

THE COMPOSITION AND ANALYSIS OF MILK AND MILK-PRODUCTS.

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THIS paper is a continuation of the annual reports of the work done in the laboratory of the Aylesbury Dairy Company. The results obtained in 1894 are given in the present communication. (For previous reports, see ANALYST, vii., 53; viii., 33; ix., 56; x., 67; xi., 66; xii., 39; xiii., 46; xiv., 69; xv., 44; xvi., 61; xvii., 62; xviii., 50; and xix., 73.)

The total number of samples analysed in 1894 was 32,295, consisting of

28,455 samples of milk.	2,269 samples of cream.
706 „ separated and skimmed milk.	
174 „ butter.	18 „ buttermilk.
22 „ water.	38 „ sundries.
613 „ bacteriological examinations.	

Of the milk-samples, 12,633 were, in order to check the quality of the milk received, taken from the railway churns on their arrival at the company's chief depot. The bulk of the milk is distributed, with the least possible delay, to the customers, a certain portion being, however, utilized for the production of cream, etc. To control the men employed in delivering the milk, a further 13,361 samples were taken before, during, and after delivery, and analysed comparatively.

The fat has been estimated this year by the Leffmann-Beam method, and the total solids were calculated by the milk-scale.

AVERAGE COMPOSITION OF MILK DURING 1894.

Month.	On Arrival.				Before Delivery.	During Delivery.	After Delivery.
	Sp. Gr.	T. S.	Fat.	S.-n.-F.	T. S.	T. S.	T. S.
January ...	1·0322	12·84	3·98	8·86	12·74	12·80	12·75
February ...	1·0322	12·66	3·82	8·84	12·61	12·60	12·57
March ...	1·0322	12·57	3·74	8·83	12·55	12·50	12·53
April ...	1·0320	12·52	3·75	8·77	12·51	12·46	12·46
May ...	1·0323	12·47	3·66	8·81	12·44	12·41	12·37
June ...	1·0323	12·48	3·68	8·80	12·47	12·45	12·42
July ...	1·0319	12·44	3·74	8·70	12·43	12·38	12·36
August ...	1·0320	12·50	3·75	8·75	12·40	12·38	12·37
September ...	1·0322	12·62	3·81	8·81	12·57	12·51	12·52
October ...	1·0321	12·74	3·93	8·81	12·63	12·63	12·66
November ...	1·0322	13·14	4·24	8·90	12·95	12·97	13·04
December ...	1·0323	13·07	4·18	8·89	12·83	12·91	12·82
Average ...	1·0322	12·67	3·86	8·81	12·60	12·59	12·57

The figures differ but very slightly from those of last year. As is usual, the poorest milk is found in the summer, and the maximum is attained in November.

In comparing the different columns, it must be remembered that not only are

the samples taken at random, and are not directly comparable, but that, for the control of the business, more attention is naturally paid to milk the quality of which is known or suspected to be below the mean (*e.g.*, the morning's milk, which is always poorer than the evening's), than to that which is above the average. Allowing for this, the agreement of the averages is almost absolute.

Cream samples were taken before and during delivery. The average of the results is given in the following table :

AVERAGE AMOUNT OF FAT IN CREAM DURING 1894.

Month.	Before Delivery.			After Delivery.		
January	46·7	...	...	46·5	...	...
February	47·9	...	...	47·9	...	...
March	49·1	...	...	49·4	...	...
April	48·6	...	...	48·8	...	...
May	49·4	...	...	49·6	...	...
June	48·7	...	...	48·4	...	...
July	48·5	...	...	49·6	...	...
August	51·0	...	...	51·2	...	...
September	48·4	...	...	49·2	...	...
October	47·6	...	...	48·3	...	...
November	48·6	...	...	48·6	...	...
December	50·8	...	...	50·5	...	...
Average	48·9	...	...	49·1	...	...

Considering the difficulty of drawing average samples of cream of such richness the agreement between the two series is satisfactory.

The Leffmann-Beam method is now adopted also for cream analysis, with very satisfactory results.

The average composition of 44 samples of clotted cream is as follows :

AVERAGE COMPOSITION OF CLOTTED CREAM DURING 1894.

Water	31·59
Fat	60·25
Ash	·69
Solids-not-Fat	8·16

These figures are not greatly different from those found in former years.

The amount of fat in separated milk was in most cases less than 0·3 per cent., and on very rare occasions was it found to be above 0·4 per cent.

The composition of the butter analysed was as follows :

AVERAGE COMPOSITION OF BUTTER DURING 1894.

French Butter, fresh; 41 samples.

Water	14·32 to 12·78	average	13·60
Fat	86·09 ,, 84·19	,,	85·05
Solids-not-Fat	2·47 ,, ·78	,,	1·35
Salt	·19 ,, ·03	,,	·09
Ratio of water to solids-not-fat, less salt ... ..	...	,,	9·2

French Butter, salt; 31 samples.

Water	...	...	13.57 to 9.68	average	11.27
Fat	...	...	87.72 ,, 82.98	,,	85.28
Solids-not-Fat	...	...	4.63 ,, 1.96	,,	3.45
Salt	...	...	3.29 ,, .57	,,	1.97
Ratio of water to solids-not-fat, less salt	...	...	...	,,	13.1

Brittany Butter; six samples.

Water	...	...	14.81 to 13.75	average	14.26
Fat	...	...	84.36 ,, 83.18	,,	83.84
Solids-not-Fat	...	...	2.01 ,, 1.78	,,	1.90
Salt	...	...	.25 ,, .09	,,	.16
Ratio of water to solids-not-fat, less salt	...	...	...	,,	12.2

English Butter, fresh; 22 samples.

Water	...	...	15.23 to 11.90	average	13.49
Fat	...	...	87.62 ,, 84.03	,,	85.70
Solids-not-Fat	...	...	1.83 ,, .48	,,	.81
Salt	...	...	1.07 ,, .01	,,	.14
Ratio of water to solids-not-fat, less salt	...	...	...	,,	5.0

English Butter, salt; 46 samples.

Water	...	...	16.39 to 10.19	average	13.11
Fat	...	...	87.65 ,, 79.99	,,	83.94
Solids-not-Fat	...	...	5.16 ,, 1.90	,,	2.95
Salt	...	...	4.30 ,, .90	,,	2.11
Ratio of water to solids-not-fat, less salt	...	...	...	,,	6.4

Australian and New Zealand Butters, salt; 6 samples:

Water	...	...	12.53 to 8.24	average	10.72
Fat	...	...	89.82 ,, 85.41	,,	87.21
Solids-not-Fat	...	...	2.59 ,, 1.44	,,	2.07
Salt	...	...	1.55 ,, .92	,,	1.23
Ratio of water to solids-not-fat, less salt	...	...	...	,,	7.9

An opportunity occurred for studying the change in composition in butter kept in casks. A salt butter was kept in a cask for one month, and was analysed directly after churning, and after one month:

	Water.	Fat.	S.-n.-F.	Salt.	Ratio of water to S.-n.-F. less salt.
Fresh	15.24	79.99	4.77	3.96	5.3
One month old	11.08	85.73	3.19	2.61	5.2

The diminution in solids-not-fat and salt show that the water had run out, and was not lost by evaporation. The salt has diminished in rather greater ratio than the water. This fact I have observed in butters kept in paper wrappers, and is possibly due to osmosis.

The results of the analysis of the fat are given in the following table:

ANALYTICAL RESULTS OF BUTTER FAT DURING 1894.

	French Butter.			English Butter.			New Zealand and Australian Butter.
Reichert-Wollny	33.2 to 28.2	av. 30.6	32.3 to 24.1	av. 28.1	31.0 to 27.5	av. 29.1	
Potash absorbed	22.88 ,, 22.49	,, 22.65	22.83 ,, 22.01	,, 22.56			
Iodine	40.2 ,, 31.3	,, 37.0	38.9 ,, 37.1	,, 37.9			Brittany Butter.
Density $\frac{39.5}{4}$	.91165 ,, .91123	,, .91143	.91174 ,, .91036	,, .91116	R. W. 28.8 to 28.6	av. 28.7	
,, $\frac{39.5}{4}$	.90484 ,, .90442	,, .90462	.90493 ,, .90356	,, .90436			
,, $\frac{100}{15}$			.8654 ,, .8652	,, .8653			