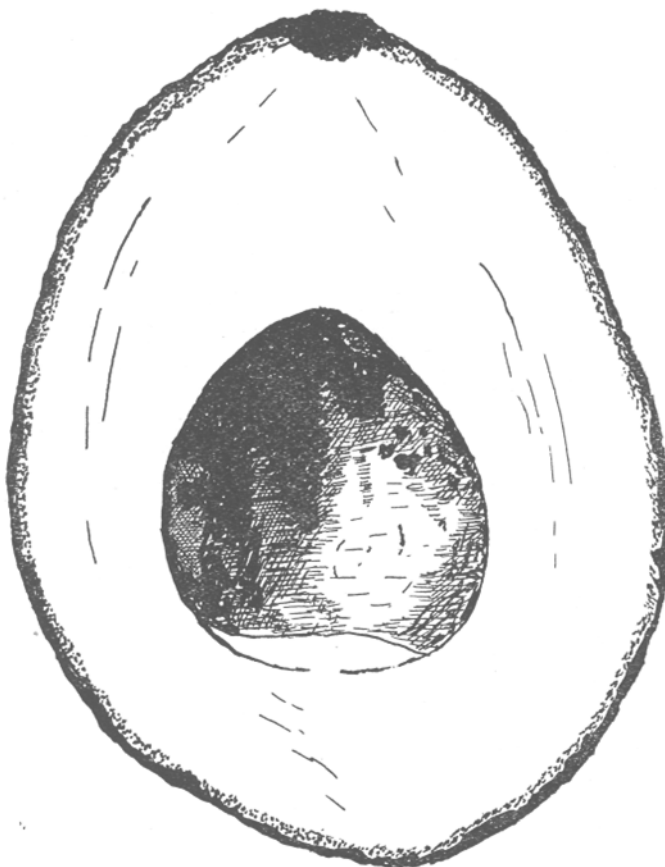


Figure 23 **PANCHOY**  
A very thick-skinned fruit of excellent quality. Rough,  
green, about a pound in weight. Midseason.

TUMIN (No. Twenty) S. P. I. 44627. From Antigua, Guatemala. Elevation 5100 ft. Remarkable for its unusual productiveness, the fruits often being borne in clusters. In addition the fruit is of desirable size and form, and of excellent quality. It is slightly oblate, shaped like the Trapp of Florida, but weighs only 12 to 15 ozs. The surface is quite smooth, almost glossy, purplish black in color. The skin is rather thin, the flesh yellow, smooth, free from discoloration, and of rich flavor. The seed is medium sized, sometimes a trifle large. The variety ripens about midseason, March to May at Antigua. (Fig. 24)

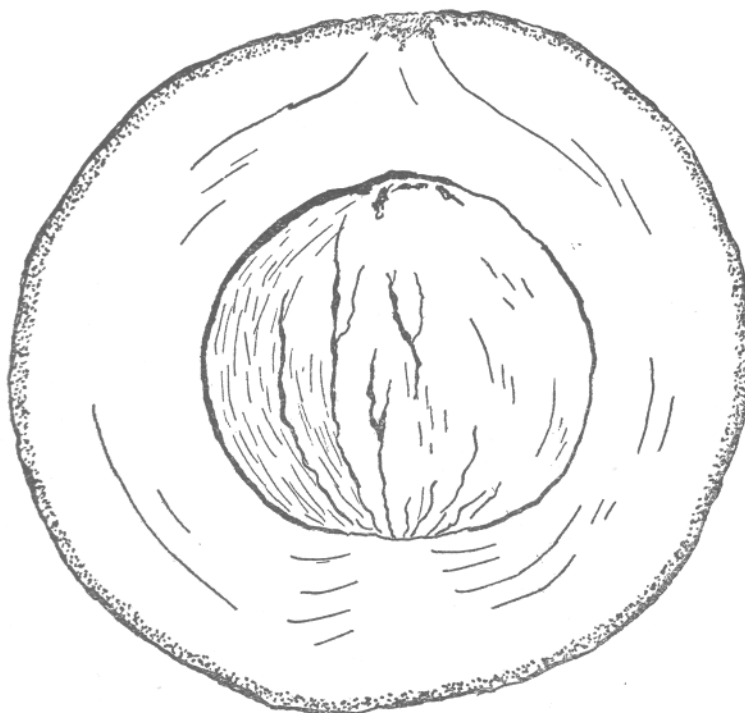


Figure 24 **TUMIN**  
Unusually productive. Smooth, almost glossy, purplish  
black in color. Weight 12 to 15 ounces. Midseason.

BENIK (No. Twenty-one) S. P. I. 44626. From Antigua, Guatemala. Elevation 5100 ft. A very handsome fruit of fine quality. In form it is pear-shaped, in weight about 20 ozs. The surface is slightly rough, maroon-purple in color, the skin moderately thick. The flesh is bright yellow, free from discoloration, and of very fine quality. The seed is medium sized. It ripens about midseason, February to May at Antigua. (Fig. 25)

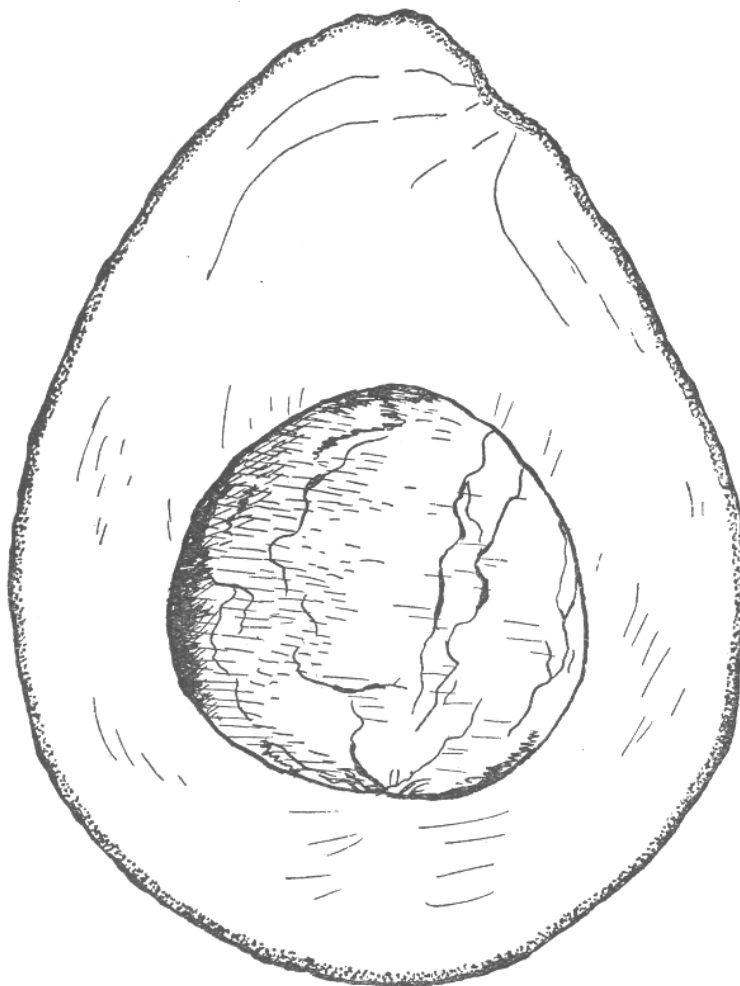


Figure 25  
**BENIK**  
Handsome and of fine quality. Rough, maroon-purple  
in color, 20 ounces in weight. Midseason.

KEKCHI (No. Twenty-two) S. P. I. 44679. From Purulá, Baja Verapaz, Guatemala. Elevation 51 50 ft. A remarkable little fruit, early in season and very productive. In form it is pear-shaped or obovoid, in weight not over 6 ozs. The surface is slightly rough, deep maroon in color. The skin is moderately thick, the flesh yellow, slightly discolored, and of very rich and pleasant flavor. The seed is comparatively small. It commences to ripen very early, December at Purulá, and continues until April or May. (Fig. 26)

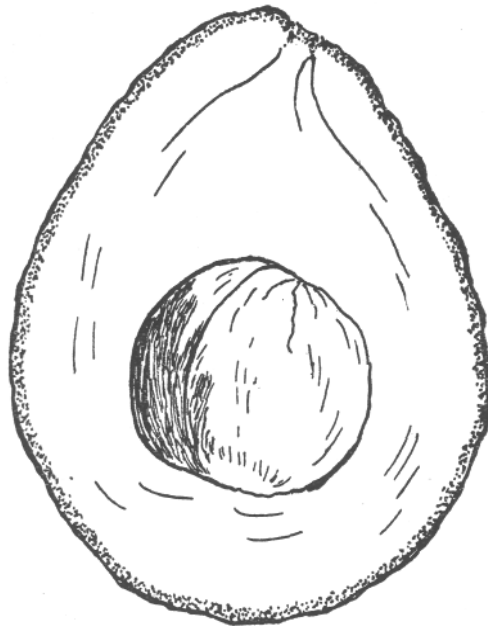


Figure 26 **KEKCHI**  
Early and very prolific. Rough, purple, 6 ounces  
in weight. The ripening season  
is unusually long.

MAYAPAN (No. Twenty-three) S. P. I. 44680. From Purulá, Baja Verapaz, Guatemala. A fruit of attractive form and size, and in quality excelled by none. It is nearly round, about a pound in weight, the surface slightly rough and deep maroon in color. The skin is very thick, the flesh deep yellow, smooth, free from all discoloration, and of exceedingly rich and pleasant flavor. The seed is small to medium sized. At Purulá the variety ripens from March to July, hence it can be termed midseason. (Fig. 27)

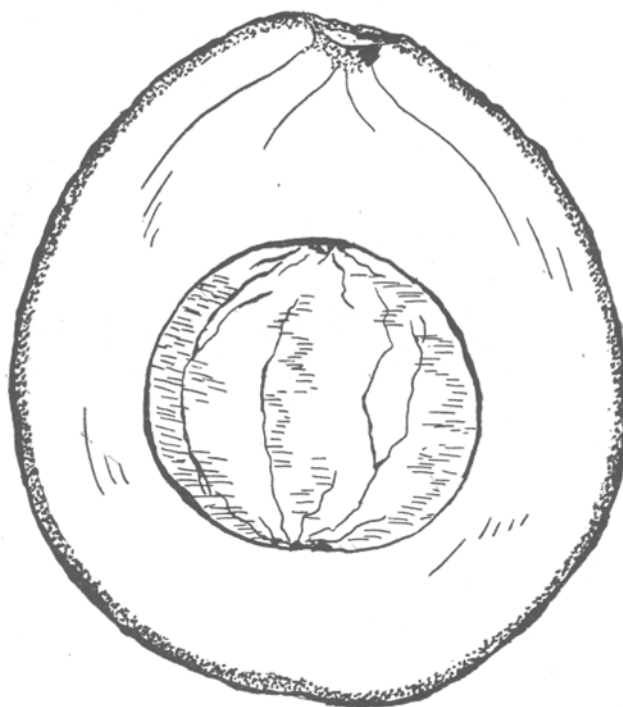


Figure 27 **MAYAPAN**  
One of the very best in quality. Rough, deep  
maroon in color, about 1 pound in  
weight. Midseason.



KAYAB (No. Twenty-five) S. P. I. 44681. From San Cristóbal Verapaz, Guatemala. Elevation 4550 ft. A round fruit similar to the Chisoy. It weighs about a pound. The surface is slightly rough, the skin thick. The flesh is deep yellow, free from discoloration, and of rich flavor. The seed is small to medium sized. The variety ripens about midseason, February to May at San Cristóbal. (Fig. 28)

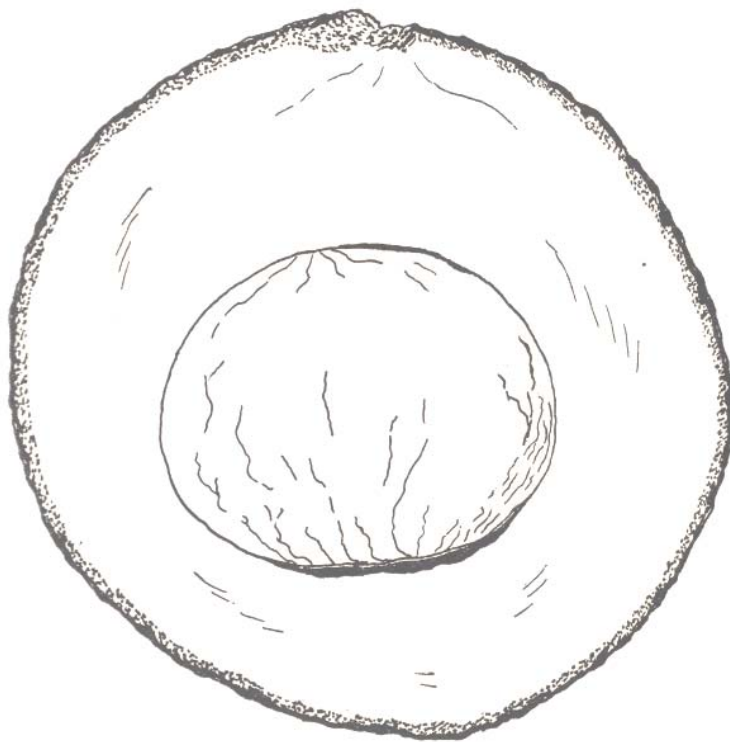


Figure 28 **KAYAB**  
A fruit of fine quality. Rough, green, about a  
pound in weight. Midseason.

MANIK (No. Twenty-six) S. P. I. 45560. From Antigua. Guatemala. Elevation 5100 ft. A productive and rather early variety of excellent quality. In form the fruit is oval to slender pyriform, in weight it varies from 8 to 12 ozs. The surface is green, slightly rough, the skin moderately thick. The flesh is rich yellow in color, free from all discoloration, and of very rich flavor. The seed is small to a trifle large. The season at Antigua is from January to June. (Fig. 29)

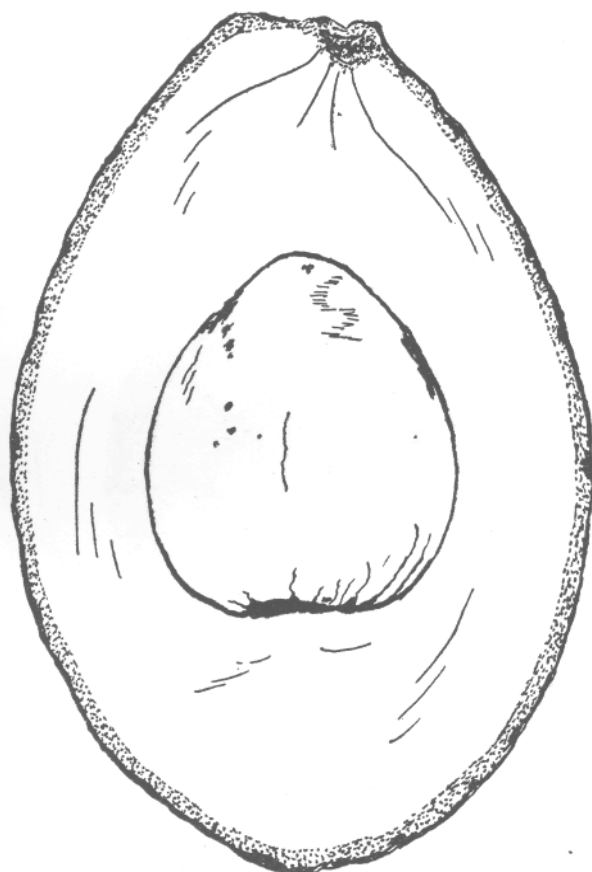


Figure 29                      **MANIK**  
Productive and rather early. Slightly rough,  
green, 8 to 12 ounces in weight.

CABNAL (No. Twenty-seven) S. P. I. 44782. From Antigua. Guatemala. Elevation 5100 ft. A productive variety of attractive form and good quality. The fruit is round, and weighs 12 to 16 ozs. The surface is rather rough, dark green in color, the skin thick. The flesh is cream-yellow, oily in texture, and of rich and rather distinctive flavor. The seed averages rather small. The variety ripens midseason to late, March to June or later at Antigua. (Fig. 30)

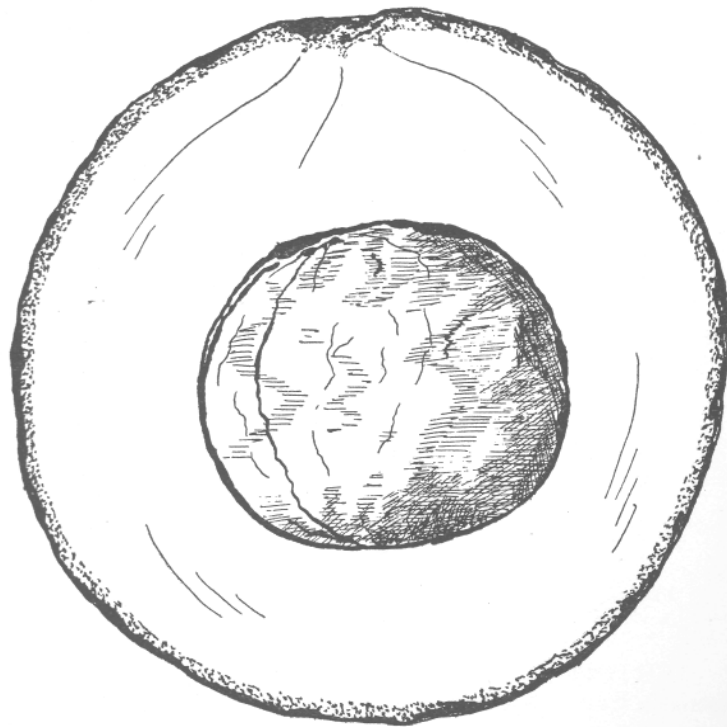


Figure 30 **CABNAL**  
A productive variety of fine quality. Rough, dark green in color, 12 to 16 ounces in weight. Midseason to late.

CANTEL (No. Twenty-eight) S. P. I. 44783. From Antigua, Guatemala. Elevation 5100 ft. A round fruit having an unusually small seed. The parent tree is young, and has not yet produced a large crop. The fruit weighs about a pound. The surface is green, pebbled, the skin moderately thick. The flesh is cream colored, of rich flavor. The seed is usually small. Ripens midseason. (Fig. 31)

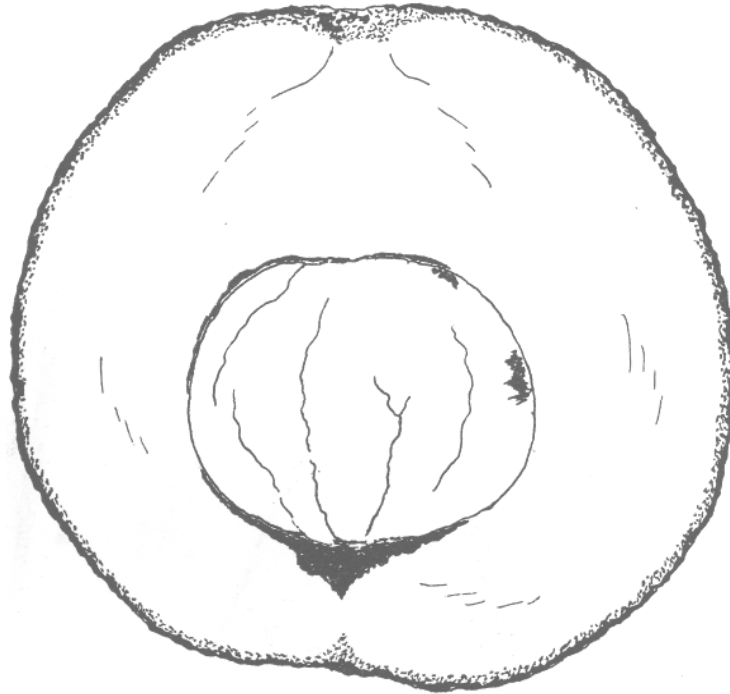


Figure 31

**CANTEL**

A variety of good quality, with an unusually small seed for a round fruit. Almost smooth, green, a pound in weight.

TERTOHO (No. Thirty) S. P. I. 44856. From Mixco, near Guatemala City. Elevation approximately 5 700 ft. A famous avocado of very large size and excellent quality. In form it is pear-shaped or almost oblong, in weight up to 3 lbs. The surface is quite smooth, deep purple in color, the skin rather thin. The flesh is yellow, free from discoloration, and of rich flavor. The seed is comparatively very small. The ripening season is rather early, February to April at Mixco. (Fig. 32)

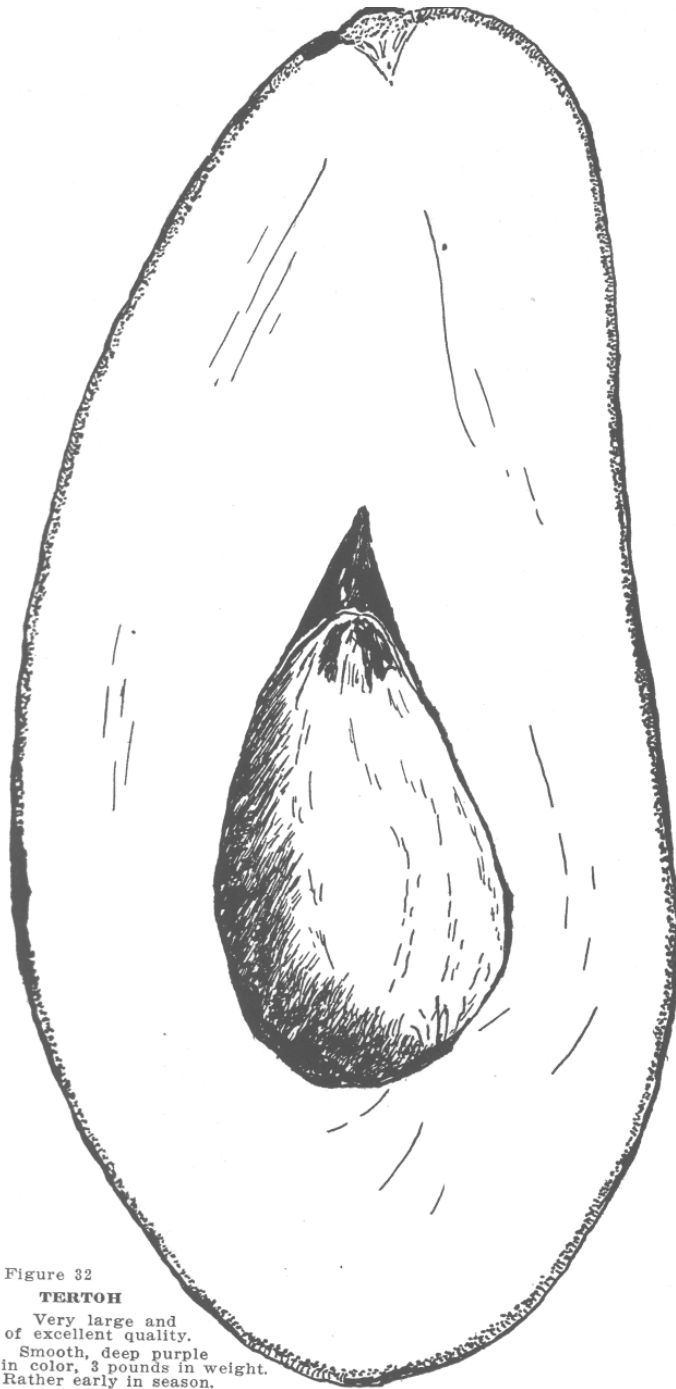


Figure 32

**TERTOHO**

Very large and  
of excellent quality.  
Smooth, deep purple  
in color, 3 pounds in weight.  
Rather early in season.

AKBAL (No. Thirty-two) S. P. I. 45505. From Amatitlán, Guatemala. Elevation 4200 ft. A particularly early avocado. In form it is long and slender, in weight about 12 ozs. The surface is quite smooth, bright green, the skin thin. The flesh is deep yellow in color, of rich and pleasant flavor. The seed is medium sized, not fitting quite as snugly within the cavity as in most Guatemalan avocados. The ripening season at Amatitlán is August to November, hence the variety may be classed as very early. (Fig. 33)

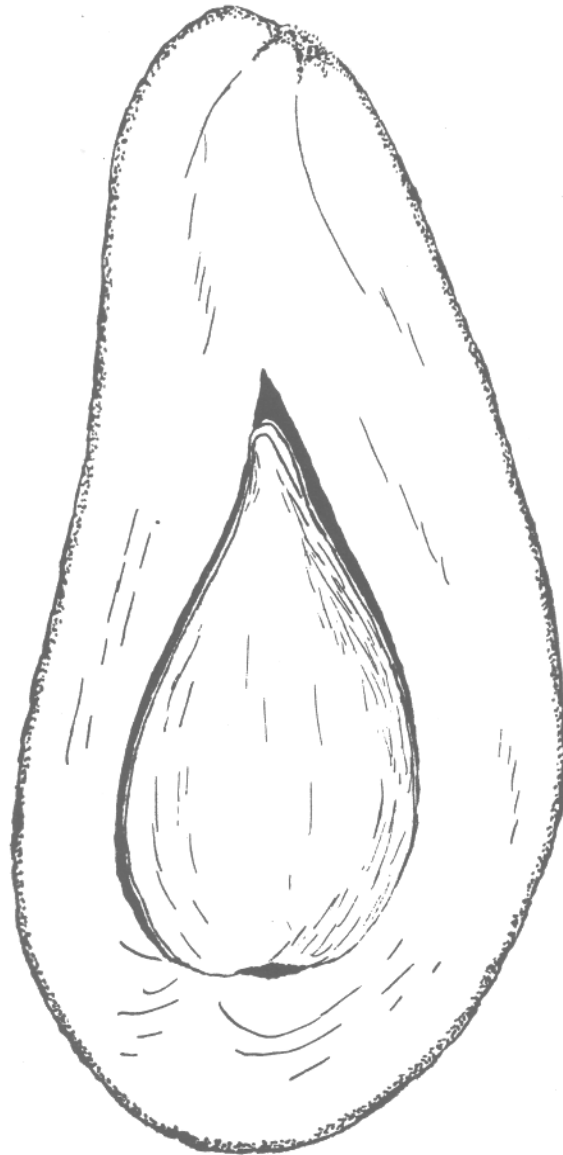


Figure 33 **AKBAL**  
Very early and of good quality, though the shape is not as desirable as some others. Smooth, green, about 12 ounces in weight.

ISHIM (No. Thirty-four) S. P. I. 45562. From San Lorenzo el Cubo, near Antigua, Guatemala. Elevation about 5500 ft. A very early variety, not quite equal in quality to some of the others in the collection. In form the fruit is pear-shaped to obovoid, in weight about 12 ozs. The surface is quite smooth, deep maroon in color, the skin very thin for this race. The flesh is cream yellow, slightly discolored, of moderately rich flavor. The seed is a trifle large. At San Lorenzo the variety ripens from October to December.

KANAN (No. Thirty-five) S. P. I. 45563. From San Lorenzo el Cubo, near Antigua, Guatemala. Elevation about 5300 ft. A medium early variety of good form and rather large size. It is round, and weighs 16 to 20 ozs. The surface is bright green, slightly rough, the skin moderately thick. The flesh is yellow, free from discoloration, smooth, and of very rich flavor. The seed is rather small. The variety matures in January at San Lorenzo. (Fig. 34)

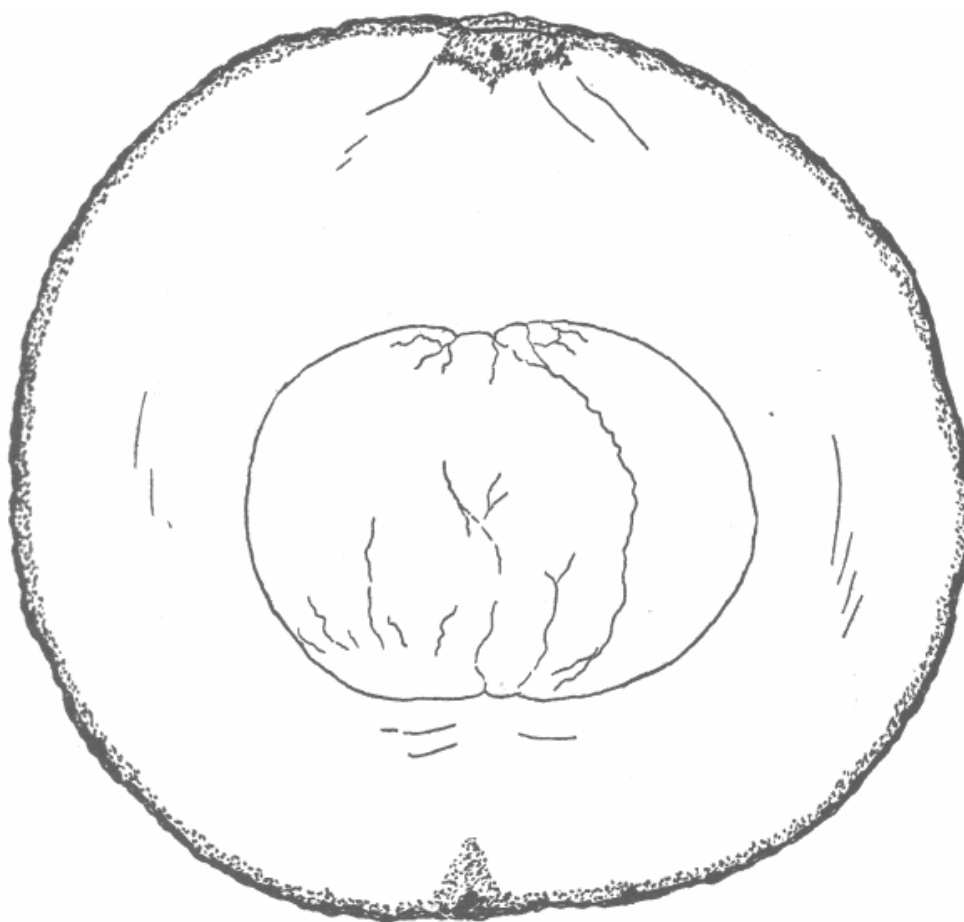


Figure 34 **KANAN**  
An excellent fruit, and rather early in season. Slightly rough, green, 16 to 20 ounces in weight.

CHABIL (No. Thirty-six) S. P. I. 45564. From San Lorenzo el Cubo, near Antigua, Guatemala. Elevation 5500 ft. A small early fruit of excellent quality. In form it is round, in weigh about 9 ozs. The surface is smooth, deep purple in color. The skin is quite thick and woody. The flesh is yellow, of rich flavor. The seed is rather small. The ripening season at San Lorenzo is November to March.