NOTE ON ANALYSIS OF JAMS.

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(Read at the Meeting, February 3, 1904.)

WHEN in a sample of jam the presence of an adulterant, such as apple pulp, has been recognised by the usual microscopical methods, it is, I believe, almost impossible to determine with any degree of accuracy the quantity of the adulterant which has been added to the jam.

I have been able to find very little literature bearing upon the subject. The ANALYST only contains five references to the matter in question, and in one of these contributions Mr. Adams gives analyses of a large number of jams; but, as he himself points out, no very definite conclusions can be drawn from them (ANALYST, vol. ix., p. 102).

In a table by König on the analysis of seed fruits which is given in Wynter Blyth's book on food analysis, it is observable that the percentage of woody fibre varies considerably in the different fruits. Thus, apple, according to this authority, contains 1·98 per cent.; strawberry, 2·32 per cent.; raspberry, 5·9 per cent.; blackberry, 5·21 per cent. of woody fibre. It must be borne in mind that the skin of apple is included in this analysis. It is evident that these differences would have been accentuated if the woody fibre had been determined on the moisture-free sample. Although, owing to the process of manufacture, the fruit in jams has undergone considerable change, it seemed to me probable that if the woody fibre were determined on the sugar and moisture free sample these differences would be maintained. I therefore determined to treat a number of jams in the following manner:

About 100 grammes of the jam was boiled with 500 c.c. of water for one hour, then filtered through linen with the aid of a filter-pump, and washed with about 250 c.c. of boiling water. In the case of stone fruits the stones were then carefully removed, the resultant pulp of skin and seeds was dried for twenty-four hours in the water-oven, and the woody fibre determined on the dried sample as follows: About 0·5 gramme of the dried pulp was boiled with 50 c.c. of a 5 per cent. solution (by weight) of sulphuric acid, and 75 c.c. of water on a hot-plate for thirty minutes, filling up to the original bulk every ten minutes with hot water. After filtering through linen and washing with boiling water, the residue was washed back into the beaker, treated with 50 c.c. of 5 per cent. caustic soda solution (by weight), made up to 125 c.c., and boiled exactly as above; then filtered through linen, and washed till free from alkali. The residue was then washed into a tared platinum dish, evaporated to dryness, thoroughly dried in the water-oven, and weighed.

I have given the above process in some detail because, as it is purely empirical, it is necessary to adhere carefully to it if concordant results are to be obtained. Thus, I have proved that prolonged boiling of the pulp with fresh quantities of water in many instances caused the results to be much higher than when the above method was adhered to. In some cases the determination of the ash was made on the residue, but no information of any value can be drawn from these figures.

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The following table gives the results obtained :

Kind of Jam.	Woody Fibre.	Ash.
Apple	9.4	0.62
"	9.7	—
"	10.5	—
"	14.0	—
Turnip	13.4	0.8
"	16.0	—
Marrow	10.8	—
"	16.0	1.02
Raspberry	44.5	—
"	44.0	—
"	46.0	1.76
"	58.0	3.9
"	58.0	—
"	65.0	3.8
"	68.0	3.9
Plum	12.5	0.84
"	12.5	—
Blackberry	33.0	1.72
"	33.0	—
Black currant	36.9	3.06
"	33.0	—
Gooseberry	54.0	1.96
"	54.0	—
Apricot	20.9	—
"	20.8	—
"	26.0	2.5
"	28.0	2.8
Strawberry	45.0	3.45
"	40.3	3.5
Damson	8.3	—
"	10.4	1.22
"	10.4	—
Cherry	19.0	2.6
"	24.0	—

It will be observed that, with the exception of plum and damson jams, the percentage of woody fibre obtained is lower in the case of apple, turnip, and marrow jams than in any of the other jams experimented upon ; and it is the difference thus obtained which I think may prove useful in determining the percentage of these adulterants. The first three raspberry jams undoubtedly contained some quantity of apple pulp, and, taking 58 per cent. of woody fibre as the minimum for raspberry, and 14 per cent. of woody fibre as the maximum for apple, this would give the percentage of added apple as about 30 per cent., calculated from the following formula :

$$\frac{(\text{Percentage of woody fibre of raspberry} - \text{percentage of woody fibre of sample}) 100}{\text{Difference between percentage of woody fibre of raspberry and apple}}$$

As Nature is by no means constant in the quality of her products, such a small number of determinations as I have been able to bring before you cannot in themselves carry any very complete conviction, and I have only brought this method before the Society as a suggestion, in the hope that by further development it may in time come to be of some help in the analysis of jam.

In conclusion, I wish to thank my pupil, Mr. Joseph Race, for his able assistance in connection with the analyses given in this paper.

DISCUSSION.

Mr. BOSELEY said that some makers who used apple pulp were not, he believed, by any means particular that it should contain all the apple. In such cases they boiled the apples first, and then filtered through bags, with the result that the whole of the juice was extracted from the fruits, and where this was the case it would, he thought, be difficult to obtain reliable results by determining the quantity of woody fibre in the jam. He thought that a method based on a determination of the organic acids present would probably answer best for the purpose, or, at any rate, that some investigation in this direction might be made with advantage. He believed that turnip and marrow were practically never used for jam adulteration, as their large proportion of water and want of gelatinizing properties would render them quite useless for the main object in view, which was to hold up as much water as possible. Apples, of course, contained large quantities of pectinous matters, and were therefore well suited to impart setting power.

Mr. Ross said that the method was intended merely for the detection of apple pulp, and not of the apple juice which was added to jam, in what was generally regarded as a legitimate manner; and in some, at any rate, of these samples the evidence of the presence of apple pulp was conclusive. He was afraid that the successful working of a method on the lines suggested by Mr. Boseley would demand a knowledge, not only of the proportion of organic acids, but also of the amounts of sugar and fruit that had been used, and such knowledge, of course, would practically never be obtainable. He might repeat that, in the process he had just described, the fibre determination was made after the elimination of sugar, juice, etc., and was therefore independent of variations in those respects.