

Original Research Article

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Effect of Body and Texture on Cultures, Sugar Levels and Storage Periods of Shrikhand

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An experiment was conducted to investigate the effect of body and texture on starter cultures, sugar levels and storage periods of Shrikhand at Department of Animal Husbandry and Dairying of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.) India. The results of the present investigation showed that the maximum score (8.00) was in case of fresh samples prepared from the combination of *Lactococcus lactis subsp. cremoris* with 40 % sugar level and mango flavour (A2B2C2D1) followed by the combination of A2B2C2D1, A2B1C3D1, A3B1C3D1, A2B2C1D1 and A1B2C3D1, respectively which were statistically at par with respect to body and texture score of shrikhand and were graded excellent quality and liked extremely. The lowest score (3.00) was registered from A1B3C1D4 samples and were graded as poor quality.

Introduction

Shrikhand is a popular Indian dessert prepared by the fermentation of buffalo milk. It has semi-soft consistency and has a sweet and sour taste. Typically shrikhand constitutes 39.0 percent moisture and 61.0 percent of total solids of which 10.0 percent is fat, 11.5 percent proteins 78.0 percent carbohydrates and 0.5 percent ash, on a dry matter basis. It has a pH range of about 4.2 to 4.4 (Boghra and Mathur, 2000B). On an industrial scale

shrikhand is prepared by using different mechanical devices (Aneja *et al.*, 1977). In this process, pasteurized milk or skim milk is inoculated with the culture. Shrikhand prepared either from buffalo or cow's milk retained quantitatively all the constituents in proportion to the addition of sugar. Little or no change in pH was seen during the conversion of chakka into shrikhand. The mineral make-up remained more or less unchanged, except citrate which disappeared completely at dahi stage of both buffalo and

cow's milk. The fermentation of milk brought about highly significant changes in mineral contents during transition from colloidal to soluble phase, which was faster and greater for buffalo milk (Boghra and Mathur, 2000A). India's market potential and current growth rate of traditional dairy products is unparalleled and all set to boom further under the technology of mass production. An estimated 50 to 55 percent of the milk produced in India is converted into a variety of traditional milk products, using processes such as coagulation, desiccation and fermentation. Indian fermented milk products utilize 7 percent of total milk produced and mainly includes three product dahi, shrikhand (sweetened concentrated curd) and lassi which may be considered the western equivalent to yogurt, quarg and stirred yogurt, respectively (Swapna and Chavannavar, 2011). Salunke and Patel (2006) concluded that there exists appreciable differences in the sensory quality of the product. The body and texture score of Shrikhand was highly affected by different sugar level (Singh *et al.*, 2015). The best of sugar responded better as compared to low level so far as flavour of the product in concerned (Singh *et al.*, 2015A).

Materials and Methods

The present investigation was carried out in the Department of Animal Husbandry and Dairying of C.S.A. University of Agriculture and Technology, Kanpur (U.P.) India.

The details of materials and methods used for preparation of Shrikhand.

Milk

Take fresh buffalo milk (6% fat and 9% SNF).

Starter culture (used during preparing of Shrikhand):

Streptococcus lactis, *Streptococcus cremoris* and *Streptococcus diacetilactis*.

Sugar

Commercial grade white crystalline sugar free from impurities.

Colour and flavour

NO colours added and three type of flavours without colours, orange, mango and checked (No flavour).

Packing materials

Plastic cup was used for packaging.

Methodology

For preparing the Shrikhand buffalo milk was used and received from Department of Animal Husbandry and Dairying of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. Different cultures with flavours and sugar were added for preparing Shrikhand (Flow Chart for Shrikhand Preparation is given as figure 1).

Results and Discussion

The body and texture score of Shrikhand is the most important quality attributes. A pleasant sweetish aroma and a mild clean acid taste are desirable characteristics of Shrikhand. It should be free from any off flavour. A good pleasant diacetyl flavour is desired in Shrikhand. It should not show any signs of bitterness, saltiness as any other off flavour. The body and texture score of Shrikhand as affected by different factors have been presented in Table 1 and its analysis of variance in Table 2. These Table and figure 2 revealed the following facts. The results of present study as well as relevant discussion have been presented here:

From Table No.-1 the means of different levels of all the factors, the following facts were observed. The highest (5.45) body and texture score was found in milk sample of A₂ (*Lactococcus cremoris*) followed by A₁ (*Streptococcus diacetilactis*) score (5.153).

On comparing average scores of body and texture of Shrikhand in case of different types of sugar levels. It was observed that the best body and texture score (5.546) was noted in case of Shrikhand prepared with 40 % sugar (B₂) and lowest score (5.081) in case of 45 % sugar level (B₃). The present findings supports neck to neck with the findings of Chauhan and Abraham (2011) they observed that acidity, pH, firmness and stickiness increases with increase in insulin level whereas whey separation, flavour, body texture and overall acceptability and microbiological analysis decreased with increase in insulin level.

Effect of flavouring agent (C) on body and texture score of Shrikhand, it was observed that the highest score (5.451) was obtained from mango flavour (C₃) followed by orange flavour (C₂). The lowest body and texture score (5.093) was observed from Shrikhand prepared by without flavouring agent. (C₁).

As regard the storage periods, the maximum body and texture score (7.402) of Shrikhand was recorded in fresh samples while, minimum (3.446) was found when samples stored at 21 days.

From Table No.-1 denoting the mean interactions between type starter cultures (A) and Sugar levels (B), it was recorded that Shrikhand prepared from *Lactococcus lactice* subsp. *cremoris* with 40% sugar (A₂B₂) showed maximum score (5.650), while minimum body and texture score (4.933) was observed from (A₁B₃) samples.

Among the blend treatment combinations of type of starter cultures (A) and flavouring agents (C), the maximum body and texture score (5.656) was observed from *Lactococcus lactice* subsp. *cremoris* with mango flavour (A₂C₃), whereas minimum body and texture score (4.933) registered from (A₁C₁).

From the interaction A.D, it was observed that highest body and texture score (7.60) was in fresh samples of *Lactococcus cremoris* subsp. *cremoris* (A₂D₁). The next maximum body and *lactice* texture score (7.40) was in case of (A₃D₁). While minimum body and texture score (3.30) was noted in (A₁D₄) samples.

Among the treatment combination of sugar levels and flavouring agents (B.C), it was observed that maximum body and texture score (5.658) in case of sample prepared with 40 % sugar level and mango flavour (B₂C₃) followed by (B₁C₂) and (B₃C₃) and minimum score (5.056) was obtained from 45 % sugar level without flavouring agent (B₃C₂).

From the mean interactions of B.D, it was found observed that the highest body and texture score (7.67) noted in fresh samples of 40 % sugar levels (B₂D₁) followed by B₁D₁, while minimum body and texture score (3.319) was obtained from (B₃D₄) samples.

From interactions C.D, it was investigated that maximum body and texture score (7.60) of Shrikhand was in case of fresh sample prepared with mango flavour (C₃D₁) followed by C₂D₁ score of (7.40) and minimum score (3.333) was recorded in C₁D₄. samples.

From Table No.-1 the effect of types of starter cultures, sugar levels, flavouring agents and storage periods (ABCD) on body and texture score of Shrikhand.

Table.1 Effect of body and texture on cultures, sugar levels and storage periods of Shrikhand

Treatments	B1	B2	B3	C1	C2	C3	D1	D2	D3	D4	Mean
A1	5.033	5.253	4.933	4.933	5.044	5.242	7.207	5.785	4.00	3.300	5.073
A2	5.467	5.650	5.261	5.267	5.456	5.656	7.600	6.207	4.422	3.607	5.459
A3	5.273	5.483	5.050	5.078	5.272	5.456	7.400	6.044	4.200	3.430	5.269
B1				5.078	5.256	5.439	7.400	6.015	4.222	3.393	5.257
B2				5.267	5.461	5.658	7.607	6.215	4.400	3.626	5.462
B3				4.933	5.056	5.256	7.200	5.807	4.00	3.319	5.081
C1							7.207	5.807	4.022	3.333	5.093
C2							7.400	6.015	4.200	3.415	5.257
C3							7.600	6.215	4.400	3.589	5.451
Mean	5.250	5.462	5.081	5.092	5.257	5.451	7.402	6.012	4.207	3.446	5.266

Table.2 Analysis of variance for body& texture of Shrikhand

S.V	Df	S.S	MSS	F. Ratio
A	2	8.053	4.026	136.339 ***
B	2	7.837	3.918	132.685 ***
C	2	6.949	3.475	117.656 ***
D	3	774.014	258.005	8736.448 ***
AxB	4	0.191	0.048	1.620 *
AxC	4	0.099	0.025	0.835 N.S
AxD	6	0.173	0.029	0.976 N.S
BxC	4	0.063	0.016	0.537 N.S
BxD	6	0.205	0.034	1.157 *
CxD	6	0.222	0.037	1.251 *
AxBxC	8	0.627	0.078	2.654 *
AxBxD	12	0.971	0.081	2.739 *
AxCxD	12	0.875	0.073	2.469 *
BxCxD	12	0.785	0.065	2.216 *
AxBxCxD	24	3.058	0.127	4.314 *
Error	216	6.379	0.030	
Total	323	810.614	2.510	

Fig.1 Flow Chart for Shrikhand Preparation

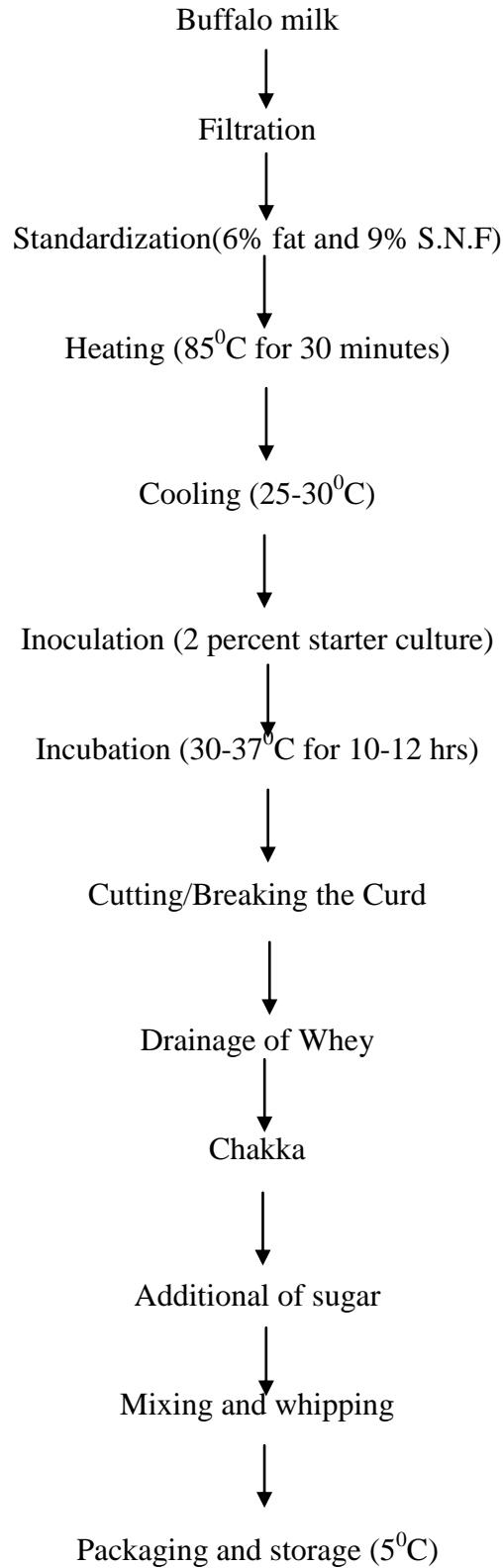
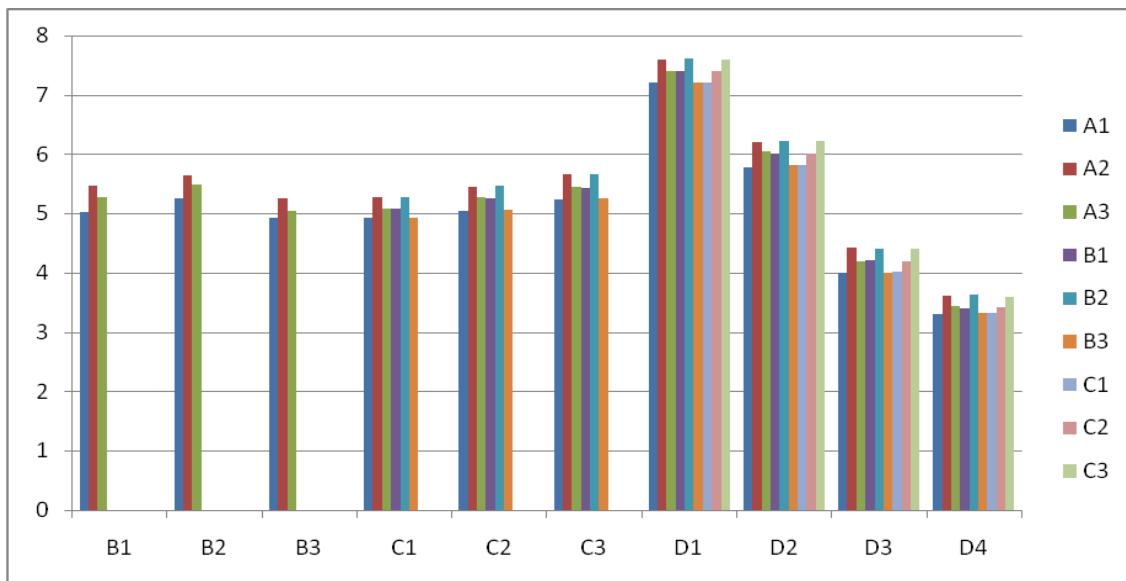


Fig.2 Effect of body and texture on cultures, sugar levels and storage periods of Shrikhand



It was investigated that maximum score (8.00) was in case of fresh samples prepared from the combination of *Lactococcus lactis* subsp. *cremoris* with 40 % sugar level and mango flavour (A₂B₂C₂D₁) followed by the combination of A₂B₂C₂D₁, A₂B₁C₃D₁, A₃B₁C₃D₁, A₂B₂C₁D₁ and A₁B₂C₃D₁, respectively which were statistically at par with respect to body and texture score of Shrikhand and were graded excellent quality and liked extremely. The lowest score (3.00) was registered from A₁B₃C₁D₄ samples and were graded as poor quality.

The analysis of variance Table No.-2 for body and texture score of Shrikhand, it was revealed that the main effect of factors A, B, C and D was found to be highly significant and the rest all first, second order interactions were observed to be non-significant and third order interactions is significant.

In conclusion on the basis of the present investigation it has been found that the *Lactococcus cremoris* culture with 40% sugar level and mango flavor had best compatibility with body and texture of Shrikhand.

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