NOTE ON THE ANALYSIS OF LARD, COTTON OIL, TALLOW, ETC.

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Read at Meeting, February, 1890.

IN the month of February, 1889,* we proposed an improved method for the volumetric estimation of oleic acid in fats and oils, and of subsequently applying Hubl's iodine

* See ANALYST for April, 1889.

absorption test to the acid thus liberated, without its having been exposed to heat or to any influence likely to be prejudicial to the accuracy of the iodine number thereby obtained. We feared that the calls of our ordinary business would make it a very tedious matter for us to examine all the common fats and oils, and to suggest standards based upon the process, and we therefore invited our colleagues to give us their co-operation with this object. In the meantime we have been applying it to the current matters that have turned up, and especially to the analysis of lard, and we now give the standards we have adopted in this matter.

1. *Tallow*.—The oleic acid isolated from tallow seems to us to be practically pure oleic acid. In many experiments we have made, we generally get from $\cdot 1$ to $\cdot 2$ per cent. from theory. Tallow is therefore, in our opinion, the best source from which to prepare perfectly pure oleic acid, giving an iodine number of 90.

2. *Lard*.—Although it would be unwarrantable to jump to the conclusion that this fat contains acids of the linoleic series, still we have not as yet met with any sample which gives an acid having as low an iodine absorbing power as the oleic acid from tallow. After careful study of many samples we propose to put the iodine number of the oleic acid from lard at 93, but not to condemn under 94.

3. *Cotton Oil*.—This oil being often subjected to a good deal of chemical treatment before it is sold, it would not be a matter of surprise if the iodine number of its oleic acid should be subject to a good deal of variation. However, in all the samples we have as yet tested, we do not find any very great difference, and we propose to put the iodine figure of the cotton oleic acid at 135.

We are not aware that any of our English colleagues have taken up the process, but it has attracted some notice abroad, and just as we are writing, we have received a copy of a paper communicated to the Hungarian Academy of Sciences by Dr. Alex. von Asboth, in which he gives a very favourable criticism of our process, and proposes to fix the iodine numbers of the fluid acids of lard and cotton oil respectively at 94 and 136. Dr. Asboth thus gets the same calculation difference between these two fats as we do, although he is one degree higher than us in both cases, which may after all be only a matter of the "personal equation" in working.

As regards the application of the process it may be interesting to extract two of our experiments on known mixtures, so as to show both the mode of calculating and the degree of accuracy that may fairly be expected in practice.

Experiment A.—This was made on a mixture of 43 per cent. of lard and 57 of cotton oil. The sample yielded 64 per cent. of fluid acids, and these acids gave an iodine absorption figure of 118 (lard = 93, and cotton oil = 135). Therefore $(135-93) : (118-93) :: 64 : x$. $x = 38$ cotton oleic acid. As we may take common cotton oil to contain about 70 per cent. of liquid acids, we get $70 : 100 :: 38 : x$. $x = 54$ per cent. of adulteration in the sample.

Experiment B.—Made on a mixture containing 75 per cent. of lard and 25 of cotton oil. Found 58 per cent. of liquid acids which gave an iodine number of 103. Therefore:— $(135-93) : (103-93) :: 58 : x$. $x = 14$ per cent. of cotton oil acids. Then as $70 : 100 :: 14 : x$. $x = 20$ per cent. of adulteration.

It will be seen that, like all such processes based upon average standards, the

accuracy diminishes as the adulteration gets smaller, and if the latter is below 10 per cent. then the process is only really of qualitative value. However, we agree with von Asboth in saying that any lard the acids of which show a greater iodine absorption than 94, must be looked upon with the gravest suspicion. One thing is certain, namely, that the true imitation lard which, if properly made, can defeat the ordinary iodine test, will not escape detection if treated by our method. The only fat which, if introduced in a judicious quantity, might upset our process is cocoanut oil. This oil contains very little olein, but still yields a fair proportion of acids (chiefly caproic) which also form lead salts that are at once insoluble in water and soluble in ether. Before our process can be applied, it is therefore necessary to remove these acids, and although our investigations on this subject are not yet complete, we believe that the best way to accomplish this will be to heat the apparent oleic acid (obtained by evaporation of the ether) in a current of carbon dioxide at a temperature of 110° to 115° C. until all the interfering acids are removed. After this is done, the remaining acids are to be weighed and "Hubled." The presence of cocoanut fat is so readily detected qualitatively, that no analyst would have any difficulty in condemning a sample containing it, so it is not probable that its use will be resorted to.

We have placed upon the table one of "Muter's olein tubes" as now manufactured in Germany, and which are readily procurable through Messrs. Baird and Tatlock, of Glasgow, or indeed of any similar house.

DISCUSSION.

MR. ALLEN said they were much indebted to DR. MUTER for this continuation of his former very important paper. The process was really one likely to throw light upon the unknown characters of these fatty acids, which rendered it extremely valuable. The constitution of these acids had been up till now ignored by chemists who had too long classed them as being all stearic, palmitic, and oleic. What they had been in the habit of calling oleic acid was by no means of such a constant character as they had been assuming. It was by highly refined researches and methods depending on the constitution of the fatty acids that they could hope to differentiate them and detect the oils of which they were constituents. It was to methods like that of Dr. Muter's and those of Hazura and other recent investigators that they might hope to detect vegetable oils in butter and lard.

(Conclusion of the Society's Proceedings.)

* Habernann. *Fres. Ztschr. anal. Chem.* 27, 663. Roese, *ib.* 28, 355.
Ca. neuve. Bull. Soc. Chim. (Paris) [3] 1, 700. See also *Dingl. Polyt. Jour.*, 273, 374.