Studies on Organoleptic and Microbiological Quality of Shrikhand Sold in and Around Hyderabad

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Abstract

The present study was carried out to evaluate sensory and microbiological quality of Shrikhand sold in and around Hyderabad city, India. The overall sensory score of the Shrikhand samples collected from cooperative sector was high (94.5), slightly less in branded private sector (93.65) and least (80.7) in the unbranded samples. The total viable counts were 2.65×10^7CFU/g, 8.85×10^7CFU/g and 4.58×10^9CFU/g, Coliform counts 5.5×10^1CFU/g, 6.8CFU/g and 2.28CFU/gand Yeast and Mould counts 5.35×10^2CFU/g, 7.95×10^2CFU/g and 3.85×10^4CFU/g in cooperative, branded private and unbranded samples respectively. The incidence was 40%, 45% and 100% for *E.coli*, 20%, 25% and 30% for *Salmonella* , 60%, 65% and 90% for *Staphylococcus*, 10%, 10% and 20% for *Listeria* and 15%, 20% and 40% for *Bacillus* and the counts were 2.35×10^2, 3.86×10^2 and 4.86×10^4CFU/g for *E.coli*, nil, niland 3×10^1CFU/g for *Salmonella*, 3.86×10^3, 4.89×10^3 and 8.65×10^4CFU/g for *Staphylococcus*, 0.5×10^1, 0.8×10^1 and 3.2×10^1CFU/g for *Listeria* and 1.2×10^1, 2.2×10^1 and 8.53×10^2CFU/g for *Bacillus* in cooperative, branded private and unbranded samples respectively. The microbiological incidence and counts were high in unbranded, least in cooperative and in between in branded private sectors.

INTRODUCTION

Fermented milk and milk products have occupied a place of satisfaction in satisfying the palate and nutritional requirements of human beings since the time ancient. There are more than 400 types of fermented dairy products available in the world. Shrikhand is fermented and sweetened milk product of Indian origin popular in western and part of southern peninsula of India (15). Shrikhand is highly perishable with an average shelf life of 1 or 2 days at room temperature. Despite so much market size the Shrikhand manufacturing is still understandardized process.

Cooperative and established private sector manufacturing in a systematic standardized process. Market studies carried have shown a great variation in Shrikhand quality in terms of sensory, chemical and microbiological attributes (21,2 and11). Spoilage microorganisms degrade milk components, creating negative sensory attributes and decreasing the shelf life. The Shrikhand prepared in the unorganized sector have high microbial load due to low quality ingredients, poor processing techniques, poor packing and post treatment contamination.

The microbiological standards for Shrikhand were included under (6) wherein the limit of 50 CFU/g for Yeast and Moulds count and 10 CFU/g for coliforms.Since much information on microbiological quality of Shrikhand is not available, but the market for Shrikhand has increased substantially in the last few years, there is a need to study the microbiological quality sold in cities. Hence the present study was undertaken to judge the sensory and microbiological quality of Shrikhand sold in and around Hyderabad, Telangana, India.

MATERIALS AND METHODS

A preliminary survey was conducted in and around Hyderabad city to know the brands of Shrikhand. Three sources were selected for Shrikhand quality *i.e.,* cooperative sector, well established branded private sector and unbranded prepared by local halwais. A total of 60 samples (20 each from 3 sources) were collected, packed in polythene bags and sealed. The samples were packed in iceboxes

and transported to Department of Veterinary Public Health and Epidemiology and stored in refrigerator till the laboratory work was undertaken. The sensory evaluation of Shrikhand samples were tested by 5 experienced judges following 100 points scorecard recommended *i.e.* flavour-50, body and texture-15, color and appearance -30 and container -05. Standard plate count, Total coliform count, Yeast and Mould count were estimated (4,5) using nutrient agar, McConkey agar and Potato dextrose agar respectively. Various medias like Bismuth sulfite agar[*salmonella*], Eosin methylene blue agar [*Escherichia coli*], Tryptic soy agar [*staphylococcus*], Brain Heart Infusion agar [*Listeria*] and Pemba media [*Bacillus*] were used for the detection of pathogens.

All medias were obtained in dehydrated forms and prepared according to manufacturer's instructions. Glassware such as petri dishes, test tubes, pipettes, conical flasks and bottles were sterilized in a hot air oven at 160^0C for 2 hours. Distilledwater and liquid media are sterilized by autoclaving at 121^0C for 15 minutes at 15 lbs pressure. One gram of Shrikhand sample was dissolved in 9ml of sterilized distilled water to make 1:10 dilution, one ml of this dilution added to 9ml distilled water and so on to get $1:10^{10}$ dilution. One ml of selected dilution is transferred into a petri dish and sufficient amount [10-15 ml] of respective liquid media was poured into plates. After proper solidification of the culture media, the plates were inverted and were incubated at 37^0C for 24 to 48 hours, except for Yeast and Mould plates which were incubated at 25^0C for 3-5 days. After the incubation period, the plates were observed for typical colonies of each microorganism and colonies were counted with the help of colony counter. The results were recorded as CFU/g. The specific biochemical tests were conducted like gram staining, catalase test, urease test, sugar fermentation test, oxidase test *etc*. for confirming specific microorganism.

RESULTS AND DISCUSSIONS

SENSORY EVALUATION OF SHRIKHAND SAMPLES:
The sensory score of Shrikhand samples from different sources was presented in table-1. The sensory score of Shrikhand samples from the cooperative sector was 94.5 and it was slightly less (93.65) of the samples from branded private sector. The sensory score was least in the samples collected from unbranded source (80.7). The flavor score was slightly higher in cooperative sector samples whereas container score was slightly higher in branded private samples. All parameters of sensory quality were less in the samples from unbranded sector.

Table:1. Sensory score of Shrikhand samples from different sources.

Characteristics	Cooperative sector	Branded private	Unbranded
Flavour (50)	47.5	46.5	40.0
Body & Texture (15)	14.0	14.25	12.5
Colour & Appearance (30)	28.5	28.0	25.0
Containers (5)	4.5	4.9	3.2
Total	94.5	93.65	80.7

Microbiological quality, Standard plate count, Coliform count, Yeast and Mould counts of Shrikhand samples from different sources in the present study was presented in table-2.

Table: 2 TPC, Coliform and Yeast &Mould counts of Shrikhand collected from

Sector	TPC (per g)		Coliforms (per g)		Yeast and Mould (per g)	
	Count	Range	Count	Range	Count	Range
Cooperative sector	2.65×10^7	3.5×10^2 4.8×10^4	5.5×10^1	nill to 12	5.35×10^2	10^2 to 10^4
Branded private	8.85×10^7	1.6×10^6 3.8×10^8	6.8	1 to 12	7.95×10^2	10^2 to 10^3
Unbranded	4.58×10^9	6.8×10^8 9.8×10^{10}	228	155to 428	3.85×10^4	3.8×10^3 to 5.7×10^5

different sources

The Standard plate count was less (2.65×10^7CFU/g) in Shrikhand samples collected from cooperative sector, slightly higher (8.85×10^7CFU/g) in the samples from unbranded private sector and highest(4.58×10^9CFU/g) in the samples from unbranded sector. Standard plate counts of 3.31×10^7CFU/g reported in branded samples in Pakistan [26,22] were almost similar to the counts in the samples from cooperative sector and branded private sector in the present study. The counts in the present study from cooperative and branded sectors were falling in the range 10^6-10^8 CFU/g which was similar to the reports from Maharashtra[20]. Lower Standard plate counts of 1.6×10^6, 3.5×10^6, 1.43×10^4, 9.8×10^4CFU/g reported from Kolhapur, Akola & certain parts of Maharashtra state respectively [17,7,8,12] compared to the counts in the present study. Very low counts of 2.16×10^3CFU/g in the Shrikhand samples collected from Hyderabad city was reported [23]. A range of 2.45×10^4 - 1.65×10^6 CFU/g [25] in the samples collected from various places in Uttar Pradesh was also less than the counts observed in the present study.

The Coliforms were less (5.5×10^1 CFU/g) in Shrikhand samples collected from cooperative samples sector, higher (6.8 CFU/g) in the samples from branded private sector and highest (228 CFU/g) in sample from unbranded sector. Coliform count of 5.0 and 5.67 CFU/g were reported [23,20] from Hyderabad and Maharashtra respectively were almost similar to the counts observed in the samples from cooperative and branded sector in the present study. Coliform count of 310 CFU/g in the samples from Kolhapur [7] was slightly higher than the counts observed in the sample from unbranded sector (220 CFU/g) in the present study. A coliform count of 0-57 CFU/g was reported [10,25,21] in the samples collected from various places of Uttar Pradesh were almost similar to the counts in the sample from cooperative sector in the present study. No coliform count was reported in the samples from Maharashtra [12]. A count of 8.12 - 2.45 CFU/g in the market samples from Maharashtra was reported [20] was almost similar to the counts observed in the present study in the samples from unbranded samples.

The Yeast and Mould count was low (5.35×10^2 CFU/g) in Shrikhand samples collected from cooperative sector, high (7.95×10^2 CFU/g) in the samples from branded private sector and highest (3.85×10^4CFU/g) in the samples from unbranded sector. Yeast and Mould count of 2.73×10^2 CFU/g was reported from Akola [8] in the market samples was almost similar to the counts in the present study. Slightly higher count of 6.5×10^3 CFU/g in the Shrikhand samples from Maharashtra was reported [12] compared to the counts in the samples from cooperative and branded private sector in the present study. Lower counts of 1.59×10^1 CFU/g and 5.5×10^1 CFU/g were reported [7] were less than the count observed in the present study from all the three sources. A count of 1.8×10^5 CFU/g was reported [25,19] which were higher than the counts observed in the samples from all the three sources in the present study. Higher counts of 7.12×10^8 CFU/g were reported [21] in the samples collected from various places in India.

The microbial counts (Standard Plate Counts, Coliforms and Yeast and Moulds) were more in local unbranded samples may be due to low quality raw materials, unhygienic conditions, post processing contamination and poor storage conditions(18)

The incidence of pathogens in Shrikhand samples collected from different sources was presented in table-3.

Table:3 Incidence of pathogens in Shrikhand samples collected from different sources.

Organisms	Co-operative sector		Branded Private		Unbranded	
	Count/ g	Range	Count/ g	Range	Count/ g	Range
E.coli	8	40	9	45	20	100
Salmonella	4	20	5	25	6	30
Staphylococcus	12	60	13	65	18	90
Listeria	2	10	2	10	4	20
Bacillus	3	15	4	20	8	40

The incidence of *E.coli* in the Shrikhand samples in the present study was high (100%) from unbranded sector, least (40%) from cooperative sector and in between (45%) from branded private sector. A low incidence (33.3%) of *E.coli* was reported in the market samples (13). No *E.coli* incidence in both plain and value added Shrikhand (23) which indicated that there was no contamination during preparation process and through out the storage period.

The incidence of *Salmonella* was 20%, 25%,30% in the samples from cooperative, branded and unbranded sectors respectively in the present study. A low incidence (33.3%) of salmonella was reported in the market samples (13). A count of $6x10^3$ reported (14) was similar to the count observed in brandless samples in the present study. No incidence of *Salmonella* was reported in the market samples (11). The incidence of staphylococci in the Shrikhand samples in the present study was high (90%) from unbranded sector. An incidence of 92% of staphylococcus was reported(16) was almost similar to the incidence observed in the unbranded samples in the present study. The incidence of Listeria in the Shrikhand samples in the present study was high (20%) from unbranded sector and 20% in the samples from cooperative and branded private sectors. An incidence of 15% observed(3) was higher than the incidence observed in cooperavtive and branded private sector and less than the incidence observed in unbranded samples in the present study. The incidence of *Bacillus* was 15%, 20%, 40% in the samples from cooperative, branded and unbranded sectors respectively in the present study.

The counts of pathogenic microorganisms in Shrikhandsamples collected from different sources was presented in table 4.

Table:4 Counts of pathogens in Shrikhand samples collected from different sources

Organisms	Co-operative sector		Branded Private		Unbranded	
	Count/g	Range	Count/ g	Range	Count/ g	Range
Escherichia Coli	$2.35x10^2$	$9.5x10^1$ to $3.2x10^3$	$3.86x10^2$	$8.9x10^1$ to $4.8x10^3$	$4.86x10^4$	$3.8x10^3$ to $6.9x10^5$

Staphylococcus	3.86×10^3	2.5×10^2 to 3.4×10^4	4.89×10^3	5.3×10^2 to 8.4×10^4	8.65×10^4	3.8×10^3 to 4.6×10^5
Listeria	0.5×10^1	0.2×10^1 To 1.4×10^1	0.8×10^1	0.3×10^1 to 1.5×10^1	3.2×10^1	0.8×10^1 to 4.5×10^2
Bacillus	1.2×10^1	0.8×10^1 to 1.8×10^1	2.2×10^1	1.1×10^1 To 1.3×10^2	8.53×10^2	1.3×10^1 to 2.5×10^3

The counts of *Escherichia coli* were 4.86×10^4, 3.86×10^2 and 2.35×10^2 CFU/g from in unbranded, cooperative sector and branded samples respectively. No counts of *E.coli* was reported (23) in the Shrikhand sample sold in Hyderabad city. The counts of *Salmonella* were nil in branded private and cooperative sector and 3×10^1 CFU/g in unbranded samples in the present study. A count of 6×10^3 reported (14) was higher than the count observed in brandless samples in the present study. No counts of *Salmonella* was reported in the market samples (11).

The counts of *Staphylococcus* were highest in unbranded samples (8.65×10^4), moderate in branded private samples (4.89×10^3) and least in cooperative sector samples (3.86×10^3) in the present study. Very low counts of *Staphylococcus* 9.4×10^2 cfu/ml in large scale samples (9) was reported. The *staphylococcus* count observed in cooperative samples in the present study (6.3×10^3 cfu/ml) was similar to the counts of 1.7×10^3 reported(1).

The counts of *Listeria* were 0.5×10^1, 0.8×10^1 and 3.2×10^1 CFU/g in cooperative, branded and unbranded samplesrespectively. Very low count of 6 cfu/g was reported (3) in the market samples was almost similar to the counts observed in cooperative branded private samples in the present study. The counts of *Bacillus* were 8.53×10^2, 2.2×10^1 and 1.2×10^1 CFU/g highest to least in unbranded, cooperative sector and branded samples respectively.

REFERENCE:
1) Abdel hameed K G 2011. Evaluation of chemical and microbiological quality of raw goat milk in Qena province, Assist Veterinary Medical Journal: 57 (129):131–144
2) 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.
3) Hadjilouka A, Loizou K, Apostolou T, Dougiakis L, Inglezakis A, Tsaltas D 2020. A Cell-Based Biosenso System for Listeria monocytogenes Detection in Food. In Multidisciplinary Digital Publishing Institute Proceedings: 60(1):49
4) Indian Standards (] 969). IS:5403. Methods for Yeast and Mold Count of food stuffs Indian Standards Institution. New Delhi, India.
5) Indian Standards (1969). IS:5401. Methods for Detection and Estimation of Coliform Bacteria in food stuffs
6) Indian Standards (1980). IS:5432. Specification for Chakka and Shrikhand. Indian Standards Institution, New Delhi, India
7) 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
8) Karche R V , Thakare V.M , Bhagat A.V. and Shirsath S.A. 2015 Microbiological quality of cow milk Shrikhand blended with sapota pulp. International Journal of Food, Agriculture and Veterinary Sciences. 5 (1):18-22

9) Kisanthini S, Kavitha M B 2019.Microbial Contamination of Yoghurt-An Overview International Journal of Science and Research (IJSR), ISSN: 2319-7064 10)

10) Kuila. RK et al. (1973). Annual Report. N.D.R.I., Kamal. 206

11) Kumbhar S.B., Ghosh J.S. and Samudre S.P. 2009. Microbiological Analysis of Pathogenic Organisms in indigenous fermented milk products, advance journal of food science and technology, 1,(1):34-37

12) Kuttabadkar, H.K., Narwade, S.G., Poul, S.P. and Kambale, V.J. (2014). Studies on chemical changes in Shrikhand prepared from safflower milk. Asian J. Animal Sci., 9(2) : 119-123

13) Miskhat O, Karar Altayeb, Fatima A. Douda, Elniema A. Mustafa and Prof. Adil M. A. Salman 2021. Microbiological analysis of yoghurt purchase in Khartoum state, Sudan *International Journal of Modern Pharmaceutical Research* 5(1) : 148-152

14) Motawee, M.M. and Neveen Saleh 2016. Microbial quality and safety of commercial market yoghurt in Giza, Egypt: 7 (1): 11 – 17

15) Nigam, N., Singh, R., Upadhayay, 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.

16) Okafor A Agu KC, Archibong E J, Anekwe D C, Ago C A, Awah N S 2014.Assessment of Bacteria Present in Yoghurt Sold on Awka Metropolis Scholars Journal of Applied Medical Sciences 2(6D):3071-3075

17) Parveez A. P. 2015, microbial and sensory attributes of lavored Shrikhand at different days of storage under refrigeration Volume 9.

18) P.D. Ubale, B.K. Pawar and D.M. Choudhari (2010). Organoleptic and microbial quality of branded Shrikhand sold in Ahmednagar market, Vet. Sci. Res. J., 2 (10) : 62-65

19) 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): 14-17

20) 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

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

22) 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.

23) Srinivas J., Suneetha W J., Maheswari K U and Krishnaiah N. 2016. Sensory Analysis and Consumer Acceptance of Value Added Shrikhand. Advances in Life Sciences. 5(18): 7982 – 7985

24) 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

25) Upadhyay, K.G. and Dave, J.M. 1977. Shrikhand and its technology. Ind ian dairyman. 29(8) : 487-489.

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