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Studies on quality parameters of Shrikhand prepared using kiwi fruit pulp

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Abstract
Shrikhand is a popular Indian dessert by fermentation of milk. In the new millennium we are witnessing the upward trend in nutritional and health awareness which has increased the consumer demand for fermented foods. Keeping this in view, industry is forced to bring fermented products in the market with acceptable sensory characteristics. The present investigation was made with an attempt to develop an Kiwi fruit pulp Shrikhand. For control milk was standardized to 4.5 milk fat, 8.5 % SNF, 35% sugar. Treatment T_1, T_2, and T_3 was standardized to 4.5% fat and 8.5% addition of Kiwi fruit pulp 3%, 6% and 9%. Physico- chemical analysis fat percentage, protein, carbohydrate, moisture, total solid, acidity, ash and Organoleptic characteristics like (color and appearance, Consistency, Flavour and taste, over all acceptability) by trained panelist using 9 point hedonic scale by trained panelist revealed that treatment with 6% Kiwi fruit pulp scored the maximum in most of the attributes. The micro biological analysis revealed that strict hygienic condition was maintained as the coliform count was found nil. All these attributes satisfied with the (FSSAI) standards. Thus treatment can be rated as T2> T0> T1> T3.

Keywords: Standard milk Shrikhand, kiwi fruit pulp

Introduction
Which other dairy products are also manufactured (Thapa, 2000) [10]. Shrikhand is a semi-soft, sweetish-sour, whole milk product prepared from lactic fermented curd. The curd (Dahi) is partially strained through a muslin cloth to remove the whey and thus produce a solid mass called Chakka, the basic ingredient for Shrikhand (Singh *et. al.*, 2014) [9]. Shrikhand is one of the important fermented milk products which derive its name from the Sanskrit word "Shikharani" meaning a curd prepared with added sugar, flavouring agents (Saffron), fruits and nuts. It is popular in western part, especially in Maharashtra, Gujarat and Karnataka. Shrikhand is known for its high nutritive, characteristic flavour, taste, palatable nature and possible therapeutic value. It is very refreshing particularly during summer months. It can be recommended as health food for specific patients suffering from obesity and cardiovascular disease due to its low fat and sugar contents (Swapna and Chavannavar 2013) [8]. India has a very rich variety of fermented foods prepared from milk, cereals, pulses vegetables, fruits and fish. Milk and milk products like curd, buttermilk lassi and Shrikhand is inseparable dish in a regular diet of Indians. As per Aneja (2002) [1].

The kiwifruit is a unique fruit of high nutritional value with different flavours, vitamins, minerals, antioxidants, phytochemicals and fibre content. Because of these characteristics, the kiwifruit offers specific health benefits and has great potential for industrial exploitation (Figoli *et al*., 2010) [5]. It has been attributed with exceptional nutritional and sensory properties, as well as high antioxidant activity comparable to that of mangosteen, avocado, papaya, mango and cempedak (Park *et al*., 2008) [4]. In recent years, consumers' food habits have changed towards greater consumption of ready-to-eat and minimally processed fruit-based products, leading to the marketing of such products (Antunes *et al*., 2010) [2]. (Beirão-da-Costa *et al*., 2006) [3]. Kiwifruit jam is also an important processed product. Quality parameters are very important during pasteurization. Lespinarda *et al*. (2012) [7]. modelled and optimized the pasteurization process in kiwifruit jams, considering the influence of container size on the quality parameters through experimental measurements and kinetic models. Their results could contribute to the optimization of thermal processing of kiwifruit jam in order to minimize quality losses, such as of texture, colour and nutritional value. Deep-frozen kiwifruit purée is used by the food industry in the production of ice cream, jam, etc. (Garcia *et al*., 2012) [6].

Materials and Methods
Standardized milk (4.5% fat/ 8.5% MSNF) was heated to 63 ºC for 30 min. and cooled to 35 ºC curd was prepared using (*S. lactis*) culture which was added in milk.

The inoculated at 35-40 ºC till desire acidity in the dahi (0.6-0.9% LA) was obtained. Kiwi fruit and sugar was obtained from the local market in Allahabad, the research work was carried out in student training dairy of Warner College of Dairy Technology Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, U.P (India).

Preparation of Shrikhand

Fresh sweet good quality standardized milk (4.5% and 8.5% SNF) and was converted to Shrikhand as follows. The standardized milk was heated to 63 °C for 30 minutes; it was cooled to 35 ºC. And then inoculated by *S. lactis* starter culture @ of 2% and incubated, at 35-40 ºC for 8 to 10 hours until a firm coagulum (Dahi) was formed. The Dahi, so formed was broken and transferred to muslin cloth and hanged for 16 hours, for drainage of whey the coaglum so obtained is called chakka, was mixed with 35% sugar and Kiwi fruit pulp was mixed in chakka, as per the treatment 3%, 6% & 9% to obtain the final product Kiwi fruit pulp Shrikhand.

Physico- chemical analysis

Moisture was determined by procedure described in IS: 1010 (1968). Fat was determined as per the procedure described in IS: 2311 (1963). In this method, the sample is treated with ammonia to dissolve the proteins and ethyl alcohol to help precipitate the proteins. Thereafter, the fat is extracted with diethyl ether and petroleum ether. The mixed ethers are then evaporated and the residue weighed. Total nitrogen/protein of Shrikhand was determined by Semi Micro Kjeldahl method (IS:1479 Part II,1961). Ash content of all the samples was determined by procedure described in IS:1547 (1985). The acidity of Shrikhand was obtained by method described in BIS (IS: 1166 1968) for condensed milk. Carbohydrate content was calculated by differential method (AOAC, 1980).

Microbiological analysis

The yeast and mold count (YMC) was determined as per the procedure described in IS: 5403 (1969) using Potato Dextrose Agar (PDA) and coliform count by the methods as described in IS: 5550 (2005) and (FSSAI 2017) respectively.

Sensory evaluation

Sensory evaluation of Shrikhand samples were carried out by a trained panel of six judges of the institute by using 9- point hedonic scale described by Lim (2011). Colour and appearance, body and texture, flavor, consistency and overall acceptability sensory parameter were include for study.

Statistical analysis

The data obtained during different phases of this study was analyzed using Randomized Block Design. The experiment was designed and responses were analyzed using software Design Expert Version 8.0.10.

Result and discussion

Different label of Kiwi fruit pulp was studied for feasibility and suitability for use in Shrikhand.

Physio-chemical quality of Control and Kiwi fruit pulp Shrikhand Carbohydrates

The highest mean value for carbohydrates percentage in Kiwi fruit pulp Shrikhand (38.36) was obtained from the treatment T0 (control) followed by T1 (38.16), T2 (37.94). The minimum score (37.72) was obtained in T3. There were significant differences found among the treatments. F Value was 5205.54, indicating significant effect of treatment on Carbohydrate percentage.

Protein percentage

The highest mean value for protein percentage in Kiwi fruit pulp Shrikhand (9.82) was obtained from the treatment T0 (control) followed by T1 (9.58), T2 (9.35). The minimum score (9.13) was obtained in T3 There were significant differences found among the treatments. F Value was 6002.25, indicating significant effect of treatment on protein percentage.

Fat percentage

The highest mean value for fat percentage in Kiwi fruit pulp Shrikhand (10.84) was obtained from the treatment T0 (control) followed by T1 (10.50), T2 (10.16). The minimum score (9.83) was obtained in T3. There were significant differences found among the treatments. F Value was 149.72, indicating significant effect of treatment on fat percentage.

Ash percentage

The highest mean value for ash percentage in Kiwi fruit Shrikhand (1.47) was obtained from the treatment T0 (control) followed by T1 (1.43), T2 (1.40). The minimum score (1.36) was obtained in T3. There were significant differences found among the treatments. F Value was 2187.66, indicating significant effect of treatment on ash percentage.

Table 1: Physico-chemical qualities of Kiwi fruit pulp Shrikhand control and experiments.

Parameters%	Scores/ values based on mean value of different parameters of treatments				F Value	CD Values
	T0	T1	T2	T3		
Carbohydrate	38.36	38.16	37.94	37.72	5205.54*	0.012
Protein	9.82	9.58	9.35	9.13	6002.25*	0.016
Fat	10.84	10.50	10.16	9.83	149.72 *	0.12
Ash	1.47	1.43	1.40	1.36	2187.66*	0.003
Total Solid	60.50	59.68	58.86	58.05	278942.3*	0.006
Moisture	39.50	40.32	41.14	41.95	44173.33 *	0.015
T. Acidity#	0.93	1.08	1.19	1.26	2218.77 *	0.009
Antioxidant activity (% Radical scavenging acidity)	0.00	79.87	82.92	86.42	47456212*	0.019

* Significant at 5% level

** Non- Significant at 5% level

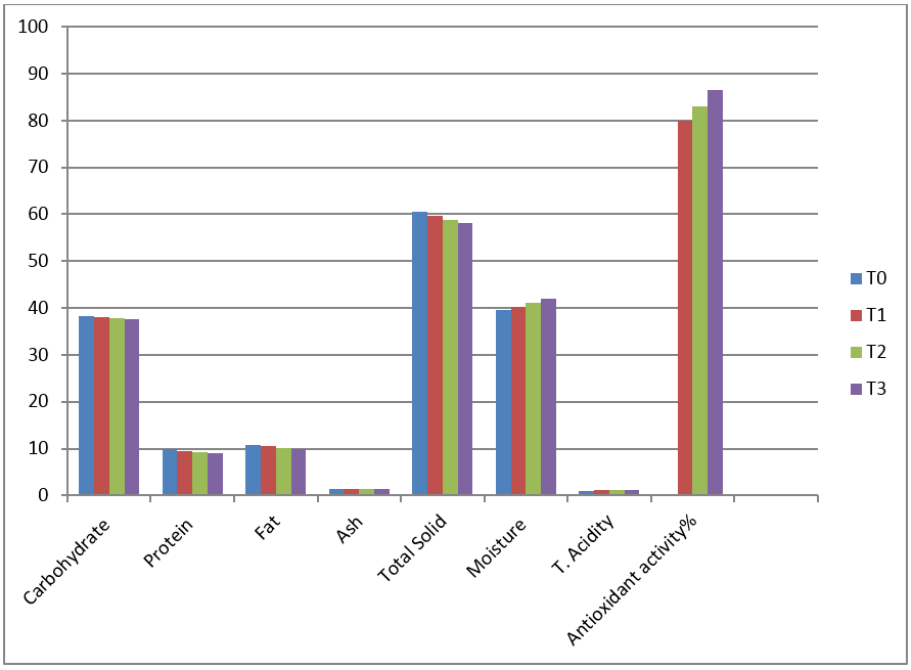
As per lactic acid.

Total Solids percentage
The highest mean value for total solids percentage in Kiwi fruit Shrikhand (60.50) was obtained from the treatment T0 (control) followed by T1 (59.68), T2 (58.86). The minimum score (58.05) was obtained in T3. There were significant differences found among the treatments. F Value was 278942.3, indicating significant effect of treatment on total solids percentage.

Moisture percentage
The highest mean value for moisture percentage in Kiwi fruit pulp Shrikhand (41.59) was obtained from the treatment T3 followed by T2 (41.14), T1 (40.32). The minimum score (39.50) was obtained in T0 (control). There were significant differences found among the treatments. F Value was 44173.33, indicating significant effect of treatment on moisture percentage

Titrable acidity percentage
The highest mean value for titrable acidity percentage in Kiwi fruit Shrikhand (1.26) was obtained from the treatment T3 followed by T2 (1.19), T1 (1.08). The minimum score (0.93) was obtained in T0 (control). There were significant differences found among the treatments. F Value was 2218.77, indicating significant effect of treatment on titrable acidity percentage.

Antioxidant activity
The highest mean value for antioxidant activity in Kiwi fruit Shrikhand (86.42) was obtained from the treatment T3 followed by T2 (82.92) and T1 (79.87). No antioxidant activity was observed in T0 (control) sample. There were significant differences found among the treatments. F Value was 47456212, indicating significant effect of treatment on antioxidant activity.



Sensory evaluation of Control and Kiwi fruit pulp Shrikhand

Colour and Appearance
The highest mean score for colour and appearance in Kiwi fruit pulp Shrikhand (8.20) was obtained from T2 followed the treatment by T3 (7.80), T1 (7.00). The minimum score (5.80) was obtained in T0. There were significant differences found among the treatments. F Value was 8.72, indicating significant effect of treatment on colour and appearance.

Flavour and Taste
The highest mean score for flavour and taste in Kiwi fruit pulp Shrikhand (8.20) was obtained from the treatment T2 followed by T1 (6.20), T0 (6.60). The score (6.20) was obtained in T3. There were significant differences found among the treatments. F Value was 3.53, indicating significant effect of treatment on flavour and taste.

Body and Texture
The highest mean score for body and texture in Kiwi fruit pulp Shrikhand (8.40) was obtained from the treatment T2 followed by T0 (6.40), T1 (6.20). The minimum score (6.00) was obtained in T3. There were significant differences found among the treatments. F Value was 3.58, indicating significant effect of treatment on body and texture.

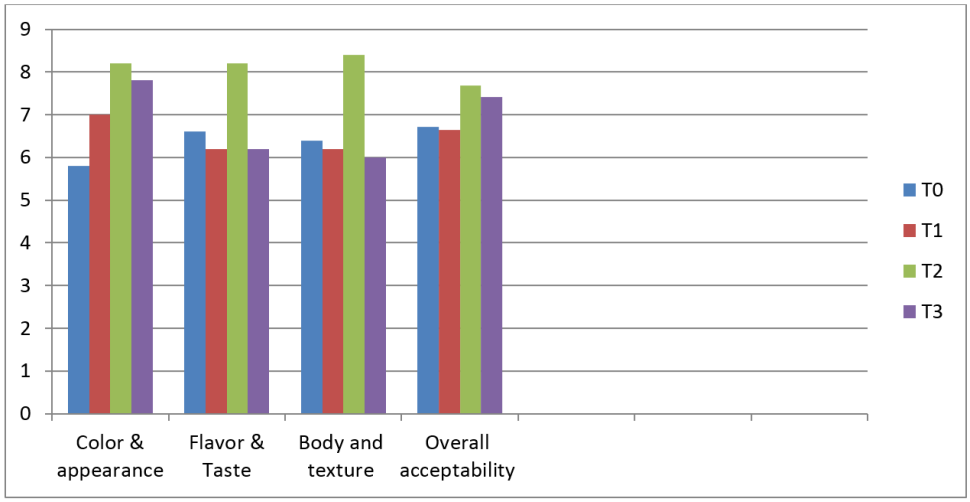
Table 2: Sensory evaluation of Kiwi fruit pulp Shrikhand

Parameters	Scores/ values based on mean value of different parameters of treatments				F Value	CD
	T0	T1	T2	T3		
Color & appearance	5.80	7.00	8.20	7.80	8.72 *	1.10
Flavor & Taste	6.60	6.20	8.20	6.20	3.53*	1.56
Body and texture	6.40	6.20	8.40	6.00	3.58 *	1.81
Overall acceptability	6.72	6.64	7.68	7.42	3.50 *	0.94

* Significant at 5% level
** Non- Significant at 5% level

Overall Acceptability

The highest mean score for overall acceptability in Kiwi fruit pulp Shrikhand (7.86) was obtained for the treatment T2 followed by T0 (6.72), T3 (6.64). The There were significant differences found among the treatments. F Value was 3.50, indicating significant effect of treatment on overall acceptability.



Minimum score (6.64) was obtained in T1.

Average of microbial analysis of Control and Kiwi fruit pulp Shrikhand

Table shows Average of microbial analysis of control and kiwi fruit pulp Shrikhand. The highest mean score for yeast and moulds in Kiwi fruit Shrikhand (8.80) was obtained from the treatment T3 followed by T2 (7.40), T1 (6.20) the minimum score (5.2) was obtained in T0 (control). There were significant differences found among the treatments. F Value was 21.29, indicating significant effect of treatment on yeast and mould count.

None of the samples of Kiwi fruit pulp Shrikhand showed presence of the coliforms at 0 day. Which indicates, proper hygienic conditions were maintained during the preparation and storage of the product

Table 3: Microbiological analysis

Parameters	Scores/ values based on mean value of different parameters of treatments				F Value	CD
	T0	T1	T2	T3		
Yeast & mould (cfu/gm)	5.2	6.20	7.40	8.80	21.29*	1.036
Coliform count (10^1/ml)	NIL	NIL	NIL	NIL		

* Significant at 5% level

** Non- Significant at 5% level

Conclusion

It concluded that good quality, value added Shrikhand with more acceptability can be prepared by addition of Kiwi fruit pulp. The treatment containing 6% Kiwi fruit pulp was most acceptable in terms of sensory score however the treatment containing 3% & 9% Kiwi fruit pulp also obtained satisfactory results as they were within the acceptable limit.

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