



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2021; 9(2): 1055-1058

© 2021 IJCS

Received: 02-01-2021

Accepted: 12-02-2021

MK Yadav

Department of Dairy
Technology, College of Dairy
Science and Food Technology,
Raipur, Chhattisgarh, India

S Jain

Department of Dairy
Engineering, College of Dairy
Science and Food Technology,
Raipur, Chhattisgarh, India

P Purohit

Department of Dairy
Technology, College of Dairy
Science and Food Technology,
Raipur, Chhattisgarh, India

KK Sandey

Department of Dairy
Engineering, College of Dairy
Science and Food Technology,
Raipur, Chhattisgarh, India

S Karthikeyan

Department of Dairy
Technology, College of Dairy
Science and Food Technology,
Raipur, Chhattisgarh, India

S Uprit

Dau Shri Vasudev Chandrakar
Kamdhenu Vishwavidyalaya,
Durg, Chhattisgarh, India

Corresponding Author:**S Jain**

Department of Dairy
Engineering, College of Dairy
Science and Food Technology,
Raipur, Chhattisgarh, India

Effect of storage period on the chemical characteristics of *Shrikhand*

MK Yadav, S Jain, P Purohit, KK Sandey, S Karthikeyan and S Uprit

DOI: <https://doi.org/10.22271/chemi.2021.v9.i2o.11960>

Abstract

Shrikhand is a semi solid, sweetish-sour, whole milk product, prepared by lactic fermentation of milk. The curd (*dahi*) obtained was partially strained through a muslin cloth to remove the whey to yield *chakka* (the basic ingredient for *shrikhand*). In the present investigation a comparative study was conducted to analyze the chemical characteristics (*viz.* acidity, pH and free fatty acid) of market and laboratory prepared sample of *Shrikhand*. Both market and laboratory samples were stored at refrigerated temperature (5 ± 2 °C) and were analyzed at intervals of 0, 5, 10, 15 and 20 days. The lactic acid content of laboratory sample of *shrikhand* increased from 0.97% lactic acid to 1.09% lactic acid while for market sample it increases from 0.98% lactic acid to 1.14% lactic acid during storage. Free fatty acid content of the stored market sample increased from 1.82 to 2.42 meq/g and 1.82 to 2.26 meq/g in laboratory sample after 20 days of storage. The pH of laboratory sample decreased from 4.49 to 4.16 while in market sample also the pH decreased from 4.32 to 4.06 during refrigerated storage.

Keywords: *Shrikhand*, acidity, *Chakka*, free fatty acid, storage study

Introduction

Since time immemorial, Indian milk sweets have played a significant role in the economic, social, religious and nutritional well being of our people. A significant portion of the milk has been used in India for preparing a wide variety of dairy delicacies. *Shrikhand* is fermented and sweetened milk product of Indian origin which is derived from Sanskrit word '*Shrikhirmi*' meaning a curd prepared with addition of sugar, flavouring material, dried fruits etc. It is a semi-soft, sweetish-sour, whole milk product prepared from lactic fermented curd. The curd (*dahi*) is partially strained through a cloth to remove the whey and thus produced a solid mass called *Chakka* (the basic ingredient for *shrikhand*). This *chakka* is mixed with the required amount of sugar, colour, flavour etc. to yield *Shrikhand* (De, 2008 and Aneja *et al.*, 1977)^[3, 1]. Due to use of different ingredients, wide variation is found in the sensory characteristics of *shrikhand* sold in the market (Bhagwan *et al.*, 2020)^[2].

Shrikhand is regularly consumed in Gujarat, Maharashtra and certain parts of Karnataka, Madhya Pradesh and Rajasthan, because of its typical sweet-sour taste; it is becoming popular in other parts of country. It has a typical semi-solid consistency with a characteristic smoothness, firmness and palatability that make it suitable for consumption directly after meal or with 'puree' or bread. *Shrikhand* is highly perishable dairy product with an average shelf life of 1 or 2 days at room temperature under Indian conditions. The shelf life of *shrikhand* mainly depends on the initial quality of milk used for its manufacture and post processing contamination. Under refrigerated condition (5 °C) it can be kept for longer period of time without deterioration (Salunkhe *et al.*, 2005)^[12]. Karthikeyan *et al.*, (2000)^[8] investigated the possibility of partial and total replacement of buffalo skim milk (BSM) with sweet butter milk (BM) in the manufacture of *shrikhand* in order to improve the textural and flavor characteristics. The compositional analysis showed no significant differences in fat, non-reducing sugar contents and acidity except in moisture, reducing sugar and protein. Rai *et al.* (2018)^[11] reported shelf life of up to 50 days at refrigeration temperature for *tulsi* (*Ocimum tenuiflorum*) enriched herbal *shrikhand*. Wide variation was found in chemical qualities of *shrikhand* samples sold in market. It mainly depends on the initial quality of milk used for its manufacture, lack of awareness to maintain hygienic and nutritional condition in *shrikhand* (Jaybhay *et al.*, 2019)^[7]. Chemical characteristics such as acidity, pH and free fatty acids

(FFA) are the major detrimental factors as far as the shelf life of *shrikhand* is concerned. Therefore, present study was undertaken to assess the chemical characteristics of market *shrikhand* (*Devbhog* brand) sold in Raipur city and was compared with the laboratory prepared samples during storage at 5 ± 2 °C for a period of 20 days.

Material and Methods

The experimental study was conducted in the laboratory of Department of Dairy Technology, College of Dairy Science & Food Technology, Raipur, Chhattisgarh. Good quality fresh toned milk (3.0% fat & 8.5% SNF) brand name AMUL TAAZA and sugar of commercial grade were procured from local market of Raipur city for the preparation of laboratory *shrikhand* sample. The market sample of *shrikhand*, brand name *Devbhog* was selected and considered for this study. The fresh market sample was brought in the chilled condition and was used for the study. 1760

Preparation of laboratory *shrikhand*

The method suggested by Prajapati *et al.* (1990) [10] was adopted with slight modification for preparation of *shrikhand*. Toned milk (3% fat & 8.5% SNF) subjected to heat treatment at 90 ± 1 °C for 15 minutes. Milk was cooled to 37 ± 1 °C. *Lactobacillus lactis sub sp. lactis* and *cremoris* culture were added in a ratio of 1:1 to the cooled milk at the rate of 1% under hygienic conditions. It was then incubated at 37 ± 1 °C for 6 to 8 h to obtain 0.8% LA. The curd thus obtained was then transferred to a clean muslin cloth and hanged for 4 to 4.5 h to drain whey in order to obtain the *chakka* (the base material for the preparation of *shrikhand*). *Chakka* was kneaded well with sugar (added @40% by weight of *chakka*) to obtain the good quality *shrikhand*. The fresh product was then packed in cleaned and sterilized polystyrene cups (100g capacity), labelled and stored at 5 ± 2 °C. The fresh sample of *shrikhand* (*Devbhog*) was procured from Raipur market. The laboratory and market samples were stored at 5 ± 2 °C for 20 days. The fresh and stored samples were analyzed for chemical quality *viz.* Titrable acidity, pH and free fatty acids at an regular interval of 5 days up to 20 days.

Chemical analysis

The fresh as well as the stored samples of *shrikhand* were chemically analyzed during the study. Titratable acidity of *shrikhand* samples (laboratory and market) was estimated by titration method as per IS-1479, Part-I (1960) [6]. The pH of *shrikhand* samples was determined by using a digital pH meter (Make- Systronic). For *shrikhand*, the pH was measured of homogenate prepared by diluting 20 g of sample in 20 ml glass distilled water. Lipolytic change in *shrikhand* was measured in terms of Free Fatty Acids (FFA). The FFA was determined by extraction-titration method as suggested by Deeth and Fitz-Gerald (1976) [4] and the results were expressed in meq/g of product.

Storage study

Storage study of *shrikhand* samples was carried out to assess the chemical changes occurred in *shrikhand* during the storage at 5 ± 2 °C. Market and laboratory prepared samples of *shrikhand* were analyzed at intervals of 0, 5, 10, 15 and 20 days for its chemical parameters (acidity, pH and FFA).

Statistical analysis

The study was replicated three times and data obtained during the course of investigation were statistically analyzed using

Completely Randomized Design (CRD) as described by Steel and Torrie (1980) [15].

Results and Discussion

The market and laboratory prepared samples of *shrikhand* stored at 5 ± 2 °C were analyzed for selected chemical parameters acidity, pH and free fatty acids at intervals of 5 days over a period of 20 days.

Effect of storage period on acidity of market and laboratory samples of *shrikhand*

The effect of storage period on acidity of market and laboratory samples of *shrikhand* is shown in Fig. 1. It can be seen from the Fig. 1 that there was a gradual increase in acidity at every interval with progress of storage time.

The titratable acidity content of laboratory sample increased from 0.97% to 1.09% lactic acid at 5 ± 2 °C while it increased from 0.98% to 1.14% lactic acid for market samples during storage. The increase in acidity for both laboratory prepared and market samples was recorded significant ($P\leq 0.05$) from 10th day of storage period. The increase in acidity content of both market and laboratory samples might be due to activity of starter during storage of the product. The conversion of lactose into lactic acid might also be the possible reason for enhancement in acidity of *shrikhand* during storage. The higher acidity content was observed in market sample as compared to the laboratory prepared samples. It may be ascribed to the poor quality of raw milk used, unhygienic manufacturing and improper handling of product and rise in temperature during transportation. Patel and Chakraborty (1987) [9] observed an increase in acidity of butter milk *shrikhand* during storage at refrigerated temperature. Similar kinds of findings were also reported by Sharma *et al.* (1973) [13], Sharma and Zariwala (1980) [14] and Upadhyay *et al.* (1985) [16] for *shrikhand* samples during their storage study. Jaybhay *et al.* (2019) [6] analyzed market *shrikhand* samples of Kholapur, India and reported that the acidity ranged from 1.01 to 1.50% LA.

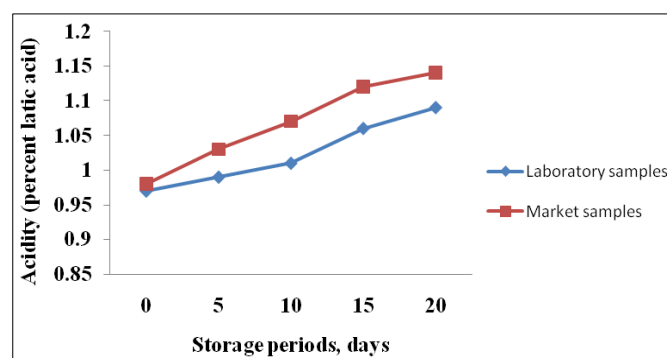


Fig 1: Effect storage period on acidity of laboratory and market samples of *shrikhand*

Effect of storage period on pH of market and laboratory samples of *shrikhand*

The effect of storage period on pH of market and laboratory samples is shown in Fig. 2. The initial pH values of 4.49 recorded at 0 day for laboratory sample which decreased to 4.16 at the end of 20 days of storage period. Market samples of *shrikhand* also showed a decreasing trend from initial pH values of 4.32 at 0 day to 4.06 at the end of 20 days of storage period. In case of market samples, there was a greater decline in the pH towards the end of storage period as compared to laboratory *shrikhand*. This could be due to the continued

activity of starter culture and other microorganisms present in the samples possibly due to presence of greater amount of substrate available for fermentation. The pH of laboratory prepared *shrikhand* sample declined significantly ($P \leq 0.05$) from 15th day of storage period, while for market sample the significant ($P \leq 0.05$) decrease in pH was observed from 10th day of storage period. The pH values of lab and market samples observed in the present study were matching with those reported by Upadhyay (1981) [17]. A decreasing trend in pH was obtained by Patel and Chakraborty (1987) [9] in buttermilk *shrikhand* during storage at 10 °C. A declining trend in pH during refrigerated storage of *shrikhand* was also reported by Sharma and Zariwala (1980) [14] and Upadhyay *et al.* (1985) [16]. The market samples *shrikhand* of Kholapur city had pH in the range of 4.00 to 5.13 (Jaybhay *et al.*, 2019) [6].

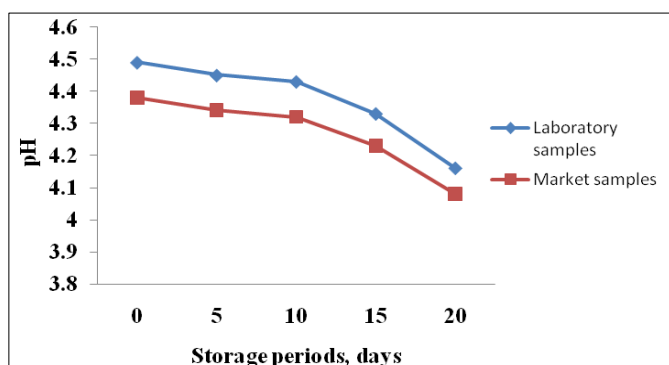


Fig 2: Effect of storage period on pH of laboratory and market samples of *shrikhand*

Effect of storage period on FFA (meq/g) content of market and laboratory samples of *shrikhand*

Fat containing fermented dairy products usually undergo lypolysis, an important storage change, which affects acceptability of the product. Lypolysis under laboratory condition within limit is desirable, but it has a detrimental effect on the keeping quality beyond certain limit. The extent of lypolytic changes during storage of *shrikhand* is an indication of shelf-life of the product (Upadhyay *et al.*, 1985) [15]. In the present study, market and laboratory prepared *shrikhand* samples were analyzed for FFA in terms of meq/g with a view to monitor the lipolytic changes during storage at 5±2 °C.

The effect of storage period on FFA of laboratory and market samples of *shrikhand* stored at 5±2 °C is graphically presented in Fig. 3. A gradual increase of fatty acids in *shrikhand* samples was noticed during storage. The FFA content of *shrikhand* increased significantly ($P \leq 0.05$) with the progress of storage period. The rate of increase in FFA was maximum in market sample of *shrikhand* stored at 5±2°C, wherein free fatty acids increased from initial value of 1.82 meq/g on 0th day to 2.42 meq/g after 20th day of storage. The rate of increase in FFA was slower in laboratory samples of *shrikhand* as compared to market sample. The initial mean FFA content recorded for laboratory sample was 1.82 meq/g which gradually increased to 2.26 meq/g during storage at 5±2 °C. The release of free fat during the preparation of *shrikhand* and presence of high moisture content could be responsible for lipolysis during storage.

An increasing trend in the total volatile fatty acids has been observed by Patel and Chakraborty (1987) [9] during storage of buttermilk *shrikhand* at 10 °C. Further, Sharma and Zariwala (1980) [14] and Upadhyay *et al.* (1985) [16] have also

observed increasing trend in FFA during storage of cow and buffalo milk *shrikhand* at refrigerated temperature.

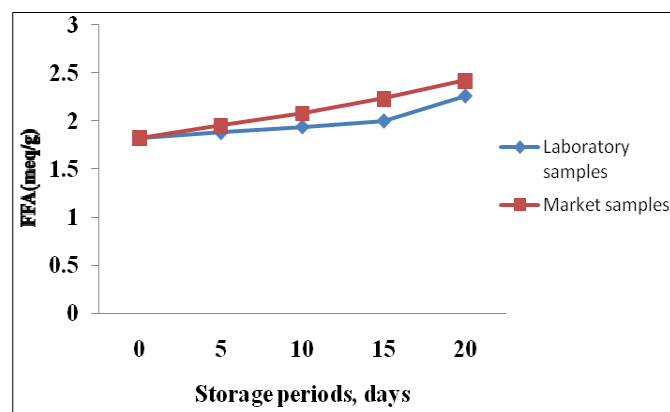


Fig 3: Effect of storage period on FFA of laboratory and market samples of *shrikhand*

Conclusion

The chemical analysis of market and laboratory samples of *shrikhand* during storage shown that acidity and free fatty acids increased significantly while pH decreased. The laboratory *shrikhand* was found superior than the market sample under study. The Acidity of both the samples (laboratory and market) were within the prescribed standards by FSSAI (2017) [5]. The free fatty acids is one of the important constituent which contributes to the flavour of dairy products up to certain level, beyond that they are detrimental to the quality. There is no standard established for free fatty acids level for *shrikhand*, so further studies could help to establish the FSSAI standards for free fatty acids.

References

1. Aneja RP, Vyas MN, Nanda K, Thareja VK. Development of an industrial process for the manufacture of *shrikhand*. Journal of Food Science and Technology 1977;14(4):159.
2. Bhagwan JV, Kamble KB, Patange DD, Kamble DK. Sensory evaluation of *shrikhand* sold in Kolhapur city. International Journal of Chemical Studies 2020;8(4):3450-3452.
3. De S. Outline of dairy technology. Oxford Uni. Press, Delhi 2008.
4. Deeth HC, Fitz - Gerald CH. Lypolysis in dairy products: A review. Australian Journal of Dairy Technology 1976;31(2):53.
5. FSSAI Standards, Gazette of India; extraordinary Part-3, section-4 2017, 103.
6. Indian Standard (IS): 1479, Part I. Method of test for dairy industry. Rapid Examination of milk. Bureau of Indian Standards, New Delhi 1960.
7. Jaybhay VB, Kamble DK, Jadhav SR. Studies on physico-chemical quality of *shrikhand* sold in Kolhapur city. Journal of Pharmacognosy and Phytochemistry 2019;8(6):2436-2438.
8. Karthikeyan S, Desai HK, Upadhyay KG. Effect of replacement of buffalo skim milk by sweet buttermilk on storage changes of *shrikhand*. Buffalo J 2000;3:307.
9. Patel RS, Chakraborty BK. Storage stability of *shrikhand* manufactured from different sources of milk solids. Japanese Journal of Dairy and Food Science 1987;36(5):209.
10. Prajapati JP, Upadhyay KG, Desai HK. Comparative quality appraisal of heated *shrikhand* stored at ambient

- temperature. Australian Journal of Dairy Technology 1990, 74.
11. Rai HK, Rai DC, Saloni. To study the shelf life of *tulsi* (*Ocimum tenuiflorum*) enriched herbal *shrikhand*. The Pharma Innovation Journal 2018;7(5):611-615.
 12. Salunke P, Patel HA, Takar PN. Comparative studies on the physico-chemical properties of *Shrikhand* manufactured by traders. Indian Journal of Dairy Science 2005;58(5):326-332.
 13. Sharma UP, Zariwala IT, Kulia RK. Deterioration of indigenous milk products during storage study and factors associated with them, milk fat, protein and lactose composition. Annual Report, N.D.R.I., Karnal 1973, 207.
 14. Sharma UP, Zariwala IT. Deterioration of *Shrikhand* during storage. Indian Journal of Dairy Science 1980;33(2):223.
 15. Steel RGD, Torrie JH. Principles and procedures of statistics: a biometrical approach, 2nd edn, New York: McGraw Hill 1980.
 16. Upadhyay SM, Dave JM, Sannabhadti SS. Chemical changes in stored *shrikhand*, their measurement and relationship with organoleptic quality. Journal of Food Science and Technology 1985;22(3):185.
 17. Upadhyay SM. Assessing the suitability of different microbiological and chemical tests as keeping quality tests for *shrikhand*. M.Sc. Thesis, Gujarat Agricultural University, S.K. Nagar, Gujarat 1981.