Microbial Quality Analysis of Shrikhand Sold in Kolhapur City, India

Jaybhay Vishnu Bhagwan¹*, K. B. Kamble², N. S. Dhadge³, D. K. Kamble⁴

Post Graduate Institute, MPKV, Rahuri, Maharashtra – 416 004, India

*Corresponding author

A B S T R A C T

Milk is known to carry both pathogens as well as spoilage microorganism. This results in the economic loss of producers/processors/consumers and can pose a serious public health concern. Spoilage microorganisms group can degrade milk components, creating negative sensory attributes, decreasing processed product shelf life and adversely affecting fermented dairy product yield. Some microorganisms are beneficial and carrying out desirable fermentation in milk (prevent spoilage through fermentation). The extent of contamination is depending upon the practices followed and available environment during and after the preparation of products. Hence, present study was undertaken to evaluate the microbial quality of shrikhand sold in Kolhapur city. Preliminary survey was conducted in market of Kolhapur city to know the availability of shrikhand samples and on the basis of survey five brands of shrikhand were selected. These brands were coded with KS₁, KS₂, KS₃, KS₄, and KS₅. Packed pouch (package) were brought to laboratory under condition for further analysis. It was observed that the, SPC (x10⁶ cfu g⁻¹) recorded in market samples of shrikhand were various 18.00, 19.00, 21.5, 19.5 and 23.00, respectively and that difference in count were significant whereas, coliform count in market samples were range of 1.00± to 3.10  cfu g⁻¹. The highest Coliform count was in KS₃ and lowest KS₁ brand. The YMC in shrikhand samples collected from Kolhapur market ranging from 15.91 to 30.18 (cfu g⁻¹) and all samples were free from salmonella contamination.

Keywords
Shrikhand, Chakka, Kolhapur city, Microbial quality

Introduction
Fermented products are those prepared where the milk is inoculated with starter culture organism mainly Lactose fermented bacteria which hydrolyze the lactose of milk into lactic acid and thus raise the acidity and decrease pH of milk. Fermented milk and milk products have occupied a place of satisfaction in satisfying the palate and nutritional requirements of human being since the time ancient. There are more than 400 type of fermented dairy products are available in the world. Shrikhand is fermented and sweetened milk product of Indian origin popular in western and part of southern peninsula of India (Nigam et al., 2009).

The product is prepared with addition of sugar, Flavoring, material, dried fruits etc.in dahi and blended very well still getting typical semi-solid consistency with a characteristic smoothness, firmness and palatability. Despite so much of market size the Shrikhand
manufacturing is still unstandardized process. Market studies carried out by Sharma and zariwala (1978), Bogra and matur (1992), Kumbhar et al., (2009) have shown great variation in Shrikhand quality in terms of chemical and microbiological attributes. In view of current liberalization program, more dairy units are coming up and Shrikhand manufacture being one of the most profitable business as pointed out by Aneja (1992).

Milk is known to carrier both pathogens as well as spoilage microorganism. This results in the economic loss of producers/ processors / consumers. Presence of pathogen can pose a serious public health concern. (Kumbhar et al., 2009). Spoilage microorganisms group can degrade milk components, creating negative sensory attributes, decreasing processed product shelf life and adversely affecting fermented dairy product yield. The extent of contamination is depending upon the practices followed and available environment during and after the preparation of products.

A Kolhapur district is the top in buffalo milk production in Maharashtra. At present, Kolhapur District Milk Union (Gokul), Warna Milk Union, Yelgud Milk Union, Shahu Milk Union are the key leader in collecting and processing of milk in the district. Number of branded Shrikhand is being prepared and marketed in Kolhapur district. There are no microbiological standard for shrikhand in PFA, however, BIS (IS: 5432-1980) has given the limit of 50 cfu/g for yeast and molds count and 10cfu/g for coliform.

Since then no information on microbiological quality of shrikhand in this area is available whereas, on other side, the product growth in the market has increased substantially in last few years. Hence, the present study deals with the microbiological analysis of differently branded Shrikhand sold in Kolhapur city.

Materials and Methods

The study entitled, ‘Microbial quality analysis of shrikhand sold in Kolhapur city’ was undertaken in the laboratory of Division of Animal Science and Dairy Science of college of Agriculture, Kolhapur, MPKV, Rahuri (Maharashtra).

Materials

All the glassware’s viz., petriplates, dairy microbiological pipette, test tubes, glass beakers, conical flask etc. of Borosil make was used to analyze shrikhand for different parameters throughout the study. AR/GR grade chemicals were used for chemical analysis of shrikhand for different parameters throughout the study. Chemicals and ingredients of qualigens and glaxo India limited. M/S Himedia laboratories used for preparation of media and used for microbial examination of shrikhand. Different equipments were used viz. Weighing balance, Autoclave, Hot air oven, Colony counter, Laminar air flow, Water bath, pH meter.

Analysis

Standard plate count of shrikhand samples was determined as per the procedure described in Amin J.B. (1997) Using Plate Count Agar (PCA); (Hi- media) was used to enumerate the standard plate counts in the Shrikhand samples. The yeast and mould count of shrikhand samples was determined as per the procedure described by Anshu et.al. (2014), Using Potato Dextrose Agar (PDA) of Hi-media was used to enumerate yeast and mould counts in the shrikhand samples. The coliform count of market samples of shrikhand was determined as per the Procedure described in IS: 5404, (1995) using violet Red Bile Agar (VRBA).of Hi-media was used to enumerate the coliform counts in shrikhand samples.
Methods

Selection of Brands of Shrikhand

Preliminary survey was conducted in the Kolhapur market, to know the brands and to ascertain the availability of shrikhand throughout the study period. On the basis of survey, five brands of shrikhand was selected and considered for this study.

Collections of shrikhand samples

Shrikhand of predetermined brands was collected from the local market and brought to the laboratory in the chilled condition as and when required to complete analysis.

Sample details

| Sample | Market shrikhand sample |
|--------|-------------------------|
| KS1    | 1                       |
| KS2    | 2                       |
| KS3    | 3                       |
| KS4    | 4                       |
| KS5    | 5                       |

Results and Discussion

The market samples of shrikhand were subjected for determination of microbial counts viz. Standard Plate Count, Yeast and mould, coliform and salmonella count. The results obtained from the present investigation as well as relevant discussion have been summarized under following heads:

Standard plate count

The average standard plate count (SPC) of market shrikhand samples sold in Kolhapur city is presented in table 1. The results on standard plate count (SPC) shrikhand of various brand sold in Kolhapur city are presented in Table 1 along its statistical analysis SPC (x10^6 cfu/ml) recorded in KS1, KS2, KS3, KS4 and KS5 of market shrikhand samples under study were 18.99 ± 0.10, 19.14 ± 0.08, 21.99 ± 0.19, 19.77 ± 0.18, and 23.29 ±0.06, respectively.

The highest SPC was observed in sample KS5 and lowest in sample KS1. These results are in line with the findings in study of Kolpe et al., (2010), who reported SPC from 18.25 to 23.25 x 10^6/ml of control sample of shrikhand prepared to evaluation of microbial quality of papaya shrikhand.

SPC from 3.31 to 7.34 x 10^7/ml of branded dahi sold in various market of Pakistan, reported by Yonus et al., (2013), Somewhat similar findings were also reported by Shekh et al., (2009) in market dahi,

The mean value of total plate count (log cfu g^-1 ) of shrikhand showed significantly (p>0.05) increasing trend with increasing storage days. Parveez (2015), however lower values of SPC in market sample of shrikhand of Gujarat (24,500 to 16, 50,000 cfu/g) reported by Upadhyay et al., (1975).

Coliform

The average coliform count of market shrikhand samples sold in Kolhapur city is presented in table 2.

The presence of coliform in milk and milk products is suggestive of insanitary condition or practices followed during production, processing, handling and storage. There, the shrikhand samples of present study were subjected to determination of coliform counts.

Sample S3 showed maximum (3.10 X10^3 c.f.u./g) coliform and inferior to other samples. sample S1 and S3 also showed coliform counts 1.0X 10^2 c.f.u./g and 1x10^2 c.f.u/g respectively remaining two (S2 and S4) samples were free from coliform organisms and hence safe for consumption.
BIS as prescribed the maximum limits of 10 coliform c.f.u/g of *shrikhand* but no such regulations exits in PFA act except three samples, remaining were no meeting the prescribed BIS limits.

Reported values of coliform counts in the present study were in close accordance with the counts with Karthikeyan (1993) and Salunke et. al. (2005). The coliform counts in product were in the range of 1.00 to 3.10 c.f.u. x 10^2/g. It is between the standard prescribed by IS (0.00 to 5.00 c.f.u./g) (Anonymous, 2009). Low number of *E. coli* was found by Kumar and Prasad (2010) in *Dahi* sold in market. Similar observations were also made by Obande and Azua (2013).

**Yeast and mould**

The average Yeast and Mould count of market *shrikhand* samples sold in Kolhapur city is presented in table 3. Yeast and mould perhaps and important group of micro-organism responsible for spoilage of dairy products. the result of yeast and mould count are presented in table 3. It was revealed from result that all market samples showed presence of yeast and mould. Sample S3 showed maximum (30.18 ± 0.08 x10^1 c.f.u/g) count and which is microbiologically inferior. While sample S4 showed least (14.19 ± 0.12 x10^1 c.f.u/g) count and microbiologically better than other samples Though the overall YMC content was significantly affected, however the YMC count between the *shrikhand* sample were at par with KS1 (15.91 ± 0.08 x10^1 c.f.u/g) and the variation was found to be statistically non-significant. All the market *shrikhand* samples were showing vary high counts and showed more yeast than moulds indicating the sugar as a possible source of contaminant.

None of the *shrikhand* sample met the requirement of BIS (1980) standard. The present observation are in confirmation with Kartikyen (1993) Prajapati et.al (1993), Upadhyay et al., (1975) reported values of (YMC) (0 to 1,83,000/g) in *shrikhand* samples of Gujarat market.

Sharma and Zariwala (1980) reported 1 to 800 x 10^3 cfu/g of sample from market *shrikhand* stored at 10 and 37 °c respectively. Whereas, Obande and Azua, (2013) found highest YMC in Nono (a fermented milk product) and yoghurt sold in Nigeria and the counts were 9.20 and 1.07x10^6/ ml, respectively.

The presence of yeast and mould were also reported by Phadatare (2009) in *lassi*, Shekh et al., (2009) in dahi. Yeast and mould may get in product from utensils, human hands, atmosphere, starter culture, etc. during handling and repeated transfer, as reported by Ali et al., (2002).

**Salmonella count**

The average *Salmonella* count of market *shrikhand* samples sold in Kolhapur city were free from *salmonella* contamination. Therefore, the *Shrikhand* sold Kolhapur city was safe for consumption from *Salmonella* contamination point of view.

A similar finding was also reported by Kumbhar et al., (2009) in market *lassi*. However, Okonkwo (2011) found *salmonella* count in Nono a fermented milk based food sold in Nigeria.
Table 1. Standard plate count for market samples of *shrikhand*

| Shrikhand samples | SPC (10^6 cfu/ml) |
|-------------------|-------------------|
| KS1               | 18.99 ± 0.10      |
| KS2               | 19.14 ± 0.08      |
| KS3               | 21.99 ± 0.19      |
| KS4               | 19.77 ± 0.18      |
| KS5               | 23.29 ± 0.06      |
| Standard Error    | 0.06              |
| CD at 5 %         | 0.19              |

* Means of six replications within column followed by the same letter are not significantly different at p < 0.05

Table 2. Coliform count (c.f.u. x 10^1 /g) in *shrikhand* samples sold in Kolhapur City

| Shrikhand samples | Coliform (c.f.u. x 10^1 /g) |
|-------------------|-----------------------------|
| KS1               | 1.00                        |
| KS2               | 0                           |
| KS3               | 3.10                        |
| KS4               | 0                           |
| KS5               | 1.43                        |
| Standard Error    | 0.08                        |
| CD at 5 %         | 0.24                        |

* Means of six replications within column followed by the same letter are not significantly different at p < 0.05

Table 3. Yeast and mould counts of market samples of *shrikhand* sold in Kolhapur City

| Shrikhand samples | Yeast and mould (c.f.u /g) |
|-------------------|---------------------------|
| KS1               | 15.91 ± 0.08              |
| KS2               | 22.3 ± 0.17               |
| KS3               | 30.18 ± 0.08              |
| KS4               | 14.19 ± 0.12              |
| KS5               | 28.36 ± 12                |
| Standard Error    | 0.05                      |
| CD at 5 %         | 0.15                      |

*Means of six replications within column followed by the same letter are not significantly different at p < 0.05
From the result it is concluded, that on the basis of microbial quality evaluation, studied here, KS$_1$ and KS$_4$ brands of *shrikhand* was significantly superior over the other brand under study. The wide variation was found among the market *shrikhand*, due to disorganized, lack of awareness to maintain hygienic and nutrition condition in *shrikhand*. Therefore to make quality *shrikhand*, KS$_3$ and KS$_5$ brands is suggested to adopt proper hygiene condition and use good quality raw materials to attract public health attention. It is also need to establish quality standards and enforcement of restriction on the quality of *shrikhand* in market, which is not appeared from the present study.

References

Ali, M.Y., Islam, M.A., Alam, M. J. and Islam, M.J. (2002). Quality of Yoghurt (Dahi) made in laboratory and available in the market of Mymensingh town in Bangladesh. *Pakistan Journal of Biological Science* 5 (3): 343-345.

Anshu S.C., Ritu T., Harleen C. and Ratika K. (2014). Microbial quality evaluation of milk products Int. J. Of development research vol.4, 12, pp.2623

Amin, J.B. 1997. Preparation of media, reagents and sterilization of glassware’s. Compendium of laboratory quality assurance in dairy industry. Pp. C-1-8.

Aneja, R.P., Vyas, M.N., Thereja, V.K. and Nanda, K. 1992. Development of shrilkhand. In Brief Communication, XX$^{th}$ Internation Dairy Congress, Paris, France. 992.

Anonymous. 2009. Milk production of India in 2009.

Boghra, V.R. and Mathur, O.N. 1992. Chemical quality of some marketed indigenous milk products. Major constituents and mineral composition of *shrikhand*. J. Fd. Sci. Technol., 29(2): 121-122.

Chemical composition of chakka. India J. Dairy Sci., 12(1): 121.

Hati, S., Vij, S., Mandal, S., Khetra, Y. and Singh, B.P. (2012). Bio-functional dairy beverages. *Indian Dairyman*, 64 (4):62-68.

ICAR (1982). Manual of dairy bacteriology, Indian Council of agriculture Research Publication.

IS 5403:1999 (Reaffirmed) 2005. Method for yeast and mould count of foodstuffs and animal feeds (first revision). BIS, Manak Bhavan, 9 Bahadurshah Zafar Marg, New Delhi- 110 002, India.

IS: 5404 (1969). Code for Practice of Handling of Samples for Microbiological Analysis. Indian Standards Institution, New Delhi, India.

Kalhapure, S.P. 1986. Bacteriological studies on dahi and chakka prepared from cow and buffalo milk. M.Sc (Agri.) Thesis submitted to mahatma Phule Krishi Vidhyapeeth, Rahuri.

Karthikeyan, S. 1993. Study on the utilization of sweet cream buttermilk for manufacture of *shrikhand*. M.Sc. (Agri.) Thesis submitted to Gujarat Agril. Univ., Gujarat (India).

Kolape R.H., Pawar B.K., Choudhari D.M., Kamble D.K. And Desale R.J.(2010) Evaluation of chemical, microbial and organoleptic quality of papaya shrikhand asian journal of animal science vol.5 issue 147-52)

Kumbhar S.B., Ghosh J.S. and Samudre S.P. 2009. Microbiological Analysis of Pathogenic Organisms in Indigenous Fermented Milk Products. Ad. Journal of Food Science and Technology 1(1): 35-38, ISSN: 2042-4876.

Kumar, R. and Prasad, P (2010). Detection of *E.coli* and *Staphylococcus* in Milk and Milk Products in and around Pantnagar. *Veterinary World*,
Meena M. Proximate Analysis of Branded Srikhand. Journal of Food and Dairy Technology. 2013; 1(2):2347-2359.

Mehta, M. 2003. Proximate analysis of branded shrikhaand. Paper Published in Workshop on Fermented foods. 2003.

Nigam, N., Singh, R., Upadhyay, P. K., (2009). Incorporation of Chakka by papaya pulp in the manufacture of shrikhand. Journal of Dairying, Foods and Home Sciences; 28(2): 115-118.

Obande, G.A. and Azua, E.T. (2013). Extent of microbial contamination of Nono, fresh cow milk and yoghurt sold in Makurdi, Benue State, Nigeria Journal of Microbial Biotech Research, 3(3):6-14.

Okonkwo, O.I. (2011). Microbiological analyses and safety evaluation of Nono: A Fermented milk product consumed in most parts of northern Nigeria. International Journal of Dairy Science, DOI 10.3923/ j.ds.2011.1-6.

Parveez A. P. 2015, microbial and sensory attributes of flavored shrikhand at different days of storage under refrigeration Volume 9.

Panse, V.G. and Sukhatme, P.V. 1985. Statistical methods for agricultural workers. ICAR, New Delhi. Pp. 143-147.

Phadatare, A.A. (2009) Evaluation of quality of branded lassi sold in Ahniednagar market M.Sc. (Agri) thesis submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.).

Prajapati, J. 1997. Microbial analysis of milk products. Compendium of laboratory quality assurance in dairy industry. Pp. C-31-35.

Prajapati, J.P., Upadhyay, K.G. and Desai, H.K. 1993. Quality appraisal of heated shrikhand stored at refrigerated temperature. Cultured Dairy Products J., 28(2): 14, 16-17.

Salunke, P., Patel, H.A. And Takar, P.N. 2005. Comparative studies on the physic-chemical properties of shrikhand manufactured by Traders. India J. Dairy Sci., 58(5): 326-332.

Sharma, U.P and Zariwala, I.T. 1980. Deterioration of shrikhand during storage. India J. Dairy Sci., 32(2): 223-231.

Sharma, U.P. And Zariwala, I.T. 1978. Survey of quality of milk products in Bombay. J. Fd. Sci. Technol., 15(3): 118-121.

Shekh, A.L., Wadud, Islam, M. A., Rahman, S.M.E., Sarkar, M.M., Ding,T., Chol, J.H. and Deog, H.O. (2009). Studies on the quality of market dahi compared to laboratory made dahi. Journal of Food Safety; 24 (4): 318-323.

Upadhyay, K.G. and Dave, J.M. 1977. Shrikhand and its technology. Indian dairymen. 29(8): 487-489.

Upadhyay, K.G., Vyas, S.H., Dave, J.M. and Thakar, P.N. (1975). Studies on the chemical composition of market samples of shrikhand. J. Fd. Sci. Technol. 12(4): 190-194.

Younus, S., Masud, T. and Aziz, T. (2013). Quality Evaluation of Market Yoghurt/Dahi. Pakistan Journal of Nutrition. 1(5): 226-230.

How to cite this article:

Jaybhay Vishnu Bhagwan, K. B. Kamble, N. S. Dhadge, Kamble. D. K. 2020. Microbial Quality Analysis of Shrikhand Sold in Kolhapur City, India. Int.J.Curr.Microbiol.App.Sci. 9(03): 2019-2025. doi: https://doi.org/10.20546/ijcmas.2020.903.234