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SOME NOTES ON THE ENZYMES OF THE AVOCADO

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Euler (General Chemistry of the Enzymes. Wiley & Sons, 1912.) defines enzymes or unorganized ferments as animal or vegetable substances of unknown composition and constitution, which, in the organism itself or even independently of the organ or cells in which they arise, are able to accelerate chemical reactions. Types of enzymes more or less familiar to all are the pepsin of the stomach secretions, the ptyalin of the saliva and the zymase of alcoholic fermentations.

The work which has been done on the enzymes of the avocado was undertaken with the hope that they might cast some light on the maturity of the fruit itself. While as yet we have reached no conclusion in the matter, we have found that the enzymes differ to some extent with the variety, but more so with the maturity of the fruit.

Euler in his work on enzymes lists some forty types in a general way. Three of these types have been found in the flesh of the avocado.

A catalase is present in both the immature and mature fruit. Its activity increases as the fruits mature, up to a certain point. The maximum activity occurs before the fat content of the fruit reaches its highest percentage. The activity is greater in the fruits which have been stored until soft than in those fresh from the tree. Catalases are characterized by their power to decompose hydrogen peroxide into water and oxygen. That avocado pulp has this power is easily demonstrated by pouring some hydrogen peroxide on a piece of the soft flesh, when in a short time a foam of oxygen bubbles will form. While catalase is found in virtually all plant juices, the avocado seems to be particularly well supplied. One sample of water-and-fat-free powdered flesh of the Sharpless set free over 12,000 cubic centimeters of oxygen per gram of powder. When you recall that a gram is about 1/28 of an ounce and that 12,000 cubic centimeters are equivalent to over 3 gallons, you will see that this activity is very marked.

Oxydase or peroxydase are also present in most of the varieties thus far examined. In one or two cases both have been absent in very green fruits, and in many cases oxydase is absent from both mature and immature samples. The varieties seem to differ slightly in this respect. The Fuerte at best shows only slight traces of oxydase at any state of maturity, which possibly accounts for the fact that this fruit does not darken readily after cutting. The Dickinson, on the other hand, contained oxydase in all of the soft samples, and our notes show that it is a type of fruit that darkens on standing. The mature Spinks also shows this tendency and also contains oxydase. It has been said that soaking in vinegar will prevent this discoloration, but our results do not wholly confirm this. The oxydase reaction may be hindered by vinegar, but it is not wholly

suppressed.

As yet, we have made no attempt to quantitatively measure the oxydase activity.

The third type of enzyme present is emulsin, which has also been reported in the olive. This enzyme is in part responsible for the odor of benzaldehyde and hydrocyanic acid in crushed bitter almonds, peach pits, etc. As the gluco-side amygdalin could not be shown to be present in the avocado, emulsin is possibly coexistant with some other glucoside. Only traces of emulsin are noticed in the fresh samples, but nearly all of the soft samples contain it in sufficient quantity to give satisfactory tests for hydrocyanic acid when properly prepared amygdalin solutions are added. Usually twelve hours elapse after adding the amygdalin before strong tests can be gotten.

As yet we have not been able to find lipase, the fat-splitting enzyme, in the avocado. Several tests have been made with negative results. The lipase of the castor bean will react with avocado oil and fresh avocado pulp mixed with it will become acid in a few hours.

Probably other enzymes are present in avocados, but owing to the time required and the difficulty of making many of the tests, we will be unable to report upon them until later, when a further paper will be offered to some scientific journal.