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COMPARATIVE MERITS OF THE CALIFORNIA AVOCADO VARIETIES

L. B. Scott
U. S. Department Of Agriculture, Washington, D. C.

Mr. Chairman, Members of the California Avocado Association, Ladies and Gentlemen:

I had the pleasure of meeting with you at San Diego, and certainly appreciate the privilege of being here today. As one part of the subtropical fruit project of the Office of Horticultural and Pomological Investigations of the United States Department of Agriculture, which project I have the honor of leading, we began a year and a half ago a study of the comparative merits of the different Florida avocado varieties, and the variations within these varieties. It seemed worth while that our Florida work should be duplicated in California, and I have, during the last six months, devoted considerable time to a study of the California varieties.

A report on our Florida investigations was given at the San Diego meeting, and I have been asked by your President, as well as a number of the members of this Association, to present a report on our California work at this time. It must be clearly understood that the observations which we have been making the last year are simply preliminary and that these investigations will of necessity have to be continued for a number of years before conclusive results can be published. However, as the most important problem which confronts the California avocado grower is the proper selection of varieties, with the understanding of the audience that any remarks which I make today that now seem conclusive may be subject, to revision even within a year's time, I am very glad to give a preliminary report of our California investigations.

In my observations I have tried to assume the role of a grower and not that of a nurseryman. The success of the California avocado industry will be determined entirely by the ability of the pioneer growers to agree on a few standard varieties which can be developed as typical California products. Just as soon as the growers,—the members of this Association, —can decide on a short list of five or six varieties which will assure a supply of good commercial fruit throughout the year, the biggest problem confronting the industry today will have been solved.

The California avocado nurserymen have been severely criticized for carrying so many varieties. I think this criticism is unjust. I have talked with every important nurseryman in the state, and they have all said that just as soon as this Association takes definite action on the matter of varieties, they will fall in line and carry only the five or six which the Association will recommend. So the solution of the problem rests with you. Until the nurserymen can be given definite assurance that certain avocados will be developed as standard products, they will continue to list forty or fifty varieties.

When I returned to California last fall I had had some experience with avocados in Florida as well as in the Eastern markets, and my observations there had led me to

believe that the ideal fruit for commercial purposes was one weighing a pound or a pound and a half, preferably pear-shaped, with a small seed, free from fiber, and last and probably most important of all, a fruit that would be served in the half shell.

At the San Diego meeting I heard some discussion of the small Mexican thin-skinned varieties and the place they would fill as commercial fruits. I wondered whether I was mistaken and whether the fruit men in the large Eastern markets and the hotel men in the East did not know the kind of fruit their trade wanted. I therefore was very glad to hear the excellent paper presented by Mr. Thos. H. Shedden of Monrovia, entitled "The Hotel and the Avocado," and to find my views confirmed by a practical hotel man. Further investigations in this state have convinced me that the ideal avocado for California and the Western markets will be the same as that demanded in the East. The tree should be hardy, a vigorous grower, and relatively immune to fungus and insect troubles; the fruit should weigh a pound, a pound and a half or possibly larger, have a small seed, be free from fiber, rich m oil, and one which can be served in the half shell. (See frontispiece.)

I wish at this time to express my appreciation to Dr. Webber and the members of this Association who have co-operated with us in our avocado studies. I have visited all the original trees of the important commercial varieties and whenever the grower was willing that we should, we have secured performance records of the amount of fruit produced by the original tree and budded trees of the different varieties. The record of the original tree is important, but of far greater importance is a knowledge of what the budded trees are doing.

I also wish to express my hearty appreciation to the growers and nurserymen who have co-operated in this work, especially Mr. Nusbickel, Mr. Whedon, Mr. Beck, Mr. Spinks, Mr. Taft, Mr. Sharpless, Mr. Wagner, Mr. Popenoe, and many others. I have tried to visit all the trees under observation a number of times, and through our co-operators have kept track and am keeping track of the amount of fruit produced by each tree. In many cases we have not only a record of the total crop produced by each tree, but also the fruit secured from each pick from the tree.

In addition to our field of work we have co-operated with Mr. E. M. Chace, of the Bureau of Chemistry, United States Department of Agriculture, whose laboratory is here in Los Angeles. He has made and will make further analyses of the varieties which we have considered merited further study. These analyses have not been made from a single fruit. At least three fruits from a single tree have been used for a sample, and in many cases samples have been secured at different times from the same tree. We hope by these and future analyses, that Mr. Chace will work out a picking maturity standard for the different California varieties, as he has so successfully done for oranges. Analyses have been made of the standard and Redondo strains of the Fuerte, the Sharpless, Monroe, Lyon, Surprise, and Lambert, and analyses are now being made or will be made of the Blakeman, Spinks, Dickinson, Taft, and Caribou.

Of the great number of avocados now growing in California, not a single one can be found which possesses all the desirable characteristics of the ideal variety. The following short list based on the past and present performance are those which seem to approach the requirements of an ideal avocado. This list which would insure in a single

planting commercial fruit throughout the whole year, is: Sharpless, Fuerte, Surprise, Spinks, and Taft. A possible substitution might be the Monroe, or Lyon for the Surprise, and the Blakeman or Dickinson for the Taft. However, if all are included, we would only have a list of nine, which certainly is much better than 1 30. Further study probably would reduce the number to five or six.

The Sharpless is, in many respects, the most remarkable avocado in California today. The original tree is owned by B. H. Sharpless, Santa Ana, R. F. D. No. 1, and first bore in 1912, bearing 2 fruits that year, 20 in 1913, 75 in 1914, 250 in 1915, and over 600 in 1916-1917. Its season is from October to March, and 9 avocados in perfect condition were remaining on the tree as late as April 1 this year. The fruits average 20 to 22 ounces in weight, are pear-shaped, and when mature show a beautiful bronze color. The seed is small and the flesh free from fiber. The only objection that can be raised to the Sharpless is that the young trees are rather tender. However, these trees undoubtdly will acquire hardy characteristics as they grow older, as the original Sharpless tree passed through this last winter without any frost injury.

Next in the list is the Fuerte. Of the desirable kinds, this is the hardiest one of which I have any record. In Mr. Phales' planting near Placentia and in the Hardin and Keller grove at Yorba Linda, young trees of the Fuerte showed practically no frost injury the past winter, when even the Knight varieties in the same plantings were damaged. According to Mr. Chace's analyses, the Fuerte shows 25 and 26 per cent fat. The only other thick-skinned fruit which runs this high is the Miller, which has been reported as containing 26 per cent. At Yorba Linda, Fuertes were picked this last season from December 28 to April 1 5; at Altadena this variety was a month to six weeks later in maturing. A performance record of all the three-year-old budded Fuerte trees in the J. T. Whedon planting showed a range in production from 1 to 85 fruits. The only objection to the Fuerte is that the fruits are slightly undersized, only averaging 12 to 14 ounces. However, because the Fuerte can withstand more cold than any other desirable variety, it can be used in home plantings instead of the Mexican thin-skins, and as its season is slightly later than the Sharpless, it matures at a time when there are no other desirable fruits in the market.

As the last of the Fuertes are being harvested, the first Surprise fruits begin to ripen. But for one characteristic, this variety would be pronounced ideal. The Surprise has been reported as only averaging 1 0 per cent fat. In former years this variety has been picked too soon, and as the analyses were undoubtedly made when the fruits were immature, this probably accounts for the low oil content. I tasted a Surprise fruit in February and another in March. Both of them had the typical sweet, watery, almost sickening flavor of an unripe avocado. Another fruit harvested in April had a fairly rich taste, and I believe the analyses which are now being made will show the Surprise ranking well in its oil content. The original tree is owned by Mr. C. F. Wagner, Fountain and Fairfax streets, Hollywood, and bore 1 fruit in 1915. The tree was seven years old at that time. It had 81 fruits in 1916 and has 300 or more this year. They average 20 ounces in weight, are pear-shaped, have a small seed, and are free from fiber. Even though the Surprise does not develop a high oil content, if allowed to remain on the tree as late as June, because of its beautiful exterior appearance and size, it will have to be ranked as a standard avocado for many years to come.

Some people no doubt would advocate the substituting of the Lyon for the Surprise. The Lyon is the most precocious avocado we have in California, and in many cases the trees literally bear themselves to death. This condition can be remedied by thinning the fruit the first two years, the best demonstration of this being in the Joseph Sexton planting at Goleta. The fruits average over a pound in weight, have a fairly rich oil content, a medium size seed, and show a slight trace of fiber. The tree has the habit of growing like a telegraph pole with no branching. This makes it unsuitable for a standard orchard planting. However, it has a distinct place, I believe, as a filler. If standard varieties, such as the Sharpless, Surprise, and Spinks, are planted in rows 24 feet apart and at intervals of 30 feet in the row, the Lyon trees could be planted as fillers so that they would be 15 feet from the standard trees. Because of their habit of growth, they could be left in the orchard for six, seven or possibly ten years, without materially interfering with the development of the other trees. One three-year-old Lyon tree in Mr. T. N. Beck's orchard, La Habrá, had over 60 fruits this year. If this tree should annually average this production for the next three years, it would be a very profitable filler in any avocado orchard.

Another spring fruit that merits further study is the Monroe. The fruits are smaller than the Surprise, have a larger seed, and show more fiber in the flesh than the latter, but have a higher oil content.

Next in the order of maturing is the Spinks, the original trees of which are owned by Mr. W. A. Spinks of Duarte. Although these trees have been severely cut for budwood, they are bearing heavy crops this year. The season of this variety now appears to be from May to August, and a two-year-old topworked tree in the Spinks planting this year gives every indication of holding its fruits even later than this. The fruits weigh considerably over a pound, are oval to slightly pyriform in shape, and turn purple when mature. Of the desirable varieties, young trees of the Spinks rank second to the Fuerte in hardiness and are much hardier than the Sharpless. They seem in this respect to be on a par with the Knight importations.

The Taft has long been looked upon as the standard summer California avocado. The fruit has a rich flavor, analyzing 18 per cent oil, and when the trees come into bearing they are productive. The Taft season is June to September. There are several serious objections that can be raised to the Taft,—the trees are very slow growers, the budded trees as a rule do not come into bearing early, and they are very susceptible to frost injury. For this reason it may be supplanted by the Blakeman as a summer fruiter or it may be found that the Spinks will completely fill the gap between the Surprise and the first of the Sharpless season.

An objection to the Blakeman is that it belongs to the Murrieta strain of trees, and budded trees of all the other varieties introduced by Mr. Murrieta appear to be very weak growers. The Blakeman shows this came characteristic at Mr. Spinks' place, and the trees which he has are making a very feeble growth; on the other hand, in Mr. Adams' planting near Upland, the Blakemans make a wonderful showing. Probably the best comparison of the Blakeman and Taft will be found in Mr. Adams" planting, where these varieties are planted alternately in a long row.

Another summer fruit that deserves further study is the Dickinson. Judge Silent of

Glendora has the largest planting of this variety. In spite of the exceptional care which he gives his trees, a few of them are making a sickly growth similar to the Dickey or Royal.

Another avocado now fruiting in California that is worthy of observation is the Caribou. This is a variety that is fruiting for the first time at Mr. Spinks' place. There are six trees of the Caribou, five of which are bearing fruit this year. The tree is as beautiful an avocado tree as I have ever seen, both as regards the quality and quantity of foliage and the symmetry of growth of the tree. As an ornamental it would be a decided acquisition. The fruit is a hard-shell and will probably average a pound in weight. No idea can be formed now as to its probable fruiting season or quality, but it looks very promising.

I have paid very little attention to the thin-skinned varieties, for, while they might prove interesting in home plantings or in varietal collections, the fruits are too small to meet the market demands, and therefore cannot be given serious consideration as commercial possibilities. Of the other thick-skins, budded trees of Colorado, Dickey, Presidente, Murrieta Green, and Royal make a very sickly growth, or if they do live to produce one or two crops, they die. The Solano has a very low oil content and the trees are quite tender. The Challenge has a large seed, a low oil content, and a large amount of fiber. The Grande fruits in Mr. Whedon's planting developed a black decay at the blossom end, and also showed a large amount of fiber. This variety has been reported by George B. Cellon in Florida as not showing any fiber (I have not seen the variety in Florida, and therefore cannot give any first hand information concerning its behavior in that state.) At the West India Gardens, the Grandes have not shown the black decay noticeable in the Whedon orchard, but some of them cracked at the blossom end. The single Perfecto fruit that was saved out of three that matured at the West India Gardens (the other two were stolen) weighed 1 pound. The seed weighed 4 ounces and the flesh showed a trace of fiber. It did not taste as rich as the Fuerte. Puebla, Wagner, and Walker are too small to be considered as standard avocados. They also mature fruit when they are in competition with larger, and better varieties; the Puebla comes in the earlier part of the Sharpless season and the Wagner and Walker mature at the same time as the Surprise and Spinks. The Lambert is a shy bearer and the fruits have a tendency to crack; the Hartley shows this same tendency. The IXL has too much fiber and the trees are not as vigorous as the Spinks. Miller, Meserve and Ferry are shy bearers. Most of the budded trees of the Sinaloa have a bushlike habit of growth and do not appear very vigorous. Beauty, Champion, Rhoad, and Señor have been discarded by Mr. Taft as not worthy of extensive propagation.

The Knight introductions are making a good growth. It is to be hoped they will mature fruit this coming year. Mr. Knight deserves a great deal of credit. He went to Guatemala, searched for the best varieties he could find in that country, and introduced budwood from these superior trees.

The Queen is blooming heavily and gives every indication of setting a crop. Linda and Rey are showing some blooms. All of Mr. Knight's introductions deserve close study this coming year.

Even though this Association should, in view of the present information and knowledge,

recommend that the Sharpless, Fuerte, Surprise, Spinks, and the Taft or Blakeman be developed as standard varieties, with the Monroe, Lyon, and possibly the Dickinson carried as supplementary ones, the problem then is only partially solved. The accompanying chart (Table 1) shows the wide range of variation in a three-year-old planting of budded Fuertes in Mr. Whedon's grove, Yorba Linda. The lowest producing tree bore 1 fruit, the highest 85. Three distinct strains were found which were characterized by the shape of the fruit, round, oval, and pyriform. The round strain has been propagated as a distinct variety under the name of Redondo. Out of the whole planting not more than ten trees were found, possibly less, which should be used as sources of budwood.

A similar variation is seen in the G. W. Beck, Lyon planting at La Habra. The plantings are of different varieties, propagated by different nurserymen, but both show the great variation that will be found in all your avocado orchards unless the nurserymen are compelled to cut bud-wood from fruiting trees with a known record.

And so, even should you feel your Association cannot take any definite action on the matter of varieties, you can at least urge the nurserymen to cut budwood only from fruiting trees. There are or will be, next year, a sufficient number of fruiting trees of the desirable varieties to furnish a large amount of record budwood.

At the San Diego meeting I urged your Association to take definite action on the elimination of varieties. I wish to go even further this time. Your Association is bound to be a great factor in the development of the avocado industry of the country; your reports are the recognized authority on all subjects pertaining to the avocado; you as members and directors of this Association owe it to the industry to publish as soon as possible, a short list of varieties which can be developed as California products. The only way you can be in a position to do this is by securing a record of the amount and quality of fruit produced by every desirable avocado tree in California.

AVOCADO VARIATIONS

GROVE OF J. T. WHEDON, YORBA LINDA, CAL., 1917

Fuerte Variety, Number Fruits Per Tree

Tree No.	Row Numbers						
	2	3	4	5	6	7	8
1	..	26	..	71	..	..	..
2	12	14	19	..	..	..	..
3	73	..	..	11	..	..	..
4	7	1	11	59	..	..	..
5	20	56	2	32	..	..	..
6	..	23	17	7	..	..	..
7	..	16	7	..	..	..	..
8	..	2	13	..	..	..	..
9	4	..	..	42	..	..	..
10	24	..	8	11	10	..	..
11	10	..	26	..	..	..	..
12	20	4	..	..	..	..	..
13	10	28	..	..	..	58	..
14	11	17	..	..	..	3	5
15	2	..	..	..	..	..	5
16	3	..	..	..	..	..	45
17	2	..	..	..	..	..	85

I hope I will be able to return to California next year and continue our investigations. I feel sure that the growers who have co-operated with us this year will continue their records another year. Although the state and federal officials may devote considerable time to a study of avocado varieties, the real solution of the question will rest with this Association. Urge every member to keep records of the output of his individual trees, appoint some official who can handle this work for the Association, and do not delay in taking some definite action on the elimination of many of your worthless varieties.