

AVOCADO CULTURE IN VENEZUELA

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The expression: "El larense se conoce porque tiene la uña verde," explains the popularity of avocados in that Venezuelan region, but it may be well applied to any other part of the country, since the avocado is one of the most popular fruits among Venezuelans, being cultivated throughout the whole country, as can be seen by the fact that the 3.347.004 plants that existed in Venezuela in 1961, were distributed along the 23 States that constitute the Venezuelan Republic.(1)

History

Forty one years after the "cartographer and good observer" Martin Fernández de Enciso mentioned the avocado for the first time in his "Suma de Geografía" published in 1519, after he had seen it near Santa Marta, Columbia; and forty eight years after Gonzalo Hernández de Oviedo described it in 1526, (12); another Oviedo-José Oviedo y Baños, born "de claros linajes peninsulares en Santa Fe de Bogotá" and who lived in Caracas for many years, described how in 1567: Cacique Anequemocane, "accompanied by either others, loaded with hens, avocados and sweet potatoes" came where the Fundador de Caracas was camping with not very good intentions (9). This fact is very significant since it can mean that either the avocado was already known in the mainland before Christopher Columbus arrived in 1498, or that it was introduced immediately after the arrival of the Spaniards, maybe from Columbia, since it was introduced in the West Indies after this time (13).

When Alejandro Von Humboldt arrived at the eastern coasts of Venezuela in 1799, he wrote "Sugarcane, bananas, mammee and avocados are among man cultivated plants which have the same properties of the coconut, that may be irrigated either with ordinary or sea water." Later on he also wrote that near Caracas "each cottage is surrounded with avocados trunks (*Laurus Persea*) at the feet of which climbing plants are grown." "Afterwards, he saw the tree in the Misión de la Divina Pastora de Baltasar de Atabapo, near the Brazilian frontier. (6). These notes from the German naturalist gives us an idea of the great distribution of the tree at that time.

In 1841, José A. Diaz commented that "the ancients" called the avocado "*Smaragdus piriforme*, that means emerald pear shaped," and showed its medical and industrial properties, calling the attention on the forgotten use of the seed in clothing marking. (4).

In 1926 Kerry Pittier (11), described seven varieties of avocado in Venezuela, which are:

"Aguacate Antillano, with oval fruits, green, large, weighing up to 500 gr. It comes from

warm land and from the coast and islands of the Caribbean Sea.

"*Aguacate redondo ordinario*, small fruit, green and tasteless.

"*Aguacate pera pequeño*, green or purple, with a fine flavor; it would not grow on places over 1000 in. high.

"*Aguacate de botella*, it is also pear shaped, but with a longer and thinner neck, its color is green or purple, and fine flavored.

"*Aguacate Veranero*, small, yellowish and tasty; it is cultivated during February and March in Caracas; it seems of a different kind.

"*Aguacate de anís*, rare in the country and from imported seed. It is a Mexican variety.

"*Aguacate pera grande*, its pulp is fragrant and fine, and comes from warm places."

Later on, mainly since 1936, a great number of varieties from different productive zones were introduced, especially from California and Florida, and some native species were selected; all this increased the extension of commercial orchards, and of course a notable improvement in the quality of the fruit was obtained.

Nevertheless, even though in 1961 existed in the country 12.264 Has. planted with avocado (1) "this great extension includes trees found in coffee and cocoa plantations and in small orchards, being the majority of poor quality." (2) Production in 1961 was calculated in 141.065.000 units, about 49.372 tons, with an average weight of 350 gr. per unit; but due to the inadequate systems of cultivation, packing, transportation and storage, the production was calculated in 34.500 tons for a value of Bs. 53.322.000 (About US \$12,000,000 at a rate of exchange of SI = Bs4.50) (2).

At the beginning of the season, farmers may obtain prices up to Bs. 140 per crate of the Pollock variety; but the product can be profitable even at a price of Bs 70 per crate. Table No. 1 gives the rate of avocado sale at the main market of Caracas during 1966.

In general we can say that the culture "tends to increase and to improve the quality, due to the great demand and the good prices that may be obtained for the fruit in the market." (2).

TABLE 1. Prices and amount of crates of avocados sold at the Main Market, Caracas, during 1966.

Months	Amount	Crates
		Average price Bs./crate
January	771	65.84
February	790	66.14
March	543	71.70
April	1451	70.78
May	1453	64.10
June	1929	80.00
July	2996	79.00
August	4314	64.00
September	5232	50.00
October	1903	70.00
November	530	103.00
December	888	71.00

Source: Departamento de Estadística, Mersifrica, Caracas.
One crate: 100 fruits.

Botany and Varieties

We will only refer to those species related to *Persea Americana* Mill. These are considered as native of the country. Luciano Bernardi (3), who wrote the only monograph existing about avocados in Venezuela, says that *Persea lignipetala*, which was considered native of the country, is in a very close relation to and has no difference from the *P. caerulea*. The same with *P. pachypetala*, which is a synonym of *P. mutisii* H. B. K., which is the only specie that he believes derived from Venezuela. He also considers Costa Rica's *P. skutchii*, as a variant of *P. caerulea*, which is extended through Colombia, Venezuela, Bolivia, and Perú.

We may as well say that the establishment of commercial orchards of avocados first started when the variety Pollock was introduced into the country from Trinidad in 1938.* Some time before this, had been introduced particularly different varieties from Ontario, California, but, really, the first important collection was established in the fields of the old Escuela Superior de Agricultura y Zootecnia**, located in El Valle, near Caracas, with grafted plants brought from California. Among the varieties of this collection were Fuerte, Puebla, Nabal and 13 others; there were also selected several native varieties. Fuerte and Trapp did not do very well at that time. Later on, some other varieties were introduced mainly from Florida ***, Brasil, Colombia and Trinidad.

Table No. 2 shows the collection of varieties Centro de Investigaciones Agronómicas, Maracay — established by Ing. Agr. Maximiano Figueroa, who has given us data of great interest for this article.

Pollock**** is the most popular variety in the country. Simmonds and Choquette follow in popularity. Booths and Lula are not being cultivated any longer.

On the following six pages, the photographs show exterior and interior appearance of selections of native material that exists in the Centro de Investigaciones Agronómicas, and in the collection of the Fundación Mendoza, located near Maracay.*****

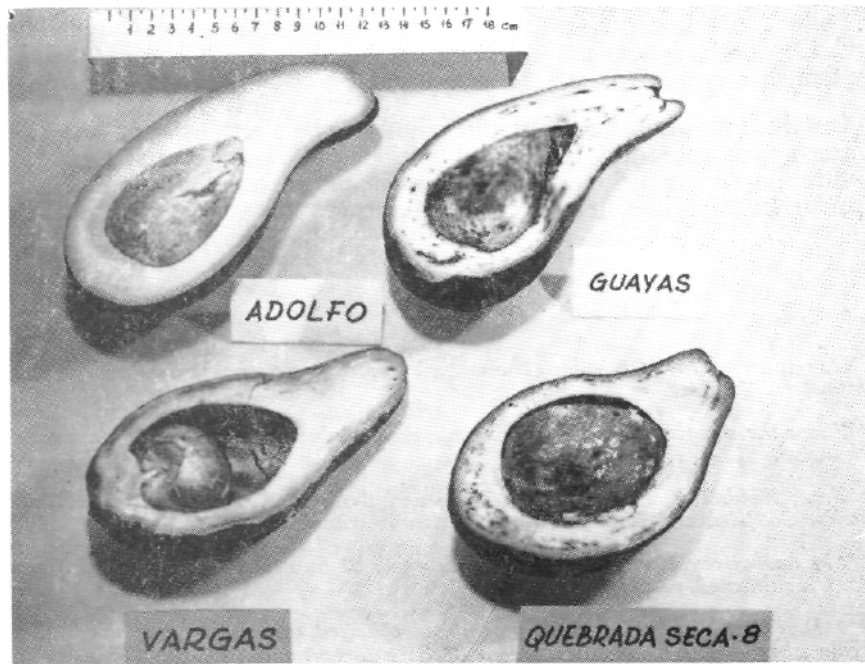
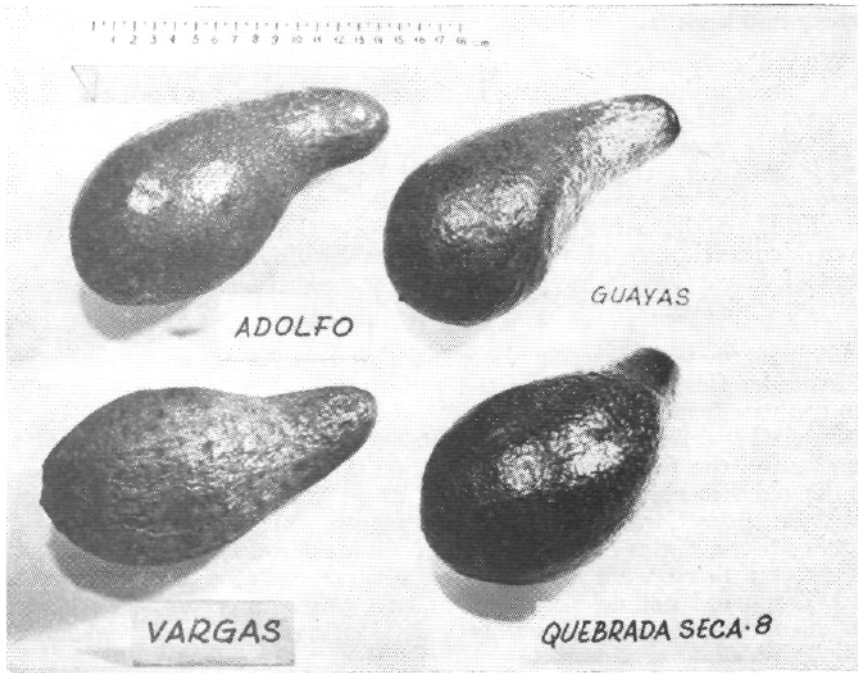
**Data given by Mr. Christian Greaves, who brought personally the first grafted plants from Trinidad.*

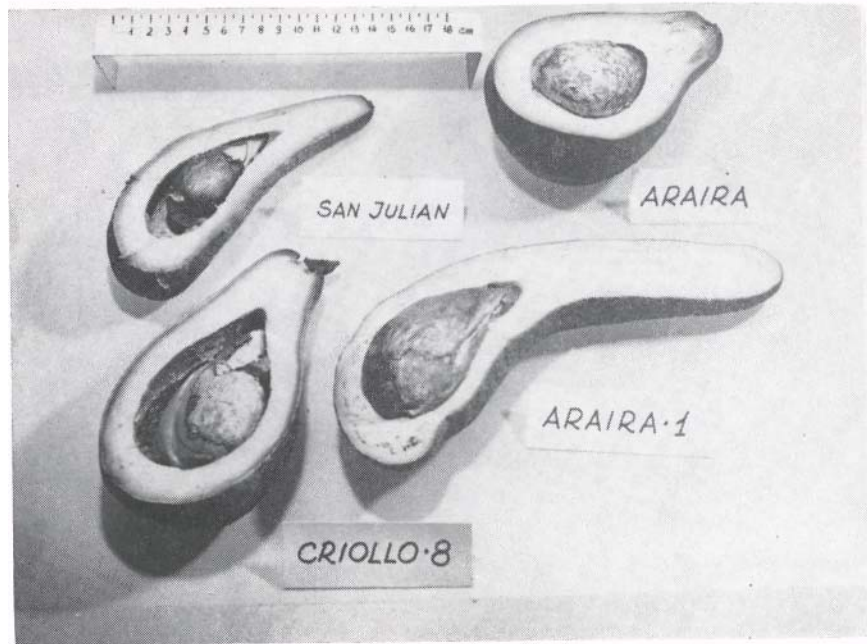
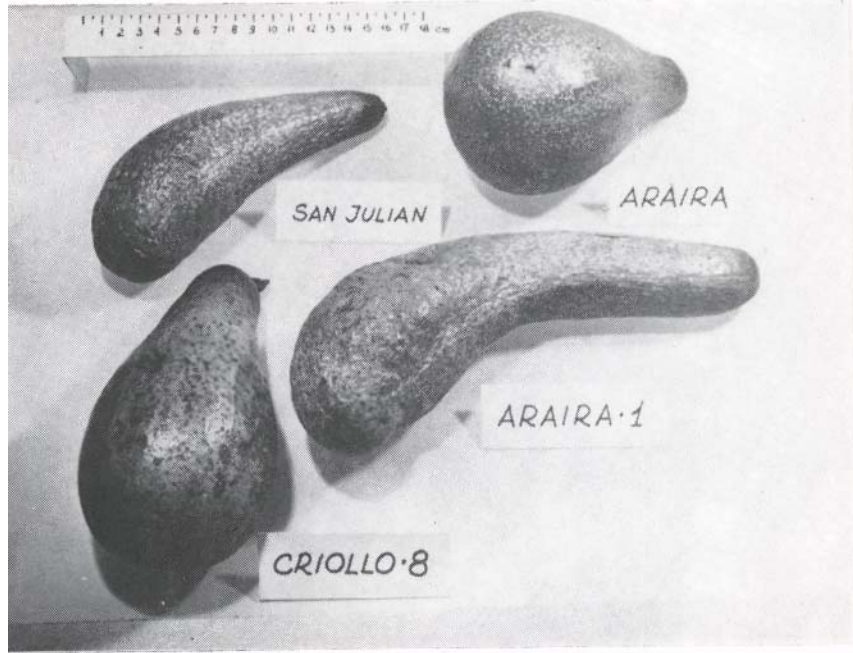
***Where the actual Facultad de Agronomía de la Universidad Central de Venezuela originated.*

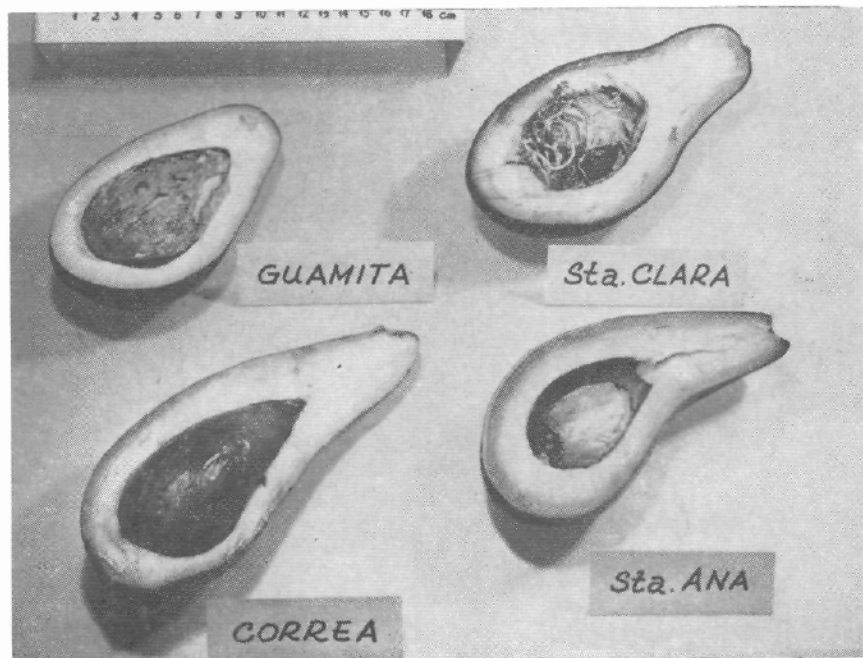
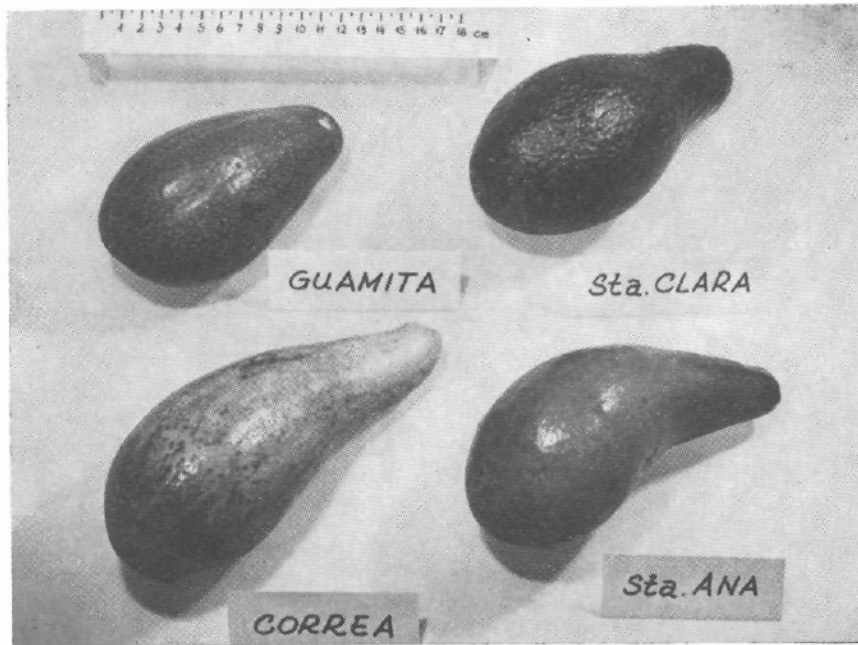
****From Kendall, Florida — imported the varieties Pollock, Fuchsia, Waldin, Simmonds, Gottfried and Lula for the collection in Maracay.*

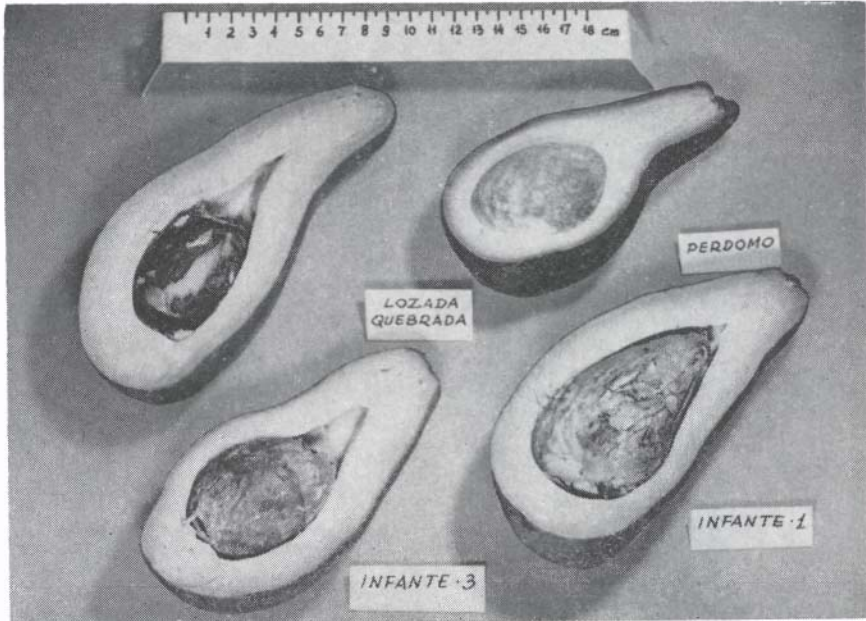
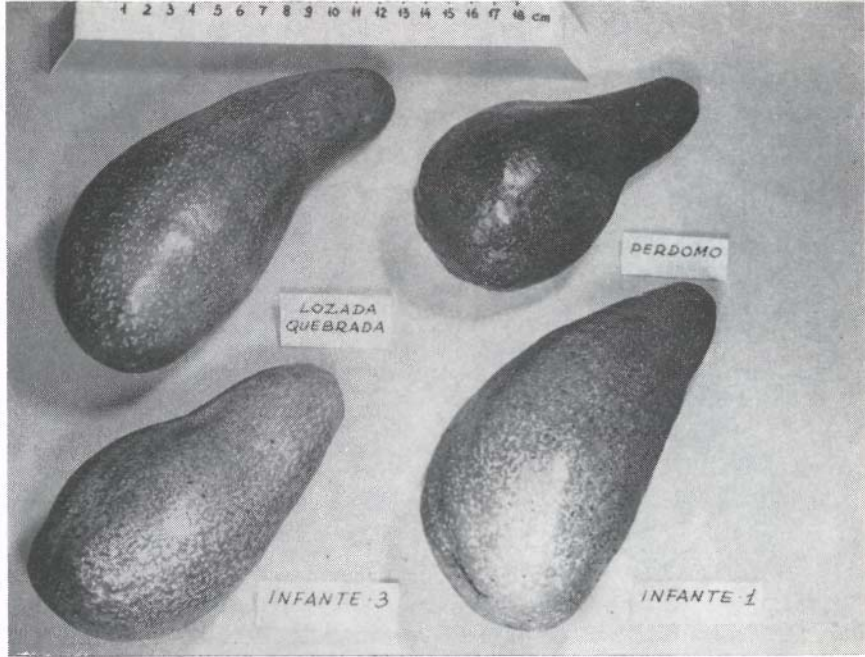
*****In one of our best grove, south of Lago de Maracaibo, a variety called Mara No. 1 is cultivated, possibly derived from Pollock.*

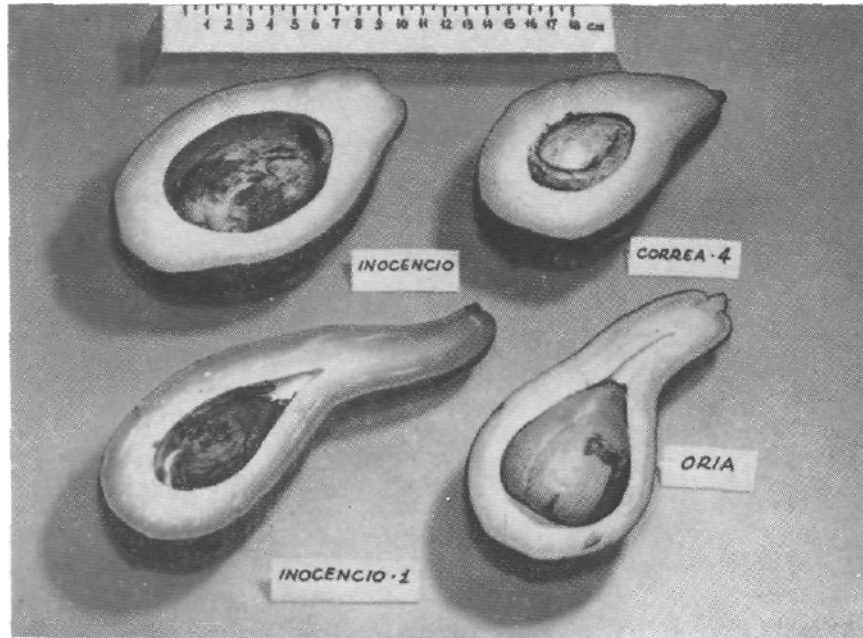
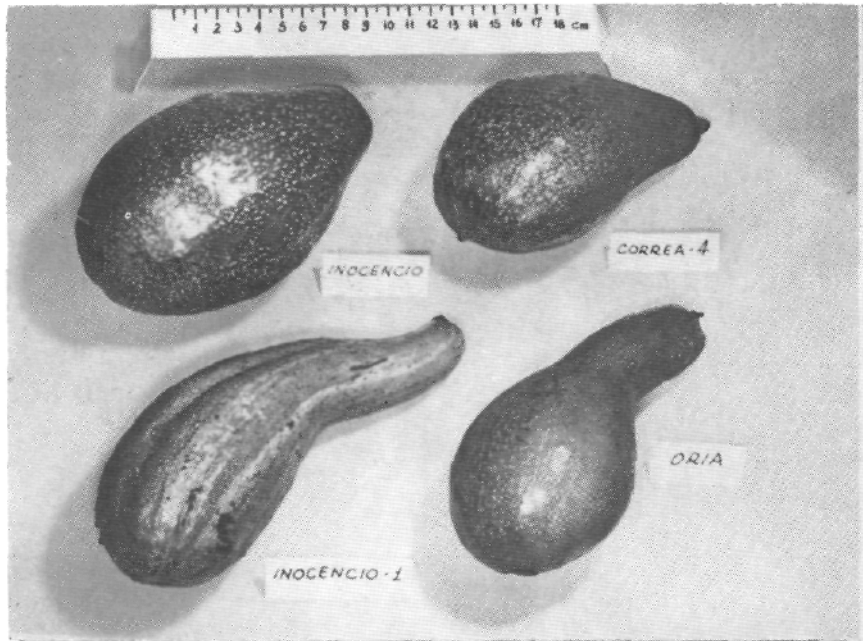
******Dr. W. Storey visited both groves and collected material of several of these Creole selections.*











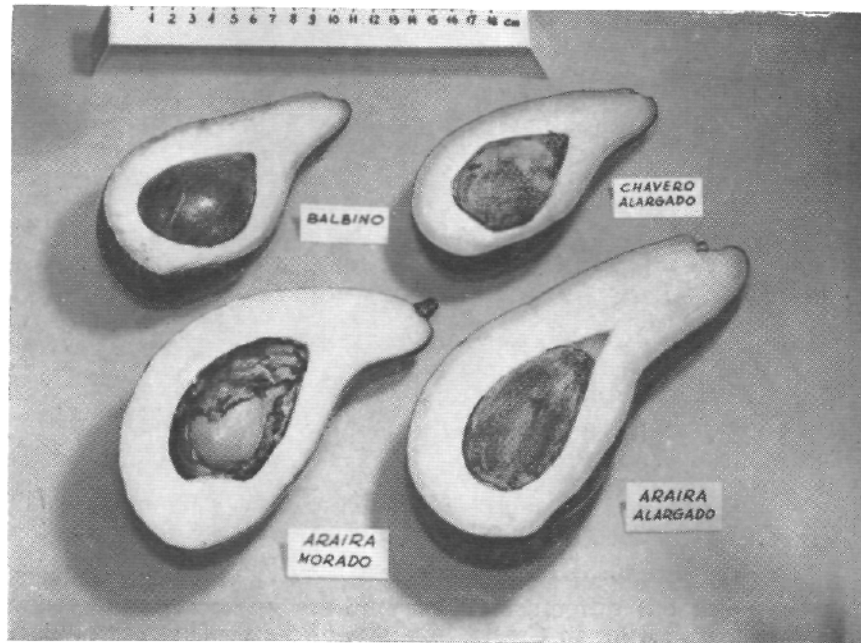
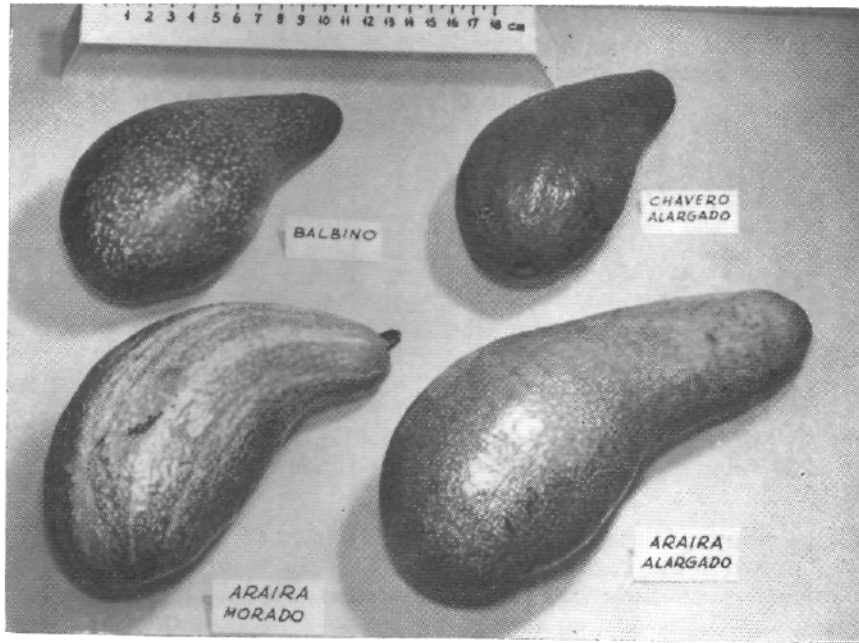


Table 2. List of name varieties being tested in the collection of the Centro de Investigaciones Agronómicas. Maracay (X).

1. Lula	16. Fuerte
2. Pollock	17. Winslowson
3. Waldin	18. River
4. Simmonds	19. Pope
5. Fuchsia	20. Russell
6. Booth-7	21. Luiz de Queiroz
7. Booth-8	22. Prince
8. Gottfried	23. Princesa
9. Puebla	24. Itzama
10. Hall	25. Gloria
11. Barker	26. Rudder
12. Choquette	27. Duke
13. Mexicola	28. Trinidad
14. Nelan	29. Linda
15. Tumaco	

(X), Collinson, Blackman, Solane, Taylor, Nabal and Northrop are also known in the country.

The Cuban varieties known as John and Catalina, are gaining some popularity among growers in the center part of the country.



Photo No. 13, shows two avocado leaves - - Creole, left Pollock, right to point out differences between them; more corrugated and with a yellowish color in Creole. The tree of the Creole, moreover, is of a different shape maintained even when grafted. Actually we are interested in the anatomical study of the leaf of the Creole!

Creoles, which provide the largest production, since they are used for shading our coffee and cocoa plantations, may be found from sea level to more than 1.000 m. high. Those Creoles fruits with a fat content in the vicinity of 12 to 15% should be cultivated in a commercial level until more information on the behavior of other imported varieties under Venezuelan conditions is found.*

Propagation

The large amount of shade seedlings and the ones found in familiar groves makes it easier to obtain a great deal of seeds for stocks. Seeds are selected from ripen fruits and according to sixes. When covers are taken off, the seeds are treated with a fungicide. Sometimes a centimeter is cut off the apical part.

Metal or plastic containers of a gallon capacity with sterilized soil are used. Some nurserymen plant the seeds on sand beds and then transplant to containers.

Budding was first used in the country, but there was a very low percentage of takes. Later on cleft grafting was recommended (14). Nevertheless, in the only experimental work, where shield budding, chip budding, veneer and side grafts were compared, it was proved that the last two yielded 93 and 98% of takes, respectively. For stocks four months old veneer** graft is recommended and side graft*** for stocks of 35 to 45 days, which represents an advantage of four to five months in the commercialization of grafted plants (5).

The price of a grafted plant ready for planting varies between \$1.50 to \$2.00. It is worthwhile to mention that a nurseryman spends approximately \$0.40 to obtain a stock ready for grafting. 80% of the sales are Pollocks.

**Quality of avocados in Venezuela is not taken from their fat content. Fruits similar to Pollock are preferred, taking in account size of the fruit, color of the pulp and fiber content.*

***As it is described for mangos on p. 540 Tropical and Subtropical Agriculture, Vol. 1, The Macmillan Co. 1961.*

****See p. 630 same.*

Climate

In Venezuela, a country twice as large as California, as is to be expected, climatic conditions vary a great deal from place to place, often, in the mountainous regions within relatively short distances. From this fact we derive that Guatemalans and Mexican avocados should not be planted in places like Maracay, for instance, with a mean temperature of 25°C and 450 m. above sea level, since some of the varieties would not even produce flowers; on the other hand, the West Indies types could not be adapted to areas as Merida with a mean temperature of 18°C and 1600 m. above sea level.

Nevertheless, with the great temperature variation and a frostless country, we assumed that all the varieties from Guatemala and West Indies races could be cultivated, including their hybrids, and maybe hybrids of the Mexican race, like Fuerte.

Soils

As a tropical country, there are few soils adapted for avocado planting in Venezuela, and there have been many failures due to the selection of a soil that, physically, and in other cases, chemically, did not have the appropriate conditions. In our opinion, soil conditions restrict avocado planting; therefore, we have proposed to the credit agencies not to give credits unless a detailed study of the soil to a depth of not less than 1.50 m. be made at the proposed site of the plantation.

In many places of the country the planting of avocados should be restricted to the soils on which seedlings are growing naturally.



In the general course on Fruitgrowing we teach students to study the physical characteristics of a good soil for avocados.

Some cultural practices

The more used planting distances are 8X8 m. or 10X10 m., depending on the variety.

Very good results have been obtained in the Centra de Investigaciones Agronómicas, Maracay, fertilizing with the formula 6-6-6-3 using 200 gr. to 1 kilo, plus 20 kilos of manure per plant, maybe because of the benefit of the organic nitrogen.

Farmers, however, use all kinds of formulas and quantities, since there is a shortness in experimental works on avocado's nutrition. Potassium deficiency is common. An iron deficiency induced by the great amount of calcium carbonate has been found in some soils, especially near the Lago de Valencia. Irrigation is used during the dry season. In Maracay, where the rainfall is 917 mm. annually during the months of May till October it is necessary to irrigate from November to April. Irrigation of alternate rows to avoid water clogging in the grove has been recommended.

Flowering and Harvesting

The flowering season and harvesting of some of the varieties on the collection of the Centro de Investigaciones Agronómicas, Maracay, may be observed from Table No. 3.

TABLE NO. 3 (15)

<i>Varieties</i>	<i>Flowering Season</i>	<i>Harvesting Season</i>
Waldin	Sep. - Nov.	July - Sept.
Pollock	Nov. - Dec.	Apr. - Nov.
Fuchsia	Nov. - Jan.	Jun. - Aug.
Lulu	Jan. - Feb.	Sept. - Oct.
Simmonds	Dec. - Jan.	July - Aug.
Booth-7	Aug. - Sept.	Mar. - Apr.
Booth-9	Aug. - Sept.	Mar. - Apr.
Gottfried	Oct. - Dec.	Apr. - Jun.
Puebla	Oct. - Dec.	Jun. - Aug.

The fruits are harvested weekly, once they have lost their natural brightness.

Unfortunately, little data about production per Ha. exists; nevertheless, there are Pollock plantations five years old near Maracay that produce 300 to 400 fruits per plant, with an average weight of 1 kilo.

Very much importance has been given in Venezuela to the classification of the different varieties according to their floral biology, so that farmers like to plant Class A varieties interplanted with Class B. It seems that there is an increase in the production when this practice is followed and many fruit growers interplant their grafted plants with seedlings, adducing that the greatest production is on the trees close to seedlings.*

**Bergh, Garber and Gustafson presented similar results in their article. The effect of adjacent trees of other avocado varieties on Fuerte fruit-set. Am. Soc. Hert. Sc. Vol. 89, 1965.*

Diseases and Pests

Root-rot disease caused by *Phytophthora cinnamomi*, due to saturated soils and poor drainage, has been found in a great number of commercial plantations and has caused considerable damages in the seedlings used for shading, sometimes killing up to 60% of the trees due to the effect of the disease. (7).

The fungus has been isolated from *P. caerulea* and Tung, also. Some other fungi causing diseases are:

Colletotrichum gloeosporioides. Causes black spots in the fruit and sunken spots on leaves.

Cercospora sp. Causes brown spots on foliage and fruits.

Oidium sp. Causes dryness of the inflorescences.

Pythium. Generally associated to *Phytophthora*, causes decay and wilting of the tree.

The alga *Cephaleurus virescens* attacks the leaves producing reddish spots.

It has been assumed that the fungus *Botryodiplodia* causes a die back according to observations made in the Centro de Investigaciones Agronómicas. Photo 14, shows the small avocado plant inoculated with *P. cinnamomi* that would not produce new growth when it is cut under the dead part. When this is done to an inoculated plant with *Botryodiplodia* it recuperates as it may be seen in the photograph. Anyway, all these observations are in their preliminary phases.



Left: Plant inoculated with *Botryodiplodia*.
Right: Plant inoculated with *Phytophthora cinnamomi*.

It is worthwhile to mention that *Sunblotch* has been found on Booth 7 at the Centro de Investigaciones Agronómicas collection.

There are only few pests attacking avocado in Venezuela. The more common are:

Selenothrips rubrocintus (Giard).

Thrips.

Selenaspidus articulatus (Morg).

Light scale.

Saissetia aleae.

Jocarassp.

Weaver worm.

Stenoma catenifer (Wals) Fruit borer.

Megalopyge lanata (Stoll) Chicken worm.

Atta sexdens (L), bachacks.

Nutritive values and uses.

Nutritive values for every 100 grs. of pulp of avocado.

Prots.	Lip.	Glucid	Cal.	Ca	P	Fe	Vit.A	Vit.B1	Ribof.	Niac.	Vit.C
Gm.	gm.	gm.		mg	mg	mg	U.I.	mg.	mg.	mg.	mg.
1.7	17.9	4.4	171	10	39	6	200	06.	12.	1.2	14.

The former Table (8) shows an analysis of the nutritional content of our avocados. Besides their use in salads and as seasoning of our typical "sancocho", avocados are most popular in the preparation of the famous and delicious "guasacaca", a meat sauce.

Following is the recipe:

¾ cup olive oil, ¼ cup wine vinegar, ½ cup chopped red pepper, ½ cup chopped onion, ¼ cup chopped parsley, 3 avocados cut into small pieces, 1 medium avocado mashed with salt, pepper and chili sauce to taste.

Mix all the ingredients in a bowl with a wooden spoon, add the salt right before serving so it won't darken the preparation. Sometimes an avocado seed is placed into the bowl.

Future

It may be briefly explained in the following paragraph: "In a few years, Venezuela may produce avocados on a large scale, but it is necessary that fruit growers understand the need of establishing their plantations on an industrial scale and with the varieties suitable for marketing. It is also necessary that they observe the essential means to harvest, pack and classify according to the required laws."

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