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Composition of Avocado Seed

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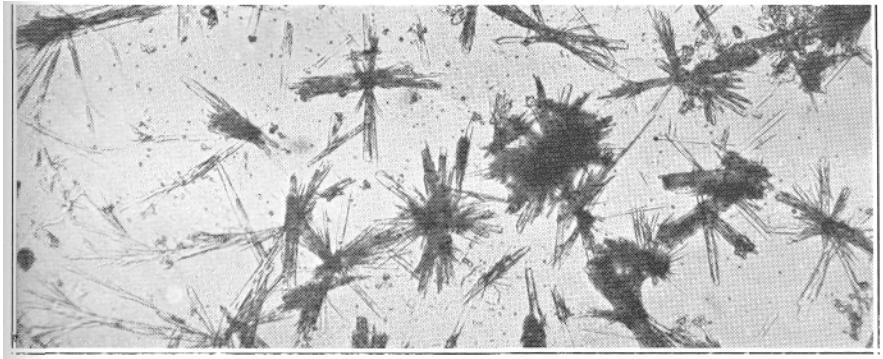
In the Chemistry Department of the University of Southern California for about the last eight years researches have been carried on in cooperation with Calavo Growers who have kindly furnished us material.

First we worked out the vitamins in avocados, as reported in the Year Books of your Association some two or three years ago. Lately we have been turning our interests toward by-products of the avocado. Although at the present time the problem of by-products has not been as large as anticipated, probably it soon will be. When you get fifty million pounds of fruit, if 2% is unmarketable that would give a million pounds of fruit for the by-products industry.

Your industry may eventually have a lot of unmarketable fruit. A main contribution of the by-products industry would be to take such low grade fruit off the market so it will not compete with the better class of fruit.



Perseit from Avocado seed. Magnified 750 times. A solid alcohol containing seven hydroxal groups. A rare substance of which avocado seed is the best known source.
Photo by Weatherby, University of Southern California.

There are several by-products from avocados which might be developed. In the manufacture of ice-cream you have one, which has so far not proved very satisfactory. A second is the manufacture of oil, which might be used as mayonnaise, salad dressing, etc. Mayonnaise is being made now right across' the road from the Calavo plant, from avocado pulp shipped from Hawaii.*

A third way is the use of oil in such products as cosmetics, soaps, etc. This has been tried out for some time but the market is rather limited and can never dispose of the amount of material that culls may furnish.

Having worked out the vitamins in avocados we have turned, as I have said, to by-

products; and I have had a number of people of late years working on the extraction and the refining of oil and getting it into edible products. Up to date ordinary avocado oil has had an unpleasant flavor. This, however, can be removed, through the refining processes. I have one research student now working on the problem of making mayonnaise from avocado oil.

Another field for by-products is that of the avocado seed; and that is what I wish to report on today. If you have a million pounds of cull fruit, with about 25% seed, you would have 250,000 pounds of seed which would be a large product to be thrown away as of no value. The first thing to do in determining the possible uses of seed is to ascertain its composition. I have here the analysis worked out by our research students. A report of this has already been made in **"Industrial and** Engineering **Chemistry."**

COMPOSITION OF AVOCADO SEED

Water.....50.4%

	Wet Basis	Dry Basis
Ash	1.3%	2.7%
Protein	2.5%	5.0%
Reducing Sugars	1.6%	3.2%
Common Sugar	0.6%	1.2%
Starch	29.6%	60.0%
Pentosans	1.6%	3.3%
Arabinose	2.0%	4.1%
Ether Extract	1.0%	2.0%
Fiber	3.7%	7.2%
Undetermined	5.6%	11.3%

**(Editor's Note—Avocado pulp is now being furnished by the Calavo Growers to the firm mentioned for the manufacture of avocado mayonnaise.)*

Now in this last undetermined part consisting of 5.6%, there are some phenols, tannins, and perseit, which is a higher alcohol.

After having this published in the Chemical Journal, I have had inquiries from several manufacturers of explosives (as well as manufacturers in other industries) for samples of perseit, as they are always looking for new substances to use in their products.

Now the composition having been worked out, the next problem is to find a use for the seed. One thing would be to make medicinal products, but a more practical one would be its use as food for cattle, with perhaps the addition of the pulp from which the oil is pressed out in the manufacture of the oil. I have had three different research people working on that— attempting to find the nature of the seed itself—whether it would be suitable as a stock food. For this experimental work we used white rats, as in the vitamin tests. Avocado seed and other materials were fed, and we followed the growth of the rats by chart—their growth rate on various foods. First we attempted to feed the seed alone, and we found that rats could live on the seed alone. Second, we attempted to feed avocado seed extracted with water, and with ether, and fed the rats various quantities of this avocado seed together with other material to see how this would affect their growth. Third, we fed them seed with various supplements to determine whether the seed was lacking in something and what was the lacking element necessary to make a complete food; and fourth, we fed the seed with other commercial products such as sesame meal, and cottonseed meal, to find out if it could be made into

commercial stock feed; again using the pressed cake of the avocado to make a complete food out of it.

The results of our researches on the food value of the seed may be summed up in three statements. First, that the animals will live on a diet of three-fourths seed if that is supplemented with other proper supplemental food. It is not poisonous. Second, the animals will live and grow quite normally on a diet up to as high as one-fourth of their food being avocado seeds. Third, those animals fed on alcohol extracted seed lived on and thrived just as well as normal animals if they were fed on seed as much as three fourths of their diet, when supplemented with certain other necessary food materials.

If the extraction of the seed by alcohol to remove substances undesirable as food would prove necessary, these extracted substances would probably more than pay this added expense through their recovery for use as medicinals, or in other commercial usages. We are still working on the extraction and utilization of these products.