

## **FOOD VALUE OF THE AVOCADO**

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It is admitted by all that the avocado has a food value, and I wish to offer some data which will tend to emphasize this fact and to indicate that the avocado should not be considered merely as a relish.

One of the best definitions of food is, "Food is that which when taken into the body either builds tissue or yields energy." In accordance with this definition, water is not considered as a nutrient in that water cannot build protein, fat or mineral matter as such. At the same time it is agreed to by all that water is absolutely necessary for the maintenance of life, health and activity. So is fresh air.

Does the avocado meet either or both of the requirements of the foregoing definition? The answer is, "It certainly does." The next question is, how? Let us compare the avocado with other fruits.

A reference to the composition of fresh fruits in general shows that the amount of water is large, in many instances above 80 per cent, and in the case of melons above 90 per cent. The avocado shows upon an average only 70 per cent of water. Therefore the amount of total dry matter or solids is far greater in the avocado than is noted for any other fruit.

The protein content of fruits is low, varying from 0.02 per cent as an average for the loquat to 2.5 per cent for the olive. The stone fruits contain on an average less than 1 per cent. The average for the avocado with respect to this nutrient is 2 per cent. The minimum figure for protein, 1.30 per cent, is nearly equal to the maximum indicated for fresh fruit, 1.5 per cent, noted for figs and currants. The maximum, 3.7 per cent, corresponds somewhat closely to the protein content of some dried fruits. In three varieties the protein is present in excess of 3 per cent; in ten varieties considerably above 2 per cent; while the average for 28 varieties is 2.08 per cent. It, therefore, may be said that so far as protein in fresh fruits is concerned the avocado stands far in the lead.

The availability of this protein, however, for the avocado has not been ascertained, but there is no reason for considering that it is any less digestible than the protein of other fruits.

The carbohydrate in fresh fruits, consisting mainly of sugar, exceeds the corresponding ingredient in the avocado. At the same time the average for a large number of varieties analyzed is between 7 and 8 per cent. This figure includes what is termed crude fibre, the least valuable of all component parts of any food. In the avocado this nutrient is present to the extent of about 1.75 per cent, comparing favorably with the content of

fibre in other fresh fruits.

The figures for the mineral matter of ash in fresh fruits are in general much lower than the corresponding data for meats or grain. The average for meat is about 1 per cent, while for fruit it is much less.

It must not be forgotten, however, that while the amount of ash is small, the percentage of potassium, so essential to the animal economy, is high. This is a very valuable base-forming element which is necessary in the maintenance of the normal neutrality of the blood and tissues. The importance of the mineral matter in nutrition and the necessity of carefully selecting the dietary so as to secure a proper balance between the base-forming and acid-forming elements is becoming more and more apparent.

It is of decided interest to note that the mineral matter in the avocado is much greater than that found in any fresh fruit. • Just how much importance can be attached to this fact can better be stated after the conclusion of the detailed analysis of the ash, which will indicate the per cent of potassium, calcium, phosphoric acid, iron, etc. The results of the ash analyses will be published later on. The minimum per cent of ash, 0.60 per cent, noted for the variety, Cardinal, from Florida, exceeds the per cent of ash determined for apples, apricots, grapes, blackberries, oranges, pears and plums, and fully equals the corresponding figure for cherries, figs, melons and prunes.

The minimum per cent of ash noted for a variety grown in California is 0.80 per cent, exceeding that found in any of the fresh fruits. The average for 28 varieties is 1.26 per cent, only slightly below the ash percentage in dates.

The foregoing discussion clearly indicates that so far as protein and ash in fresh fruits are concerned, the avocado stands at the head of the list, and with reference to the carbohydrates, contains on an average fully 50 per cent of that found in many fresh fruits. These facts alone would warrant due consideration being given to the value of the avocado as a fresh fruit.

The chief value of the avocado as food, however, is due to its high content of fat. This varies from a minimum of 9.8 per cent to a maximum of 29.1 per cent, with an average of 20.1 per cent.

Reviewing the analytical data at hand, it is seen that ten varieties show more than 23 per cent fat and seven other varieties an excess of 18 per cent.

The only fruit comparable with the avocado in this respect is the olive. In this connection, it is of interest to compare, as shown in the following table, the fat percentages of the edible portion of ten varieties of the olive.

Showing percentage of fat or oil in the avocado or olive:

VARIETY	EDIBLE PORTION		
	ORIGINAL MATERIAL		WATER FREE
	Water %	Fat %	Fat%
Chappelow	62.84	29.10	78.01

Seedling No. 1	62.65	27.89	74.67
Northrup	61.08	27.60	70.88
Mattern	61.55	25.70	66.84
Ganter	63.86	25.60	70.84
Blake	65.80	25.50	74.48
Miller	66.60	23.70	70.96
Seedling No. 3	65.10	23.40	67.05
Unnamed	65.50	23.10	66.96
Northrup	66.31	23.00	68.27

### Olive

VARIETY	EDIBLE PORTION
	ORIGINAL MATERIAL Oil %
Corregiolo	27.68
Nlgerina	26.16
Nevadillo Blanco	22.92
Mission	22.51
Rubra	22.01
Pendulina	21.36
Redding Picholine	20.83
Macrocarpa	20.41
Manzanaillo	19.73
Columbella	19.54

The figures in this table indicate that the avocado ranks higher in fat or oil than the average or commonly used olive. The latter fruit also has the disadvantage of requiring special treatment before it is ready for consumption and should really rank as a processed fruit rather than a fresh one. The data in the table show that when considering the dry matter, only, the Chappelow shows the highest percentage of fat.

While it is true that the real value of any food is not always represented by the heat units or calories, at the same time the total food value is so indicated. This difference between the real value and total food value is not always properly understood. For instance, the energy value of a pound of sugar is 1820 calories, while the corresponding value for lean meat is less than 1000 calories. Yet we would hardly say that the real value of a pound of sugar was 1.8 times that of a pound of lean, meat, if the question of growth were under consideration. When, however, the matter of energy is being discussed the case is entirely different, and the value of a food as a source of energy varies directly with its caloric value.

The energy values of the edible portion of the commonly used fresh fruits are low, ranging from a minimum of 175 calories to a possible maximum of 400 calories per pound.

An inspection of the following table shows that the avocado has a far higher value in this respect; the average of 26 varieties being 984 calories per pound, or more than twice the maximum noted for other fruits. The minimum figure, 597, is also in excess of this

maximum. The maximum, 1325 calories per pound, approaches that noted for some varieties of dried fruits. It corresponds to about 75 per cent of the fuel value of the cereals and is about the same as that noted for average lean meat:

Table Showing the Energy Value of the Avocado.

Variety—	Energy Value Per Lb. Calories.
Ganter .....	1,194
Harman .....	923
Miller .....	1,107
Walker .....	952
Sharpless .....	741
Chappelow .....	1,325
Blake .....	1,147
Chappelow .....	867
Carton .....	.....
Carton .....	.....
Unnamed .....	1,115
Topa Topa.....	778
Mattern .....	1,240
Northrup .....	1,303
Seedling No. 1.....	1,282
Seedling No. 2.....	812
Seedling No. 3.....	1,132
Seedling No. 4.....	1,019
Seedling No. 5.....	846
Seedling No. 6.....	948
Harman .....	852
White .....	722
Fowler .....	987
Cardinal .....	597
Northrup .....	1,101
Trapp .....	599
Azusa .....	1,042
Bread .....	1,200
Meat (medium).....	1,000
Sugar .....	1,820
Cheese .....	2,000
Butter .....	3,000

Until recently it was considered that the digestion coefficients of the nutrients in fruits were low, thereby indicating a low nutritive value. Metabolic experiments carried on at the University of California have disapproved this and have shown that the digestion coefficients for protein are practically equal to those obtained for graham bread while the digestion coefficients for the carbohydrates, fat and mineral matter compare very favorably with those obtained for the mixed diet (U. S. Dept. of Agriculture, Bulletin No. 107). As previously stated no metabolism experiments have been carried on in connection with the avocado, yet it is only fair to assume that this fruit is as easily digested as any other whose coefficients have been ascertained.

The dietic value of fruit, aside from the actual nutrients which it contains, lies in its succulency—its minerals and organic acids. If gauged by its nutritive value alone, fruit would seem to be an expensive form of nourishment, but when its hygienic qualities are considered its money value to the consumer is difficult to estimate. Some fruits carry

more nourishment with their hygienic properties than others. Some contain minerals which are more valuable to the system or less commonly distributed than others. Therefore, while there are general properties which are common to all fruits, each has special properties which justify individual consideration.

While the special dietetic value of a food cannot always be forecast by the chemical analysis, it is certainly permissible to suggest the possibilities which are indicated through such investigation. It is always necessary that such theory be confirmed by clinical experience.

Judging from its composition, the avocado should perhaps prove to have laxative qualities of a peculiar or individual type, possessing as it does the combination of the usual "fruit principles," and that of fat or oil. The laxative properties of most fruits depend upon the stimulating effects of the fibre upon the wall of the intestine and partly upon the organic acids and minerals. Oil has a tendency to soothe and to lubricate the intestine even while it acts as a mild laxative. The avocado is a natural combination of these two types of foods—as if fruit and olive oil had been chemically combined by nature. Whether or not there is any special advantage in this natural combination over that made by a proper selection of foods remains to be proved. There are no clinical data on the subject, but future experimental work may give some interesting results.

Fat is very important in the diet and should not be overlooked. It has different process of digestion from other sub-classes of the non-nitrogenous group and separate channels of absorption. The failure to use fat overworks the organs engaged in the digestion of starch and sugar and further throws out of commission the fat digesting apparatus and it is well-known that the disuse of any organ tends to weaken it.

It was formerly considered, as far as digestibility and growth are concerned, that one fat was practically as good as another. In view, however, of the studies of Osborne and Mendel, McCollum and Hart, and others, the old ideas have materially changed. According to results of their experiments, it would appear that milk fat, egg fat, cod liver oil, have a higher nutritive value as far as growth is concerned than has either lard, almond oil or olive oil.

The avocado oil has not been investigated and it might be that as far as growth is concerned in the very young this may not be as valuable as milk fat. At the same time experiments might indicate that the avocado oil would be just as valuable as those fats yielding positive results in the above referred to experiments. In other words, there is offered several opportunities for metabolic investigations with reference to the use of the avocado.

Summarizing, then, it would appear that the avocado may be said to be, as far as fruits are concerned, in a class by itself, containing on the average a far higher caloric value than any other fresh fruit with the exception of the olive and in view of the fact that the avocado ranks higher in fat or oil than the average or commonly used olive, it outranks even this fruit with respect to its total food value.