

OIL TESTING OF AVOCADOS AND ITS SIGNIFICANCE

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Address delivered at the Annual Meeting at Whittier

Mr. President; Ladies and Gentlemen:

I know that you can't understand all of these charts in the short time you will have to study them. These will be printed in the Annual Report and you will have plenty of opportunity to study them at your leisure.

The two main reasons for our making oil analysis of the avocado are:

First of all to determine if the fruit possesses the 8% oil necessary to meet the legal standard. It is unlawful to sell, offer for sale, or ship any avocados that contain less than 8% of oil by weight.

The second reason we make oil analysis is to determine whether or not the fruit in question possesses the necessary oil to meet the Calavo standard which is in most cases twice as high as the legal standard.

The actual work of making the test takes a lot of experience. It has to be kept up continuously, it is rather technical and probably not so interesting as some of the incidental data gained from the tests.

The most important by-product of our testing work which we have discovered to date is probably the comparison between oil content and eating quality of different varieties or the relation between maturity and eating quality. Perhaps the best method of bringing this to your attention would be a practical demonstration and illustration of how we carry on these comparisons. I am going to ask the boys to pass out six plates of little samples. Take the sample and pass it on and form your opinion of what you think of the fruit. You are not supposed to know what the fruit is or what the test is until after you have sampled it.

These expressions show the opinion we have had after we have sampled it (pointing to chart showing ratings on eating quality). It starts out with "rotten". That is a pretty nasty word but it is hard to express a nasty opinion in a nice word.

We have "rotten" and "rotten plus". We started out with poor but found that not low enough so we have made the range from Rotten to Excellent: Rotten, Rotten plus, Poor minus, Poor, Poor plus, Fair minus, Fair, Fair plus, Good minus, Good, Good plus, Excellent minus, and Excellent.

Now then after you have had your sample, I am going to ask you to hold up your hands when I point to various sections and we will count hands. How many believe this fruit you have sampled is rotten? (15 held up hands). Rotten plus? (10) Poor minus? (1)

Poor? (5) Poor plus? (6) Fair minus? (3) Fair? (12) Fair plus? (2) Good minus? (3) Good? (7) Good plus? (1) Excellent minus? (None) Excellent? (None).

We will pass out the second sample. This test is all *off*. Somebody passed out both samples together! I will have to explain how we make the tests at the Calavo headquarters: We have about half dozen to a dozen more or less experienced tasters sampling. They have been sampling for a couple of years and it is surprising how near they come to each other in their tests. They often will not even vary between Fair Minus and Fair or Good Minus and Fair Plus. They come rather close together and agree remarkably well. Some of the testers are of the State Department of Agriculture, some from the County Horticultural Office, and some our own office employees, and some are various growers who drop in at the right time.

The method of making an oil extraction with which we compare the flavor tests is rather technical so I will skip over it in a short time. In the first place we receive the fruit and analyze it visually: we take its weight, size, color, shape, texture of skin, number of spots, note the little depressions or the warts on either end. We then look at the stem as to color, and size, and rigidity with which it is fixed into the fruit. We examine the place where the stem is fixed. Then we examine the flesh as to color and appearance and as to fiber. Then the seed cavity, seed, and seed coat—whether thick or pulpy or dried. The seed itself gets a thorough examination as to weight, external and internal appearance.

Then after that we scoop out most of the flesh from the fruit. Mr. Wilson has been making some tests here on the platform. He grinds it up to get a uniform sample, takes a very small amount of that flesh which must be weighed very carefully; then this sample is mixed with a small amount of *Halowax oil*. The two are macerated or ground together for a considerable length of time. That is one of the longest operations for it takes one-half to three-quarters of an hour to grind this up. A few drops of the oil are placed on the refractometer. It casts a little shadow and the density determines the percentage of oil contained in that particular fruit. That, in brief, is our method of making oil analysis.

Now as to our reasons for making the flavor tests. It would have been easier to explain that if we had succeeded with the one we tried to make and didn't. In the first place, when they started to talk about Standardization, it was suggested that we have three-fourths of the normal oil content as the standard for each variety. At that time, and perhaps now, we didn't know what the normal oil content was for most varieties. We didn't know whether three-fourths of the normal oil content, or three-fourths of normal maturity would be a good standard. Others suggested 6%, 8% and 10% oil and finally they compromised on 8% for no particular reason, but hoping that it would work and that most varieties would be normally mature when they possessed 8%. It has worked. Considering the circumstances and the information available, it has worked remarkably well and it has been surprisingly successful. A great many growers criticized 8% as being far too high a standard for low oil fruit but as a matter of fact all mature fruits have passed the test. We believe that the data we are gaining from these tests in the last two or three years will furnish the best guide for future standardization laws. We actually use these tests at the present time in determining the Calavo standard.

Since we have bought our refractometer in October, 1926, we have made 1,324 tests which makes quite a little group when you get them all together. In addition to the oil and sampling tests, we have all the appearance tests. This is all being compiled and eventually we will have some very reliable and really authentic data with which to judge maturity of varieties by eye.

In addition to the oil and sampling tests we use various other factors in arriving at the Calavo standard: shriveling or not shriveling, general appearance, fiber, keeping quality, etc.

Now you will note on the chart that opposite these expressions of opinion as to the flavor we have fixed a numerical rating so that we are enabled to average them up. (Note chart). In trying to figure out what the Calavo standard should be for different varieties, we decided that good or better should be our minimum standard for Calavos. Therefore, we took this line represented by the figure 75% which means the fruit after a number of tests was considered good. For the legal standard no basis of eating quality has been fixed. In other words we adopted 8%, believing it would be reasonably good and that it would work but we did not fix it on any basis of eating quality. I assume for the purpose of argument that fair would probably be low enough for even a minimum legal standard which would be the figure 50%.

On the test for Fuertes, these 33 tests were all made in the year 1928.

We started off with the first test showing 8% and at that time the sampling test showed the fruit was considered poor minus. Then between poor plus and fair, there are several tests running all the way from 6% to 10%. Between fair and good, there are several tests running all the way from 8% to 15%. In other words the line goes like this (illustrating a zigzag line) rather than like this one which shows the averages for some are as high as 15% and some down to 8%. Now this is just one variety. We take them individually in our sampling test. In the line of good or 75%, there was one test at 8% and 10% oil was considered good. By averaging these various tests, we get this red line which starts in with 8% and ends up with 25%. When it crosses the line fair, you will notice that the oil test is between 9% and 10%. If you were going to base your standard on fair being good enough for the law, you would follow that line along until it hit the other line and you would find the oil content was between 9% and 10%. Turning to good, our Calavo Standard, you will find it crosses a little above 12%. In excellent, it runs clear on up to 25%. (*Question: What time of the year does that represent?*) These are made over quite a period for we get the fruit from different sections at different times. There is no set time.

The Lyon shows 24 tests. This is one of our most consistent curves because there is very little variation on either side. In a sample averaging 5%, it is judged to be rotten. You understand when tests are made, the samplers don't know what the fruit is, what the oil content is, and don't know what anybody else has said about it. They agreed it was rotten when it only tested 5%- When they agreed it was poor, it was 7%. When fair, it was a little over 10%. Good tested about 15%. The highest rating we happen to have on Lyon was 18%.

On Taft we have 50 sampling tests. This is also a very consistent chart. We had an easy time averaging it up and making our curve. We started off with rotten plus at 6%.

When we got to 11%, it was judged poor. When we got to 12%, it was judged only fair. When we got over to between 12% and 14%, or 13%, it was judged good or good enough for Calavo standard. The tests then run on to about 17%.

The next one is the Challenge. We have 9 tests on that. It starts off with rotten at 4%, Poor is around 7%. Fair about 11%. Good about 12%. We have no excellent rating for that particular variety.

This is the Dickinson. We start off first with a very low test, only 3% and that was judged rotten. The next one or poor is 5%. (There are more tests, you know. This is just the average.) Fair is 8% which is exactly what the standardization law is now. Good about 12%. We have no rating above that for that particular variety.

On the Solano, we have a total of ten tests represented here. Starting off with poor at 7½%, fair at 9%, and I assume it would be in the neighborhood of good at about 11½% but it didn't get that far. This is a fruit which many were afraid would not pass the law when mature.

Spinks is only represented by five tests. In regard to the previously *proposed* standardization law of three-fourth's normal oil content, it was argued particularly strongly, for this variety. The Spinks proponents claimed that the Spinks would be more than mature at 8% and that the law should be a sliding scale that would allow fruits like this to be sold at less than 8%. Now following out this plan three-fourths of the normal oil would be 6%, and yet the fruit is graded as rotten plus at 7%. It is still poor at 10% and when we get over to fair, it is about 11%. I judge good would be in the neighborhood of over 12%.

Now coming back to the Fuerte, I will just leave this for you to look at but remember this shows only the average of tests. If all these tests were shown, it would be a series of zigzag marks.

One reason that we don't show many tests as good or better is that after the fruit has passed the Calavo standard, we have simply stopped testing it. Time is limited and also money and we have to turn our attention to fruits somewhere in the argumentative group between poor and good. We have very few tests showing fruit running up around 25%.

I am sorry I can't give you the results of your test. I had hoped to make that the feature of this little talk to see how you had checked out with your analysis. The first fruit was a Solano running between 9 and 10%. The other was a Fuerte testing in the neighborhood of 25%.

I will give you some conclusions that we have drawn from these tests today though you understand our data is not complete. There are a *great* many more tests to be made. These oil and sampling tests will have to be carried on for the next two or three years in order for us to become thoroughly acquainted with the eating quality as compared with the oil content.

To date, you can see that the fear of California producers that some varieties will not pass the 8% is unfounded. We have not found such a fruit. All will pass before they reach maturity. Some will color up though, apparently look mature, and drop *off* the trees before they reach 8%. That doesn't mean that they are mature. Other fruits

hanging on the same tree will stay several months longer and be picked and test at 15% or 16%. We have had this year a lot of trouble with certain varieties such as Dickinsons, Challenge, Tafts, etc. dropping off the tree and the grower bringing them in and wanting to sell them, yet not being able to because they would not pass the law. Later the same variety on the same tree will reach maturity. What causes it to drop off is something for Dr. Haas and other scientists to figure out. Other fruits drop and you don't think much about it. We have the June drop on Oranges, Prunes, etc. We are going to have the same thing on avocados and I don't think we are going to get away from it.

Florida growers have objected to our standardization law on the basis that their fruit would reach maturity and fall off the tree and give good eating satisfaction before 8%. When the standardization law was first figured out, we looked over the tests on Florida fruits and thought we were safe. Perhaps we are not. I don't know. Your president is going to talk about that this afternoon.

The suggestion that we adopt a sliding standard based on three-fourths of normal oil content of each variety is also answered, I believe. According to these charts, some of the high oil-content varieties that have a high oil content when normally mature will give reasonable satisfaction at lower oil content than some of the normally low oil content fruits. For example, I showed that the Fuerte was fairly satisfactory from the eating point of view at around 9½% to 10% whereas the Spinks, the last one I showed you, was clear up in the neighborhood of 11% before testing fair and still went a good deal higher on later tests.

Before trying to figure out just what standards ought to be, I think we ought to first consider what we want and what a standardization law is for—to *benefit the industry by protecting the consumer against the -purchase of fruit that will not give reasonably good satisfaction when eaten*. I don't know that you can put that in a law. You have to be careful when you define maturity. I personally believe standards should be based on some such premise as that. If the fruit is reasonably good as far as maturity is concerned, it should be allowed to be sold. We are trying to find what the oil content is for each variety when that variety will give reasonably good satisfaction. For our own purpose, that is for the Calavo standard, we have set that at good or better. Perhaps fair should be all right for the standardization law. Of course, in the present law of 8%, it will run less than fair for some varieties. I will give the variety and present legal standard, the proposed standard based on three-fourths of normal oil content or three-fourths of maturity, and the standard based on fairly satisfactory eating quality:

Variety	Proposed Standard based on $\frac{3}{4}$ Proposed Standard based on $\frac{3}{4}$ Normal Oil Content	Present Standard	Standard based on Fairly Standard based on Fairly satisfactory eating quality

FUERTE	19%	8%	9%
LYON	16	8	10
TAFT	13	8	12
CHALLENGE	10	8	11
*DICKINSON	9	8	8
SOLANO	7	8	9
SPINKS	11	8	11

*Note:—The Dickinson happens to hit the law where it is today.

These figures demonstrate, clearly, I think, that any sliding scale based on three-fourths, two-fifths, five-eighths, or any fraction or per cent of maturity, would not be sound. I will read again that last-column which would be the standard based on a fairly satisfactory eating quality: Fuerte, 9½%, Lyon, 10½%, Taft 12%, Challenge, 11%, Dickinson, 8%, Solano, 9%, Spinks, 11%.

A few moments ago, talking to Mr. Taylor, he tells me that if we want to make any changes in the standardization law this year for the next three years, we will have to get busy right away for all proposed legislation must be submitted in the next few months. The law is working satisfactorily. I should suggest this afternoon that you consider the advisability of making changes. If you do want to make such changes we have this data available for practically all varieties and I personally believe that our standard is too low for many of our varieties and not too high for any of them.

President Dutton: I think that Mr. Hodgkin's talk gives you some idea of one of the many problems he is called upon to deal with. That is only one of them. The business is all new. I think some people who do not have a full understanding of what he is up against, will understand it a little better