A Rapid Method for the Sorting of Butters and Margarines *

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THE disadvantage of the Reichert process, if comparable results are to be obtained, lies in the close attention that must be paid to the details of the distillation process. The present paper deals with a rapid method of sorting butters and margarines, and depends, like the Reichert process, upon the butyric acid content. No distillation is involved, and the figures obtained with butters closely approximate to those obtainable from Kirschner determinations. In the case of margarines the figures (with one exception) whilst being somewhat higher than the corresponding Kirschner values, are still, as with butters, lower than the corresponding Reichert values. For twenty butters examined the figures ranged from 20.6 to 26.4, whilst for eighteen margines the limits were 0.0 and 5.1. (See Tables I and II.)

The New Method. The following are the details of the process: Five grams of the filtered fat are saponified with 20 c.c. of glycerol soda solution (made by mixing 900 c.c. of pure glycerol with 100 c.c. of a 50 per cent aqueous solution of

*Read before the Society of Public Analysts.

TABLE I.

Butters.

No. of sample	Reichert (R)	M value	Kr.	Km.	Polenske	Boric acid Per cent
1	28.0	26.4	...	...	1.2	...
2	27.8	23.4	...	...	2.2	...
3	29.4	22.8	...	...	2.4	...
4	27.0	23.4	...	...	1.8	...
5	28.9	26.3	...	...	1.7	...
6	29.1	25.6	...	...	2.2	...
7	28.5	21.6	...	...	1.9	...
8	27.0	21.6	...	...	...	...
9	28.2	23.0	...	...	1.7	...
10	27.6	22.2	...	...	1.7	0.03
11	...	21.9	...	21.9	...	...
12	...	22.1	...	22.1	...	...
13	28.6	26.2	25.2	26.6	1.5	...
14	...	22.3 22.1	...	22.6	...	...
15	...	20.6	...	...	...	...
16	29.0	23.1†	...	...	...	...
17	...	20.6	...	...	...	...
18	...	22.2	...	21.9 22.0		
19	...	23.2	...	23.2 23.1	...	...
20	27.2	22.5	23.1	22.7	...	...

† Increased to 24.2 by hot water washing of the insoluble acids.

TABLE II.

Margarines.

No. of sample	Reichert	M. value	Kr.	Km.	Polenske	Boric acid Per cent
1	5.5	2.5	1.6	1.9	4.6	...
2	4.2	2.8	2.1	1.6	4.6	0.23
3	5.0	2.6	1.1	1.2	3.9	0.15
4	3.9	1.2	1.0	0.9	4.8	...
5	5.8	2.2	1.7	1.7	5.5	0.20
6	5.3	2.4	1.2	1.6	6.5	0.14
7	4.9	3.4	2.6	1.2	4.9	...
8	4.7	1.6	1.3	1.3	4.1	0.27
9	2.3	1.8 1.8	1.7	1.4	0.6	0.33
10	8.5	5.1	3.8	3.8	2.8	0.20
11	...	Nil	...	Nil	...	0.33
12	...	Nil	...	Nil	...	0.20
13	...	2.0	...	1.4	...	0.20
14	4.5	3.0	2.2	1.4	1.3	0.22
15	2.5	2.5	2.5	2.5	1.3	0.02
16	5.4	1.6	1.3	1.4	5.9	...
17	...	1.2	...	...	...	0.25
18	...	2.3	...	...	...	0.29

sodium hydroxide) and the soap dissolved in 100 c.c. of boiled distilled water. Into the cooled solution 4 drops of 0.5 per cent methyl orange solution are introduced and sulphuric acid (25 per cent by volume) added from a burette until the solution is faintly pink. The total volume of the solution and precipitated fatty acids is taken and 100 c.c. filtered off,* nearly neutralized with 10 per cent. sodium hydroxide solution, and the neutralization completed with 0.1 *N* sodium hydroxide solution. In this way the sulphuric acid is neutralized, leaving only soluble fatty acid, which is then titrated with 0.1 *N* sodium hydroxide, after the addition of 0.5 c.c. of 0.5 per cent phenolphthalein solution. The number of c.c. of 0.1 *N* sodium hydroxide solution taken, less the number required for a blank, is represented as the M value.

The blank is carried out upon 20 c.c. of glycerol soda solution dissolved in 100 c.c. of distilled water (free from carbon dioxide). In measuring the glycerol soda solution, 20 c.c. are poured into a 25 c.c. cylinder, and after the bulk has been transferred to the flask, four drops are allowed to enter, after which the cylinder is removed. In this way a reasonably uniform quantity is used in each case.

If to the neutral solution, obtained as above from a butter-fat, 0.5 gram of silver sulphate is added, and a Kirschner determination made, the value obtained in every case is the same, or very nearly the same, as the M value.

Significance of the Km Value. This figure is referred to as the Km value, as distinct from Kr, the ordinary Kirschner value. These results seem to indicate that the volatile soluble acids other than butyric are co-precipitated with the insoluble acids, and this theory is to some extent borne out by the fact that when the insoluble acids are washed several times in a separating funnel with hot water, and the washings passed through

*By using 18.5 cm. paper, the whole of the solution may be transferred at once, thus saving unnecessary expenditure of time in supervision of the filtration.

TABLE III.

Mixtures of Butter Fat with Coconut Oil.

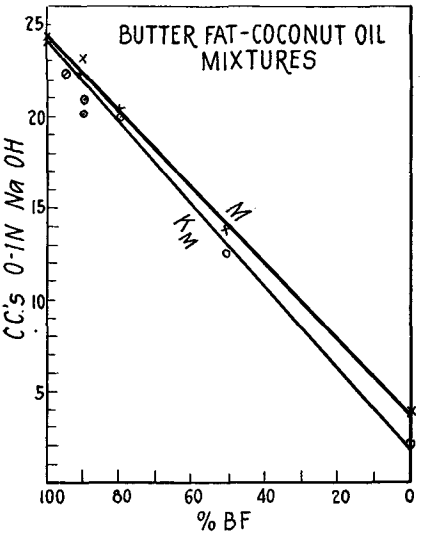
	M.	Km.	(M-Km).	Reichert.	Kr.	Polenske.
Butter fat, 100 per cent...	24.3	24.1	0.2	28.9	24.8	2.6
Butter fat, 95 per cent.... / Coconut oil, 5 per cent.....	22.1	22.1	0.0	27.7	23.5	2.7
Butter fat, 90 per cent....	23.0	20.7	2.3	26.7	22.1	3.9
Coconut oil, 10 per cent...	22.0	19.9	2.1			
Butter fat, 80 per cent.... / Coconut oil, 20 per cent...	20.3	19.9	0.4	25.0	20.1	4.5
Butter fat, 50 per cent.... / Coconut oil, 50 per cent...	13.7	12.4	1.3	19.2	13.7	7.9
Coconut oil, 100 per cent..	3.8	2.0	1.8	8.2	2.6	13.4

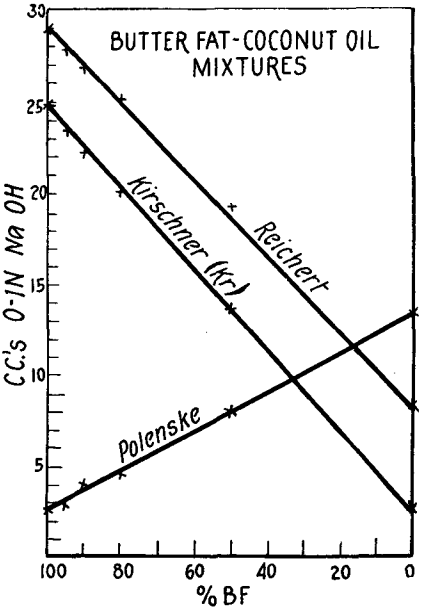
a filter paper, an increase in the M value results, although even so it does not become equal to the Reichert figure (Butter No. 16). This may possibly be accounted for by the preferential solubility of the soluble acids (other than butyric) in the liquid layer of the higher fatty acids (partition coefficient).

Detection of Coconut and Palm Kernel Oils in Butter Fat. For margarines, speaking generally, the Km value is lower than the M value. In margarines in which the presence of coconut or palm kernel oil has been indicated by the Reichert-Polenske-Kirschner determinations it would appear that some of the caprylic acid escapes co-precipitation, and this fact, along with the identity of the M and Km values in the case of butter-fats, suggested the possibility of detecting coconut and palm kernel oils, when present in butter-fat, by means of the difference which might exist between the M and Km values in such cases. To this end mixtures of butter-fat and coconut oil were prepared containing 5, 10, 20, and 50 per cent of the latter, the M and Km values, and also the Reichert - Polenske - Kirschner values, being then determined and the results plotted. (See Table III and Curves.) No difference was observable in the 5 per cent coconut oil mixture between the M and Km values, and only a slight one (0.4 c.c.) in the 20 per cent mixture. In the 50 per cent mixture the difference amounted to 1.3 c.c., no very great amount in view of the proportion of coconut oil present. On the other hand, the 10 per cent mixture showed a difference of 2.3 c.c.—a figure that was supported by a check determination

TABLE IV.

	Reichert	Kr after precipitation lasting— 60′	30′	15′	5′
Margarine No. 10..	8.5	3.8			
	8.6		...	4.0	3.9
Butter No. 21.....	27.8		22.7	23.7	..
	28.1	22.9			
	M value.	Km after precipitation lasting— 60′	30′		
Butter No. 19.....	23.2	23.2	23.1	...	..





which yielded a difference of 2.1 c.c. In view, however, of the slight differences obtained with the 20 per cent and 50 per cent mixtures, it would be difficult to formulate any definite conclusions. It was thought, however, that a qualitative test might be used, based upon the surmise that silver nitrate (or silver sulphate) added to the solution obtained in the M value determination would produce no turbidity in the case of a genuine butter (owing to the identity of the M and Km values) if sodium hydroxide free from chloride were used throughout, but that a turbidity would ensue if coconut or palm kernel oil were present.

Limitations of the Test. The alcoholic sodium hydroxide used for the saponifications and the aqueous sodium hydroxide solution used for the titrations in these tests were prepared from metallic sodium. The solutions were free from chloride. No turbidity was obtained with silver nitrate or silver sulphate in the case of a genuine butter fat, and only the faintest indication of such with a fat containing 5 per cent of coconut oil. At a concentration at which an appreciable turbidity was obtainable it was found that an approximately equal turbidity was yielded by the solution prepared from a pure butter-fat.

Thus it is not considered that this test can serve to distinguish butter fat in samples containing 5 per cent coconut oil.

Since these experiments were carried out, some chloride-free glycerol sodium hydroxide solution has been prepared, with results that have supplemented those obtained with the alcoholic sodium hydroxide solution.

Experiment has shown that boric acid has no effect on the M value. A clear filtered margarine fat was tested for boric acid alongside some of the whole margarine; the whole margarine showed the presence of boric acid, whilst the filtered fat gave a negative reaction.

Whilst, as yet the method here described for examining butters

cannot claim the accuracy of the Polenske process, it can be used instead with advantage in the examination of margarines, for the majority of which no butter content is expected, and for these the possibility of a butter fat content in excess of 10 per cent is, for obvious reasons, extremely small. Of the 20 margarines examined, in only one case did the M value exceed 3.4. In this case (No. 10. M =5.1) the Polenske-Kirschner figures corresponded with a 10 per cent butter content. In this case also, and in several others, the Km and the Kr values were identical. Generally, where the M value is 5.0 or over, determinations of both the Km and Kr values are recommended.

It has been found that for margarines a period of five minutes is sufficient time for the complete precipitation of the silver salts in Kirschner determinations. This effects a saving in the time of one hour recommended by Kirschner and adopted by Revis and Bolton. Similarly, for butters, thirty minutes were found sufficient. (See Table IV).

In conclusion, I wish to express my thanks to Mr. Harri Heap for his interest and criticisms.

Cotton in California

Cotton has become established as one of the leading industries of California. Last year 160,000 acres were planted which yielded 128,000 bales. To handle this crop, there are 82 gins, 5 compresses and 16 oil mills. By counties, the acreage devoted to cotton is as follows:

Kern County	35,000 bales
Tulare County	21,000 bales
Fresno County	21,000 bales
Kings County	21,000 bales
Madera County	10,500 bales
Merced County	9,600 bales
Stanislaus County ..	4,900 bales
San Joaquin Valley..	114,000 bales
Riverside	23,300 bales
Imperial Valley	26,000 bales

Ninety per cent of the cotton is of the Acala variety, which is found most suited to California soil and climate. The actual yield per acre last year was 382 pounds for the state, with the San Joaquin lands going as high as a bale to the acre.

Milk Fat Comparisons

New York State Agricultural Experiment Station at Geneva, N. Y. has just published a bulletin (Technical Bulletin, No. 122) which is entitled "A Comparison of the Babcock, Gerber, and Roese-Gottlieb Methods for Determining the Percentage of Fat in Milk and Cream."

The recent introduction into this country of the Gerber test, as well as the occasionally expressed belief that the Babcock test gives results which are too high, prompted this study.

A total of 925 tests of milk and cream were made by the Roese-Gottlieb, Babcock, and Gerber methods in three different research laboratories and four dairy control laboratories.

It was soon recognized that, altho results by the Roese-Gottlieb method made at one laboratory agreed well with results of the same laboratory, they did not always agree so well with the results of another laboratory. In investigations which consider the accuracy of the Babcock or Gerber tests to percentages of less than 0.10, it is quite essential that the accuracy of the results by the Roese-Gottlieb method should also be studied.

The results of the study are given in the bulletin which may be obtained on request.