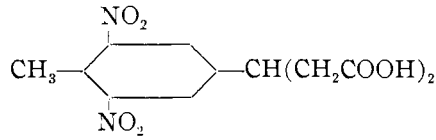

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[CONTRIBUTION FROM THE BUREAU OF CHEMISTRY, U. S. DEPARTMENT OF AGRICULTURE.]

THREE NEW PRELIMINARY TESTS FOR MAPLE PRODUCTS.

BY ALBERT P. SY.

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The Color Test.—The literature on maple products contains very few references to the color of these products. This color is due to caramel produced during the evaporation of the sap, and to other substances the nature or composition of which is not understood. It is known that tannin is present, but in very small quantities. Caramel is insoluble in amyl alcohol, while the other coloring matters in maple products are soluble in it; they are, however, also soluble in water. In order to decrease this latter solubility, phosphoric acid is used, which causes most of the coloring matters to go into solution in the amyl alcohol. The test is made as follows: Put 15 cc. of sirup, or 15 grams of sugar and water to make 15 cc., into a test tube or narrow cylinder, add 3 cc. of pure amyl alcohol and 1 cc. of a 20 per cent. solution of phosphoric acid; mix the whole thoroughly by shaking; let stand until the alcohol separates and then note the color of the amyl alcohol layer.

The depth of color of the alcohol varies, of course, with the color of the sample taken. The test has been applied to a great many samples of maple products, of which a complete analysis was also made. A number of these samples were made by the writer and known to be pure; others were bought as pure from parties known to the writer to be producers of maple products from their own trees. In all cases the presence of maple was indicated by the color of the amyl alcohol; pure products always gave a decided brown color; adulterated samples gave from a trace of color to a light brown, according to the amount of maple product present as indicated by the results of a complete analysis. Cane sugar products colored with caramel gave no color.

The Foam Test.—This test was the result of the observation that sirups and sugars consisting mostly of cane sugar do not give any trouble and produce hardly any foam when heated and ignited for the ash determination. Pure maple products on the other hand often produce considerable foam when heated. Preliminary tests showed that a pure maple sirup diluted with water and shaken produced a persistent foam

or lather, while adulterated products produce very little, and this disappears very rapidly. The test is made as follows: Five cc. of sirup are placed in a narrow tube or cylinder graduated in 0.1 cc.; 10 cc. of water are added and the mixture shaken vigorously for one-half minute; allow to stand ten minutes, and read the volume of the foam in cubic centimeters.

The results obtained by this test on 60 samples of sirup gave an average of 4.1 cc. foam for pure maple, the minimum being 3.0 cc. and the maximum 6.0 cc. Adulterated or mixed products all gave below 3.0 cc. In two samples, where a complete analysis gave constants for pure maple sirup, the foam was 0.1 cc. and 1.0, respectively; these samples, however, were not normal, since each had a very disagreeable, glue-like odor and flavor; this was evidently due to chemical changes of the substances (nitrogenous?) which cause the formation of foam in normal, pure maple products.

Volume of Lead Subacetate Precipitate.—This test cannot be described as an entirely new one, but is a modification of those in which the volume of the lead precipitate is determined. In Jones' method[1] 5 grams of sirup or sugar are weighed into a Purdy sediment tube, dissolved in 10 cc. of water and 2 cc. of subacetate of lead solution added; these are mixed and the tube whirled in a Babcock centrifuge for four minutes. Pure maple products will give a precipitate of from 1.5 to 3.0 cc.; cane sugar gives only a trace, while adulterated products give results from a trace to about 1.0 cc.

Hortvet's method[2] is similar to the above except that a special form of tube is used for the precipitation, and cream of alumina and lead subacetate are used.

Experience shows that with any method where centrifugal force is used, it is difficult to obtain concordant duplicate results on the same sample; the results from different samples as also results from the same or from different samples by different analysts are not comparable.

The following test is very much simpler and gives more concordant results than those where centrifugal force is used: Five cc. of sirup, or 5 grams of sugar and water to make 5 cc., are placed in 25 cc. measuring cylinder; 10 cc. of water and 2 cc. of lead subacetate[3] are added; mix thoroughly and allow to stand 20 hours; at the end of this time read the volume of the settled precipitate. For pure maple products this will be over 3.0 cc., and usually is over 5.0 cc.

In 23 samples of pure maple products this test gave the following results:

[1] *17th Annual Report, Vermont Expt. Station*, p. 454.

[2] THIS JOURNAL, 26, 1532.

[3] *Bull.* 107, *Bur. Chem., U. S. Dept. Agr.*, p. 40.

	Sirups. cc.	Sugars. cc.
Average	8.5	7.9
Min	6.7	4.7
Max	10.7	13.6

The results on nearly fifty adulterated samples are in each case much lower than the above and correspond closely to the amount of pure maple present in the sample, as indicated by the results of a complete analysis.

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MALT ANALYSIS; DETERMINATION OF EXTRACT. II.[1]

BY H. AUG. HUNICKE.

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The continuation of a study of the quantitative influence of various disturbing elements in the determinations of the extract of malt has resulted in observations of more or less general interest. The investigation is incomplete and of necessity fragmentary. Little more than the recording of experimental results is contemplated in this paper. Being without immediate hope of completion results are given in their incomplete form because they may even so be of some interest to workers in the same field of research.

The method of extract determination in use in the United States is not explicit in directing the use of the entire filtrate for the density determination as does the German method; it even suggests that only so much of the filtrate need be taken as is sufficient for a density determination. Such a procedure leads to a variation of results which makes the determination one of great uncertainty in the case of coarse grindings.

The difficulties of devising well defined methods of procedure for the extract determination of malt are great both on account of the chemical processes involved and the peculiar physical conditions prevailing. The mashing fluid consisting of carbohydrates, including, besides the crystallizable maltose, a more or less variable amount of viscous dextrins closely related to the original starch, both in their solubility and extreme slowness of diffusion; while the insoluble fibrous cellular pulp remaining in contact with the wort not only retains the more viscous constituents, mechanically preventing a ready diffusion, it also assumes, only very slowly, a state of equilibrium with respect to the solution. The phenomena of absorption and adsorption, both operative, respond to changes of concentration only with great slowness and it is for this reason that the dilution of the unfiltered wort just before filtration formed the subject of a series of experiments. The ordinary procedure of cooling down to the temperature of the room and then adding cold water

[1] Part I, THIS JOURNAL, 26, 1211.