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Studies of the Manufacture of

CREAM-TYPE CHEESE

Made from Condensed Cream

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Cream cheese must meet certain ingredient and processing standards as defined by the Food and Drug Administration (11)*. The process used in the manufacture of cream cheese is labor consuming. The transferring of the coagulated cream from the vat to the draining cloths, and the transferring of the drained curd back to a vat for further processing, are labor-consuming operations. The drain cloths are unsightly and may be a source of contamination.

These disadvantages have led a number of experimental workers to investigate the possibility of by-passing the draining process in the manufacture of cream cheese. This study is an attempt to find a way of making a cream-type cheese by using condensed cream.

REVIEW OF LITERATURE

The first to introduce a method for making cream cheese without draining was Dahlberg (1) who used non-fat dry milk solids for building up the total solids content rather than employing the draining process to concentrate the milk solids. Marquardt (5, 6, 7), Reid and Alley (10), Sommer (11), and Link (4) have reported somewhat similar methods for making cream cheese without the use of drain cloths.

Other methods for making cream cheese have eliminated the draining process. Reichart and Crowe (9), and Dahle and Nageotte (2, 3) used cultured cream, cottage cheese curd, salt, and stabilizer with good results. Dahle and Nageotte further investigated the possibility of

* Numbers in parentheses refer to Literature Cited, page 10.

using butter and cottage cheese curd, and condensed cream. All combinations tried were considered successful except the one where condensed cream was the sole source of milk solids. This product was criticized for having a poor body and a flavor which was unpleasantly sweet.

EXPERIMENTAL PROCEDURE

The analytical and general manufacturing procedures used, except for minor variations noted later, were as follows:

Good quality milk and cream from the milking herd at Oklahoma A. & M. College were used for making the cream cheese. The milk and cream were mixed in the right proportions to give the desired amounts of fat and of solid-not-fat in the finished cheese. The mixtures of milk and cream were prewarmed to 150° to 160° F. and condensed in a 28-inch Rogers vacuum pan. Each lot was condensed to a Baumé reading of 4.0° at 120° F. This concentration was greater than necessary for the finished product but permitted the later addition of water used to dissolve the salt and the stabilizer.

The samples of the condensed product were analyzed for butterfat by the Babcock method for testing cream and for total solids either by the Mojonnier method (8) or the Dietert moisture tester. In the Babcock test a little more acid was used than for cream because of the relatively high percentage of solids-not-fat.

After condensing, the concentrated product was dropped into a cottage cheese vat, cooled to 70° F., inoculated with 1 percent of an active starter culture and incubated at 70° F. for about 14 to 16 hours or until the titratable acidity reached approximately 1 percent. The titratable acidity was determined by weighing 4.5 grams into a 125 ml. Erlenmeyer flask, diluting with 4.5 ml. of distilled water and titrating with N/10NaOH. Phenolphthalein was used as the indicator. After the desired acidity had developed in the concentrated product, .5 percent stabilizer (.15 percent gelatin and .35 percent locust bean gum) and 1 percent salt, dissolved in sufficient water to standardize to the desired composition, were added. The product was then heated to 180° F. and homogenized at a pressure of 3000 pounds per square inch.

Immediately after homogenization, the hot product (about 180° F.) was packaged in jars or tumblers. In the first 10 trials, regular half pint fruit jars were used and in subsequent trials 9½ ounce tumblers closed with "Anchorvac T-style" caps were used. An exception to

the usual procedure was employed in Trial 1 in which the product was homogenized after condensing without previous cooling. The product was then cooled to 70° F., inoculated, ripened, and packaged without further heat treatment. This procedure was abandoned because the product kept very poorly. The keeping quality of each lot was determined by observing defects occurring in samples stored at room temperature (70° to 80° F.) and at 40° to 50° F. Observations were made at intervals over a 6-month period.

RESULTS

Fourteen trial lots of cream cheese were prepared in which variations were made in butterfat, milk solids-not-fat, salt, stabilizer, total solids, and acidity in an effort to find the most desirable composition for a high quality product. Table I shows the composition, general quality, and keeping quality of each of the 14 lots of cheese.

Variations in Milk Solids and Total Solids

The ratio of butterfat to milk solids-not-fat was kept fairly constant at 2 to 1. This 2 to 1 ratio was used because it seemed to give the most desirable body in the initial trials. Variations in the milk solids-not-fat seemed to have the greatest influence on the flavor, body and texture, and keeping quality. In Trials 2, 3, 8, 9, 12, 13 and 14, the flavor was mildly acid and pleasing. The maximum concentration of milk solids-not-fat for this group was 17.23 percent. In the remaining trials (except Trial 1) the flavor was criticized as being too sweet; in these trials the milk solids-not-fat concentrations were 17.53 percent or above. The objectionable sweetness was apparently due to the relatively high milk sugar content.

The body and texture in Trials 2, 3, 4, 6, 8, 9, 12 and 13 was firm and smooth, with good spreading quality; the maximum concentration of milk solids-not-fat for this group was 18 percent. The body on Trial 1 was very weak due to the low total solids (47.97 percent), and the absence of heat coagulation in the presence of acid. In the remaining trials (except Trial 6) the body was mealy. The Trial 6 product was gummy due to the high content of locust bean gum. The mealy defect was apparently caused by too high a concentration of milk solids-not-fat. From the above observations, it is apparent that the defects of sweet flavor and mealy body can be avoided by limiting the milk solids-not-fat concentration to about 17 percent. Lower concentrations of milk solids-not-fat and low total solids will likely result in a weak body as demonstrated in Trial 1.

Table I.—Composition, Quality, and Keeping Quality of Mixes Studied in Each Trial.

Trial No.	Butterfat (percent)	M.S.N.F. (percent)	Salt (percent)	Stabilizer: Gelatin (percent)	Stabilizer: Locust bean gum (percent)	Total solids (percent)	Titratable acidity (percent)	Flavor criticisms	Body and texture criticisms	Keeping quality[1] 70°-80°F	Keeping quality[1] 40°-50°F
1	31.67	15.30	.50	.10	.40	47.97	1.20	Acidy	Very weak	2 days	1 week
2	33.78	16.17	.50	.10	.40	50.95	1.10	No criticism	No criticism	2 mos.	6 mos.
3	32.80	16.28	1.00	.15	.35	50.58	1.05	No criticism	No criticism	2 mos.	6 mos.
4	35.96	18.00	1.00	.05	.45	55.46	1.12	Too sweet	No criticism	3 mos.	6 mos.
5	32.96	18.80	1.00	.15	.40	53.35	1.48	Too sweet	Mealy	2 mos.	6 mos.
6	33.00	17.53	1.00	.09	.70	52.32	1.32	Sl.[2] sweet	Gummy	2 mos.	6 mos.
7	36.11	18.24	1.00	.10	.50	55.95	1.22	Sl. sweet	Sl. mealy	3 mos.	6 mos.
8	33.91	17.08	1.00	.15	.35	52.49	.95	No criticism	No criticism	2 mos.	6 mos.
9	34.12	16.92	1.00	.15	.35	52.54	.96	No criticism	No criticism	2 mos.	6 mos.
10	34.60	18.60	.80	—(CMC)[3].50		54.50	1.10	Sl. sweet	Sl. mealy	3 mos.	6 mos.
11	36.33	18.25	1.00	.15	.35	56.08	1.14	Sl. sweet	Mealy	2 mos.	6 mos.
12	33.89	17.02	1.00	.15	.35	52.41	.98	No criticism	No criticism	------	------
13	34.02	17.23	1.00	.15	.35	52.75	1.21	No criticism	No criticism	------	------
14	33.50	16.74	1.00	.15	.35	51.74	1.11	No criticism	Sl. mealy	------	------

[1] Period held with no apparent defects.
[2] Sl.=slightly.
[3] CMC=carboxymethocel.

To further demonstrate the influence of total solids content on the body and texture and keeping quality, a portion of the product in Trial 3 was divided into five lots. Water was added in varying amounts to four of the lots to reduce the total solids contents to different levels. Additional stabilizer and salt were incorporated into each of the diluted lots so that all five had .5 percent stabilizer and 1.0 percent salt. Table II shows the composition of the five lots together with the body and texture and keeping quality. No flavor criticisms were noted. In Lots A, B and C, with total solids concentration ranging from 33.44 to 41.76 percent, the texture was grainy and the body was weak. In Lot D, with 47.37 percent total solids, the body was slightly weak but the texture was smooth. The control lot (E) with 50.58 percent total solids showed no defects. The keeping qualities of Lots A, B and C were relatively poor while Lot D kept almost as good as the control lot (E).

All of the regular lots of cheese shown in Table I that had total solids concentrations of more than 50 percent kept well at both room temperature and at 40° to 50° F. There appeared to be a general tendency for the lots with high concentrations of total solids to keep better at room temperature than those with lower concentrations. The defect that commonly developed was oxidized flavor, except in the cheese listed as Trial 1 in Table I, and the diluted lots shown in Table II. The cheese in the latter trials showed spoilage due to the growth of microorganisms.

Variations in Stabilizer

In most of the lots, .5 percent stabilizer representing .15 percent gelatin and .35 percent locust bean gum was used. This combination appeared to give the product a desirable body and to prevent serum from being freed from it. However, when pimientos were added, some serum was expressed after prolonged storage. In Trial 6, in which .09 percent gelatin and .70 percent locust bean gum were used, the body was gummy. In Trial 10, carboxymethocel was used at the rate of .50 percent. In this latter trial, the body was mealy, which was probably due to the high concentration of milk solids-not-fat. Minor variations in amounts of stabilizers appeared to have no influence on the quality of the cream cheese.

Variations in Salt

In Trials 1 and 2, .50 percent salt was used but this amount was apparently not sufficient to give the most desirable flavor. In later

trials (except Trial 10 with .80 percent), a concentration of 1.00 percent was used and this amount seemed satisfactory.

Variations in Acidity

The titratable acidities ranged from .95 percent to 1.48 percent with 12 of the 14 lots having 1.22 percent or lower. The variations in titratable acidity appeared to have no significant influence on the quality of the product.

General Observations

The cream cheese made in Trials 2, 3, 8, 9, 12, 13 and 14 was considered to be the most satisfactory. The approximate composition of these lots was 34 percent butterfat, 17 percent milk solids-not-fat, 1 percent salt, .5 percent stabilizer and a titratable acidity of about 1 percent. A product of this composition is being produced commercially at the present time in the Oklahoma A. and M. College Dairy Plant. The demand for this product is increasing as more people become acquainted with it.

Before attempting commercial production, samples were distributed for criticism. Samples were also exhibited at the annual cheese festival held on the A. & M. College campus. Also the product was used in various ways by each of the five dining halls on the A. & M. College campus. No adverse criticism has been received thus far.

In most trials, the cheese was divided into portions to which certain flavoring materials were added. The flavoring materials used

Table II.—The Influence of Composition on Body and Texture and Keeping Quality of Cream-type Cheese.

Lot No.	Butterfat (percent)	M.S.N.F. (percent)	Total solids (percent)	Titratable acidity (percent)	Body and texture criticisms	Keeping Quality[1]	
						70°-80°F	40°-50°F
A	21.23	10.71	33.44	.97	Grainy—very weak	2 wks.	2 mos.
B	24.91	12.09	38.50	1.10	Grainy—weak	2 wks.	2 mos.
C	27.22	13.04	41.76	1.14	Sl.[2] grainy—sl. weak	3 wks.	2 mos.
D	30.57	15.30	47.37	1.95	Sl. weak	2 mos.	3 mos.
E (Control)	32.80	16.28	50.58	1.05	No criticism	2 mos.	6 mos.

[1] Period held with no apparent defects.
[2] Sl.=slightly.

were: ground blue cheese, pimiento puree, chopped olives, and crushed pineapple. The blue cheese was added at the rate of 10 to 12 percent while the pimiento, olives, and pineapple were added at the rate of 2 percent. The blue cheese and pimiento were added before homogenization and the olive and pineapple were added after homogenization.

The blue cheese flavored product was the most popular. Many customers dislike blue cheese, but relish the blue cheese flavored spread. Some have even cultivated a taste for blue cheese by eating the blue cheese flavored spread. The pimiento flavored product ranked second in popularity with the customers, the olive flavor third, the plain or natural flavor fourth, and the pineapple flavored product ranked fifth.

SUMMARY AND CONCLUSIONS

A satisfactory cream-type cheese can be made by condensing low fat cream (about 15 percent fat), ripening the condensed product with culture, adding stabilizer and salt, pasteurizing and homogenizing. For best results the finished product should contain about 34 percent fat, 17 percent milk solids-not-fat, 1 percent salt, .5 percent stabilizer (.15 percent gelatin and .35 percent locust bean gum) and 52.5 percent total solids. The titratable acidity should be about 1 percent.

This product has a pleasing, mildly acid flavor and a smooth, firm body with good spreading properties. It keeps well for two months or longer at room temperature, and for six months or more at moderate refrigeration temperatures. A variety of flavors can be produced by adding to the cheese such materials as blue cheese, chopped olives, pimiento puree, and crushed pineapple. This cream-type cheese can be used the same as any cream or neufchatel cheese, and it has had good consumer acceptance locally.

Under present statutes, this product cannot legally be called cream cheese, therefore the term "cream-type" has been used in the title of this bulletin.

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