A Comparative Study of Mississippi and Minnesota Butter From the Standpoints of Certain Fat Constants and Heat Resistance

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MUCH of the butter made in the cotton belt has characteristics somewhat different from those of butter made in the northern states. Southern butter commonly has a different texture, described as firm, hard or gummy, and a flavor that is flat, oily and slow to "clear up." The butter does not melt completely and quickly with the production of the cooling sensation and the flavor of northern butter.

The character of southern butter is of economic importance to the southern dairyman and butter manufacturer, since the butter is discriminated against when placed on the northern markets, receives a lower score and, therefore, a lower price than butter made from cream of equal quality in the northern states. The Cooperative Creamery, State College, Miss., rarely receives a score above 91, although 90 percent of the butter is made from sweet cream, with good equipment and by skilled workmen.

In view of the apparent differences between southern and northern butter, a comparative study of certain fat constants of the two seemed desirable.

The comparative study was made systematically over a period of one year beginning Macrh, 1931, using butter from Minnesota and Mississippi. Two samples of butter scoring 93 or above were secured on the first and fifteenth of each month from the Land O' Lakes Creameries at Minneapolis, Minn.; the samples were selected from two creameries dependent on local cream. Samples of butter were obtained on the same dates from the Cooperative Creamery located at State College, Miss.

DETERMINATION OF FAT CONSTANTS AND HEAT RESISTANCE

The various fat constants were determined upon arrival of the samples. The butter for analysis was melted and filtered in an insulated box warmed by an electric light which kept the fat in a liquid condition.

The melting points were determined by the Wiley method (1). At least four determinations of the melting point were made on each sample and the results were averaged.

The Zeiss butyro-refractometer was used in running the refractive indices (1). These tests were made at 40° C. and the readings only were recorded. The Reichert-Meissl numbers were obtained in duplicate by the Leffman and Beam method (1). The Iodine Absorption numbers were determined in duplicate by the Hanus method (1), five-tenths being considered the maximum variation permissible. The ability of the butter to withstand heat was determined by the method of Eckles and Palmer (2).

RESULTS AND DISCUSSION

The data showing the fat constants obtained on Mississippi and Minnesota butter over a period of one year are given in table 1.

A comparative study of the melting points show that the Mississippi butter reached the highest value of 41.1° C. in December and the lowest value of 33.9° C. in June, whereas the Minnesota butter gave a maximum melting point of 34.0° C. in December and a minimum of 31.5° C. during June. There was a variation of 7.2° C. in the melting points of the butter from Mississippi as compared with only 2.5° C. in the Minnesota butter, which indicates a comparatively low variation in the melting points of the northern butter. The lowest melting point of the southern butter was practically the same as the highest point of the northern butter. In the southern butter the minimum melting point was 2.4° C. higher than the minimum shown by the northern butter, while the maximum point reached by the former was 7.1° C. higher than that of the latter.

Usually the lowest melting points of butter are expected in the spring and early summer when fresh, green grass makes up a large part of the cows' ration. The effect of the earlier arrival of grass in Mississippi was shown by a decided lowering of the melting points beginning in March and continuing to decrease until a minimum value of 34.0° C. was reached the first of May, whereas the minimum point of the Minnesota butter was reached about one month later. The southern butter appeared to establish two distinct melting point levels; from March until October a comparatively low melting point was maintained, followed by an abrupt increase in October, with the higher level prevailing until the following March. The melting point of the southern butter produced in March, 1932, was 2.2° C. higher than that produced in March, 1931, and was due,

TABLE 1. *Fat constants of Mississippi and Minnesota butter over a period of one year*

Date	Mississippi butter				Minnesota butter			
	Melting point °C.	Refractive index values[2]	Reichert-Meissl No.	Iodine No.	Melting point °C.[1]	Refractive index[1]	Reichert-Meissl No.[1]	Iodine No.[1]
3-15-31	36.8	42.5	28.7	35.6	33.7	41.3	30.1	32.5
4- 1-31	36.4	42.6	30.2	36.2	33.4	41.3	29.2	32.0
4-15-31	35.5	42.6	29.5	35.5	33.6	41.8	30.7	33.3
5- 1-31	34.0	42.0	31.0	34.7	32.1	42.0	28.9	33.5
5-15-31	34.3	42.0	30.7	36.8	32.4	42.5	28.9	35.3
6- 1-31	33.9	42.2	30.1	36.0	31.5	43.3	29.2	38.5
6-15-31	34.9	42.3	31.0	32.9	31.8	43.3	28.8	37.3
7- 1-31	35.4	42.3	28.6	33.9	32.3	44.2	27.0	41.5
7-15-31	34.1	42.2	27.6	34.4	33.0	43.6	24.3	42.8
8- 1-31	34.2	42.5	29.1	34.3	33.0	44.2	24.1	41.5
8-15-31	34.6	42.4	27.1	34.6	33.0	43.8	24.2	41.0
9- 1-31	34.3	42.5	28.3	33.6	33.0	44.1	25.7	41.3
9-15-31	35.5	42.4	27.7	34.0	33.8	43.3	26.5	39.0
10- 1-31	35.7	41.5	25.8	33.0	33.6	43.0	26.6	38.0
10-15-31	39.3	42.7	25.5	33.9	33.2	43.0	26.8	37.0
11- 1-31	38.7	40.7	26.7	31.8	32.9	43.3	27.6	36.0
11-15-31	39.2	42.4	26.3	32.1	33.1	42.9	30.0	36.0
12- 1-31	41.0	42.4	25.7	31.5	34.0	41.7	29.5	32.4
12-15-31	41.1	42.2	25.7	32.5	33.7	41.0	31.0	30.1
1- 1-32	39.1	42.2	26.8	34.1	33.0	41.0	30.8	31.6
1-15-32	40.1	42.5	27.0	33.1	33.6	41.3	31.0	31.5
2- 1-32	40.0	42.1	27.7	32.9	33.1	41.1	30.1	31.6
2-15-32	40.2	42.3	27.5	33.9	33.1	41.3	29.9	31.5
3- 1-32	39.8	42.8	26.9	34.9	33.0	40.7	30.9	30.8
3-15-32	39.0	42.6	27.5	32.7	33.2	41.9	29.6	33.1

[1] Values are averages of two samples.

[2] Values obtained with Zeiss butyro-refractometer.

presumably, to the very late spring which retarded the growth of pasture grasses.

The refractive value of the Mississippi butter reached its highest point of 42.8 in March and its lowest point of 40.7 in November. With the Minnesota butter the maximum was 44.2 in July and August; then the values declined to about 41.0 during December, January, February and March. With the exception of two tests in October and November, the refractive values of the Mississippi butter showed less than a one point variation, whereas a variation of 3.5 points was recorded for the butter received from Minnesota. Butter from both sources showed a minimum value of 40.7. The highest value (42.7) found with the Mississippi butter was 1.5 points below the highest point recorded for the Minnesota butter.

The Reichert-Meissl numbers of the Mississippi samples were highest in May and June, reaching 31.0 in both months, and declined to a low point of 25.5 in October. A value of 31.0 in December and January was the highest observed in the Minnesota butter, and the lowest value of 24.1 was reached in August. The southern butter showed a variation of 5.5 points in the Reichert-Meissl numbers during the year and the northern butter varied 6.9 points. Higher values from the Mississippi samples than from the Minnesota samples were obtained during May, June, July, August and September. There seemed to be no tendency for the Reichert-Meissl numbers of the southern butter to vary with the seasons, but with the northern butter there was an abrupt drop in June which persisted at a low level until September, followed by a progressive increase leading to a high level in December and January.

The iodine numbers of the Mississippi butter were highest in May when the maximum value of 36.8 was reached, and the lowest point of 31.5 occurred in December. With the Minnesota butter the highest number (42.8) was obtained in July and the lowest (30.1) in December. The southern samples showed a variation of 5.3 points between the maximum and minimum values, whereas a difference of 12.7 points was observed in the northern samples. The highest iodine number found in the southern butter was 6.0 points below the maximum for the northern butter; the lowest value for the former was 1.4 points higher than that for the latter. No seasonal trend in the iodine numbers was observed in the samples collected from Mississippi which was in marked contrast to the seasonal variations of the Minnesota butter. Beginning in April the iodine number of the northern butter increased abruptly to a high level in July which was partially maintained until September followed by an equally rapid decrease to a low point in December. This low level reached in December persisted until March, when the numbers again showed an increase.

As the samples of butter were received a portion of each was put in a cold storage room having an average temperature of — 17° C. At the end of the year one sample from Mississippi and one from Minnesota, representing each month, were removed, tempered at about 7° C. for several days, cut in blocks 1¼″ x 1¼″ x 1″ and these pieces placed in an insulated room. The temperature was gradually increased to 37° C. over an 8-hour period. The butter was then hardened and the samples, arranged in monthly sequence, were reviewed. A visual examination of the samples showed that the Mississippi butter produced during the months of January, February, March and December manifested great resistance to the heat applied since the blocks of butter representing these months were affected only slightly by the temperatures used. None of the samples of Minnesota butter, on the other hand, showed much resistance to the heat. The northern butter, however, melted with considerable

uniformity, which was not the case with the southern butter. Due, presumably, to the effect of early pasture in Mississippi, relatively soft butter was produced during April and May, whereas the northern butter which was least resistant to heat was produced in June and July.

From the data presented, as well as from general observation, it is evident that southern butter is commonly firmer and more resistant to heat than much of the northern butter. The production of this type of butter in the south has certain merits. While churning temperatures are generally higher than those used in the north, the butter is easily handled through the different manufacturing steps during the warm season. This type of butter is also desirable from the standpoint of the southern consumer and unquestionably gives the southern creameries advantages during the summer months. The flat, oily and gummy tendencies of southern butter, however, and the lack of uniform melting properties are considered very undesirable from the standpoint of marketing.

CONCLUSIONS

1. The melting point of Mississippi butter was higher than that of Minnesota butter; it followed rather definite seasonal trends and reached its high points during the fall and winter months.

2. The resistance of the Mississippi butter to heat followed the variation in the melting point. There was very little variation in the heat resistance of Minnesota butter throughout the year.

3. The values for the refractive indices, and the Reichert-Meissl and iodine numbers of the Mississippi butter did not follow the decided seasonal trends shown by the Minnesota butter.

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