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Effect of different levels of safflower milk and inulin on organoleptic properties of Srikhand

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Abstract
In the present study, buffalo milk was standardized to 6% fat and 9% solid not fat for manufacturing of Chakka. During the preparation of Shrikhand; using different levels of Inulin viz., @ 2 percent, @ 4 percent, @ 6 percent and @ 8 percent and levels of Safflower (*Carthamus Tinctorius* L.) milk viz., @ 5 percent, @ 10 percent, @ 15 percent and @ 20 percent was added. Sugar was added @ 35 percent. This prepared Shrikhand was compared with control (T0) i.e. without addition of inulin and safflower (*Carthamus Tinctorius* L.) milk. From the result of present investigation, treatment Y11 (@ 6 percent inulin and @ 15 percent Safflower milk) scored the highest in organoleptic parameters viz., flavour, colour and appearance, consistency and overall acceptability. It revealed that the mean value of flavour score, texture score, colour score and overall acceptability score was found to be 8.23, 8.50, 8.49 and 8.52 respectively. The addition of inulin and safflower (*Carthamus Tinctorius* L.) milk in Shrikhand samples improved the sensory characteristics as well as acceptability of the product.

Keywords: genetic combining ability, specific combining ability, okra, variance, growth, yield and quality

Introduction

India is the biggest milk producer in the world. The demand for milk is expected to grow to 141 million tons (Singh *et al*., 2013) [10]. It is mentioned that approximately 50 to 55% of milk produced in India is transformed into loads of chocolates and desserts, which might be deep-rooted in ancient traditions and have a robust cultural heritage (Aneja *et al*., 2002) [1]. Indian fermented milk products utilize 7% of general milk produced and particularly encompass 3 products: Dahi (curd), Shrikhand (sweetened focused curd), and stirred curd-like Lassi which may be measured the western equivalent to guarg, yoghurt, and stirred yoghurt respectively (Sarkar, 2008) [12].

The fermented food product is a matter of health and relies on trust also. Traditionally for several centuries man has followed fermentation as a method of food upkeep and also observed them have dietary and therapeutic advantages. Fermented milk products represent a vital element of the human food plan in many regions of the world (Kumbhar *et al*., 2009) [8]. The microorganisms which are used for training fermented kinds of milk regulate the milk biochemically and organoleptically into edible products and are thus commonly palatable, safe, and nutritious. In India, Dahi the most popular fermented milk consumed in various forms including Misti Dahi, kadhi, Shrikhand, lassi, buttermilk, etc. In India almost 7% of the milk is being converted to fermented kinds of milk and the demand for fermented milk products is developing at about 20% annually.

Fermentation is one of the oldest economical techniques of manufacturing and maintaining ingredients in growing countries (David and Aderibigbe, 2010) [6]. Opara *et al*. (2013b) show that extending the shelf-existence of ingredients is one of the major objectives of fermentation, with aspects together with wholesomeness, acceptability, and common quality.

Shrikhand is a fermented sweetened product rich in fat, protein, and carbohydrates, however lacks dietary fibre. Dietary fibre is well identified as one of the important dietary constituents due to its functional properties. It can be resulting in texture modification and enhancement of heat stability within the formulations of foods, at some point in manufacturing and storage wished for amazing health (Lee *et al*., 2004) [9]. Oat and barley are special amongst cereal grains due to their high content material of soluble dietary fibre, broadly speaking beta-glucan. They also are precious sources of many bioactive compounds; several health-promoting consequences of oat bran and barley have been attributed due to beta-glucan. Mitsou *et al*., 2010 [8]; Shen *et al*., (2012) [9].

Materials and Methods

The Experimental work was carried out in the research laboratories of Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.).

Procurement and collection of ingredients-

1) **Buffalo milk: -** Buffalo milk was collected from the local market at Prayagraj.
2) **Safflower seed: -** It was collected from A.D.A. Market Alopi Bag, Prayagraj -211001, Uttar Pradesh
3) **Sugar: -** Sugar was collected from local general stores of Prayagraj.
4) **Starter culture: -** Starter culture was collected from NCDC, NDRI, Karnal.
5) **Inulin: -** It was procured from Azelis (India) Private Limited, Navi Mumbai**.**

Sodium Hexametaphosphate: - Procured from M/S Scientific and Allied Industries, E-39 New Agra – 282005.

Flow diagram for preparation of safflower milk

Safflower seeds (50gm)
↓
Seeds washed with hot water
↓
Grinding of seed (in a small amount of water)
↓
Filtration (Final seed to water ratio 1:5)
↓
Additionofsodiumhexameta-phosphate (@ 0.2 percent)
↓
Addition of common salt (@ 0.05 per cent)
↓
Heating of milk
↓
Safflower milk (250ml)

Flow diagram for manufacturing of shrikhand

Receiving of Buffalo milk
↓
Standardization (fat 6%, S.N.F. 9%)
↓
Heat treatment (85°C/30 minutes)
↓
Cooling (50-60^{0}C)
↓
Addition of Safflower milk (5%, 10%, 15%, 20%)
↓
Addition of Inulin powder (2%, 4%, 6%, 8%)
↓
Cooling (30°C)
↓
Inoculation (@ 2% starter culture) (NCDC-167)
↓
Incubation (32°C/ 10-12 hrs)
↓
Breaking the curd
↓
Draining the whey
↓
Chakka
↓
Addition of sugar (35%)
↓
Kneading to a smooth paste (5 min.)
↓
Filling in cup
↓
Shrikhand
↓
Storage (5-7ºC

Table 1: Treatments combinations of developed Shrikhand supplemented with the addition of inulin and safflower (*Carthamus Tinctorius* L.) milk levels.

Y0-	100% Buffalo milk (T_0) Shrikhand without Safflower milk (S_0) and Inulin (I_0).
Y1-	Shrikhand prepared with 95% Buffalo milk (T_1) 5% Safflower milk (S_1) 2% and Inulin (I_1)
Y2-	Shrikhand prepared with 90% Buffalo milk (T_2) 10% Safflower milk (S_2) 2% and Inulin (I_1).
Y3	Shrikhand prepared with 85% Buffalo milk (T_3) 15% Safflower milk (S_3) 2% and Inulin (I_1).
Y4	Shrikhand prepared with 80% Buffalo milk (T_4) 20% Safflower milk (S_4) 2% and Inulin (I_1).
Y5	Shrikhand prepared with 95% Buffalo milk (T_1) 5% Safflower milk (S_1) 4% and Inulin (I_2).
Y6	Shrikhand prepared with 90% Buffalo milk (T_2) 10% Safflower milk (S_2) 4% and Inulin (I_2).
Y7	Shrikhand prepared with 85% Buffalo milk (T_3) 15% Safflower milk (S_3) 4% and Inulin (I_2).
Y8-	Shrikhand prepared with 80% Buffalo milk (T_4) 20% Safflower milk (S_4) 4% and Inulin (I_2).
Y9-	Shrikhand prepared with 95% Buffalo milk (T_1) 5% Safflower milk (S_1) 6% and Inulin (I_3).
Y10-	Shrikhand prepared with 90% Buffalo milk (T_2) 10% Safflower milk (S_2) 6% and Inulin (I_3).
Y11-	Shrikhand prepared with 85% Buffalo milk (T_3) 15% Safflower milk (S_3) 6% and Inulin (I_3).
Y12	Shrikhand prepared with 80% Buffalo milk (T_4) 20% Safflower milk (S_4) 6% and Inulin (I_3).
Y13	Shrikhand prepared with 95% Buffalo milk (T_1) 5% Safflower milk (S_1) 8% and Inulin (I_4).
Y14	Shrikhand prepared with 90% Buffalo milk (T_2) 10% Safflower milk (S_2) 8% and Inulin (I_4).
Y15	Shrikhand prepared with 85% Buffalo milk (T_3) 15% Safflower milk (S_3) 8% and Inulin (I_4).
Y16-	Shrikhand prepared with 80% Buffalo milk (T_4) 20% Safflower milk (S_4) 8% and Inulin (I_4).

T= Buffalo Milk (T_1-95%, T_2-90%, T_3-85%, T_4-80%)
S= Safflower milk (S_1-5%, S_2-10%, S_3-15%, S_4-20
I= Inulin (I_1-2%, I_2-4%.I_3-6%, I_4-8%)

Organoleptic evaluation of developed Shrikhand supplemented with the addition of inulin and safflower (*Carthamus Tinctorius* L.) milk levels.

Developed Shrikhand was evaluated using 9 points hedonic scale for parameter organoleptic properties. Were judged under the following heading:

- Colour and appearance
- Flavour
- Consistency
- Overall acceptability

Result and Discussion

In the present study, Shrikhand was incorporated with both safflower (*Carthamus tinctorius* L.) Milk and Inulin and thereafter organoleptic properties were studied. The organoleptic quality of the developed Shrikhand was evaluated using 9 points hedonic scale for parameter organoleptic properties. The sample of herbal ghee was analyzed for sensory parameters like flavour score, texture score, colour score and overall acceptability score. The data collected on different aspects have been tabulated and analyzed statistically by using Analysis of Variance (ANOVA) and Critical Difference. The observations obtained in the present study related to the preparation of Shrikhand by incorporation of safflower (*Carthamus tinctorius* L.) Milk and Inulin are being presented below.

Table 1: Average chemical composition of buffalo and safflower milk

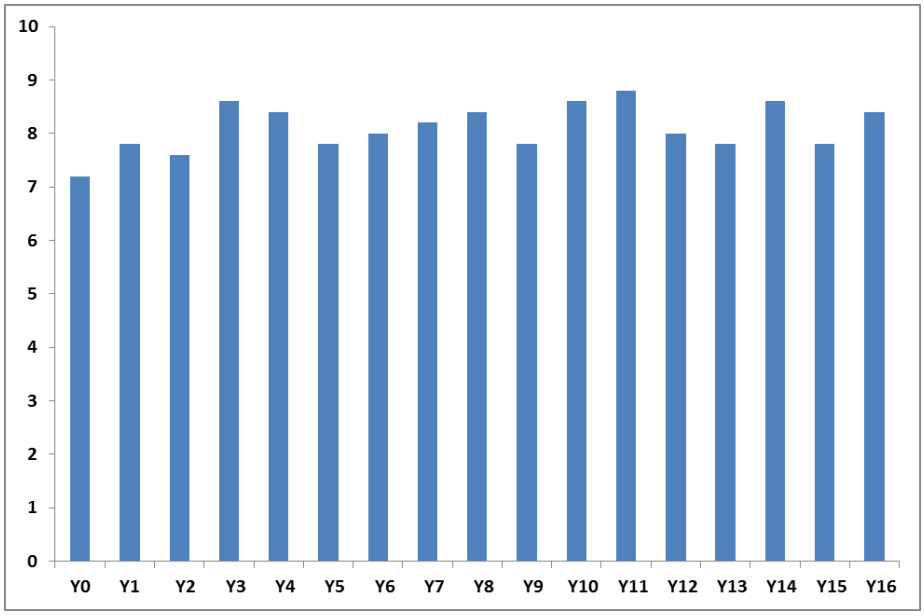
Parameter	Fat (%)	Protein (%)	Lactose (%)	Ash (%)	TS (%)
Buffalo milk	6.00	3.78	5.10	0.78	15.66
Safflower milk	4.50	2.34	2.27	0.67	9.78

Table 2: Table showing average values of sensory scores of developed Shrikhand by incorporation of safflower (*Carthamus tinctorius* L.) Milk and Inulin

Treatments combination	Colour and Appearance	Flavour	Consistency	Overall acceptability
Y0 (Control)	7.2	7.4	7.6	7.0
Y1	7.8	7.63	7.42	7.51
Y2	7.6	8.00	8.36	8.39
Y3	8.6	8.83	8.90	8.93
Y4	8.4	7.16	7.00	7.06
Y5	7.8	7.52	7.25	7.29
Y6	8.0	7.91	8.10	8.16
Y7	8.2	8.53	8.61	8.64
Y8	8.4	7.09	6.90	6.92
Y9	7.8	7.49	7.10	7.16
Y10	8.6	7.87	7.90	7.91
Y11	8.8	8.50	8.49	8.52
Y12	8.0	7.00	6.81	6.84
Y13	7.8	7.35	7.07	7.11
Y14	8.6	7.81	7.71	7.76
Y15	7.8	8.45	8.40	8.43
Y16	8.4	6.95	6.73	6.75

Effect of incorporation of safflower (*Carthamus tinctorius* L.) Milk and Inulin on Colour and Appearance of developed Shrikhand

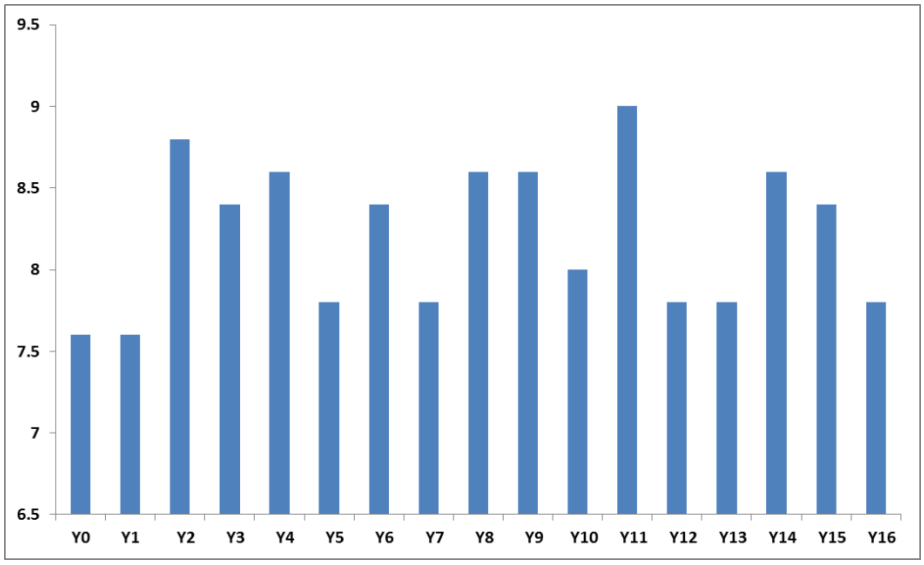
In the present study, buffalo milk was standardized to 6% fat and 9% solid not fat for manufacturing of Chakka. During the preparation of Shrikhand; using different levels of Inulin viz., @ 2 percent, @ 4 percent, @ 6 percent and @ 8 percent and levels of Safflower (*Carthamus Tinctorius* L.) milk viz., @ 5 percent, @ 10 percent, @ 15 percent and @ 20 percent was added. Sugar was added @ 35 percent. The highest value of colour and appearance in developed Shrikhand treatment Y3 (@ 6 percent inulin and @ 15 percent Safflower milk) score was 8.80. Samples and treatments Y0 (7.2), Y1 (8.12), Y2 (8.13), Y3 (8.67), Y4 (8.18), Y5 (8.0), Y6 (8.05), Y7 (8.26), Y8 (8.18), Y9 (7.93), Y10 (8.11), Y11 (8.23), Y12 (8.17) Y13 (7.99), Y14 (8.10), Y15 (7.22) and Y16 (8.16) accordingly. Pandit *et al*., (2018) [11] who conducted a study on sensory attributes of litchi juice fortified dahi in which they reported colour and appearance score 6.70, 7.65, 8.45, and 7.80 of different treatments as T0, T1, T2 and T3 respectively.



Colour and Appearance

Effect of incorporation of safflower (*Carthamus tinctorius* L.) Milk and Inulin on flavor score of developed Shrikhand

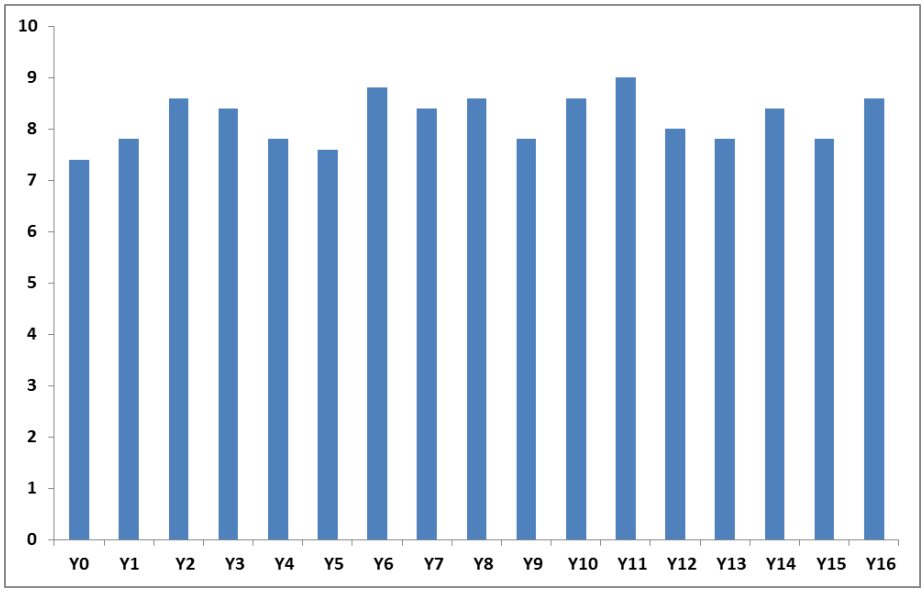
In the present study, buffalo milk was standardized to 6% fat and 9% solid not fat for manufacturing of Chakka. During the preparation of Shrikhand; using different levels of Inulin viz., @ 2 percent, @ 4 percent, @ 6 percent and @ 8 percent and levels of Safflower (*Carthamus Tinctorius* L.) milk viz., @ 5 percent, @ 10 percent, @ 15 percent and @ 20 percent was added. Sugar was added @ 35 percent. The highest value of Flavour score in developed Shrikhand treatment Y3 (@ 6 percent inulin and @ 15 percent Safflower milk) score was 8.80. Samples and treatments Y0 (7.40), Y1 (7.63), Y2 (8.0), Y3 (8.83), Y4 (7.16), Y5 (7.52), Y6 (7.91), Y7 (8.53), Y8 (7.09), Y9 (7.49), Y10 (7.87), Y11 (8.50), Y12 (7.0) Y13 (7.35), Y14 (7.81), Y15 (8.45) and Y16 (6.95) accordingly. Observations were reported by Pandit *et al*., (2018) [11] who conducted a study on sensory attributes of litchi juice fortified dahi in which they reported flavour score 6.10, 7.50, 8.20, 7.80 of different treatments as T0, T1, T2 and T3 respectively.



Flavor score

Effect of incorporation of safflower (*Carthamus tinctorius* L.) Milk and Inulin on the consistency of developed Shrikhand

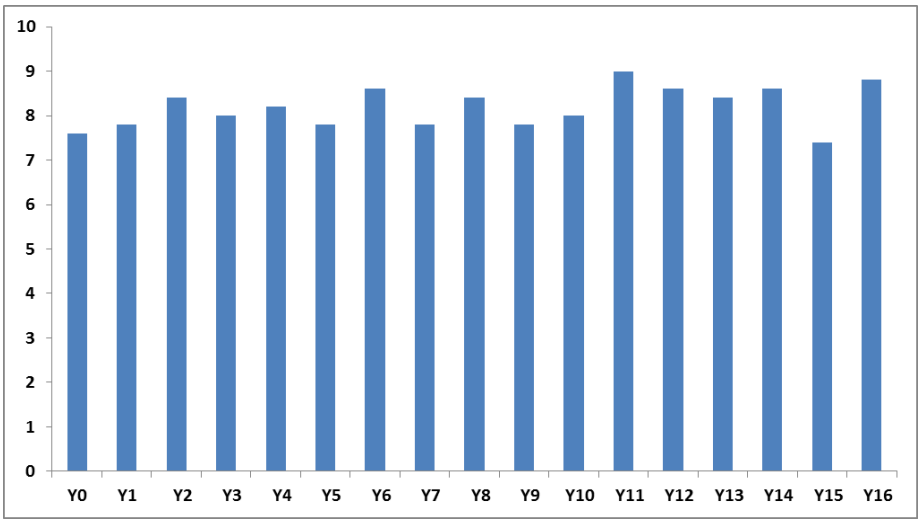
In the present study, buffalo milk was standardized to 6% fat and 9% solid not fat for manufacturing of Chakka. During the preparation of Shrikhand; using different levels of Inulin viz., @ 2 percent, @ 4 percent, @ 6 percent and @ 8 percent and levels of Safflower (*Carthamus Tinctorius* L.) milk viz., @ 5 percent, @ 10 percent, @ 15 percent and @ 20 percent was added. Sugar was added @ 35 percent. The highest value of Consistency in developed Shrikhand treatment Y3 (@ 6 percent inulin and @ 15 percent Safflower milk) score was 8.80. Samples and treatments Y0 (7.60), Y1 (7.42), Y2 (8.36), Y3 (8.90), Y4 (7.00), Y5 (7.25), Y6 (8.10), Y7 (8.67), Y8 (6.90), Y9 (7.10), Y10 (7.90), Y11 (8.49), Y12 (6.81) Y13 (7.07), Y14 (7.71), Y15 (8.40) and Y16 (6.73) accordingly. Observations were reported by Pandit *et al*., (2018) [11] who conducted study on sensory attributes of litchi juice fortified dahi in which they reported flavour score 6.93, 7.75, 8.72, 7.76 of different treatments as T0, T1, T2 and T3 respectively.



Consistency score

Effect of incorporation of safflower (*Carthamus tinctorius* L.) Milk and Inulin on overall acceptability of developed Shrikhand

In the present study, buffalo milk was standardized to 6% fat and 9% solid not fat for manufacturing of Chakka. During the preparation of Shrikhand; using different levels of Inulin viz., @ 2 percent, @ 4 percent, @ 6 percent and @ 8 percent and levels of Safflower (*Carthamus Tinctorius* L.) milk viz., @ 5 percent, @ 10 percent, @ 15 percent and @ 20 percent was added. Sugar was added @ 35 percent. The highest value of Overall acceptability in developed Shrikhand treatment Y3 (@ 6 percent inulin and @ 15 percent Safflower milk) score was 8.80. Samples and treatments Y0 (7.0), Y1 (7.51), Y2 (8.39), Y3 (8.93), Y4 (7.06), Y5 (7.29), Y6 (8.16), Y7 (8.64), Y8 (6.92), Y9 (7.16), Y10 (7.91), Y11 (8.52), Y12 (6.84) Y13 (7.11), Y14 (7.76), Y15 (8.43) and Y16 (6.75) accordingly. Observations were reported by Pandit *et al*., (2018) [11] who conducted a study on sensory attributes of litchi juice fortified dahi in which they reported flavour score 6.75, 7.58, 8.50, 7.69 of different treatments as T0, T1, T2 and T3 respectively.



Overall acceptability

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