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Consumer sensory acceptability of fresh cow milk curd samples on altering certain major milk constituents prepared at 40 °C fermentation temperature

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Abstract

Curd has assumed an important place in the daily diet of most of Indians. An experiment was conducted on the consumer acceptability of fresh cow milk curd samples on altering major milk constituents prepared at 40 °C fermentation temperature. Based on the sensory evaluation, flavour, body and texture, colour and appearance and overall acceptability scores were higher in the curd samples prepared at 40 °C fermentation temperature containing 5 percent and 9 percent solids not fat compared to control curd sample. Flavour and Texture, Colour and Appearance, Body and Texture, Overall acceptability scores of cow milk curd samples prepared at incubation temperature 40 °C with 5% fat and 9% Solids Not Fat combination was 8.61 ± 0.11 , 8.66 ± 0.22 , 8.75 ± 0.03 , 8.73 ± 0.02 respectively.

Keywords: Fresh cow milk curd, flavour, texture, colour, appearance, body and texture, overall acceptability scores, fermentation temperature

Introduction

In our country India, the consumers have different taste preferences for traditional products varying from region to region. (Chaudhary *et al.*, 2018) [3]; Sharif *et al.*, 2017) [10]) This made the traditional products available with a varied taste. Curd is also made in different varieties with region specific tastes. (Atunes *et al.*, 2008) [8]. Curd is made from milk with different milk composition. All ingredients should be of high quality and should be maintained the quality standard. While manufacturing curd at commercial level it is necessary to standardize and control the day to day product to meet consumer expectations and regulatory obligations. (Akalin *et al.*, 2008) [1]. Since the total solids in cows milk ranges from 11 to 18 percent, therefore the cultured products from these milks vary in consistency from fluid to pudding like. So an experiment was conducted to now about Consumer acceptability of fresh cow milk curd samples on altering major milk constituents mainly Fat and Solids Not fat ratio kept at 40 °C fermentation temperature.

Material and Methods

Cow milk used in this experiment was obtained fresh from the Livestock Farm Complex, Veterinary College Research Institute, Namakkal, and skim milk powder with 5 percent moisture and 95 percent solubility was purchased from Aavin, Salem were used in this study. Milk was adjusted to contain the desired fat and SNF levels using the Pearson square method (Bakke *et al.*, 2016) [11].

Dahi culture NCDC 159 was obtained from the National Collection of Dairy Cultures (NCDC), Division of Dairy Microbiology, National Dairy Research Institute, Karnal (Haryana) was used in this study.

Consumer acceptability of fresh cow milk curd samples on altering major milk constituents Fat and SNF were altered as per the following table:

Species	Cow milk																
	Trial	C1 (Control)			C2			C3			C4						
Fat %		3.2			3.5			4			4.5						
SNF %		8.3	8.5	9	10	11	12	8.5	9	10	11	12	8.5	9	10	11	12

Species	Cow milk															
Trial	B5			B6				B7				B8				
Fat %	5			5.5				6								
SNF %	8.3	8.5	9	10	11	12	8.5	9	10	11	12	8.5	9	10	11	12

C2A12	-	Cow milk curd made with 3.5% fat and 8.5% SNF under incubation temperature 40 °C													
C2A22	-	Cow milk curd made with 3.5% fat and 9% SNF under incubation temperature 40 °C													
C2A32	-	Cow milk curd made with 3.5% fat and 10% SNF under incubation temperature 40 °C													
C2A42	-	Cow milk curd made with 3.5% fat and 11% SNF under incubation temperature 40 °C													
C2A52	-	Cow milk curd made with 3.5% fat and 12% SNF under incubation temperature 40 °C													
C3A12	-	Cow milk curd made with 4% fat and 8.5% SNF under incubation temperature 40 °C													
C3A22	-	Cow milk curd made with 4% fat and 9% SNF under incubation temperature 40 °C													
C3A32	-	Cow milk curd made with 4% fat and 10% SNF under incubation temperature 40 °C													
C3A42	-	Cow milk curd made with 4% fat and 11% SNF under incubation temperature 40 °C													
C3A52	-	Cow milk curd made with 4% fat and 12% SNF under incubation temperature 40 °C													
C4A12	-	Cow milk curd made with 4.5% fat and 8.5% SNF under incubation temperature 40 °C													
C4A22	-	Cow milk curd made with 4.5% fat and 9% SNF under incubation temperature 40 °C													
C4A32	-	Cow milk curd made with 4.5% fat and 10% SNF under incubation temperature 40 °C													
C4A42	-	Cow milk curd made with 4.5% fat and 11% SNF under incubation temperature 40 °C													
C4A52	-	Cow milk curd made with 4.5% fat and 12% SNF under incubation temperature 40 °C													
C5A12	-	Cow milk curd made with 5% fat and 8.5% SNF under incubation temperature 40 °C													
C5A22	-	Cow milk curd made with 5% fat and 9% SNF under incubation temperature 40 °C													
C5A32	-	Cow milk curd made with 5% fat and 10% SNF under incubation temperature 40 °C													
C5A42	-	Cow milk curd made with 5% fat and 11% SNF under incubation temperature 40 °C													
C5A52	-	Cow milk curd made with 5% fat and 12% SNF under incubation temperature 40 °C													
C6A12	-	Cow milk curd made with 5.5% fat and 8.5% SNF under incubation temperature 40 °C													
C6A22	-	Cow milk curd made with 5.5% fat and 9% SNF under incubation temperature 40 °C													
C6A32	-	Cow milk curd made with 5.5% fat and 10% SNF under incubation temperature 40 °C													
C6A42	-	Cow milk curd made with 5.5% fat and 11% SNF under incubation temperature 40 °C													
C6A52	-	Cow milk curd made with 5.5% fat and 12% SNF under incubation temperature 40 °C													
C7A12	-	Cow milk curd made with 6% fat and 8.5% SNF under incubation temperature 40 °C													
C7A22	-	Cow milk curd made with 6% fat and 9% SNF under incubation temperature 40 °C													
C7A32	-	Cow milk curd made with 6% fat and 10% SNF under incubation temperature 40 °C													
C7A42	-	Cow milk curd made with 6% fat and 11% SNF under incubation temperature 40 °C													
C7A52	-	Cow milk curd made with 6% fat and 12% SNF under incubation temperature 40 °C													

The curd samples were prepared at 40 °C fermentation temperature

Standard curd culture purchased from National Dairy Research Karnal was used as a starter culture. Best combination of fat and SNF for cow and buffalo milk curd was selected based on the consumers sensory attributes.

Consumer acceptability of fresh cow milk curd samples on altering major milk constituents prepared at 40 °C fermentation temperature through sensory evaluation:

Consumer sensory acceptability of fresh cow milk curd prepared at 40 °C fermentation temperature mainly colour and appearance, body and texture, flavour, and overall acceptability were evaluated on a nine-point hedonic scale (9 for liking extremely and 1 for disliking extremely) by a panel of six discriminative and communicative judges. (Antunes *et al.*, 2004 [2]; Meshram *et al.*, 2009 [7]; (Hussain *et al.*, 2016) [5]; Guler-Akin *et al.*, 2016 [4])

Results and Discussion

Table 1 and 1a tabulated here shows the sensory scores of the cow milk curd samples prepared with altering major milk constituents fat and SNF and with incubation temperature of 40 °C. There exists ($p < 0.01$) significant difference between the control and treatments (C2A32, C3A32, C4A32, C5A22, C6A12, C7A12). The C5A22 sample received a higher overall acceptability score than the other curd samples incubated at 40 °C. (Fig1)

In this experiment, the C5A22 sample (5 percent fat and 9

percent SNF) received a higher overall acceptability score than the other curd samples incubated at 40 °C. This observation findings are in accordance with the observation of Lee and Lucey (2004) [6]; who had experimented that gels of yogurt at fermentation at 40 °C. These samples were found to be more obviously branched and homogeneous interconnected protein networks, and the gels networks underwent less obvious structural changes during fermentation, compared with yogurt gels made at 45.7 °C.

Our research findings also correlate with the findings of Sarkar *et al.* (2019) [9], who opined that an incubation temperature of 40 °C was found optimum to obtain commercial curd.

Meshram (2014) [7] reported the overall acceptability score between 5.2 to 7.5 for commercial dahi samples. Chaudhary and Prajapati (2016) [3] reported an overall acceptability score of 7.52 to 7.84 for the dahi samples prepared from combination of dairy starter cultures. Further, Hussain *et al.* (2016) [5] recorded the overall acceptability scores in the range of 7.00 to 7.75 in probiotic dahi incorporated with various levels of Aloe vera. The observed overall acceptability score of the cow milk curd samples are higher than the reported value of Meshram (2014) [7], Chaudhary and Prajapati (2016) [3], and Hussain *et al.* (2016) [5] respectively. This may be attributed to difference in the fat and solids not fat content of the milk used for curd making and variation in the curd starter culture and incubation temperature.

Table 1: Mean (\pm SE) firmness and consistency values - textural profile analysis for the selection of acceptable cow milk curd samples prepared by incubation at 40 °C using various fat and SNF combinations

Treatments (n=6)	Cow milk curd samples based on the sensory scores with various fat and SNF combinations					
Group 1*	Control	C2A12	C2A22	C2A32	C2A42	C2A52
Flavour score	7.84 ^b \pm 0.11	7.88 ^b \pm 0.22	7.97 ^b \pm 0.26	8.34 ^a \pm 0.11	8.28 ^a \pm 0.26	8.27 ^a \pm 0.08
Body and Texture	6.46 ^d \pm 0.22	6.54 ^d \pm 0.20	7.49 ^c \pm 0.17	8.41 ^a \pm 0.22	8.26 ^b \pm 0.26	8.16 ^b \pm 0.21
Colour and appearance	8.71 ^a \pm 0.25	8.74 ^a \pm 0.22	8.74 ^a \pm 0.17	8.74 ^a \pm 0.15	8.70 ^a \pm 0.27	8.68 ^a \pm 0.11
Overall acceptability	7.79 ^d \pm 0.21	7.88 ^d \pm 0.20	8.05 ^c \pm 0.20	8.63 ^a \pm 0.17	8.26 ^b \pm 0.31	8.26 ^b \pm 0.18
Group 2*	Control	C3A12	C3A22	C3A32	C3A42	C3A52
Flavour score	7.84 ^b \pm 0.11	7.90 ^b \pm 0.22	7.99 ^b \pm 0.26	8.36 ^a \pm 0.11	8.30 ^a \pm 0.26	8.28 ^a \pm 0.08
Body and Texture	6.46 ^d \pm 0.22	6.74 ^d \pm 0.20	7.69 ^c \pm 0.17	8.61 ^a \pm 0.22	8.31 ^b \pm 0.26	8.17 ^b \pm 0.21
Colour and appearance	8.71 ^a \pm 0.25	8.74 ^a \pm 0.22	8.75 ^a \pm 0.17	8.75 ^a \pm 0.15	8.70 ^a \pm 0.27	8.69 ^a \pm 0.11
Overall acceptability	7.79 ^d \pm 0.21	7.91 ^d \pm 0.20	8.08 ^c \pm 0.20	8.65 ^a \pm 0.17	8.28 ^b \pm 0.31	8.19 ^b \pm 0.18
Group 3*	Control	C4A12	C4A22	C4A32	C4A42	C4A52
Flavour score	7.84 ^c \pm 0.11	8.09 ^b \pm 0.22	8.19 ^b \pm 0.26	8.56 ^a \pm 0.11	8.52 ^a \pm 0.26	8.50 ^a \pm 0.08
Body and Texture	6.46 ^d \pm 0.22	6.74 ^d \pm 0.20	7.89 ^c \pm 0.17	8.61 ^a \pm 0.22	8.33 ^b \pm 0.26	8.17 ^b \pm 0.21
Colour and appearance	8.71 ^a \pm 0.25	8.71 ^a \pm 0.22	8.75 ^a \pm 0.17	8.75 ^a \pm 0.15	8.70 ^a \pm 0.27	8.70 ^a \pm 0.11
Overall acceptability	7.79 ^d \pm 0.21	7.91 ^d \pm 0.20	8.08 ^c \pm 0.20	8.65 ^a \pm 0.17	8.28 ^b \pm 0.31	8.18 ^b \pm 0.18
Group 4*	Control	C5A22	C5A32	C5A42	C5A52	C5A12
Flavour score	7.84 ^a \pm 0.11	8.19 ^b \pm 0.26	8.61 ^a \pm 0.11	8.57 ^a \pm 0.26	8.55 ^a \pm 0.08	8.52 ^a \pm 0.08
Body and Texture	6.46 ^d \pm 0.22	8.10 ^b \pm 0.17	8.66 ^a \pm 0.22	8.32 ^b \pm 0.26	8.19 ^b \pm 0.21	8.19 ^b \pm 0.21
Colour and appearance	8.71 ^a \pm 0.25	8.75 ^a \pm 0.17	8.75 ^a \pm 0.03	8.71 ^b \pm 0.27	8.69 ^b \pm 0.11	8.69 ^b \pm 0.11
Overall acceptability	7.79 ^d \pm 0.21	8.46 ^b \pm 0.18	8.73 ^a \pm 0.02	8.33 ^b \pm 0.21	8.25 ^b \pm 0.22	8.18 ^c \pm 0.22

Group 5*	Control	C6A22	C6A32	C6A42	C6A52	C6A12
Flavour score	7.84 ^b \pm 0.11	8.60 ^a \pm 0.11	8.57 ^a \pm 0.26	8.57 ^a \pm 0.08	8.55 ^a \pm 0.08	8.54 ^a \pm 0.08
Body and Texture	6.46 ^b \pm 0.22	8.65 ^a \pm 0.22	8.42 ^b \pm 0.26	8.28 ^b \pm 0.21	8.26 ^b \pm 0.21	8.18 ^b \pm 0.21
Colour and appearance	8.71 ^b \pm 0.25	8.75 ^a \pm 0.01	8.68 ^b \pm 0.27	8.66 ^b \pm 0.11	8.66 ^b \pm 0.11	8.66 ^b \pm 0.11
Overall acceptability	7.79 ^c \pm 0.21	8.72 ^a \pm 0.02	8.34 ^b \pm 0.21	8.25 ^b \pm 0.22	8.23 ^b \pm 0.22	8.19 ^b \pm 0.22
Group 6*	Control	C7A22	C7A32	C7A42	C7A52	C7A12
Flavour score	7.84 ^b \pm 0.11	8.60 ^a \pm 0.11	8.56 ^a \pm 0.26	8.54 ^a \pm 0.11	8.53 ^a \pm 0.26	8.52 ^a \pm 0.08
Body and Texture	6.46 ^c \pm 0.22	8.65 ^a \pm 0.22	8.41 ^b \pm 0.26	8.29 ^b \pm 0.21	8.25 ^b \pm 0.21	8.23 ^b \pm 0.21
Colour and appearance	8.72 ^b \pm 0.25	8.74 ^a \pm 0.02	8.72 ^b \pm 0.17	8.72 ^a \pm 0.15	8.68 ^b \pm 0.27	8.66 ^b \pm 0.11
Overall acceptability	7.79 ^d \pm 0.21	8.72 ^a \pm 0.01	8.34 ^b \pm 0.21	8.28 ^b \pm 0.22	8.24 ^b \pm 0.22	8.23 ^c \pm 0.22

*Means bearing superscript within the treatments differ significantly ($p < 0.01$) (n=6)

Table 1.a: Best cow milk curd sample selection based on sensory evaluation from the selected fat and SNF combinations fermented at 40 °C

Sensory attributes	Control (n=6)	C2A32	C3A32	C4A32	C5A22	C6A12	C7A12
Flavour	7.89 ^b \pm 0.01	8.38 ^a \pm 0.02	8.40 ^a \pm 0.03	8.60 ^a \pm 0.02	8.61 ^a \pm 0.11	8.60 ^a \pm 0.11	8.60 ^a \pm 0.11
Body & Texture	6.59 ^b \pm 0.02	8.46 ^a \pm 0.01	8.65 ^a \pm 0.03	8.65 ^a \pm 0.03	8.66 ^a \pm 0.22	8.65 ^a \pm 0.22	8.65 ^a \pm 0.22
Colour & appearance	8.67 ^a \pm 0.03	8.78 ^a \pm 0.03	8.78 ^a \pm 0.01	8.77 ^a \pm 0.04	8.75 ^a \pm 0.03	8.75 ^a \pm 0.01	8.74 ^a \pm 0.02
Overall acceptability	7.84 ^d \pm 0.02	8.68 ^a \pm 0.02	8.70 ^a \pm 0.12	8.70 ^a \pm 0.11	8.73 ^a \pm 0.02	8.72 ^a \pm 0.02	8.72 ^a \pm 0.01

Means bearing superscript within the treatments differ significantly ($p < 0.01$) (n=6)

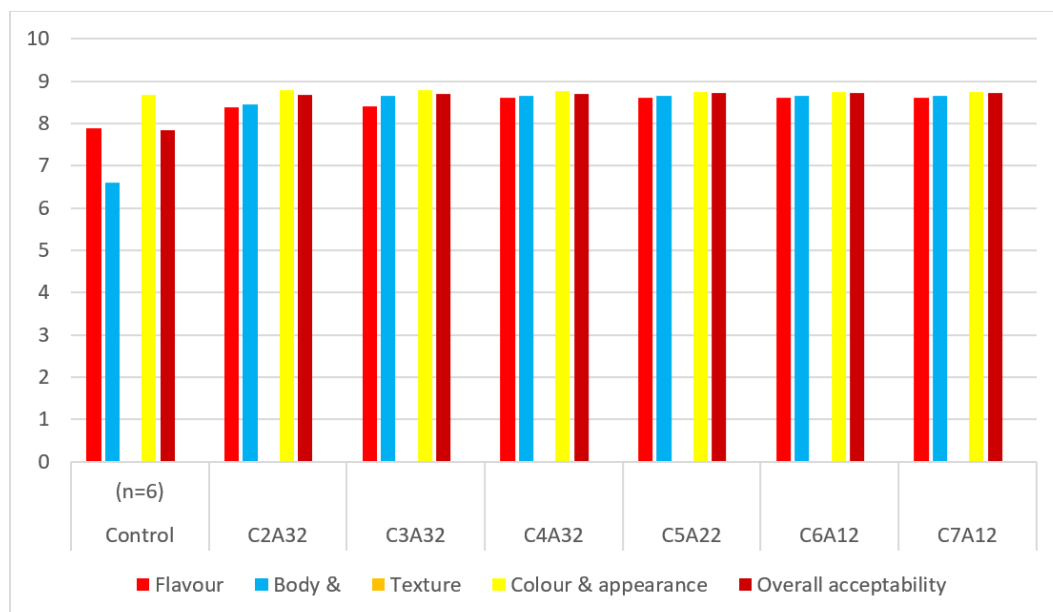


Fig 1: Selection of best cow milk curd sample based on sensory evaluation from the selected fat and SNF combinations fermented at 40 °C

Conclusion

According to the results obtained, consumer acceptability of fresh cow milk curd samples on altering major milk constituents prepared at 40 °C fermentation temperature based on the sensory attributes viz flavour, body and texture, and colour and appearance score, Overall acceptability scores, it was finalized that cow curd sample with 5% fat and 9% Solids Not Fat prepared under fermentation temperature 40 °C was rated as the best among the treatment samples. This experiment on consumer acceptability of fresh cow milk curd samples on altering major milk constituents prepared at 40 °C fermentation temperature will be more useful for commercial manufacture of curd.

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