walls, setting them free as above described, is present in very small but undetermined quantity, while the nitrogenous food (protein) amounts to about 1 per cent.

Although the absolute food value of the banana is not greater than that of some other fruits, high though it is, nevertheless when considered in relation to the cost to the purchaser it is probably the highest. This low cost is made possible by the nature of the fruit—especially to the character of the peel which very efficiently protects the pulp and prevents the entrance of bacteria and fungi which might otherwise rapidly cause decay.

Although the peel is at present waste, it may not be superfluous to indicate something of the food and other content since some turn of conditions might very well make the use of the peels imperative. We, in a new country, are too much given to ignoring of waste, and the sting of necessity may one day force an issue.

In the unripe fruit the amount of starch is 4 to 5 per cent. This undergoes alteration into sugar as in the pulp, falling to somewhat less than 2 per cent and giving rise to about 3.5 to 5 per cent total sugars. Besides sugar there is a small but undetermined amount of resins (with fat-like physical properties), the which, so far as I know, have not been studied. These resins are associated in an intimate way with a caoutchouc (india rubber), the mixture occurring in large droplets [1] suspended in a clear watery juice or sap having very peculiar properties. This sap, which contains tannin, the agent responsible for the astringency of the fruit, is found also in numerous large cells scattered in a definite manner throughout both peel and pulp. In Figs. 2 and 8 the occurrence of these cells in the pulp can be seen—the black strands being composed of the cells in question. At this point we may naturally consider

Changes in Flavour

These consist of the following: (1) Loss of astringency; (2) increase of sweetness, and (3) development of aroma. We consider them in this order.

Astringency, being due to the presence of tannin, has been thought to disappear through the loss of the tannin by chemical change (oxidation). The fact, however, that tannin is present in the ripe banana, apparently in undiminished quantities, was observed by Jaehkel [1] but he was able to offer no explanation of the apparent contradiction. My own studies of the banana show that this fruit is, in regard to the behaviour of the tannin, in precisely the same case as certain other fruits, among which are the persimmon, sapote, and date.[2]

As above noted, the cells which contain tannin also contain a watery solution of a substance which can be turned into a sort of jelly, and which as a matter of fact does so during the ripening process. As long as the jelly-forming substance remains watery, the tannin comes out readily, as can be demonstrated by laying a piece of moist blotting paper on a cut surface of unripe fruit,[3] (Fig. 1G). As, however, the jelly becomes firmer, less tannin can escape from it, so that in four days after the beginning of ripening only a small amount can be taken up by the blotting paper (Fig. 1.R). When the fruit is fully ripe, very little indeed of the tannin can be so separated (Fig. 1.VR). It will be noticed from the figures that more tannin can

[1] These were incorrectly described by Jaehkel as oil-droplets. (Ueber Anatomie und Mikrochemie der Bananenfrucht und ihre Reifungserscheinungen. Kiel, July 24, 1909.)

[1] In the paper cited.

[2] Lloyd, F. E. The Tannin-colloid complexes in the Fruit of the Persimmon, Diospyros. Biochemical Bulletin, 1: 7-41. Sept., 1911.

[3] Lloyd, F. E. A visual method for estimating astringency. Plant World 19: 106-113, April, 1916.