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# The Manufacture of High-Scoring Butter<sup>1</sup>

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**H**IGH-SCORING butter must be full and rich in flavor and aroma without showing any indication of uncleanness or sourness. The butter must be smooth and close in texture. A trier plug taken from the butter should show very little loose moisture and no tendency toward stickiness.

The selection of the cream for high-scoring butter is of primary importance. The buttermaker's chief aid in cream selection is his sense of taste. The acid test is of little value, since cream showing a noticeable degree of acid development is undesirable for the manufacture of high-scoring butter. The cream must be sweet and clean in flavor without even a trace of such defects as oily, metallic, rancid, tallowy or weedy flavors. Certain feed flavors, such as those due to grass and silage, are not heavily penalized by the judges; however, it is usually a good plan to use for fancy butter the cream which has the least grass flavor during the grass season and the cream with the least silage flavor during the season when silage is fed. Such feed flavors as those due to rye pasture, rape, musty hay or musty cornstalks are very undesirable. The cream should be at least one to two days old so the undesirable flavors have a chance to develop to such an extent that they are easily discernible. It is usually a good plan for at least two people to grade the cream, since certain flavors are sometimes recognized by one person and not by another. Cream testing 30 to 35 percent in fat is desirable from the standpoint of obtaining a good body and texture in the finished butter.

In the pasteurization of cream for fancy butter care should be taken not to overheat or scorch the cream. This is especially important when

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TABLE 1. *The manufacture of high-scoring butter*

Trial	Original acidity of the cream in %	Treatment as to neutralization	Kind of butter culture	Amount of butter culture in %	Method of using the butter culture
1	0.14	.....	Regular	8	Not ripened; held 6 hrs.
2	.15	.....	Regular	8	Not ripened; held 6 hrs.
3	.15	.....	Regular	9	Not ripened; held 6 hrs.
4	.14	.....	Regular	7	Not ripened; held 6 hrs.
5	.13	.....	Regular	8	Not ripened; held 6 hrs.
6	.15	.....	Regular	7	Ripened 1 hr.; held 12 hrs.
7	.14	.....	Modified <sup>1</sup>	8	Not ripened; held 12 hrs.
8	.18	.....	Modified	7	Not ripened; held 12 hrs.
9	.17	.....	Regular	7	Not ripened; held 12 hrs.
10	.16	.....	Regular	7	Not ripened; held 12 hrs.
11	.18	.....	Regular	7	Not ripened; held 12 hrs.
12	.16	.....	Modified	8	Not ripened; held 12 hrs.
13	.14	.....	Modified	8	Not ripened; held 12 hrs.
14	.14	.....	Modified	8	Not ripened; held 12 hrs.
15	.18	.....	Modified	8	Not ripened; held 12 hrs.
16	.18	.....	Regular	8	Not ripened; held 12 hrs.
17	.17	.....	Regular	8	Not ripened; held 12 hrs.
18	.18	.....	Regular	7	Not ripened; held 12 hrs.
19	.16	.....	Regular	7	Not ripened; held 12 hrs.
20	.13	.....	Regular + 0.15% citric acid	8	Not ripened; held 12 hrs.
21	.14	.....	Regular + 0.15% citric acid	8	Not ripened; held 12 hrs.
22	.18	.....	Regular + 0.15% citric acid	8	Not ripened; held 8 hrs.
23	.13	.....	Regular + 0.15% citric acid	12	Not ripened; held 8 hrs.

<sup>1</sup> Made from milk cultures of *S. paracitrovorus* acidulated with 0.30% sulphuric acid and 0.15% citric acid.

TABLE 1. (Continued)

Acidity at churning in %		Time of contest	Type of contest	Fresh butter score	Storage butter score	Criticism
Cream	Cream serum					
0.26	0.33	Dec. '31	State	94.00		
.25	.32	Jan. '32	State	94.00		
.27	.37	Feb. '32	National	93.16		Sl. coarse
.24	.33	March '32	State	94.00		
.26	.36	April '32	State	93.50		Sl. coarse
.27	.37	May '32	State	93.66		Sl. coarse
.25	.33	June '32	National	94.25	93.50	
.27	.37	July '32	State	92.00		Coarse
.26	.36	Aug. '32	National	93.00		Sl. coarse
.25	.36	Nov. '32	State	93.16		
.26	.35	Dec. '32	State	93.00		
.24	.33	Jan. '33	State	94.00		
.23	.30	Feb. '33	National	94.00		
.23	.31	March '33	State	94.00		
.25	.35	April '33	State	92.50		Coarse acid
.26	.37	May '33	State	92.00		Coarse acid
.26	.36	June '33	National	94.00	93.50	
.26	.36	July '33	State	92.00		Coarse acid
.25	.35	Dec. '33	State	93.00		Sl. coarse
.23	.31	Jan. '34	State	94.50		
.24	.33	Feb. '34	National	94.00		
.27	.36	March '34	State	93.00		Sl. coarse
.24	.33	April '34	State	94.50		

TABLE 1. (Continued)

Trial	Original acidity of the cream in %	Treatment as to neutralization	Kind of butter culture	Amount of butter culture in %	Method of using the butter culture
24	.15	.....	Regular + 0.15% citric acid	12	Not ripened; held 8 hrs.
25	.12	.....	Regular + 0.15% citric acid	10	Not ripened; held 8 hrs.
26	.18	.....	Regular + 0.15% citric acid	7	Not ripened; held 8 hrs.
27	.18	.....	Regular + 0.15% citric acid	7	Not ripened; held 8 hrs.
28	.19	Neutralized to .1% using NaHCO <sub>3</sub>	Regular + 0.15% citric acid	8	Ripened 1 hr.; held 8 hrs.
29	.17	Neutralized to .1% using NaHCO <sub>3</sub>	Regular + 0.15% citric acid	9	Ripened 1 hr.; held 8 hrs.
30	.16	Neutralized to .1% using NaHCO <sub>3</sub>	Regular + 0.15% citric acid	7	Ripened 1 hr.; held 8 hrs.
31	.13	Neutralized to .08% using Sesqui.	Regular + 0.15% citric acid	9	Ripened 1 hr.; held 8 hrs.
32	.13	Neutralized to .08% using Sesqui.	Regular + 0.15% citric acid	10	Ripened 1 hr.; held 8 hrs.
33	.15	Neutralized to .08% using Sesqui.	Regular + 0.15% citric acid	10	Ripened 1 hr.; held 8 hrs.
34	.14	Neutralized to .08% using Sesqui.	Regular + 0.15% citric acid	12	Not ripened; held 8 hrs.
35	.15	Neutralized to .08% using Sesqui.	Regular + 0.15% citric acid	9	Ripened 1 hr.; held 8 hrs.
36	.14	Neutralized to .1% using Sesqui.	Regular + 0.15% citric acid	10	Ripened 2 hr.; held 8 hrs.
37	.17	Neutralized to .1% using Sesqui.	Regular + 0.15% citric acid	10	Ripened 1 hr.; held 8 hrs.
38	.16	Neutralized to .1% using Sesqui.	Regular + 0.15% citric acid	10	Ripened 2 hr.; held 8 hrs.
39	.14	Neutralized to .1% using Sesqui.	Regular + 0.1% citric acid	12	Not ripened; held 8 hrs.
40	.18	Neutralized to .1% using Sesqui.	Regular + 0.1% citric acid	12	Not ripened; held 8 hrs.
41	.19	Neutralized to .1% using Sesqui.	Regular + 0.1% citric acid	12	Not ripened; held 8 hrs.
42	.19	Neutralized to .1% using Sesqui.	Regular + 0.1% citric acid	12	Not ripened; held 8 hrs.
43	.17	Neutralized to .1% using NaOH	Regular + 0.1% citric acid	14	Not ripened; held 8 hrs.
44	.17	Neutralized to .1% using NaOH	Regular + 0.1% citric acid	13	Not ripened; held 8 hrs.
45	.16	Neutralized to .1% using NaOH	Regular + 0.1% citric acid	14	Not ripened; held 8 hrs.

TABLE 1. (Continued)

Acidity at churning in %		Time of contest	Type of contest	Fresh butter score	Storage butter score	Criticism
Cream	Cream serum					
.26	.35	May '34	State	93.00		Sl. coarse
.24	.33	June '34	National	94.25	94.00	
.27	.36	July '34	National	93.00		Sl. coarse
.27	.36	Aug. '34	State	92.50		Coarse
.24	.33	Sept. '34	National	95.25		
.25	.34	Oct. '34	National	94.25		
.25	.34	Oct. '34	State	93.50		
.24	.32	Nov. '34	State	95.00		
.24	.33	Dec. '34	State	95.00		
.23	.30	Jan. '35	State	93.00		Mild
.23	.29	Feb. '35	National	94.75		
.25	.34	March '35	State	93.00		
.24	.33	April '35	State	94.50		
.23	.30	May '35	State	93.00		Mild
.24	.32	June '35	State	94.00		
.22	.27	June '35	National	95.00	94.00	
.22	.26	July '35	State	94.50		
.23	.27	Aug. '35	National	95.00		
.23	.27	Aug. '35	State	95.00		
.24	.33	Sept. '35	National	96.00		
.24	.33	Oct. '35	National	95.00		
.24	.32	Nov. '35	National	95.25		

pasteurizing small lots of cream in large vats. If the water in the coil of the pasteurizer is over 35 to 40 degrees hotter than the cream (when the usual positive circulating systems are used), the coil is apt to become steam-logged and a scorched and heated flavor may result. When cream is heated in the ordinary vat pasteurizers, it is usually best not to go above 150° to 155° F.; otherwise a slight heated or cooked flavor, which is undesirable in high-scoring butter, may result.

The treatments used by the author in the manufacture of butter entered in state and national contests during the years 1932 to 1936 are presented in table 1. Various procedures were employed from the standpoint of the type of culture used, the method of using culture and the neutralization of the cream before adding the culture. These are summarized as follows:

1. Twelve churnings were made by adding 7 to 9 percent regular culture to the cream after cooling.

2. One churning was made by adding 7 percent regular culture to the cream, ripening for 1 hour and cooling.

3. In six churnings 7 to 8 percent of modified culture was added to the cream after cooling.

4. Sixteen churnings were made with 7 to 14 percent culture prepared by adding 0.15 percent citric acid to the milk; the culture was added to the cooled cream.

5. Ten churnings were made with 7 to 10 percent culture prepared by adding 0.15 percent citric acid to the milk; the culture was added to the cream at 70° F., and the cream was then ripened 1 hour and cooled.

6. In 18 churnings the acidity of the cream was neutralized to 0.08 percent after pasteurization through the use of various soda neutralizers. The cream was then treated with culture and cooled; it was usually held from 8 to 12 hours at a low temperature before churning.

In a general way, the data indicate that the addition of 0.15 percent citric acid to the milk intended for culture resulted in the manufacture of higher scoring butter than had previously been obtained. The butter appeared to have a "fuller" flavor than ordinary butter which was expected because of the importance of citric acid as a source of butter flavor and aroma materials. Still further improvement in the scores of the butter was noted as a result of neutralizing the acidity of the sweet cream to 0.08 to 0.10 percent after pasteurization. This practice made it possible to develop a high degree of flavor in the butter, either by the addition of more culture or by ripening the cream, without the danger of developing a sour or coarse flavor.

The churning, washing and working procedure used for high-scoring butter was not greatly different from that employed in ordinary commercial practice. In order to obtain a firm, close, smooth-boring body on the

butter it was necessary to churn the cream at as low a temperature as possible, to use a wash-water temperature that would keep the butter firm and to work the butter intermittently, draining carefully through a cracked door between each working period.

