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Sweet versus sour cream butter

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SWEET VERSUS SOUR CREAM BUTTER.

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The objects of the work herein described were to compare the sweet-cream and the sour-cream methods of butter-making, with reference to the following points:

1. Relative losses of butter fat.
2. Relative amounts of butter produced.
3. Relative keeping qualities of the butter.
4. Relative amounts of casein in the butter.

The work was done between January 13 and April 8, 1892. Nine different experiments or comparative trials mere made, all conducted on the same general plan, which was as follows: A quantity of sweet cream, fresh from the (Alpha) separator, was thoroughly mixed and then accurately divided by weight into two equal parts; one of these parts was churned immediately (or in some cases after keeping cool and sweet over night with ice—about 16 hours); the other was ripened at 60° Fahr. for 24 to 48 hours, and then churned; the buttermilk was tested for fat by the Babcock Test, and in a few cases the wash-water and drippings from the working table were also tested; the butter was regularly analyzed at the laboratory, and in one case—as a check on the other work—the cream also was analyzed.

In each trial the two kinds of butter received the same amount of salt and the same amount of color.

Four 10-lb. tubs of the butter produced—two of each kind—were held in cool storage, at about 50° F., in order to compare keeping quality.

[Unfortunately, in the first five trials the samples of butter for analysis were inadvertently taken in (unsoaked) *wooden* boxes of 2 lbs. capacity and allowed to remain there for from 12 to 36 hours previous to analysis—thus affording opportunity for small and variable losses of water. Because of this, although complete analyses of the samples were made, the results for *Water* and *Fat* in these ten analyses are discarded since they are probably untrue *for butter as taken from the working table.* The figures for Casein would not be appreciably affected by this cause, and those for Salt but slightly; they are therefore included in the report.]

Following are the data and results for the several trials:

FIRST TRIAL.

	SWEET CREAM. Churned Jan. 13. Weight, 579½ lbs.	SOUR CREAM. Churned Jan. 15. Original weight, 579½ lbs. Ripened 44 hours.
Temp. of cream in churn	54°	60°
Temp. of buttermilk in churn	57°	62°
Time of churning	25 min.	13 min.
Weight of buttermilk	434 lbs.	396 lbs.
Test (Babcock)	.35 per ct.	.2 per ct.
Fat lost in buttermilk	1.52 lb.	.79 lb.
W't of worked and salted butter	136½ lbs.	137½ lbs.
	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water		
Fat		
Casein	.87	.97
Salt	5.29	4.03

SECOND TRIAL.

	SWEET CREAM. Churned Jan. 24. W't, 210 lbs. Held 16 hours with ice before churning.	SOUR CREAM. Churned Jan. 25. Original weight, 210 lbs. Ripened 46 hours.
Temp. of cream in churn	52°	60°
Temp. of buttermilk in churn	62°	62°
Time of churning	115 min.	25 min.
Weight of buttermilk	152 lbs.	134 lbs.
Test (Babcock)	.4 per ct.	.2 per ct.
Fat lost in buttermilk	.61 lb.	.27 lb.
W't of worked and salted butter	48 lbs.	52½ lbs.
	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water		
Fat		
Casein	.95	.91
Salt	2.40	3.83

THIRD TRIAL.

	SWEET CREAM. Churned Feb. 4. W't, 245 lbs. Held 16 hours with ice before churning.	SOUR CREAM. Churned Feb. 5. Original weight, 245 lbs. Ripened 40 hours.
Temp. of cream in churn	52°	58°
Temp. of buttermilk in churn	56°	60°
Time of churning	45 min.	25 min.
Weight of buttermilk	208 lbs.	185 lbs.*
Test (Babcock)	.35 per ct.	.3 per ct.
Fat lost in buttermilk	.73 lb.	.55 lb.
W't of worked and salted butter	57¾ lbs.	59 lbs.

	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water	.....	.....
Fat	.....	.....
Casein	.89	1.23
Salt	4.25	3.66

*Assumed; weighing omitted by mistake.

FOURTH TRIAL.

	SWEET CREAM. Churned Feb. 10. Weight, 280 lbs.	SOUR CREAM. Churned Feb. 12. Original weight, 280 lbs. Ripened 40 hours.
Temp. of cream in churn	52°	60°
Temp. of buttermilk in churn	56°	62°
Time of churning	20 min.	12 min.
Weight of buttermilk	241 lbs.	185 lbs.
Test (Babcock)	.4 per ct.	.3 per ct.
Fat lost in buttermilk	.96 lb.	.55 lb
W't of worked and salted butter	57 lbs.	59¼ lbs.

	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water	.....	.....
Fat	.....	.....
Casein	.79	1.04
Salt	4.38	2.31

FIFTH TRIAL.

	SWEET CREAM. Churned Feb. 17. Weight, 350 lbs.	SOUR CREAM. Churned Feb. 19. Original weight, 350 lbs. Ripened 48 hr's. W't then, 344 lbs. Added 11 lbs. of water.
Temp. of cream in churn	52°	61°
Temp. of buttermilk in churn	56°	64°
Time of churning	18 min.	8 min.
Weight of buttermilk	272 lbs.	257 lbs.
Test (Babcock)	.4 per ct.	.4 per ct.
Fat loss in buttermilk	1.09 lb.	1.03 lb.
W't of worked and salted butter	66 lbs.	65 lbs.
	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water	.....	.....
Fat	.....	.....
Casein	.82	92
Salt	5.90	2.62

SIXTH TRIAL.

	SWEET CREAM. Churned Feb. 24. Weight, 350 lbs.	SOUR CREAM. Churned Feb. 26. Original weight, 350 lbs. Ripened 42 hr's. W't then, 344 lbs. Added 18 lbs. water.
Temp. of cream in churn	51°	59°
Temp. of buttermilk in churn	56°	61°
Time of churning	12 min.	16 min.
Weight of buttermilk	258 lbs.	262 lbs.
Test (Babcock)	.35 per ct.	.2 per ct.
Fat lost in buttermilk	.90 lb.	.52 lb.
Fat lost in washing and working, approximate	.04 lb.	.00 lb.
W't of worked and salted butter	80¾ lbs.	82¼ lbs.
	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water	12.30	13.90
Fat	81.15	80.30
Casein	.81	1.13
Salt	5.74	4.67
	100.00	100.00
	BUTTER FAT, computed from analyses and tests.	
	Lbs.	Lbs.
In butter,	65.53	66.04
In buttermilk and washings	.94	.52
Total	66.47	66.56

SEVENTH TRIAL.

	SWEET CREAM. Churned March 9. Weight, 315 lbs.	SOUR CREAM. Churned March 11. Original weight, 315 lbs. Ripened 46 hr's. W't then, 315 lbs. (?). Added 36 lbs. water.
Temp. of cream in churn	50°	59°
Temp. of buttermilk in churn	54°	60°
Time of churning	16 min.	17 min.
Weight of buttermilk	226 lbs.	273 lbs.
Test (Babcock)	.45 per ct.	.25 per ct.
Fat lost in buttermilk	1.02 lbs.	.68 lbs.
Fat lost in washing and working, approximate	.13 lbs.	.13 lbs.
W't of worked and salted butter	69½ lbs.	71 lbs.
	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water	12.51	13.55
Fat	82.48	81.46
Casein	.84	.97
Salt	4.17	4.02
	100.00	100.00
	BUTTER FAT, computed from analyses and tests.	
	Lbs.	Lbs.
In butter	57.32	57.83
In buttermilk and washings	1.15	.81
Total	58.47	58.64

EIGHTH TRIAL.

	SWEET CREAM. Churned March 24. Weight, 280 lbs. Held 16 hours with ice before churning.	SOUR CREAM. Churned March 25. Original weight, 280 lbs. Held 16 hours with ice before ripening. *Ripened 24 hours.
Temp. of cream in churn	50°	58°
Temp. of buttermilk in churn	56°	58°
Time of churning	35 min.	9 min.
Weight of buttermilk	213 lbs.	198 lbs.
Test (Babcock)	.15 per ct.	.1 per ct.
Fat lost in buttermilk	.32 lb.	.20 lb.
Fat lost in washing and working, approximate	.06 lb.	.03 lb.
W't of worked and salted butter	72 lbs.	75½ lbs.
	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water	12.50	14.37
Fat	83.12	80.24
Casein	.87	1.15
Salt	3.51	4.24
	100.00	100.00
	BUTTER FAT, computed from analyses and tests.	
	Lbs.	Lbs.
In butter	59.85	60.58
In buttermilk and washings	.38	.23
Total	60.23	60.81

*Ripened at 64°.

NINTH TRIAL.

	SWEET CREAM. Churned April 6. Weight, 350 lbs. Added 10 lbs. water.	SOUR CREAM. Churned April 8. Original weight, 350 lbs. Ripened 46 hours. Weight then, 342 lbs. Added 28 lbs. water.
Temp. of cream in churn	50°	60°
Temp. of buttermilk in churn	56°	64°
Temp. of air in room	66°	70°
Time of churning, (delay from belt slipping)	32 min.	(?)
Weight of buttermilk	252 lbs.	233 lbs.
Test (Babcock)	.25 per ct.	.1 per ct.
Fat lost in buttermilk	.63 lb.	.23 lb.
Fat lost in washing and working, approximate	.00	.13 lb.
W't of worked and salted butter	88¾ lbs.	91⅛ lbs.

	ANALYSIS OF BUTTER. Per cent.	ANALYSIS OF BUTTER. Per cent.
Water	12.34	14.12
Fat	82.84	80.63
Casein	.79	1.20
Salt	4.03	4.05
	100.00	100.00

	BUTTER FAT, computed from analyses and tests. Lbs.	Lbs.
In butter	73.52	73.77
In buttermilk and washings	.63	.36
Total	74.15	74.13

Analysis of cream used in this trial: Duplicates, 21.06 and 21.18 per ct. fat=mean 21.12; 350 lbs. cream would then contain 350×.2112=73.92 lbs. fat. This serves as a check on the above described work of this trial, and proves it correct within a fifth of a pound of butter fat: (74.14—73.92 =.22).

The following tables bring together the principal results obtained in the nine trials, and some deductions therefrom:

BUTTER PRODUCED, AND TIME SPENT IN CHURNING.

No. of trial.	Relative yields, pounds.		Times required for churning, min.		ANALYSIS OF THE BUTTER.					
					Water, per cent.		Fat, per cent.		Casein, per ct.	
	Sweet	Sour.	Sweet	Sour.	Sweet	Sour.	Sweet	Sour.	Sweet	Sour.
1	100	100.7	25	13	.....	.....	.....	.....	.87	.97
2	100	109.4	115	25	.....	.....	.....	.....	.95	.91
3	100	102.2	45	25	.....	.....	.....	.....	.89	1.23
4	100	103.9	20	12	.....	.....	.....	.....	.79	1.04
5	100	98.5	18	8	.....	.....	.....	.....	.82	.92
6	100	101.9	12	16	12.30	13.90	81.15	80.30	.81	1.13
7	100	102.2	16	17	12.51	13.55	82.48	81.46	.84	.97
8	100	104.9	35	9	12.50	14.37	83.12	80.24	.87	1.15
9	100	103.1	.....	.....	12.34	14.12	82.84	80.63	.79	1.20
Av'r'ge	100	103	.....	.....	12.41	13.98	82.40	80.66	.85	1.06

APPROXIMATED LOSSES OF FAT IN THE BUTTERMILK.

[Determined by the Babcock Test.]

NO. OF TRIAL.	Losses per 100 lbs. of butter produced.		Relative losses.	
	Sweet. Lbs.	Sour. Lbs.	Sweet.	Sour.
1	1.11	.58	100	52
2	1.27	.51	100	44
3	1.26	.93	100	75
4	1.68	.93	100	57
5	1.65	1.58	100	94
6	1.16*	.63*	100	55
7	1.65*	1.14*	100	70
8	.53*	.30*	100	61
9	.71*	.39*	100	57
Average ...	1.23	.78	100	63

*Loss in washing and working included.

It is worthy of mention that although the same amount of color (Fargo's oil color) was used in each trial for the sweet and the sour cream churning, nevertheless the sweet cream butter was always several shades lighter colored than the ripened cream product; and the buttermilk from the former was always more or less yellow. The sweet cream butter did not "take" the color as well as the ripened.

KEEPING QUALITY.

Two 10 lb. tubs, one of sweet the other of sour cream butter, made on Jan. 23d and 25th, and kept in cool storage at about 50°, were examined on April 20th—the length of storage being then practically three months. The record of examination is as follows:

	SWEET CREAM BUTTER.	SOUR CREAM BUTTER.
Score on Flavor.....	40	40
REMARKS:	Has not suffered by keeping, but is still lacking in flavor; has not perceptibly acquired flavor. Color, pale.	Has perceptibly suffered by keeping; is not quite sweet, leaving bad after-taste in the mouth. Color, right.

Examined again on June 17th. Length of storage, 5 mos. lacking one week.

REMARKS:	Butter flavor has increased. A fair butter; would sell for table use.	Distinctly rancid. Fit only for cooking. Not worth as much as the sweet cream butter into 6 cents a pound.

Two 10 lb. tubs, of the sweet and the sour cream product respectively, churned Feb. 17th and 19th, and held in storage at 50°, were examined on April 20th. Length of storage, 2 mos. Here is the record:

	SWEET CREAM BUTTER.	SOUR CREAM BUTTER.
Score on Flavor.....	42	35
REMARKS:	Has not suffered by keeping; has acquired considerable of the flavor of ripened cream butter. Color, pale.	Has perceptibly deteriorated. Color, right.

Examined again June 17th. Length of storage, 4 mos.

REMARKS:	Still a fair butter. Would sell for table use.	Flavor a little strong. Would hardly sell for table use. Not worth as much as the sweet cream butter into 3 or 4 cents per lb.

The facts and figures above given are condensed in the following

SUMMARY.

[Sweet cream churned at 50° to 54°, sour cream at 58° to 60°.]

1. The yield of butter from sour cream was usually larger than from sweet; in nine trials it averaged 3 per cent. larger.

2. Sour cream usually churned quicker than sweet.

3. The butter from sour cream usually contained less fat and more water than did that from sweet cream. In four trials the average difference in fat was nearly 2 per cent.

4. The butter from sour cream usually contained a trifle more casein than did that from sweet. This was the case in eight of the nine trials made. The average difference was .2 of one per cent.

5. The losses of fat in churning, washing and working were less with sour than with sweet cream. In nine trials the average difference was nearly one-half pound of fat per 100 lbs. of butter made. This difference was sufficient to make the loss about 50 per cent greater in churning sweet than in churning sour cream.

6. The sweet cream butter suffered less deterioration by keeping 5 months (at a temp. of about 50°) than did the sour cream product. The former acquired in a measure the flavor and aroma of ripened cream butter. [These results fully confirm those obtained by one of us in 1890, in an experiment made jointly by the Station and Mr. J. M. Daniels, of Dayton, Iowa. See Bulletin No. 11.]

7. Sweet cream butter did not "take" the color (oil color, Fargo's) as well as did that from sour cream; it was always some shades lighter in color.