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Using the Refractometer to Quickly Determine the Percentage of Oil in Avocados

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The most characteristic and valuable constituent of avocados is their oil. The oil content is an important index of maturity and market value. Knowledge of the oil content is valuable in determining when avocados are sufficiently mature to be picked, in accordance with the California Standardization Act, which requires a minimum of 8 per cent oil, as well as the market grade under which they should be packed.

The Calavo Growers of California, some ten years ago, found it necessary to have frequent determinations of oil made. They were obliged to employ the services of a chemical laboratory to make these determinations by the standard method of first drying and then extracting all the oil from a weighed sample of avocado flesh with ether, evaporating off the excess ether, and weighing the extracted oil. This method is time consuming, somewhat costly and not suited to field or packing house conditions.

Manager George B. Hodgkin of the Calavo Growers appealed to the Agricultural Experiment Station of the University of California to develop a quick, inexpensive method of determining oil in avocados. This request was referred to the writer, who was at that time Assistant Professor of Fruit Products and Associate Chemist in the Experiment Station.

A study was made of the known methods for determining oil in food products. Several of the more promising methods, such as the Babcock test for fat in milk and cream, were tried without success. Finally it was decided to try a method developed by Wesson for determining oil in products such as cotton seed meal. Suffice to say, a modification of this method was developed for use on avocados which was found to give results closely agreeing with the standard ether extract method.

NOW GENERALLY USED METHOD

The details of the method were published by B. E. Lesley and A. W. Christie in the Journal of Industrial and Engineering Chemistry of January 15, 1929, since which time it has been adopted as the standard method used both by Calavo Growers and by government officials responsible for enforcement of the maturity standard. Most any one can learn to use the relatively simple equipment required and can, if the directions are meticulously followed, accurately determine the oil content of an avocado in less than a half hour.

The method consists of grinding a small accurately weighed sample of ground avocado

flesh with a measured amount of a solvent known as Halowax oil and then determining the refractive index of the filtered mixture of Halowax and avocado oils. The per cent of oil in the avocado is then obtained from a chart giving the relation between the refractive index of such a mixture and the per cent of oil in the avocado.

The refractometer is an optical instrument which measures the angle to which a beam of light is refracted, or bent, when passed through a clear liquid. For example, when a beam of sunlight enters a pool of clear water, the path of the beam below the surface of the water is seen to be at a different angle than the beam above the water.

By placing a very thin film of any liquid between the two flint glass prisms of a refractometer and focusing the telescopic lens of the instrument on a beam of light passing through the film, the angle by which this beam is deflected can be measured to a high degree of accuracy.

Not only do different liquids refract a beam of light to different degrees, but when some substance is dissolved in a liquid, like sugar in water, the angle of refraction of that liquid is changed, in proportion to the kind and amount of substance dissolved in the liquid.

Since the refractive index of the Halowax oil used is known, or can be quickly determined, when a measured amount of it is used to extract the oil from an exact weight of avocado flesh, the change in the refractive index serves as a measure of the amount of oil dissolved from the avocado flesh and from this change the per cent of oil in the avocado is calculated.

Those who may be interested in using the method may secure complete details by applying to the California Avocado Association, 4803 Everett Avenue, Los Angeles. The refractometer is rather costly (about $165.00) but the other necessary equipment is inexpensive and simple.