

COMPOSITION OF DUTCH BUTTER.

BY JOHN CLARK, PH.D.

(Read at the Meeting, February 5, 1901.)

DURING the last five years I have had occasion to analyse a large number of butters, all of which are certified by the importers as being derived from factories in Friesland, a province in the north of the Netherlands, in which, I understand, no margarine is manufactured. As each sample represents a shipment, I have thought it would be of some interest to publish the results which I have obtained, to show the extent to which the volatile acids in the fat may fall in butters the genuineness of which seems to be beyond question. All the results were obtained by Leffmann and Beam's alkali-glycerin process, which, in my opinion, is quite as accurate as the Reichert-Wollny method and more expeditious. A blank was made with the alkali-glycerin, and the distillation was carried to about one-fourth of the original volume. In most cases I employed a slight excess of sulphuric acid to decompose the soap, but I have found by numerous experiments that the same results are obtained when a considerable excess of phosphoric acids is used for this purpose. The volatile acids, after deducting the blank, are given in their equivalent of butyric acid :

Year.	Month.	Number of Samples.	VOLATILE ACIDS PER CENT.		
			Average.	Maximum.	Minimum.
1896	January	3	4.90	5.06	4.80
	February	5	5.17	5.52	4.80
	March	4	5.50	5.57	5.44
	April	1	5.54		
	May	2	5.27	5.36	5.18
	June	None			
	July	3	5.26	5.29	5.13
	August	4	5.37	5.50	5.24
	September	None			
	October	1	4.75		
	November	1	4.70		
	December	1	5.34		
1897	January	1	4.90		
	February	3	5.37	5.72	4.99
	March	1	4.96		
	April	None			
	May	2	5.50	5.72	5.28
	June	2	5.45	5.54	5.36
	July	None			
	August	1	5.44		
	September	None			
	October	1	5.00		
	November	2	4.73	4.90	4.57
	December	1	5.50		
1898	January	None			
	February	2	5.14	5.18	5.10
	March	None			
	April	None			
	May	None			
	June	5	5.55	5.90	5.01
	July	1	4.84		
	August	2	5.16	5.48	4.85
	September	3	4.96	5.08	4.81
	October	4	4.79	5.01	4.45
	November	9	4.88	5.14	4.62
	December	2	4.97	5.15	4.80
1899	January	2	5.15	5.20	5.10
	February	1	5.15		
	March	2	5.74	5.86	5.63
	April	3	5.88	6.06	5.80
	May	1	5.90		
	June	None			
	July	1	5.50		
	August	8	5.16	5.83	4.84
	September	3	5.15	5.20	5.05
	October	4	4.92	5.12	4.71
	November	6	4.77	5.04	4.43
	December	None			

Year.	Month.	Number of Samples.	VOLATILE ACIDS PER CENT.		
			Average.	Maximum.	Minimum.
1900	January	...	1	5.20	
	February	...	2	5.15	5.20
	March	...	3	5.65	5.96
	April	...	5	5.56	5.80
	May	...	None		
	June	...	3	5.45	5.74
	July	...	1	5.12	
	August	...	4	5.12	5.35
	September	...	16	4.80	5.17
	October	...	29	4.76	5.25
	November	...	34	4.67	5.18
	December	...	3	4.76	4.86

The above analyses indicate that the volatile acids in Friesland butter by this method are, on an average, 5.17 per cent. On seven occasions they fell below 4.5 per cent., but in several of these cases I have been able to prove the genuineness of the butter. In 1898 the sample giving 4.45 per cent. of volatile acids was reported as of doubtful purity, and for the satisfaction of the importers I was requested to send someone to visit the factory in which the butter was made. For this purpose I nominated Mr. B. A. van Ketel, analyst in Amsterdam, who forwarded to me a sample of butter, which he certified was churned in his presence, and a portion of the cream from which it was made. The analyses of the fat of each of these gave the following results :

	Butter Fat.	Cream Fat.
Volatile acids per cent. ...	4.42	4.45

In October of last year two samples of butter from different factories showing 4.35 per cent. of volatile acids were also reported as of doubtful purity, and to satisfy the importers I again asked Mr. van Ketel to visit these factories, and send me samples of the butter and of the cream. On analysis the fats of these gave the following results :

	No. 1. Butter.	No. 1. Cream.	No. 2. Butter.	No. 2. Cream.
Volatile acids per cent. ...	4.30	4.35	4.33	4.33

In November two of the butters gave only 4.2 and 4.22 per cent. of volatile acids, and although I had no opportunity in these cases of examining certified samples from the churn, I received a letter from Dr. K. H. M. v. d. Lande, Director of the Government Agricultural Station at Hoorn, stating that on November 10 he had analysed a sample of butter from the same factory, taken from the churn in presence of witnesses, and that he found it to contain 4.19 per cent. of volatile acid, calculated as butyric acid.

The above results indicate that the poverty in volatile acid in these cases is not due to adulteration, but to natural causes, and this seems to take place mainly from about the middle of September till the middle of November, and is said to be due to the exposure of the cattle to the cold, combined with indifferent feeding, as the proportion of volatile acid gradually increases after the cattle are housed.

DISCUSSION.

Mr. HEHNER said that it was very difficult to discuss such a paper as this in the absence of the author. He would have liked to ask what the author meant when he spoke of volatile acids. He gathered that the process used was practically the Wollny process, excepting that the saponification was carried out according to Leffmann's method, with sodium hydroxide and glycerin. It was, however, practically impossible to distil off completely the volatile fatty acids, and as no correction appeared to have been made for that portion of the acids which did not distil over, the figures would be simply the Wollny figures, multiplied by a factor for conversion into percentages of volatile fatty acids. Unfortunately, the results of such processes were ordinarily recorded, not in percentages of volatile fatty acids, but in c.c. of decinormal alkali neutralized by a given quantity of butter. It would have been much more satisfactory if a system of the kind followed in this paper had been adopted from the first: as it was, it was almost impossible to form any opinion on the figures as they stood. For many years past the Dutch butter importers had been up in arms every November against analysts in England who condemned samples representing consignments of Dutch butter, which were said to be perfectly genuine. There was no doubt that this state of things was in a great measure due to the fact that in Holland the calving of the cows was managed in a preposterously bad manner. The cows somehow or other were allowed to get dry all at the same time, and consequently all at the same time to reach a condition in which the fat of their milk was quite abnormal in composition. This occurred at about the end of October or the beginning of November, just at the same time at which the change took place from the open air to stall feeding, a change which deeply affected the composition of the butter-fat. Taking these two circumstances together, it might very well happen, apart from any question of fraud, that the butter might analyse abnormally; but no such fluctuations would occur if the Dutch farmers chose to arrange that the calving of their cows was fairly divided over the year, as was the case in any country where farming was reasonably conducted, and if they stabled their cows rather earlier than hitherto. He understood that this matter was now being discussed by the more intelligent of the Dutch farmers themselves. As a result of this unfortunate management, and the difficulties which arose in consequence, Dutch butter had become discredited to such an extent that the Belgian Government now enacted that no butter should be exported from Belgium which gave a Reichert-Wollny figure lower than 25.

Mr. BEVAN said it seemed quite clear that the process which Dr. Clark had used was analogous to the Reichert-Wollny process, and he thought it quite right to assume, therefore, that the figures were comparable with the Reichert-Wollny figures expressed in terms of c.c. of decinormal alkali.

Dr. DYER said that he would have liked to ask Dr. Clark to restate these figures in what were now the usual terms. He thought that Mr. Hehner's view was probably correct as to the curious arbitrary method of statement which was used in the Reichert process; but that method of statement was now so universally adopted that it did not seem desirable to change it. He did not agree that it would be better to state the results in terms of the volatile acids, for, in speaking of percentages of

volatile acids, the calculation was made on the assumption (which of course was also arbitrary) that the volatile fatty acids all consisted of butyric acid, which was not the case; whereas the Reichert figure was at least a statement of fact, viz., that a certain quantity of butter yielded under certain circumstances a quantity of volatile fatty acids represented by a certain quantity of standard alkali.

(The following reply to some of the points in the discussion has been received from Dr. Clark.—ED.)

The "volatile acids" are stated in terms of butyric acid, and are calculated from the Reichert-Wollny figures. They represent the volatile acids distilled over, *not* the total volatile or butyric acid. This is the manner in which I always report my butter analyses, and is one more easily understood by a court. The process employed is analogous to the Reichert-Wollny process, and the results given can be converted into the Reichert-Wollny figures, expressed in terms of c.c. of decinormal alkali, by multiplying the volatile acids by 5.682. In this way it will be found that 4.4 per cent. of butyric or volatile acid corresponds to the Reichert-Wollny figure 25.
