Preliminary Observations on the Production of Sour Cherry or Cacao Sauce Added Cultured Cream in Different Fat Contents

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Abstract

Cultured cream samples were produced using with starter culture and cream in different fat contents, packed in polyethylene containers, and stored 10 d in a refrigerator at 41°C. Nine different treatments of sour cherry (SC) or cacao sauce (CS) were applied in the production. Some physico-chemical, microbiological and sensory properties of the samples were monitored after at 1st and 10th d of ripening. There were significant differences in total solids, fat contents, diacetyl and total free fatty acids value of cream samples made with different fat content ($p<0.01$). Titratable acidity, pH, consistency, acid value and microbiological properties were significantly affected by different flavouring materials ($p<0.01$). The results of this study indicate that cultured cream in different fat contents can be produced with sour cherry or cacao sauce without negative effects on the product quality.

Key Words: Fermented cream, flavour, quality, product development

INTRODUCTION

Milk fat is one of the most complex of all common fats. More than 400 different fatty acids have been detected in milk lipids. Some of these fatty acids present biological, physiological and nutritional properties, which are very interesting and have vital importance for consumuer health, especially conjugated linoleic acid (CLA) and butyric acid. Because of these reasons, dairy products including cream, fermented cream and butter are nourishing and attractive food for consumers (Gursoy et al., 2003). Cream is, like milk, an emulsion of fat-in-water, although the fat content is higher. Traditionally, cream was produced by hand skimming milk, which had often been slightly scalded, yielding a product of somewhat variable fat content and by-product, skimmed milk. Today, however, apart from some production of clotted cream, cream is mostly produced by means of mechanical separation. Cream is used as an ingredient in a wide range of foods and beverages (Komorowski and Early, 1992). Fermented cream is produced by fermentation of cream, which is

contained 10-40% milk fat, with a starter culture. It is also made with addition of glucanodeltalacton or some organic acids such as lactic and citric acid. Cultured cream has a slight acidic taste (Yetismeyen et al., 2000; Eagle, 2004). Its popularity has grown and is now consumed in most parts of the world. In North Europe and Russia, cultured cream is one of the traditional fermented dairy products and of high consumption level. Cultured cream consumption per year is 7740 tonnes in Norway, 1200 tonnes in Egnland, 13244 tonnes in Finland, 61408 tonnes in Hungary and 7288 tonnes in Denmark (Puhan, 1988). Although several flavouring materials on the production of cultered cream have been applied, no information is available in the literature on the use of sour cherry or cacao sauce in the production of cultured creams in different fat contents. The present work was carried out to determine the effects of sour cherry or cacao sauce addition and different fat contents on the physico-chemical, microbiological and sensory properties of the product.

MATERIALS AND METHODS

Materials. Homogenized and pasteurized cultured cream (35% milk fat) was obtained from Pinar Dairy Products Co., Izmir, Turkey. Skim milk was from pilot dairy plant of the Department (Dept. of Dairy Technol., Ege University, Turkey). Starter culture (Ezal, RR022) was obtained from Maysa A.S. (Istanbul, Turkey), containing *Lactococcus lactis subsp. lactis, Lactococcus lactis subsp. cremoris, Lactococcus lactis subsp. diacetylactis* and *Leuconostoc mesenteroides subsp. cremoris*. The emulsifier (mono-di gliserid) used for emulsification was from Dept. of Food Engineering, Ege University, Turkey. Two types of flavouring materials were studied: sour cherry concentrate (brix: 65%, acidity as citric acid: 55%) (Dimes A.S., Tokat, Turkey) and cacao sauce (Pinar Dairy Products Co., Izmir, Turkey). Pectin and fructose syrup (brix: 75%) was from Cargill (Istanbul, Turkey).

Production of cultured cream. Cream were divided into there equal portions and then each sample was standardized to 10%, 20% and 30% milk fat contents with skim milk powder (~11% w/w total solids), respectively. Nine different treatments of sour cherry (SC) and cacao sauce (CS) and, of fat contents (A1: 10% CS added cream with 10% fat, A2: 8% SC added cream with 10% fat , A3: regular cream with 10% fat , B1: 10% CS added cream with 20% fat, B2: 8% SC added cream with 20% fat, B3: regular cream with 20% fat, C1: 10% CS added cream with 30% fat, C2: 8% SC added cream with 30%, C3: regular cream with 30% fat, respectively) were applied in the production. For high quality structure, we used pectin (1% for SC added cream samples) and mono-di gliserid (0.15% for CS added and control) in the production. Then each samples was heat-treated at 85°C for 30 min. After cooling to 22°C, the samples were inoculated with starter culture (1% v/v) and then incubated at 22±1°C for 14-16 h. After ripening at room temperature for 24 h, the samples were stored at 4±1 °C for 10 d.

Analyses. The samples were analysed for pH (Beckman SS-3 pH-meter) (Oysun, 1996), titratable acidity (°SH) (Oysun, 1996), total solids (Oysun, 1996), fat (Oysun, 1996), diacetyl (Cogan, 1972), tyrosine content (Citti et al., 1963), total free fatty acids value (Horwitz, 1965), peroxide (Downey, 1975) and firmness using a Gerber penetrometer (measured mm of penetration after 20 seconds at a product temperature of 4°C) (Harwalkar and Kalap, 1983). Cream samples (10 g) were homogenized in 90 ml of sterile ringer solution (Merck, Darmstadt, Germany) at ~25°C for 20 s in a stomacher (Colworth Stomacher 400, Seward Lab., U.K.) for microbiological analysis. Total bacteria and yeasts and moulds were enumerated in each sample following serial dilution to 10^6 using Ringers' solution. Appropriate dilutions were plated in duplicate using the following media [1] plate count agar (PCA) (Oxoid Ltd., Hampshire, England) for the enumeration total bacteria, incubated aerobically at 37 ± 1°C for 48 h (Terzaghi and Sandine, 1975; Sharpe, 1978; Uysal et al., 2003), [2] potato dextrose agar (PDA) plus tartaric acid (Oxoid Ltd., Hampshire, England) for the enumeration of yeasts and moulds, incubated aerobically at 25 ± 1°C for 5 days. Five panellists using a mixed-point system judged about the sensory qualities of the cream samples. The sensory vocabulary comprised attributes describing appearance, texture and taste. Analysis of variance (ANOVA) was performed using the General Linear Model procedure of SAS (SAS, 1987). In all cases, the 0.05 probability level was considered. All experiments and analyses were completed in dublicate.

RESULTS AND DISCUSSION

Physico-chemical properties

Variations in the physico-chemical properties of the samples during storage are presented in Table 1. The total solids of the samples ranged between 13.700.24% (A3) and 36.711.38% (C2) (data not shown) and the differences during storage period found to be insignificant ($p>0.05$) for all samples. Fat contents effected total solids of the samples ($p<0.05$). The type of flavoring material did not affect the diacetyl , peroxide and tyrosine values of the samples ($p>0.05$). The slight decrease in pH of cream samples during storage for 10 days at 41°C could be due to the continued metabolic activity of the starter culture. After fermentation and during storage, there were no significant changes in gross compositions. The storage period affected the titratable acidity, pH, diacetyl , peroxide, total free fatty acids value, firmness and tyrosine content of all samples ($p<0.05$). During storage titratable acidity (°SH) was found to be lower in cultured creams containing cacao sauce than the others. While the titratable acidity of the samples increased gradually during storage, the lowest acidity was found in the cultured creams containing cacao sauce. The concentration of free fatty acids in samples (fresh and stored) ranged between 0.960.07 and 2.360.18 $mEqKOHg^{-1}$ fat in fresh creams, and 1.700.34 and 2.960.28 $mEqKOHg^{-1}$ in stored creams. It indicates that the starter culture possesses high lipolytic activity and the increase in the content of free fatty acids in stored samples. The tyrosine content at day-10 was significantly higher than that of day-1 at $p<0.05$. Fat content and the type of flavoring material used in the

production affected the penetration values ($p<0.05$). The firmness of almost all samples increased during the storage. Cultured cream containing cacao sauce remained significantly firmer than the other cream samples throughout storage ($p<0.05$).

Table 1: Some physico-chemical properties of cultured cream samples during storage (n=2)

Sample	Storage time (d)	pH	Titratable Acidity (°SH)	TFF Value (mEqKOH /g fat)	Diacetyl (μg/ml)	Tyrosine (mg/100 ml)	Peroxide (meqO_2/ kg fat)	Firmness
A1	1	4.27±0.05	31.23±0.25	1.62±0.10	0.13±0.01	0.89±0.01	0.83±1.87	16.08±4.10
	10	4.17±0.10	32.83±0.76	2.59±0.52	1.40±0.17	1.04±9.60	0.86±0.77	14.83±3.21
A2	1	4.21±0.02	33.43±1.25	2.36±0.13	0.14±0.02	0.90±2.95	0.75±1.93	22.50±3.46
	10	4.10±0.01	35.23±0.25	2.96±0.28	1.41±0.14	1.03±1.12	0.90±0.17	20.16±0.28
A3	1	4.58±0.13	31.03±1.00	1.29±0.21	0.14±0.12	1.02±0.13	0.79±2.08	17.23±2.48
	10	4.30±0.15	33.03±0.64	2.83±0.07	1.40±0.17	1.10±0.12	0.88±1.63	16.17±2.46
B1	1	4.40±0.10	35.83±0.28	1.08±0.09	0.16±0.20	1.02±6.50	0.70±0.25	11.83±3.32
	10	4.36±0.01	37.36±0.32	2.22±0.62	1.06±0.11	1.07±4.14	0.80±1.66	11.66±3.32
B2	1	4.17±0.06	34.73±2.19	1.62±0.10	0.14±0.03	1.07±0.01	0.70±0.26	19.16±5.05
	10	4.12±0.15	37.06±0.49	2.52±0.49	1.00±0.34	1.14±9.16	0.83±0.11	15.83±0.28
B3	1	4.39±0.03	28.93±0.90	1.11±0.11	0.18±0.01	1.08±2.95	0.75±1.61	15.83±2.75
	10	4.26±0.01	30.70±0.60	1.70±0.34	1.00±0.17	1.09±0.15	0.90±0.17	13.83±1.52
C1	1	4.59±0.08	24.93±0.40	1.82±0.71	0.18±0.10	1.07±0.01	0.69±0.16	9.83±0.57
	10	4.48±0.08	29.13±1.58	2.66±0.23	1.00±0.17	1.05±0.12	0.76±0.77	9.33±0.57
C2	1	4.00±0.04	31.80±2.03	1.41±0.50	0.16±0.11	0.90±0.01	0.72±0.10	10.16±0.28
	10	3.80±0.17	33.13±1.79	2.73±0.11	0.93±0.23	1.09±1.21	0.96±0.77	10.83±0.28
C3	1	4.20±0.02	25.33±0.58	0.96±0.07	0.14±0.01	1.06±3.41	0.66±0.19	9.83±0.28
	10	4.13±0.00	26.20±0.96	2.26±0.46	1.00±0.35	1.04±0.10	1.03±0.11	10.16±0.28

SC: sour cherry, CS: cacao sauce, A1: 10% CS added cream with 10% fat, A2: 8% SC added cream with 10% fat, A3: regular cream with 10% fat, B1: 10% CS added cream with 20% fat, B2: 8% SC added cream with 20% fat, B3: regular cream with 20% fat, C1: 10% CS added cream with 30% fat, C2: 8% SC added cream with 30%, C3: regular cream with 30% fat, TFF: total free fatty acids

Microbiological properties

The levels of total bacteria and yeasts and moulds gradually increased from the 1st day until the 10th day of storage ($p<0.05$) (data not shown). This situation can be explained by the growth of starter lactic acid bacteria during the storage period and insufficient hygienic conditions of the pilot plant and packaging materials. The addition of different flavouring materials to cream bases caused significant ($p<0.05$) differences in counts of total bacteria and yeasts and moulds. The cultured creams containing sour cherry had the highest total bacteria than the others.

Sensory properties

According to the results of sensory evaluation (Table 2), at the first day of storage, the 10% cacao sauce added cultured cream with 30% fat and, 8% sour cherry added cultured cream with 30% had higher scores than the others in terms of taste ($p<0.05$). The cultured cream containing 10% milkfat received significantly poorer scores for taste attribute. The samples produced with the 30% milkfat were most preferred by the panellists. In all samples, lactococci convert lactose to lactic acid and the by-product, citric acid, which is itself converted to diacetyl resulting in butter/dairy notes by the leuconostocs (Table 1). This is an desirable sensory characteristic from consumer preferences point of view.

Table 2: Sensory properties of cultured cream samples during storage period (n=2)

Sample	Storage time (d)	Appearance (1-5)	Structure (1-5)	Taste (1-10)	Total (1-20)
A1	1	3.06	3.13	6.40	12.30
	10	2.80	3.06	5.56	11.53
A2	1	3.06	2.76	6.56	12.39
	10	3.66	3.33	7.26	14.26
A3	1	4.13	3.50	6.36	14.00
	10	3.53	3.40	4.73	11.66
B1	1	4.20	4.06	7.06	15.33
	10	3.66	3.86	6.66	14.19
B2	1	4.53	4.26	7.83	16.63
	10	3.53	4.20	8.06	15.80
B3	1	4.40	4.93	7.50	16.83
	10	3.73	3.53	5.46	12.73
C1	1	4.86	4.66	8.00	17.53
	10	3.86	4.20	7.06	15.13
C2	1	4.53	4.60	8.76	17.90
	10	4.33	4.13	8.93	17.40
C3	1	5.00	4.66	7.93	17.60
A1	10	4.26	4.00	6.66	14.93

SC: sour cherry, CS: cacao sauce, A1: 10% CS added cream with 10% fat, A2: 8% SC added cream with 10% fat, A3: regular cream with 10% fat, B1: 10% CS added cream with 20% fat, B2: 8% SC added cream with 20% fat, B3: regular cream with 20% fat, C1: 10% CS added cream with 30% fat, C2: 8% SC added cream with 30%, C3: regular cream with 30% fat

CONCLUSIONS

The use of different fat contents and flavouring materials in the production of cultured cream affected some physical, chemical, microbiological and sensory properties of the samples. Some significant differences were also found during the storage period. The number of total bacteria and yeasts-moulds increased during storage period. This was verified by the increase in starter and, possible microbial contaminations. According to panellists' statements, the cultured creams made with 30% milk fat and added 8% sour cherry had better sensory properties than the other samples. The present study suggested that flavouring materials (cacao sauce and sour cherry) could be used for the production of cultured creams containing about 30% milkfat with superior sensory properties.

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