

## ON THE IODINE ABSORPTION OF BUTTER FAT.

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PREVIOUS to Mr. Allen reading his valuable paper on "Some Abnormal Samples of Butter" before the Society of Public Analysts in December last (*ANALYST*, vol. xiv., p. 5) I had on a few occasions determined the proportion of iodine absorbed by the filtered fat of various butters submitted to me for analysis.

Since then I have applied the iodine absorption test to a large number of butters and butter substitutes, in the hope of obtaining information of a nature reliable enough to be of service in certain cases where the methods usually employed in the examination of butter have failed to give the analyst complete satisfaction.

It has, I think, been pretty well established by Mr. Allen and others that butter of a perfectly genuine character, but possessing somewhat abnormal properties, might be condemned as sophisticated, if, for instance, the analyst based his opinion too implicitly on the proportion of volatile and soluble fatty acids present in the sample. A knowledge of this fact has latterly placed chemists in an awkward predicament, in order to extricate themselves from which it has been thought desirable to examine minutely certain methods of analysis, more or less novel, as applied to the detection of adulterants in butter.

The particular point to which I have lately devoted a considerable amount of attention is, as indicated by the title of my paper, the question of the iodine absorption of butter fat, and although the results which I have obtained have not proved absolutely constant and conclusive, still I believe they are of sufficient interest and importance to justify me in bringing them under the notice of the members of this Society.

Before giving a description of my own results I ought, perhaps, to make a brief reference to a paper on "The Analysis of Fats and Oils," read by Muter and De Koningh at the February meeting of the Society of Public Analysts, the first part of which is published in the current number of the *ANALYST*. I was not present at the meeting in question, but I gather from the partial report which has already appeared that the iodine absorption of the fatty acids, separated from butter fat by a special process, was one of the points dealt with. As my determinations of the iodine absorption were, however, all made on the pure butter fat, and not on certain fatty acids produced therefrom, as in the case of Muter and De Koningh's experiments, our respective results are perhaps hardly comparable.

A short time ago, when I examined the most likely books of reference, in the hope

of coming across work of a similar nature by other chemists, the only iodine absorptions of butter fat of which I could find any record are those given in Allen's "Commercial Organic Analysis" (vol. ii., p. 50), and I was surprised at the discrepancies between the results there stated.

According to Hübl, the iodine absorption of butter fat varies from 26·0 per cent. to 35·1 per cent., while Moore found it to be from 19·5 per cent. to 38 per cent. These figures are so widely divergent that, if such extreme variations were likely to occur in the case of genuine butter, it is evident the iodine absorption test would be of comparatively little value as a means of detecting adulteration.

However, I determined to investigate the matter more fully myself, by ascertaining the iodine absorption of a number of specimens of butter, the genuine character of most of which I can vouch for, and also that of samples which were received for analysis in the ordinary way of business. The estimations were all made under as nearly as possible the same conditions. About ten grains of the filtered fat of each sample was dissolved in 300 grains of chloroform; then a measured quantity of Hübl's reagent (usually 400 grains) was added, and the mixture allowed to stand four hours. At the end of that time 300 grains of a 10 per cent. solution of potassium iodide and 1,000 grains of water were added, and the excess of iodine determined by means of decinormal-thiosulphate solution. A blank experiment was, of course, always made at the same time, with exactly the same quantities of the various reagents.

In the following table will be found some of the results which I have obtained by the examination of butter, margarine, and mixtures of the two in this manner:—

BUTTERS.				BUTTERS— <i>continued</i> .			
No.		Iodine Absorption.		No.		Iodine Absorption.	
		Per Cent.				Per Cent.	
1	English	..	..	33·62	25	Swedish	..
2	"	..	..	36·31	26	" (said to be old)	..
3	"	..	..	35·09	27	Finnish	..
4	"	..	..	35·30	28	"	..
5	"	..	..	33·83	29	French (stale Brittany)	..
6	"	..	..	32·35	30	New Zealand	..
7	Irish	..	..	39·42			
8	"	..	..	37·17			
9	"	..	..	38·91			
10	Danish	..	..	34·11	MARGARINES.		
11	"	..	..	34·69	No.		
12	"	..	..	38·70	1	Ordinary	..
13	"	..	..	40·36	2	"	..
14	"	..	..	35·74	3	"	..
15	"	..	..	34·64	4	Good	..
16	"	..	..	34·01	5	"	..
17	"	..	..	33·68	6	Cheap	..
18	"	(very fine quality)	..	38·91	7	"	..
19	German	..	..	35·49			
20	"	..	..	34·51	MIXTURES.		
21	"	..	..	36·21	No.		
22	"	..	..	38·25	1		50·27
23	"	..	..	35·01	2		50·24
24	"	..	..	23·60	3	Better than above	..
					4	High priced	..

The above list contains representative samples of butter from several countries, although it is by no means as complete as I should have wished. An examination of the figures given in the table will show that, with one exception, the iodine absorptions of all the samples of butter fat were fairly concordant, the mean of thirty determinations being 35·34 per cent., with extreme limits of 23·6 per cent. and 40·3 per cent.

I am unable to give any satisfactory explanation of the former result. It was yielded by a butter, the genuine character of which I have no reason to doubt, judging both by the source whence it came and also by the results which were obtained on examining the sample by the usual methods of butter analysis.

The sample with the highest iodine absorption (40·3 per cent.) which I have recorded in the table was also, to the best of my knowledge, genuine butter, but, as only a partial analysis was made, I am unable to speak with absolute certainty upon this point.

Another sample, said to be German butter several months old, which was submitted to me for examination, had an iodine absorption of 52·4 per cent. The other analytical results obtained during the examination of this sample led me to the conclusion that margarine was present, and I reported to that effect.

It will, of course, be readily understood that I had a special desire to apply the iodine absorption test to butter known to be genuine beyond all possible doubt, but possessing decidedly abnormal properties, in order to ascertain whether the iodine absorption was affected to any extent.

Several samples which I had at hand gave more or less abnormal results as regards the volatile and soluble fatty acids, etc., but, strictly speaking, I could not guarantee their absolute genuineness.

A couple of months ago I accordingly wrote to Mr. Allen, asking him to kindly supply me with a small quantity of the abnormal butter referred to in his paper of December last. Mr. Allen informed me that he had none of the butter left, but as he had sent some to Mr. Estcourt, he advised me to apply to that gentleman, which I did. Mr. Estcourt was, however, unable to let me have any of his sample, so I have unfortunately not been able to carry out my intention in connection with a genuine abnormal butter.

This fact notwithstanding, I believe the figures which I have tabulated in this paper will in many cases be of considerable value to my brother analysts, and it is entirely with that object in view that I now publish the results of my experience with this particular process.

It has been suggested to me by a well-known butter merchant, for whom many of the analyses recorded above were made, that in summer the iodine absorption of butter may vary to a greater or lesser extent from that of butter produced in the same districts during the winter months.

This is a point which remains to be investigated, and if the results obtained are of sufficient interest, I shall be glad to bring them before the Society on some future occasion.