

The Avocado in Southern California

F. W. POPENOE*

Pasadena, California

That the avocado will succeed in Southern California has been proved conclusively by the seedlings planted fifteen to twenty-five years ago which are now bearing, and by more recent experiments with budded trees; and the establishment of an avocado industry in the immediate future is assured. As to whether we shall proceed at once to the production of the best fruits or whether the loss of much money and time with the incident disappointment to all concerned shall be caused by the planting of inferior varieties is the vital question at this moment. It is to the solution of this problem that the earnest endeavor and careful efforts of all our nurserymen should be directed, and it is in the hope that some help may be given in eliminating wasteful efforts that this article is written.

For centuries the avocado has been grown in Mexico and other tropical countries, propagated only by seed. Like other fruit trees grown from seed, it comes true in but a very small percentage of cases. This has led to the existence of a wide range of varieties. All avocados so far fruited in California are these mere chance seedlings, most of them of indifferent value and not worth propagation on an extensive scale. There are many varieties of good size and flavor, fruiting in Mexico and other parts of the tropics, which will doubtless succeed here as well as the smaller and inferior ones. Some of these Mexican varieties are of such superior quality as to leave nothing to be desired.

It is therefore manifestly the part of wisdom for California planters of this fruit to proceed with intelligence and accept nothing but the best. Attracted by prospective large returns some investments of a doubtful character are already being made. There is really no excuse for this.

Investigation and care will lead anyone in the right path. There will be no demand for seedling or inferior fruits once a superior avocado is to be found plentifully in our markets. Nor need there be delay or groping in the dark for these superior varieties. At our very door lies a boundless experimental garden in which for centuries the avocado has been grown, where countless varieties have originated, and where now are growing hundreds of thousands of trees from among which we have only to select the best.

By taking advantage of this opportunity California can obtain in a comparatively short time the choicest varieties, which it would take years of time and a large expenditure of money to produce by the ordinary methods of plant breeding,

* Special student in Pomona College

carried on here.

The results presented in this preliminary paper on this subject have been worked up in the Biological Laboratory of Pomona College, and acknowledgments are here made for the facilities placed at my disposal there and the constant and kindly assistance extended to me.

TYPES GROWN IN CALIFORNIA

Broadly speaking, the avocados which have fruited here so far may be divided into two classes; those of Mexican origin, which include all the smooth and thin skinned varieties, and those of Guatemalan origin, which are easily distinguished by their very thick skins and rough exterior. This is not saying, of course, that all avocados can be divided into these two classes.

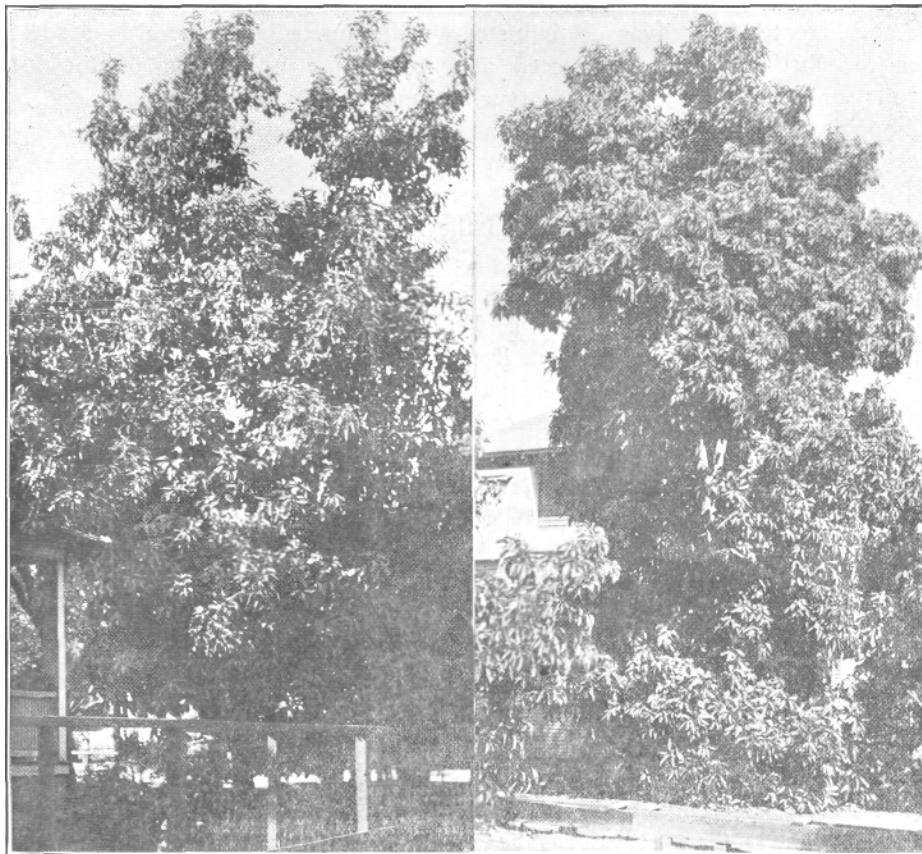


Figure 1. At left the parent tree of the Blake Avocado, growing at Pasadena, age eight years; this tree would be of good form if topped. At right, parent tree of the Walker Avocado growing at Hollywood, age fourteen years, the tree showing a very bad form for a cultivated Avocado.

Of the Mexican type many trees may be found scattered all over the southern end of the state, most of which have been grown from seed obtained from Monterey and other points in northern Mexico. The famous Chappelow tree is the oldest and best known of the lot.

Most of these Mexican varieties produce fruits of small size, dark purple in color,

but of good quality, and are preferred by many to the large green fruits, it being the belief that they are richer and of better flavor than the larger varieties.

They are also somewhat hardier than the larger varieties and would probably be valuable in locations where the latter would not thrive.

For home use these varieties will always be desirable, but as a commercial fruit they are out of the question altogether. They are too thin skinned to stand shipment, and would probably not take at all in American markets in competition with the larger, thick skinned fruits.

A few varieties of Mexican origin and green in color are now grown here which are larger than the purple varieties, but these also are thin skinned and of little more value commercially than the purple ones, although the quality is all that could be desired in some cases. To be profitable commercially, the fruit will have to be thick and tough skinned, so as to stand shipment, and as yet no Mexican variety which has fruited here has this quality.

Outside of the Mexican varieties the only other type known to have successfully fruited here is the Guatemalan. The trees of this type are probably all descendants of the old Miller tree the seed of which was brought from Guatemala and planted at Hollywood over twenty-five years ago. Numerous seedlings have been grown from this tree, several of which are now bearing. The Walker tree is the best known of these, and is the most prolific tree known here, its crop every year running into the thousands. From the behavior of these trees it seems certain that this type is admirably adapted to this climate, a fact of the greatest importance to the future of the industry here.

In his bulletin on the avocado, Collins speaks of the avocados of Guatemala as forming a very distinct group, the most peculiar characteristic of which is the unusual thickness and toughness of the skin, and he considers them the most promising of all types from a commercial standpoint. It is particularly fortunate, then, that this type has been tested here and its adaptability proved, for the way has been paved for the introduction of numerous forms of the type with practical assurance of success. Another noteworthy point in regard to this type is the fact that all of the local trees are spring bearers, this point alone making them of great value. Being spring bearers their blooming season is considerably later than the fall bearing Mexican sorts, so that danger of the crop being destroyed by late frosts is almost eliminated. Already we have several varieties of this type that are well worth growing, of which the Lyon is the most promising, it being the finest avocado yet produced in California, of good size and excellent quality. This variety has just come into bearing, and therefore is little known as yet, but its prolificacy and good qualities promise to place it in the lead of the local varieties. The trees of the Guatemalan type are easily distinguished from those of the Mexican type because more spreading, particularly when young, and the leaves are more lanceolate.

It has been the general impression that the South American type which is grown in Florida would not succeed here, but this remains to be proved.

Budded trees of many Florida varieties are being tested in Southern California, and the Bureau of Plant Industry expects to send out a large number this spring for trial. One large tree at Sherman which was worked over to the Trapp variety flowered this year for the first time, and numerous other trees are becoming old enough to bear and will be watched with interest for the next few years. This type is certainly more tender than the Mexican, but the past few winters have shown that some varieties at least will stand our average winter temperature without injury. Future experience will likely confirm the present belief that this type will succeed in many locations here.

Numerous seedlings of Hawaiian, Cuban, and West Indian varieties have been grown, but as yet these have not come into bearing. Budded trees will have to be tested before anything definite can be said of their adaptability.

It has been stated that the avocado would not succeed in the hot and dry interior parts of California. Trees are known to have grown without injury as far into the interior as Redlands and Riverside, and have fruited heavily at Pomona and San Fernando, and should be tried at Imperial.



Figure 2. At left the parent tree of the Ganter Avocado growing at Whittier, Cal., age eight years; at right the parent tree of the White Avocado, growing at Santa Barbara, age twelve years.

PROPAGATION

BY SEED. This is the simplest method, and the one most practiced in California up to the present time. The seeds of most varieties are obtainable during late summer and autumn, and should be planted as soon after removal from the fruit as possible. It has been found to hasten germination greatly if the seeds are buried in moist sand or sawdust for a period of two to four weeks before planting. During this time they should be occasionally examined, and when they show signs of germinating they can be taken out and planted in pots. After this treatment they

will start to grow very promptly and it has the added advantage that only seeds that are sure to grow are planted, and no labor is wasted. For most seeds a four inch pot is large enough. The seeds should be placed in the pot pointed end up, or in the case of the round seeded varieties, the end toward the stem of the fruit, and about one-fourth of the seed left exposed above the surface of the soil. A good rich soil is essential to the best development of the young plant, and should be kept thoroughly moist, but care should be exercised to avoid standing water in the pots, as this is fatal to either the seed or the young tree. While the young trees should be grown in a warm situation, the direct rays of the sun should be avoided. If the seeds have not been buried in moist sand before planting they will often be slow in germinating, especially if not grown under glass. Many of the seeds planted in the fall in a lath house do not come up until the following spring. After the young trees have made a growth of eight to twelve inches they should be shifted into larger pots or cans, if it is desired to carry them on in this way, or set out in the nursery to be grown until of suitable size to bud.

BY BUDDING. It is only during the past season or two that much attention has been given to budding the avocado in California, although previously a few nursery-men most interested in this fruit had tried it. Having no experience of their own in the budding of this particular tree, most of those who have budded during the past year or two have simply applied the methods they would use for citrus fruits, while a few others have followed the instruction given in various publications by those who have experimented in Florida. In all cases the results have proved the budding of this fruit to be no more difficult than that of the citrus fruits, and when a little more experience has been acquired the operation will be performed with as much assurance of success as with the orange.

For commercial purposes plants are grown in pots until about twelve inches high, when they are set out in nursery rows three and one-half to four feet apart, and fourteen inches apart in the rows. Here they are grown and budded and allowed to remain until of saleable size, when the trees are balled, or transplanted into pots, and allowed to become established before being sold.

The method of budding is practically the same as used for the orange. In regard to such points as the best size of stock and buds, and season for carrying on the work, there has, however, been some uncertainty.

Experiments have been carried out locally on stocks ranging in diameter from about one-fourth of an inch to over one inch, with budwood of all sizes, from the young and tender tops to well matured wood of the previous season's growth. Results lead to the conclusion that for small stocks, such as will be obtained during the first summer's growth of the seedling tree, buds from young wood of the current season's growth are the only ones which will give good results. On older trees, mainly two-year-olds, the buds from older wood seem to take better, but are liable to drop after taking, leaving a blind bud.

The experience of P. J. Wester, in charge of the avocado investigations of the Bureau of Plant Industry, is unquestionably the most valuable to be had on this subject. Under date of January 4, 1911, he writes me as follows: "In 1906 I

published an article in the Florida Agriculturist that has been reproduced in many papers, but which does not now wholly represent my views on the subject. The stock should be the size of a lead pencil, in vigorous growing condition with sap flowing freely, and young budwood, i. e., that from the current year's growth, with well developed buds, used. Do not use old and hard budwood, as such buds after taking frequently drop. Cut the buds large, and cover entirely with waxed tape. The last point may not be so important in California's dry climate. Continued experimentation since I wrote the above mentioned paper shows that budding may be practiced any month of the year, provided the stock is in condition, though for nursery practice I would not bud in August, September, October or November."

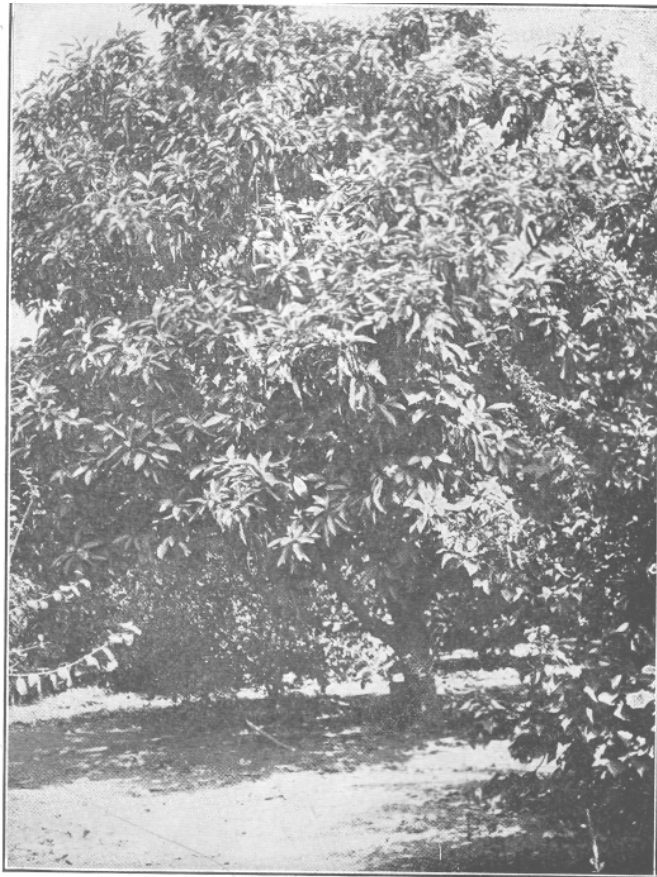


Figure 3. Parent tree of the Harmon Avocado, growing at Sherman, Cal. This tree is thirteen years old, and shows a fine orchard form for an Avocado.

Regarding the best season to bud, it seems to be the consensus of opinion here that October and November, which are mentioned by Mr. Wester as undesirable months, are as good a season as any, if not the best of the whole year. This is probably owing to the climatic conditions of Southern California being different from those of Florida.

Three weeks after insertion the buds will have taken and the trees should be lopped back to several inches above the bud. The buds will then start into growth, and when a growth of eight to twelve inches has been made the stock

may be trimmed back to the bud.

Edgar Harman, of Sherman, has done considerable experimental budding and what he says will be of value to those contemplating doing this work. The seeds are started under glass and as soon as the plants are two inches high they are set in pots and placed in a protected place in the open. When they have grown to the diameter of three-eighths to one-half of an inch, they are budded. Mr. Harman considers that this operation can be performed successfully any month of the year except July and August. Young and tender budwood is used and the buds cut from three-fourths to one inch long. Waxed cloth is used for wrapping, and the buds are not wrapped very tightly. As soon as the buds swell, which should be in about three weeks, the top of the stock is lopped over at about the fourth leaf above the bud, and a little later on it is cut clear off. When the bud has started into growth the top is cut back to a level with the bud. The sap must be flowing freely at the time of budding to insure success.

C. P. Taft of Orange has probably had more experience in growing and budding the avocado than any other person in California. He says: "I am inclined to regard the months of October and November as the best for budding, though I think there is a short period in the spring when considerable success can be had. The buds I put in my three-year-old orchard last fall have done well and are making a fine growth. About 25% of the buds on stock in cans succeeded. Those put in during the warm summer months were an almost total failure."

In April, 1909, D. W. Coolidge of Pasadena budded about 150 two-year-old seedlings growing in the open ground at Hollywood. The buds were taken from well matured wood of the previous year's growth, and waxed cloth was used for wrapping. Fully 90% of these buds took, but quite a number dropped their buds after having taken. However, fully 75% of the buds inserted developed into trees. Mr. Coolidge has made several attempts to bud stock grown in cans, but with no success, probably because trees thus grown are not sufficiently vigorous.

William Chappelow of Monrovia, owner of the original Chappelow tree, states that he proceeds exactly as in budding citrus fruits, and has budded at all seasons of the year with about equal success.

Large avocado trees which are unproductive should be cut back and budded over to some good variety. The method is simple, and as described has been practiced very successfully by Mr. Harman. The large limbs are all cut back close to the trunk, and the cut ends covered with white lead to prevent bleeding. In a short time numerous sprouts will make their appearance; all of these should be kept cut off but three or four of the most promising, selected on different sides of the tree so as to form a good head. In a short time they will be large enough to bud, and should be budded in the same way as small seedlings. The wraps must be loosened every four or five days, as the sprouts make a very rapid growth. After the buds have made a growth of several inches the stocks may be cut back and the buds allowed to develop into the new tree. In two years time a good sized head will be obtained.



Figure 4. Avocado tree of the Mexican type growing at Redlands, Cal., showing what the Avocado may become when not pruned or cut back.

The best material for budding tape is cheap cotton cloth which will tear easily. The method of preparing it is described by Mr. Wester as follows: "Rip up the cloth in strips of desired widths, say six inches, and roll these tightly on stout iron wire as long as the width of the strips. Several strips may be rolled on until the roll is one inch in diameter; tie a string around the roll at each end to prevent unrolling while being boiled in the wax. A good wax is made by boiling together two pounds beeswax, two pounds rosin, and half a pound of good lard; when in boiling state put in the rolls of cloth and let them remain for fifteen minutes, when they are taken out and cooled before being stored away. The iron wire is more desirable than sticks of wood, as the weight of the wire will keep the roll below the surface of the boiling mass. Another advantage in using the wire is that if the sticks are not quite dry the water, as it is converted into steam, will cause the contents to boil over."

INARCHING has never been practiced in California, but J. L. Hickson, of Miami, Florida, a large and successful grower of the avocado, states that he propagates entirely by this method, as he considers it produces a stronger and better growth than budding. However this may be, the method is slow and laborious, and trees cannot be produced in sufficient quantities to make it commercially practicable here.

GRAFTING has been performed successfully in a few instances, but has not been attempted to any great extent as yet.

CUTTINGS have been very successfully rooted by being placed in clear sand in a lath house, but it is doubtful if this method of propagation produces as strong a plant as the others.

ORCHARD PLANTINGS

It is only within the last year or two that orchard plantings of the avocado have been made in Southern California, and then only in very small acreages, but the next few years will see the territory devoted to the culture of this fruit on a commercial scale greatly increased.

The trees may be planted at the same distance apart as orange trees, or if space is available at a somewhat greater distance. Budding seems to dwarf the tree, and budded trees will require much less room than seedlings. In either event the trees should not be allowed to grow to an unlimited size, but should be pruned like deciduous fruits, allowing only the strongest branches to develop and form the head of the tree, and all weak and undesirable growths cut out each year. The top should be kept cut back to facilitate picking the fruit, and not allowed to grow to an unlimited height as has been done with all the seedlings grown here.

Transplanting should be done in early spring, before the trees have started into new growth.

During the first year or two of its growth, the tree is more tender than when larger, and in locations subject to heavy frosts should be protected during the winter by some covering. Palm leaves are used for this purpose if they can be obtained in sufficient quantities, or a frame can be constructed of lath and covered with burlap or cheesecloth. The danger from frost, however, lies not so much in the possibility of injury to the trees themselves, as in the destruction of the crop through freezing of blossoms of early flowering varieties. To avoid this, late blooming varieties may be planted, such as those of the Guatemalan type, which bloom so late in the spring as practically to eliminate all danger from this source. It is only occasionally that the Mexican varieties are caught, but as the crop is practically certain to be lost, if a very heavy frost occurs during the blooming season, the only safe way will be to plant late blooming varieties.

The tree requires about the same irrigation as the orange. Insufficient irrigation will result in small fruit.

In selecting varieties for planting on a commercial scale, there are a number of points which should be kept in mind. Fruits which ripen during midwinter will command the highest prices in the markets, and there will probably be the greatest demand for avocados at this season of the year. As to size of fruit, there is no advantage in having the very largest. While a two pound avocado is a regal fruit, for practical purposes one of half that size is better. Quality should be one of the most important factors in choosing a commercial fruit, and other desirable points are prolificness, a smooth, thick and leathery skin which will stand shipment, good

keeping qualities, and a small seed, completely filling the cavity, as a loose seed pounds the walls in transit, causing early decay. We must, however, have still smaller varieties for cheaper trade, and summer varieties for local consumption, and we already have a good assortment of varieties to choose from for these purposes.



Figure 5. At left a Mexican seedling Avocado, eighteen months from seed; at right a budded tree of the South American type, three years from the bud and grown in California.

THE FUTURE OF THE AVOCADO IN SOUTHERN CALIFORNIA

It may seem a strong statement to say that within the next quarter of a century the avocado will rank with the orange as a commercial fruit in Southern California. But there is a strong foundation of fact underlying this statement and the reasons seem sufficient, indeed, to warrant the belief that it may become even more important.

First, the adaptability of the avocado to this climate has been proved beyond the possibility of a doubt. There are one hundred or more trees now in bearing, ranging in age from three to twenty-five years, scattered over the southern end of the state from the cool sea coast to the hot and dry interior. These trees embrace a number of widely different types, sizes and characters of fruits. This test of adaptability ought to be sufficient to satisfy the most skeptical.

Second, the food value of the fruit is the main basis for the above statement. It presents in a most easily digested and assimilated form as high as 12 to 18% of fat, which places the fruit in a class with the staple food products, instead of being a

mere luxury as is the case with many fruits. The taste for the avocado is not always acquired upon first trial, but a few repetitions are usually sufficient to make any one extremely fond of it. The price is now prohibitive to most, and only a few have had opportunity to acquire the taste, but as the production becomes greater and the price lower, an almost unlimited demand will be created throughout the whole country. It is, of course, universally known as one of the most important staple fruits through- out the tropics and subtropics of the world.

Culture of the fruit in this country will be restricted to limited areas in Florida and Southern California, and consequently the danger of overproduction will be practically eliminated. As rapidly as price and production permit, the avocado will become an important and indispensable part of the daily food of the majority of the people of the United States.

LIST OF VARIETIES known in California, arranged according to general characters and possible usage:

For winter fruiting: Lyon.

For late fall fruiting: White, Ganter.

For late summer and early fall fruiting: Harman, Fowler, Chappelow, Blake.

For spring fruiting: Walker, Miller.

Large varieties: Lyon, Miller.

Small to medium varieties: White, Walker, Harman, Ganter, Fowler, Chappelow, Blake.

Best varieties for shipping: Lyon, Walker, Miller.

Best varieties for local use only: Ganter, Chappelow, Fowler, Blake, Harman.

Most prolific varieties: Walker, Ganter, Lyon.

DESCRIPTION OF VARIETIES

The following list contains not only those varieties of local origin which have been named up to the present time but is a complete list of all the named varieties in cultivation of which it has been possible to obtain descriptions.

With the increasing number of varieties being propagated every year, it will be absolutely essential to any exact knowledge of this subject that the introducer of any variety shows sufficient differences between the new variety and all previously known ones to warrant giving it a name.

Better Known Varieties

PROVISIONAL KEY TO THE VARIETIES

This key is not to be considered as anything definite for the determination of varieties. It is merely intended to point out the distinguishing characters of the

varieties described and supplement the descriptions.

A. Skin smooth.

B. Towards base broadly rounded; general shape round to oblong.

C. Skin thick.

D. Roundish oblate to oblate pyriform; seed more or less loose in cavity - **TRAPP**

DD. Round to oval; seed tight in cavity - **SINALOA**

CC. Skin thin; shape oval to oblong.

D. Averaging more oblong; flesh very rich and buttery; skin glossy; seed not compressed - **FOWLER**

DD. Averaging more oval; flesh more watery, and not buttery; skin not glossy; seed compressed - **GANTER**

BB. Towards base more or less tapering, pear shaped, or bottlenecked.

C. Black, or dark or reddish purple when ripe.

D. Slender pear shaped, or even banana-shaped.

E. Skin thin; seed tight; becoming almost black when ripe - **CHAPPELOW**

EE. Skin medium thick, seed loose; purple with scarlet streaks - **FAMILY**

DD. Stout pear-shaped; reddish purple; skin medium thick - **WESTER**

CC. Red mottled with yellow; skin thick; seed tight in cavity - **CARDINAL**

CCC. Green principally when ripe, in ground color at least.

D. Without distinct neck; seed loose in cavity; skin thin - **HARMAN**

DD. With a more or less distinct neck.

E. Skin thick and tough.

F. Weight up to 3.5 pounds - **POLLOCK**

FF. Weight up to 1.5 pounds - **LONDON**

EE. Skin thin.

F. Color clear green.

G. Size small - **BLAKE**

GG. Size large - **QUALITY**

FF. Color green, washed with purple; size small - **WHITE**

AA. Skin rough, usually thick.

B. Towards base broadly rounded; pedicel inserted on one side; color dark green - **MILLER**

BB. Towards base more or less tapering, pear-shaped, or bottlenecked.

C. Color deep, dark green; weight up to 1.3 pounds.

D. Length about 4 ins.; pedicel inserted at center; flesh thin - **WALKER**

DD. Length about 6 ins.; pedicel inserted on one side; flesh thick - **LYON**

CC. Color pale greenish yellow; weight up to 2 pounds - **RICO**

Trapp (Figure 6 A)

Form roundish oblate to oblate pyriform; size medium to large; cavity regular, small, shallow, with gradual slope, somewhat furrowed; stem stout; apex slightly depressed; surface smooth and undulating, with numerous brownish dots, some of which are indented; color pale green, with faint and indistinct pale yellow stripes; skin very thick and tough, separating readily from the flesh; flesh fairly thick, firm, but smooth and rather oily in texture, ranging from pale green near the skin to greenish yellow next the seed cavity; flavor mild, pleasant; seed large, oblate, with loose seed coats, and loose in the cavity, sometimes germinating in the fruit when allowed to remain late on the tree, though, so far as observed, without injury to either texture or flavor of flesh; quality very good; season from October 1 to January in South Florida, occasional specimens having remained on the tree in good condition until March. The tree is reported to be a fairly vigorous grower and very productive — 1905 Yearbook U. S. Dept. of Agriculture.

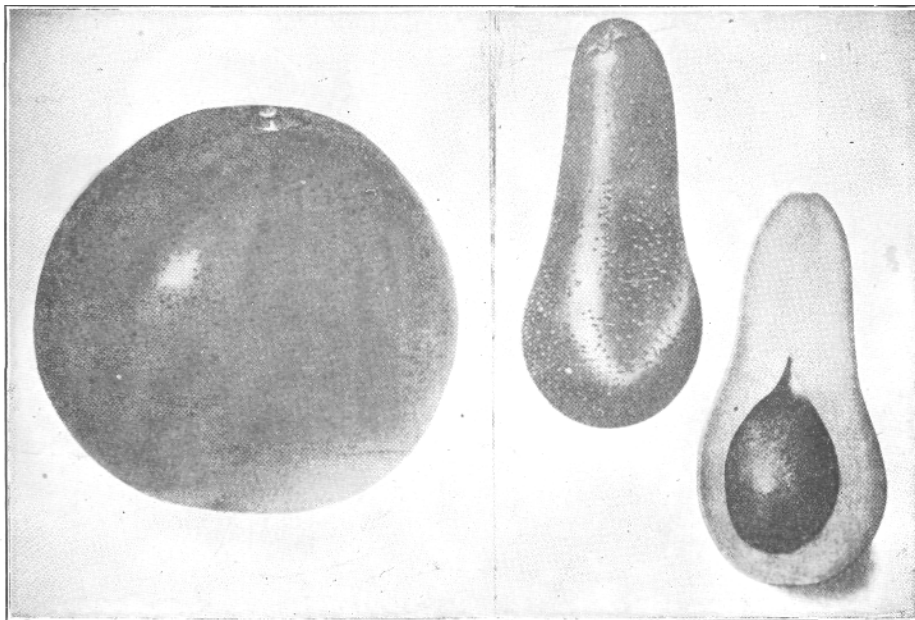


Figure 6. At left the Trapp Avocado and at right the Chappelow, as originally figured in Year Book U. S. Dept. Agriculture.

Sinaloa (Figures 7 and 8) (*avocadosource editor's note: not to be confused with Sinaloa variety described by K. Ryerson, Pomona College Journal of Economic Botany. 1913. 3(1):424-429*)

Form oval; size medium to large; stem stout; surface smooth, undulating; color light green with numerous large, irregular, brownish dots; skin thick and very tough; flesh rich yellow in color, shading to light green near the skin; texture smooth and very buttery; flavor very rich and nutty; quality very good; seed large, oblate, tight in cavity; season September to October. Originating in Mexico and now in our own plantations.

Fowler

Form oblong to oval; dimensions, length four and one-fourth inches, diameter three and one-fourth inches; apex a dot; base flattened slightly; cavity regular, small and shallow, flaring; pedicel stout; surface smooth; color light green, with numerous

small, rounded, yellowish dots; skin very thin, glossy, adhering closely to flesh; flesh yellow, changing to yellowish green near skin; texture smooth and buttery; flavor very rich and nutty; fibre slight; quality very good; seed medium large, oblong-conical, tight in cavity; season July to October at Pasadena, California.

Tree is of vigorous growth, upright, round topped, with abundant healthy foliage. Rather shy bearer. This is originally described here. A seedling of the Blake, and very similar to the Ganter.

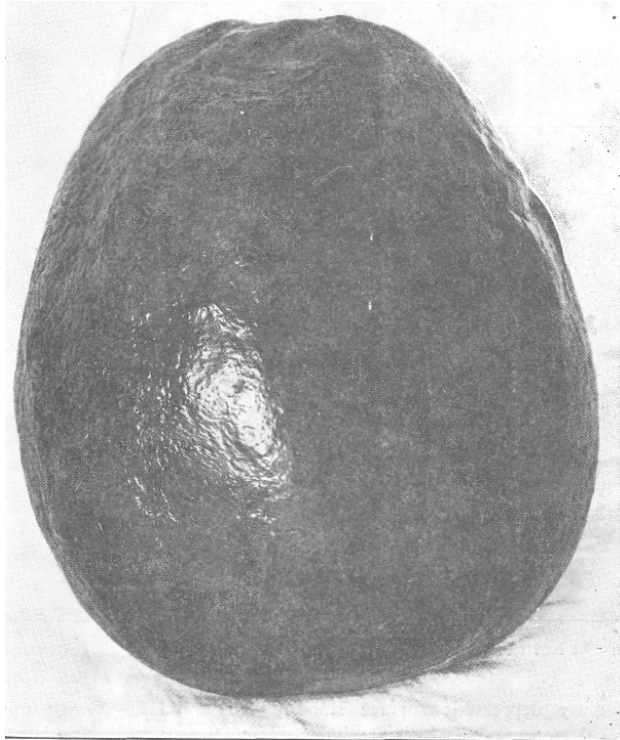


Figure 7. The Sinaloa Avocado, natural size.

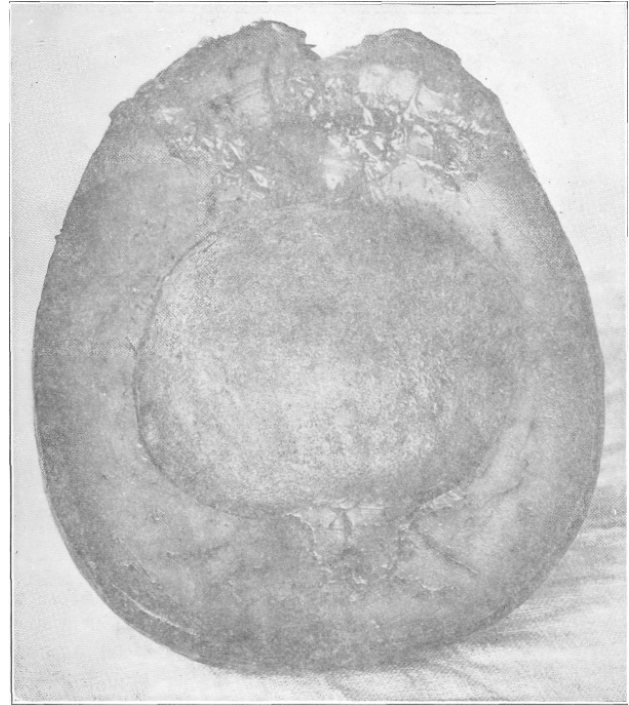


Figure 8. The Sinaloa Avocado.

(avocadosource editor's note: pictures reduced in size during re-formatting).

Ganter (Figure 9 A)

Form oval to oblong; dimensions, length two and one-half to four inches, diameter one and three-fourths to two and three-fourths inches; apex slightly depressed; base flattened; cavity regular, small, rounded or flaring, slightly furrowed; pedicel very stout; surface smooth, undulating; color light green, with numerous small, irregular yellowish green dots; skin thin and tender, adhering closely to the flesh; flesh yellowish cream color, changing to pale green near the skin; texture smooth but not very buttery; fibre very slight; flavor rich, nutty; quality very good; seed large, oblong-conical, somewhat compressed, about 25% loose in the cavity; seed cavity medium large; season November to December at Whittier, California.

Tree is a vigorous grower and rather spreading in habit, with abundant healthy light green foliage. A very prolific bearer. Here first described. Very similar to

the Fowler.

Chappelow (Figure 6 B)

Form oblong, slender pyriform or "bottlenecked"; size medium to large for the Mexican type; cavity small, shallow and wrinkled; stem stout; surface undulating, smooth, glossy; color dull purple, with reddish brown dots; apex a mere dot, skin very thin, tender, adhering closely; flesh pale greenish yellow, buttery; seed large in proportion to size of fruit, roundish conical, filling internal cavity; flavor pleasant, though less rich than the best varieties of the West Indian type. Season July to October at Monrovia, California.

The tree is a vigorous, rather diffuse grower, with slender wood. It is productive, although being an early bloomer it is sometimes caught by frost.— 1906 Yearbook, U. S. Dept. of Agriculture.

The fruits produced by the original tree show considerable variation in form, and Mr. Chappelow states that they are becoming larger as the tree grows older.

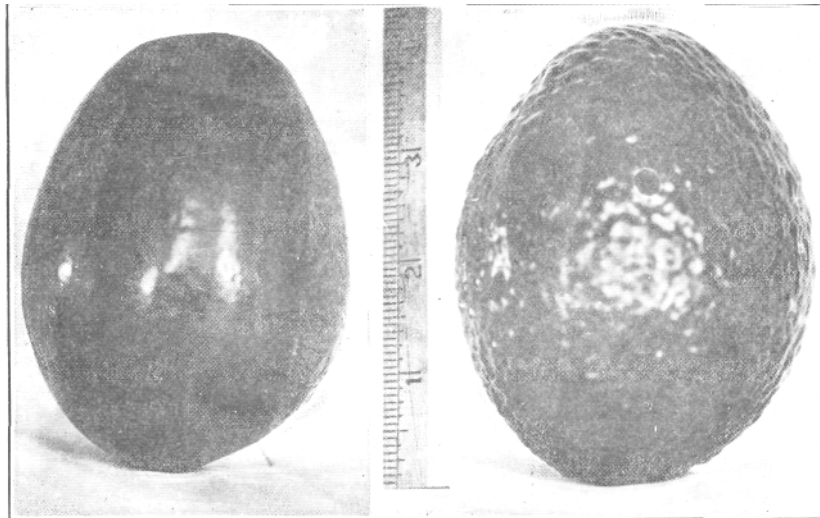


Figure 9. At left the Ganter Avocado, grown at Whittier; at right the Miller, grown at Hollywood.

Family

A strong growing tree of spreading habits, being an abundant bloomer and moderate cropper. Blooms in late February and during March. Ripens fruit during July, August and September, and into October.

Shape of fruit variable, from pear-shaped to long-oblong, nearly banana-shaped; size, variable from 6 by 3½ to 3½ by 1½ inches; color purple, with scarlet streaks, very attractive; skin medium thick, smooth; stem large; meat yellow, free from fibre; flavor good, seed small, loose in cavity.—*Rolfs*.

Wester (Figure 10)

Form roundish or obliquely pyriform with short neck; average weight 650 grams; skin medium thick, smooth and glossy, adhering to meat; color reddish purple; meat greenish next to skin, rich yellow toward center of fruit; flavor good, rich and buttery;

seed medium large, usually loose in cavity; season October.

This variety is of vigorous growth and very prolific.—Bureau of Plant Industry.

Cardinal

Form bottlenecked; skin thick, red, mottled with yellow; flavor very good, a trifle watery; seed small, filling cavity; season October in South Florida.— *Wester*.

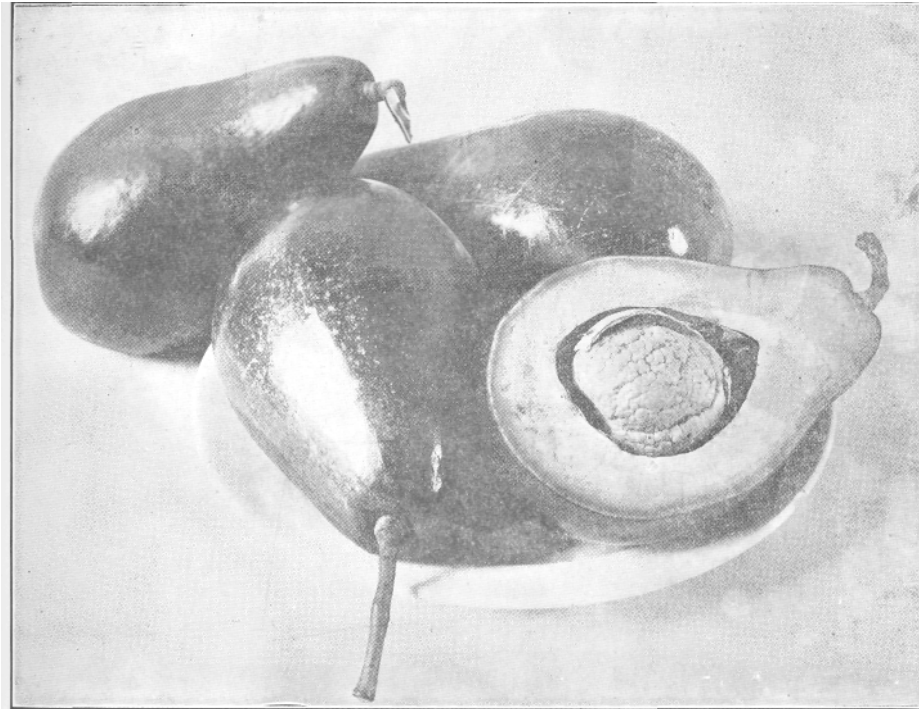


Figure 10. A common Cuban type of large purple Avocados, apparently the same as the *Wester*.

Harman (Figure 11 A)

Form irregularly oval, slightly compressed, and flattened obliquely at the apex; dimensions, length three to four and one-half inches, diameter two to three and one-half inches; apex a dot; base tapering somewhat and slightly flattened; cavity regular, small, shallow, flaring, and somewhat furrowed, calyx persistent in the form of 6 divisions surrounding the stem base of fruit; pedicel stout, insertion usually one sided; surface smooth, glossy; color light green, washed with reddish purple, with numerous large, irregular greenish yellow dots; skin thin, adhering closely to the flesh; flesh greenish yellow, changing to yellowish green near the skin; texture smooth and very buttery; fibre practically none; flavor very rich and nutty; quality very good; seed very large, roundish conical, often loose in cavity; seed cavity very large; season October to November at Sherman, California.

Tree is upright, round-topped, and of fairly vigorous growth. Foliage rather scant, but healthy. Moderately prolific. This is the first description of this variety.

Pollock

Tree moderate grower, heavy bearer, profuse bloom, limbs rigid; blooms in February and March; ripens in September and October. Upright grower with strong central stem.

Fruit pear-shaped, being about six and one-half by four and one-half inches; weight up to three and one-half pounds; color greenish; rind medium; meat yellowish; flavor good; seed medium.—*Rolfs*.

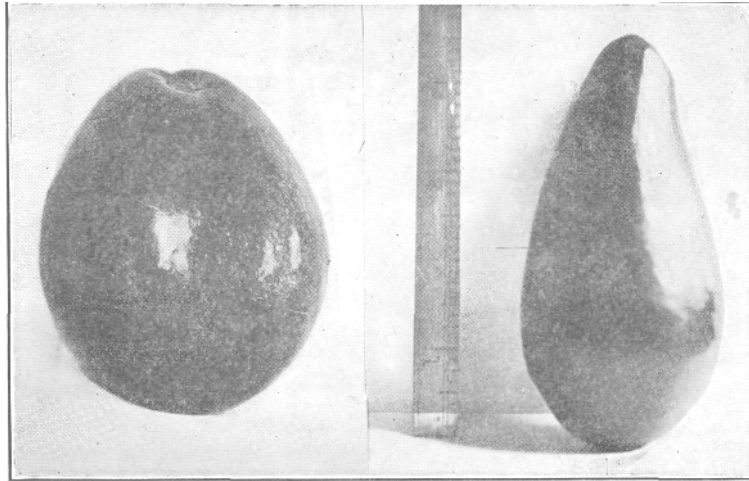


Figure 11. At left the Harman Avocado grown at Sherman, Cal.; at right the White Avocado grown at Santa Barbara.

Landen

Form broad pyriform or bottlenecked; size medium to large, average weight one and one-fourth pounds; surface smooth, undulating; color light green; skin thick and tough, separating readily from the flesh; flesh rich yellow, changing to yellowish green near the skin; texture very smooth and buttery; flavor rich and melting; quality very good; seed medium large, broadly conical, tight in the cavity; season September to October in South Florida.

Quality

Form bottlenecked; size large; color green; skin thin, smooth; quality very good; seed medium large, loose in cavity; prolific bearer; season September in South Florida.—*Wester*.

Blake

Form slender pyriform, bottlenecked; dimensions, length three and one-half to four and one-half inches, diameter one and three-quarters to two and one-fourth inches; apex slightly protruding to form a point; base very slightly flattened; cavity regular, small, very shallow and flaring; pedicel stout; surface smooth, slightly undulating; color light green with numerous small, round, greenish yellow dots; skin very thin, adhering closely to the flesh; flesh creamy yellow, changing to yellowish green near the skin; texture smooth and buttery; fibre very slight; flavor very rich and oily; quality very good; seed medium, conical, often loose in the cavity; seed cavity

medium large to large; season September to October at Pasadena, California.

Tree upright, of fairly vigorous growth, with abundant, healthy, light green foliage. Moderately prolific. Here first described.

White (Figure 11 B)

Form slender pyriform; dimensions, length four and three-quarters, diameter two and one-fourth inches; apex slightly protruding to form a point; base somewhat flattened; cavity regular, small, shallow, rounded, pedicel stout; surface smooth; glossy; color bright green, washed with purple, with numerous small, round, yellowish dots; skin thin and leathery, adhering closely to the flesh; flesh cream color, changing to pale green near skin; texture smooth; fibre objectionable; flavor rather watery; quality fairly good; seed conical, large, tight in cavity; seed cavity long, pointed, and wrinkled; season November to December at Santa Barbara, California.

Tree is upright, moderately vigorous, and a rather shy bearer. First described here.

Miller (Figure 9B)

Form oval; dimensions, length four and one-half inches, diameter three and one-half inches; apex a slight point; base rounded; cavity regular, small and shallow, flaring, furrowed; pedicel very stout, insertion usually one sided; surface very rough; color dark green, with numerous small, round, yellowish dots; skin very thick and tough, separating readily from the flesh; flesh yellowish cream color, changing to yellowish green near the skin; texture, smooth; fibre very slight; flavor fairly rich; quality good; seed large, roundish conical, tight in cavity; seed cavity large; season February to April at Hollywood, Los Angeles, Cal.

Tree is upright, vigorous, with abundant dark green foliage. Moderately prolific. Here described for the first time.

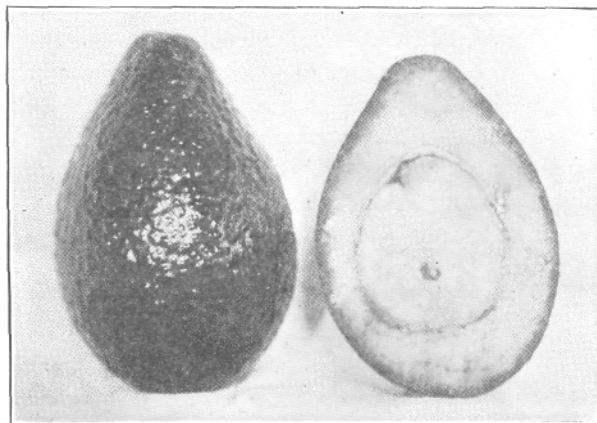


Figure 12. The Walker Avocado, one of the Guatemalan type, one-half natural size.

Walker (Figure 12)

Form broad pyriform; dimensions, length four and one-fourth inches, diameter two and one-half inches ; apex a dot; base rounded; cavity none; pedicel rather slender;

surface very rough; color dark green, with numerous medium sized, round, yellowish green dots; skin very thick and tough, separating readily from the flesh; flesh cream color, tinged with green near the skin; texture smooth, but not buttery; flavor fair, rather watery; fibre objectionable; quality fair; seed large, broadly conical, tight in cavity; seed cavity large; season March to May at Hollywood, Los Angeles, Cal.

Tree is a vigorous grower, spreading in habit, with abundant, healthy, dark green foliage. Extremely prolific. A seedling of the Miller. Here first described.

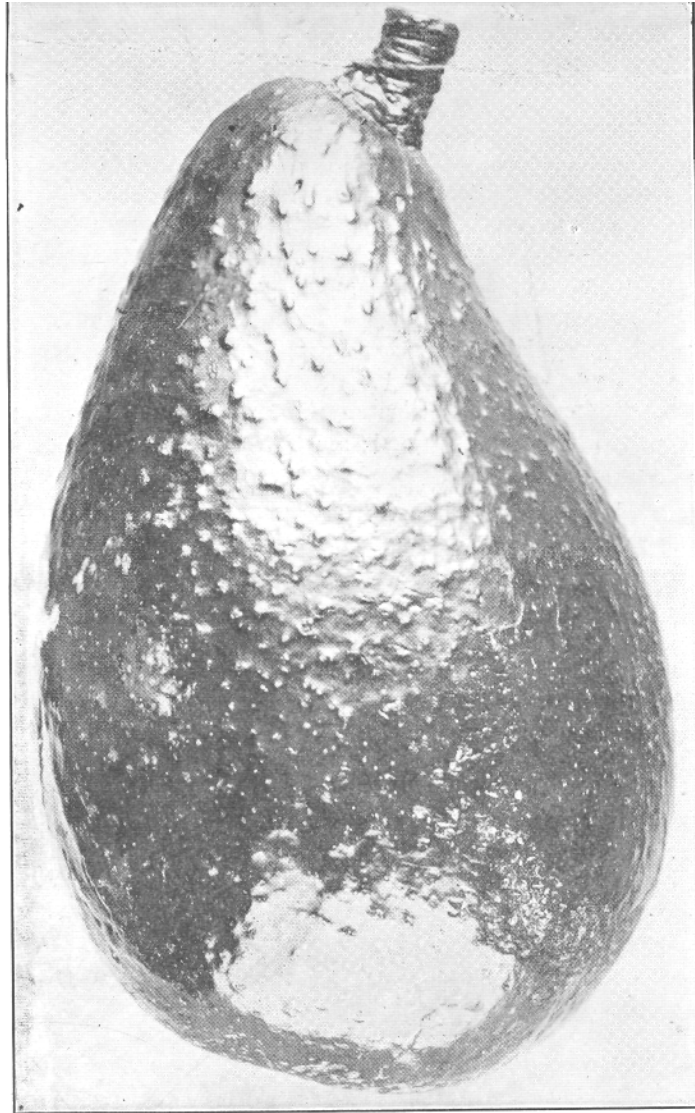


Figure 13. The Lyon Avocado, a fine example of the Guatemalan type. This specimen grown at Hollywood. Natural size.

Lyon (Figure 13)

Form broad pyriform; dimensions, length five and one-half inches; diameter three and one-half inches; apex slightly depressed; cavity almost none; pedicel very stout, insertion usually one sided; surface rough, color dark green, with numerous small,

irregular, yellowish or russet dots; skin very thick and tough, separating readily from the flesh; flesh yellowish cream color, tinged with green near the skin; texture smooth and fairly buttery; flavor rich and nutty; fibre none; quality very good; seed large, broadly conical, tight in cavity; seed cavity medium large; season February to April at Hollywood, Los Angeles, Cal.

Tree is a vigorous grower, upright, with abundant, healthy foliage. Very prolific. This is the first description of this variety.

Rico

Form rather oblong, thick necked, with oblique depressed flattening on opposite sides of both ends; average weight two pounds; skin rough; color pale greenish yellow; flesh pale yellow, with very little green near the skin; texture fine grained, firm; flavor very rich, nutty and buttery; season August to November in South Florida.—*Cellon*.

Insufficiently Known Varieties

Largo

Budwood from Mr. C. H. Matthews, who described the fruit as follows: "Egg shaped, very large, three and one-half to four pounds in weight; skin green, very thin; flavor very good; seed small; ripens in August and September."—*Wester*.

Johnstone

Budwood from Judge R. S. Johnstone, who gave the following description of the fruit: "Pear-shaped, but rather broad at basal end; skin smooth, thin; flesh yellow, almond flavored; seed large; famous as the best avocado in the Bahamas. Ripens in August and September."—*Wester*.

Blackman

Form oblong; size medium large to large; color greenish red to chocolate; skin thick and leathery; flesh delicate yellow, soft and melting; seed tight in cavity, medium large; quality good; season September in South Florida.— *Wester*.

Cyrus

Form pear-shaped to round; skin smooth, yellowish, thin, quality good; seed loose in cavity; very prolific; season September to October in South Florida. (Analysis gave 17% fat.)—*Wester*.

Sterling

Skin thick; color dark bronze red; quality good; seed filling cavity, medium large; season October in South Florida.—*Wester*.

Baldwin

Tree a vigorous grower, with strong central stem; branches rather rigid ; light bloomer, but heavy cropper. Blooms in February and March. Fruit at best in

August; drops in September. Ripens uniformly. Shape of fruit approaching oblong, four by five and one-half inches, not regular; color green, with a few yellowish streaks; rind smooth, thin, stem small; meat deep cream, one-fourth green, firm, flavor excellent. Seeds are rather large, firm in cavity.—*Rolfs*.