

AVOCADO VARIETIES

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The following discussion is intended for the many new California avocado growers who are continually entering the industry. Old and experienced growers may wish to skip it.

It has been aptly said that an avocado variety to be permanently successful should "Bear well, look well, ship well and eat well." In over forty years of testing innumerable varieties and seedlings, none has so far been found which fully meets all these four requirements. Since the organization of the California Avocado Society in 1915 the variety committee has been very active in the evaluation of the characteristics of new varieties and in studies of their individual climatic adaptation.

Edible avocados are classified in three races, the West Indian or tropical form which is not adapted to California climate and has never been commercially grown here. The Mexican, which is rather hardy to cold, has small fruit, thin skin and matures eight to ten months from bloom. The Guatemalan, which is less hardy to cold, has larger fruit usually, thick or leathery skin and matures twelve to fifteen months from bloom. In addition there are many hybrids between the Mexican and Guatemalan races.

When an avocado seed germinates, grows into a tree and bears fruit, the probability is that it will not meet more than one or two of the above requirements and be of little or no value. It must be budded or grafted over to some good and well tested variety in order for the crop to be worth while. Our present commercial kinds are those which approach the ideal in several of the above requirements. We are always hopeful of developing a variety which more nearly meets our ideals. For the originator or discoverer of such a kind is waiting both honor and financial reward.

In the early days, Wilson Popenoe, then with the United States Department of Agriculture, traveled extensively in Central and South American countries searching for the most promising avocado seedlings growing in those countries. He succeeded in introducing a great many kinds into California and Florida where they were tested and evaluated. Some were of very fine quality, but because they fell short in some important particular, practically none are being planted commercially today. One of the reasons some introduced varieties failed to become popular in the United States was because the fruits were too large to suit the average consumer. A seedling which bears fine fruit in Latin America may, when grown in the United States, prove a failure because of the great difference in the environmental complex. When seedlings of these introduced varieties are grown to fruiting in California they show much variation. Among them is sometimes found one or more which retain some of the high quality of the introduced parent and are at the same time better suited to our local conditions. With one notable exception, the Fuerte, all of the present varieties now being planted commercially have

originated as seedlings grown in California. Many fine old trees of introduced varieties, such for example as Nabal and Puebla, are still retained but are no longer being planted for profit.

One variety however is not enough for the basis of a sound commercial industry. In California we have the unique advantage of being able to harvest and market avocados throughout the year. Six months is about the limit for harvest and marketing of any one variety. That is why we in California grow varieties of both the Guatemalan and Mexican races as well as hybrids between the two, thus providing a supply for market throughout the year.

Each avocado variety has pronounced individual climatic and environmental adaptation and requirements. In California we have many differing climates; seashore, foothill and interior with many local areas where peculiar conditions prevail. Therefore the Variety Committee has been at great pains to observe and publish from time to time observations on the climatic adaptation of each variety under study.

Among varieties there is great variation in the size and form of buds used in propagation. Nurserymen are in that business to make a profit. There is a tendency for nurserymen to favor varieties which are easy to bud and which grow into thrifty and good looking nursery trees. Several of the best varieties ever found, with respect to quality and bearing have failed to achieve commercial planting because of the difficulty or extra expense involved in the propagation of nursery stock.

Consumer demand for avocados is not the same throughout the year. The greatest demand is from December 1 to June 1 when there is less competition from other fresh fruits, melons and vegetables.

The principal area of present commercial production consists of a narrow belt, variable in width, extending from the Mexican border northward to and including the western part of Santa Barbara county. In general a given variety will mature earlier in the southern end of this belt. This is fortunate as it extends the marketing period of the better kinds, such as Fuerte and Hass, which consumers have learned to recognize and prefer.

The manner in which a variety ages on the retail stand is of vital importance. As an example, the Spinks, considered a heavy bearing and good variety in the old days, went completely out of favor because, when aging, it first showed spoilage around the seed. Thus the consumer was deceived by the fine external appearance, and made so much complaint that dealers refused to handle the Spinks except at very low prices. In contrast the Fuerte, like an aging banana, begins to show spoilage on the outside first, and no one need be deceived.

REGISTRATION

In order to reduce confusion in regard to the names of meritorious seedlings, to encourage growers to report on their most promising ones and submit samples of the fruit; this society, in 1931, established a system of seedling and variety registration. Growers are invited to furnish samples of seedling fruit to the variety committee, a suggested name and information with respect to location, age and bearing record of the parent tree. The fruit is tested in the laboratory and submitted to a tasting test by

experienced personnel. A report is then sent to the grower and a description may be published in the Yearbook. If the suggested name consists of one word, neither adjective nor verb, and has never before been used for an avocado, it is registered for this particular seedling. This procedure names and identifies the seedling but does not make it a variety. Only propagation and distribution under that name gives it a true varietal status. During the past twenty-five years hundreds of seedlings have been registered, several of which have become well-known varieties. This service by the society has resulted in a great reduction in the confusion which arose from the previous indiscriminate naming and propagation of seedlings.

TOO MANY VARIETIES

Since the beginning of the industry several thousand avocado seedlings have been named and propagated to some extent in California and Florida. Basically this has been a good thing because without it the chance of recognizing a superior kind would have been small. Many varieties are quite limited in their environmental requirements. It is therefore necessary to test them by planting budded trees in different localities and observing their behavior for several years. This requires much time and before their value is fully known enthusiasts may have planted more trees than later developments warrant. Even if a variety proves lacking in marketability, few growers are in any hurry to top graft to some better kind so long as the tree yields a reasonable amount of fruit which may be salable at some price. Thus we find the present market burdened with a great number of mediocre kinds which packinghouse men refer to as "Cats and Dogs." In the 1953-54 crop year there were delivered to Calavo 184 different kinds comprising a total of 1,392,119 forty-pound field boxes. Of these 38,221 boxes were mostly cats and dogs which not only depressed the market by confusing consumers, but caused much extra expense in packing and marketing.

This society is now conducting a campaign of publicity to impress growers with the urgency of top-grafting their cats and dogs to better kinds thus reducing this handicap to the industry. While that is all to the good we must keep in mind that we are still diligently searching for better varieties than any we now have which mature at a time of good market demand. The only way to test marketability is to subject a considerable volume of fruit of a new variety to the consideration of packers, shippers, retailers and consumers. Their verdict may be hard but will be realistic. While this takes time, it is absolutely essential for intelligent evaluation of a variety. A certain amount of such trial fruit, preferably in cooperation with the society, is necessary in the interest of progress. Nevertheless the number of varieties delivered for sale could, by a top-grafting campaign, be reduced to about fifteen or twenty without serious harm to any grower and with great eventual benefit to the industry.

For too long this industry has been carrying on its back a great load of deadwood in the form of antiquated varieties now of little or no commercial value. But if we do not continue to produce new and better kinds we will stagnate. The public-spirited grower who is interested in growing and testing new seedlings of some promise should be encouraged. He should separate his test plot from the rest of his orchard. In many ways he may find it an expensive luxury.

PATENTED VARIETIES

Under the United States Plant Patent Law of 1930 all rights of propagation and sale of a patented plant variety are reserved to the owner of the patent. Since passage of the law some fourteen avocado seedlings have been named and patented. So far only one, the Hass, has achieved commercial status. The patent rights on the Hass expired in 1952.

The plant patent law is most advantageous when applied to plants, such as carnations and roses, which are largely propagated for a very short life use. So much expense and time is involved in bringing an avocado seedling into popular recognition and demand that the use of the plant patent law is at present not very attractive.

SEASONAL MARKET DEMAND

As previously pointed out the demand for avocados is not the same throughout the year. The peak of consumer demand is from February through May. Demand is much less during the summer months when deciduous fruits, grapes and melons, not to mention West Indian race avocados from Cuba and Florida, are plentiful and compete for the housewife's money. Therefore the varieties which are marketable from the first of January to the first of June are the logical choice for principle commercial planting in California. The Fuerte variety meets this requirement and as a result has come to represent between 65 and 70 per cent of the avocado production in this state.

Some experienced avocado growers are now raising the question as to whether the California industry is getting out of balance. Do we now have too large a proportion of Fuerte which is notably unpredictable in bearing habits? The total crop varies too widely from year to year to sustain an economical advertising program. This creates serious problems for the agencies responsible for packing and marketing. In the long run this results in generally lower prices for the growers. It is therefore timely that newcomers have dependable information about the Fuerte when deciding on what proportion of that variety for their location.

FUERTE REVIEW

The Fuerte variety originated as a seedling in the patio of Alejandro LeBlanc in the town of Atlixco, State of Puebla, Mexico. The original tree was discovered by Carl Schmidt who, in 1911, sent budwood to the West India Gardens in Altadena, California. There it was successfully propagated. The buds grew so well that the name "Fuerte," which in Spanish means strong or vigorous, was given it. Nothing is known as to the parentage, but inasmuch as its characteristics include those of both Guatemalan and Mexican races, both of which grow in Atlixco, it is assumed to be a natural hybrid. It grows well on Mexican rootstock.

Because of the vigor and ease of propagation, nurserymen found more profit in growing the Fuerte than any other variety and became advocates and promoters of it. Like many other varieties Fuerte does not do equally well in all localities.

The frost resistance of Fuerte is midway between the tender Guatemalans and the more hardy Mexican varieties. For this reason it has been extensively planted at somewhat

lower elevations than are safe for such Guatemalan varieties as Anaheim, Nabal and Hass.

In the foothill zone in Southern California Fuerte appears to be immune to the anthracnose disease of the fruit to which it is so seriously subject in localities of much higher atmospheric humidity such as Florida and south Texas. In a narrow zone immediately adjoining the coast, in northern San Diego County, there has been trouble due to spotting of the fruit by the fungus *Dothiorella*. As a result few Fuertes are being planted very near the sea in this area.

MARKETABILITY

The Fuerte is unique with respect to its marketing season which extends from November in southern San Diego County to June in Santa Barbara County. It is also unique in its ability to hold mature fruit on the tree in good condition for three or four months or more. This permits shippers to spread the crop over a longer season than is possible with any other variety. Consumers have become familiar with its green skin, pyriform shape and general appearance and have learned to recognize and prefer it.

Through all the operations of picking, handling, packing and shipping to distant markets the Fuerte stands up well. It has the valuable quality of showing age spotting on the outside first. Oil content usually reaches the legal content of 8% in some southern areas as early as the end of October, at which time the rich nutty flavor is somewhat lacking. Optimum flavor for most consumers is associated with oil content above 12%. The seeds of some seriously over mature fruits may sprout inside the fruit before picking and grow through the flesh.

When properly softened the leathery skin yields to gentle pressure and peels readily from the flesh. The size of the seed is medium, the proportion of flesh being satisfactory. The brown seed-coats sometimes adhere to the flesh, especially in over mature fruits and this is objectionable. When cut up for salads, Fuerte flesh does not oxidize or turn brown on standing as is the case with many other varieties. This feature is greatly appreciated by housewives.

BEARING HABITS

It has been pointed out that to be permanently successful an avocado variety should bear well, look well, ship well and eat well. The Fuerte meets the last three of these requirements to such a high degree that it has been widely planted in spite of its failure to yield fruit dependably. While it rates tops with consumers and all those responsible for marketing, the growers who depend on yield for profit are, as time goes on, becoming more and more impatient. Indeed the Variety Committee, in cooperation with the University of California, has for years been searching for some "Fuerte-like" new variety which will bear better; so far with little success.

While this search goes on it may be well to try to discover the causes of the wide variation in yields between individual Fuerte trees in the same orchard. Many other kinds of fruit trees have a tendency toward alternate bearing and this is undoubtedly

true with some kinds of avocados. Records of yields of individual trees in a number of Fuerte orchards, extending over a period of years, have shown that certain trees are, in fact, dependable bearers. This difference in yield habit may be due to two distinct independent factors; somatic variation and root-stock influences.

SPORTING (Somatic Variations)

The Fuerte, being a hybrid between two races appears to have a much greater tendency toward sporting than varieties of one race such as Nabal or Mexicola. In the opinion of some students, the original Fuerte mother tree in Atlixco probably had a sport limb and as a result the original buds cut by Schmidt may not have been completely uniform genetically. This cannot be proved because the original tree is now dead. Be this as it may it is now generally recognized that it is much more important to use great care in selecting buds for Fuerte propagation from trees with a record of regular bearing, than it is with other varieties. Lack of knowledge of this need in the early years of the industry probably accounts for the unwitting propagation of many of the low yielding or barren trees in the earlier plantings. Responsible nurserymen now use such great care in the selection of Fuerte buds that present supplies of nursery trees are greatly improved. However this has by no means completely solved the problem because it has been observed that in orchards in which all the trees have been budded with buds from one good mother tree, there is still considerable variation in the yield record between trees growing under similar conditions.

ROOT-STOCK INFLUENCES

Many varieties including Fuerte have a natural tendency toward alternate bearing. While, due to late spring weather conditions, the Fuerte crop as a whole may be light two years in succession, it is notable that variations in yield between trees budded from the same source and growing in the same orchard show greater variations in yield than can be attributed to somatic variations.

Inasmuch as all Mexican root-stocks are, as far as we know, heterozygous (of mixed parentage), each tends to influence the Fuerte in different ways. One such influence may have to do with the time of blooming, and in this there is much variation between trees. It is common observation that Fuerte blossoms do not set fruit well until atmospheric temperatures during the blooming season have reached a certain high level. It has also been observed that individual trees that bloom early are likely to be all through blooming before spring weather warms up sufficiently to permit setting. In contradistinction those trees which may be influenced by the root-stock to retard or prolong bloom are, in similar environment, the best producers.

Probably the Fuerte acquired its early blooming habit from its Mexican race parentage. Some pure race Guatemalans, such as Anaheim, Dickinson and Hass are all late bloomers and usually set good crops in spite of the presence on the trees of fruits of the previous year.

It has been found that for various reasons neither the Guatemalan or West Indian races of avocados are suitable for root-stocks in California. Hybrids between the races are too

variable in growth characteristics to be used profitably by nurserymen. In California Mexican race root-stocks are almost invariably used.

Much research by investigators has been devoted to the problem of rooting cuttings from a particularly vigorous Mexican seedling to be used as root-stock in the hope of getting more uniform resistance to root-rot. This is being accomplished but the process is so complicated that it is not satisfactory under commercial conditions. It is important that such research be continued, and as far as Fuerte propagation is concerned, limited to cuttings from sprouts from below the bud-unions of old Fuerte trees which bloom late and have good bearing records.

Another approach to the problem of getting greater yields within the Fuerte season may be the increased use of other varieties which encroach on either end of that season. Fuertes harvested too early or too late are less satisfactory to the consumer. There is always a tendency for producers to pick too early or too late in the hope of gaining from the price reputation of Fuerte.

At a meeting of this society on November 4, 1932, at Santa Ana the principal subject of discussion was "How to Make the Fuerte Bear." There were eight addresses by men who were leaders in the industry at that time. The problem is not new and so far, although progress has been made, it has not yet been satisfactorily solved.

Newcomers who purchase properties with old bearing avocado trees which include Fuerte and perhaps some old and obsolete varieties would be well advised to do two things. Keep a three-year record of the amount of fruit produced by each individual Fuerte tree. Those which fail to bear profitable crops should be top-worked with scions from a heavy bearing mother tree growing in the same area. In the experience of this writer this has resulted in improved bearing even though the root-stock has not been changed.

Old trees of undesirable or obsolete varieties should be grafted to better kinds. In deciding on what kind, it is advisable to secure advice of the local county Farm Advisor who will be familiar with the climatic environment and perhaps may know of some yield records taken in that neighborhood.