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Quality evaluation of *chakka*: A fermented dairy product sold in Shirol tehsil of Kolhapur district

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Abstract

Chakka means a white to pale yellow semisolid fermented product of good texture and uniform consistency obtained by draining off the whey from dahi/yoghurt obtained by lactic fermentation of milk. This product is prepared and marketed on large scale in Shirol block of Kolhapur district, hence study was planned. Since there is no information on sensory, chemical and microbial quality of *chakka* in this area is available whereas, on other side, the product growth in the market has increased substantially in last few years. Considering the production of *chakka* at large scale in the villages it is planned to evaluate the quality of *chakka* sold in Shirol tehsil of Kolhapur.

The flavour score of *chakka* ranged from 7.23 ± 0.07 to 7.89 ± 0.08 . The minimum and maximum score for *chakka* was obtained for sample GS₁ and GS₄ respectively. The highest mean score (8.21 ± 0.11) for colour and appearance was obtained by GS₂ sample followed by GS₄ (7.98 ± 0.08) with lowest mean score (7.45 ± 0.10) was obtained by GS₅. The moisture content in *chakka* sample GS₃ was maximum (67.98 ± 0.47) followed by *chakka* sample GS₄ with mean of 67.86 ± 0.14 and lowest moisture content was found in *chakka* sample GS₂ (67.62 ± 0.13). The negative but highly significant correlation ($r = -0.33$) was observed between moisture and acidity of *chakka*. The fat content of five samples of *chakka* i.e. GS₁, GS₂, GS₃, GS₄ and GS₅ were 13.03 ± 0.14 , 13.24 ± 0.14 , 13.38 ± 0.17 , 13.58 ± 0.08 and 13.15 ± 0.15 , respectively. The positive significant correlation observed between fat and ash ($r = 0.98$), fat and total solid ($r = 0.99$), fat and flavour score ($r = 0.90$) and fat and body and texture score ($r = 0.95$). The average protein content in *chakka* samples were 10.89 ± 0.21 , 11.31 ± 0.04 , 11.40 ± 0.11 , 11.64 ± 0.26 and 11.09 ± 0.12 in GS₁, GS₂, GS₃, GS₄ and GS₅, respectively. The average SPC, expressed as log/g varied from 1.31×10^6 log/gm (GS₄) to 1.51×10^6 log/gm (GS₁). The SPC recorded in samples of *chakka* under study were GS₂ (1.47×10^6 log/gm), GS₃ (1.34×10^6 log/gm) and GS₅ (1.44×10^6 log/gm). Sample GS₁ showed maximum ($1.19 \pm 0.02 \times 10^2$ cfu/g) coliform count. Sample GS₃ and GS₅ also showed coliform counts $1.13 \pm 0.07 \times 10^2$ cfu/gm, $1.07 \pm 0.08 \times 10^2$ cfu/gm, respectively whereas remaining two (GS₂ and GS₄) samples were free from coliform organisms. The average values of YMC ranges between 1.77×10^6 log/gm (GS₄) to 1.90×10^6 log/gm (GS₁). All samples were free from salmonella contamination. Therefore, it can be stated that the *chakka* sold Shirol tehsil of Kolhapur district was safe for consumption.

Keywords: *Chakka*, sensory evaluation, chemical analysis, microbial analysis

Introduction

Milk and milk product constitute very important part of our daily food intake in view of their extremely high nutritive value and health attributes. Breast milk is the sole food for humans during the first part of lives and even animal milk carries many nutrients that the infants need for growth and development. For children, adolescent, elderly people, pregnant and nursing mothers, milk play an important role in meeting the requirements of many essential nutrients and hence milk is considered as protective food. Milk is also utilized in the form of various milk products by applying various processes to milk, including fermentation, heat desiccation, heat acid coagulation, fat concentration, freezing, etc. Amongst these process, fermentation of milk by suitable starter culture is economical and having several health benefits. The fermentation can be broadly defined as the process in which the carbohydrates like compounds are broken down, under anaerobic or aerobic conditions. Fermentation is an economical and affordable technology that protects the food, enhances its nutritional value and helps in upgrading its sensory properties (Rasane *et al.*, 2017) [23]. It also assists the detoxification and elimination of objectionable factors present in unprocessed foods such as phytates, tannins and polyphenols (Gadaga *et al.*, 1999) [7].

There are more than 400 type of fermented dairy products are prepared in the world. In India, fermented products such as Dahi (curd), Mishti Doi (sweetened curd), Shrikhand, Lassi and Chhachor Mohi (butter milk), Chhurpi, Somar, Philu and Shyoware the known ethnic fermented products (Dewan and Tamang, 2007)^[5]. From that fermented milk products *chakka* is an important traditional base product which is used for preparation of shrikhand, an Indigenous sweet delicacy. As per FSSAI (2011)^[6] *chakka* means a white to pale yellow semisolid product of good texture and uniform consistency obtained by draining off the whey from dahi/yoghurt obtained by lactic fermentation of cow's milk, buffalo's milk, skimmed milk and recombined or standardized milk which has been subjected to minimum heat treatment equivalent to that of pasteurization. As per requirement, *chakka* shall have pleasant yoghurt like flavour. It should be free from objectionable flavour and odour. With this the *chakka* shall be good in texture and uniform consistency and free from any coarseness. *Chakka* should contain minimum 30 per cent total solid (TS), milk fat minimum 33 per cent (on DM basis), milk protein minimum 30 per cent (on DM basis), titratable acidity maximum 2.5 per cent, total ash (on DM basis) maximum 3.5 per cent. Kolhapur is the top most district in buffalo milk production in Maharashtra. At present, Kolhapur District Milk Union (Gokul), Warna Milk Union, Yelgud Milk Union and Shahu Milk Union are various co-operative organizations and they are key leaders in collecting and processing of milk in the district. Consumption of milk and milk products in the Kolhapur district is also quite high due to economic status and awareness among the people about nutritional importance of milk and milk products in the diet (Patange *et al.*, 2011)^[17]. There are several established pockets of milk processing including Narsobawadi for basundi production, Gaourwad for khoa production, Kurukali for burfi Production, Rajarampuri for ice-cream production and Ganeshwadi for *chakka* production. There are some villages engaged in *chakka* production from Shirol tehsil of Kolhapur district like Ganeshwadi, Narsobawadi and Kavthe Guland etc. Ganeshwadi is one of those villages which is situated on Maharashtra and Karnataka boundary in Shirol tehsil of Kolhapur district. Since last four generation one of the common practice in the village is to collect the milk from adjoining areas and process into market milk and milk products including *chakka*. Several families involved in this business are Phadtare, Kognare, Phalle, Gatade, Shirgave, Daphalpure etc. The members of these families prepare *chakka* and the other product is transported to metropolitan cities including Kolhapur, Pune and Mumbai as per demand. In all as per visual survey approximately 1000 to 15000 kg of *chakka* is prepared and marketed daily from this village. Today they have adopted modernization in their business. In this business transport machineries and computerized all system available. It came to know that each producer follows their own method of production of *chakka* as a result each has its own unique quality.

Since there is no information on sensory, chemical and microbial quality of *chakka* in this area is available whereas, on other side, the product growth in the market has increased substantially in last few years. Considering the production of *chakka* at large scale in the villages it was planned to evaluate the quality of *chakka* sold in Shirol tehsil of Kolhapur District.

Materials and Methods

Collections of *chakka* samples

From 5 different villages of Shirol tehsil, district – Kolhapur, periodically for the 4 times *chakka* samples were procured within 3-4 hours from production of *chakka*. The *chakka*

samples were on ice during transportation to laboratory for further analysis and they are kept at refrigerated temperature until the product is evaluated. The samples were served to the judges for organoleptic evaluation.

Samples Details

GS₁-Market *chakka* sample-1 village

GS₂-Market *chakka* sample-2 village

GS₃-Market *chakka* sample-3 village

GS₄-Market *chakka* sample-4 village

GS₅-Market *chakka* sample-5 village

Methods

Sensory quality of *Chakka*

The refrigerated (6±1°C) stored *chakka* samples were subjected to sensory evaluation. The panel of five semi-trained judges from Division of Animal Husbandry and Dairy Science, RCSM College of Agriculture, Kolhapur was provided samples for sensory evaluation. The sensory quality in terms of flavour, Colour and appearance, body and texture, and overall acceptability of *chakka* samples was evaluated as per '9' point hedonic scale. Samples were served in three-digit number coded container and placed in random manner, along with water (to rinse the mouth) in laboratory.

Chemical characteristics of *Chakka*

Chakka samples were analyzed for its chemical parameters viz. moisture, fat, protein, ash, total solids, acidity by adopting standard procedure.

Microbial quality of *chakka*

All the samples of *chakka* were analyzed for different microbial counts such as standard plate count, coliform count, yeast and mould count and salmonella detection by adopting standard procedure.

Statistical analysis

The data generated during research was tabulated and statistically analyzed by Randomized Block Design (RBD) with four replications (Panse and Sukhatme, 1985)^[16].

Results

Sensory quality of *chakka*

Flavour

The flavour score of *chakka* ranged from 7.23±0.07 to 7.89±0.08. The minimum and maximum score for *chakka* was obtained for sample GS₁ and GS₄, respectively. The mean values of flavour score for other *chakka* samples were 7.65±0.05, 7.33±0.08 and 7.51±0.09 for GS₂, GS₅, and GS₃ respectively. From this data the flavour score obtained is above 7 on 9-point Hedonic scale which described liked moderately. The positive significant correlation (r = 0.90) was observed between flavour and fat of *chakka*.

Singh and Paswan (2015)^[28] described that the best flavour of Shrikhand was obtained when it was prepared with buffalo milk having 6 per cent fat. Nalawade *et al.* (1998)^[13] studied the effect of composition variable on sensory quality and consistency of Shrikhand. They concluded that increase in fat content significantly increased colour and appearance, flavor, body and texture and over all acceptability of Shrikhand.

Colour and appearance

Colour and appearance score of *chakka* collected from market showed a significant ($P < 0.05$) difference among the samples. The highest mean score (8.21 ±0.11) for colour and

appearance was obtained by GS₂ sample followed by GS₄ (7.98±0.08). The lowest mean score (7.45±0.10) was obtained by GS₅ which was statistically at par with GS₁ (7.58±0.22). Sample GS₂ recorded score was above 8 and all other samples recorded score above 7 on 9-point Hedonic scale which indicate that samples were liked very much and liked moderately respectively.

Karhikeyan and Desai 1996, found that buffalo skim milk *chakka* was yellowish in colour except that made with 18% TS buffalo skim milk *chakka*. Patel *et al.* (1993) [18] reported that *chakka* stored in sealed polyethylene bags at 5, 10, and 30°C, should decrease in colour and appearance during storage. The variation in colour and appearance of dahi marketed in Bangladesh were also observed by Shekh *et al.* (2009) [25] and they reported that colour of fermented milk products depends on the colour of milk or caramelized colour obtained during heating of the milk or added color material.

Body and texture

The highest mean score (8.05 ±0.10) for body and texture was obtained by GS₄ sample followed by GS₂ (7.81±0.09) which was statistically at par with GS₁ (7.79±0.12). The lowest mean score (7.34±0.16) was obtained by GS₃.

Biyabani *et al.* (1998) [2] stated that use of disodium hydrogen phosphate significantly improved body, texture and flavour scores. Coagulation pH of 4.8 and disodium hydrogen phosphate at 0.1% produced *chakka* with the most acceptable texture and this combination was used for manufacture. Rajorhia, (2000) [20]. Stated that *chakka* is preferably prepared from buffalo milk because the curd obtained from cow milk is soft weak and of low curd tension. On the other hand, curd from buffalo milk is hard, smooth and mellow.

Overall acceptability

On an average the overall acceptability score of *chakka* sample were acceptable and rated in between liked moderately (score 7) and liked very much (score 8) on 9-point Hedonic scale. The minimum and maximum score was obtained by sample GS₅ and GS₄ respectively. Sample GS₁, GS₃ and GS₅ were statistically at par with each other.

Upadhyay *et al.* (1984) [31] found that there was deterioration in quality of shrikhand when stored for longer time and at higher temperature. Nalawade *et al.* (1998) [13] studied the effect of composition variable on sensory quality and consistency of shrikhand. They concluded that increase in fat content significantly increased colour and appearance, flavor, body and texture and over all acceptability of shrikhand.

Chemical characteristics of Chakka

Moisture

The mean moisture content in *chakka* sample GS₃ was maximum (67.98 ±0.47) followed by *chakka* sample GS₄ with mean of 67.86 ±0.14. The lowest moisture content was found in *chakka* sample GS₂ which was at par with GS₁ and GS₅ with mean values of moisture for these samples were 67.62 ±0.13 and 67.56 ±0.19, respectively. According to moisture content, the *chakka* sample studied here could be placed in descending order as GS₃ > GS₄ > GS₁ > GS₅ > GS₂.

The negative but highly significant correlation (r = -0.33) was observed between moisture and acidity of *chakka*.

Aneja *et al.* (1977) [1] reported that draining of whey was slower from heat treated (>85 °C) milk and *chakka* retained more moisture. Rao *et al.* (1986) [22] estimated that drainage overnight 16 hr. caused an increase in acidity, a decrease in yield and unacceptable dry texture of *chakka*. Trivedi, (1992)

[30] reported the average chemical composition of *chakka* prepared from buffalo skim milk with 75.04 per cent moisture. Shinde (1995) [26] analyzed *chakka* samples and found that it contains moisture 67.06 per cent.

Fat

The fat content of five samples of *chakka* i.e. GS₁, GS₂, GS₃, GS₄ and GS₅ were 13.03 ±0.14, 13.24±0.14, 13.38±0.17, 13.58±0.08 and 13.15±0.15, respectively. Maximum fat was observed in sample GS₄ whereas minimum fat was observed in sample GS₁. Sample GS₂ and sample GS₅ are statistically at par with each other. There were no large variation in fat content in *chakka* samples. It might be because of used milk for preparation of *chakka* was shown less variation in fat as milk constituents. According to the fat content the *chakka* samples arranged in descending order as GS₄ > GS₃ > GS₂ > GS₅ > GS₁. The positive significant correlation observed between fat and ash (r = 0.98), fat and total solid (r = 0.99), fat and flavour (r = 0.90) and fat and body and texture (r = 0.95).

Shipurkar, (1999) stated that fat content in *chakka* was 13.03 per cent. Kulkarni, (1997) [9] in his study observed the average fat content of *chakka* without SMP and with SMP were 13.11 and 9.19 respectively. Desai *et al.* (1985) [4] prepared *chakka* from homogenized milk and observed that had slightly higher yield with higher fat recovery. Munde *et al.*, (2017) [12] stated that variation in fat content of lassi might be because of use of milk as a raw material with wide variation in fat content or without standardization.

Protein

The average protein content in *chakka* samples were 10.89±0.21, 11.31±0.04, 11.40±0.11, 11.64±0.26 and 11.09±0.12 in GS₁, GS₂, GS₃, GS₃, GS₄ and GS₅, respectively. The maximum protein was found in sample GS₄ which was superior to other samples. However, the difference between samples GS₂ and GS₃ is statistically at par with each other.

Patel *et al.*, (1993) [18] and Shinde (1995) [26] who recorded 13.83 and 10.32 per cent protein respectively in *chakka* samples. De and Patel (1990) [3] noticed the protein per cent of *chakka* prepared from standardized buffalo milk and buffalo skim milk was 12.62 and 13.87 per cent respectively.

Lactose

Average values of lactose content of *chakka* sold in Shirol tehsil of Kolhapur district showed significant (P < 0.05) variation. The highest lactose (2.63 ±0.03) was found in samples from GS₅. The overall lactose content ranged in between 2.27 to 2.63. The lowest lactose content was found in GS₃ sample (2.27±0.04). GS₂ (2.41±0.06), GS₄ (2.48±0.15) and GS₁ (2.52±0.08) are statistically at par with each other. As well as, sample GS₄ and GS₅ also at par with each other. Sharma and Zariwala (1978) [24] compared the range of lactose content in different *chakka* samples and they recorded that lactose content in lab samples from cow milk, lab sample from buffalo milk and market sample were 0.89-2.56, 0.87-1.86 and 0.08-2.48, respectively.

Ash

Ash content in *chakka* sample GS₁, GS₂ and GS₅ were statistically at par with each other. The highest total ash content was observed in *chakka* sample GS₄. It might be because of highest total solid content in respective sample. On the basis of total ash content in *chakka*, the samples could be arranged in ascending order as GS₁ < GS₅ < GS₂ < GS₃ < GS₄.

The positive significant correlation was observed between ash and total solid. ($r = 0.97$).

Similar findings were also observed by Sachdeva *et al.* (1994) they concluded that the RO (Reverse Osmosis) *chakka* had 1.9 per cent ash against the respective values for conventional *chakka* of 1.3 per cent. Singh, (2006) [29] reported the ash in *chakka* of whole milk and skim milk was 3.5 and 5 per cent on dry matter basis.

Total solids

The total solid content in *chakka* samples collected from Shirol tehsil of Kolhapur district was ranged from 31.90 to 32.80 per cent. The maximum total solid (32.80 ± 0.30) was found in the *chakka* sample GS₄, followed by in *chakka* sample GS₃ (32.52 ± 0.09), GS₂ (32.25 ± 0.12), GS₅ (32.20 ± 0.16) while lowest was recorded in GS₁ (31.90 ± 0.07). The samples GS₂ and GS₅ are statistically at par with each other. The positive correlation observed between total solid and fat ($r = 0.99$) and total solid and protein ($r = 0.97$).

Rani *et al.* (2012) [21] observed that higher retention of whey in *chakka* from boiled milk may increase the yield of product and even the retention of solids but it will have an adverse effect on its consistency and total solid concentration. Singh, (2006) [29] also reported that *chakka* content total solid 30 per cent on dry matter basis.

Acidity (%LA)

Maximum acidity was observed by the sample GS₁ (1.85 ± 0.07) while, GS₄ recorded minimum acidity (1.51 ± 0.04). According to per cent of acidity these samples could be placed in GS₄ < GS₂ < GS₃ < GS₅ < GS₁ in ascending order. The negative but highly significant correlation was observed between acidity and moisture ($r = -0.33$) and acidity and pH ($r = -0.99$).

Sharma and Zariwala (1978) [24] compared the range of acidity content in different *chakka* samples and they recorded that acidity content in lab samples from cow milk, lab sample from buffalo milk and market sample was 1.79, 2.07 and 0.6-2.95, respectively. The variation in per cent acidity found in *chakka* sample may be due to uncontrolled incubation, post production handling and storage conditions.

pH

The pH in *chakka* sample was ranged from 4.32 ± 0.03 to 4.76 ± 0.07 . The minimum pH was recorded for the *chakka* of GS₁ and maximum was recorded to GS₄. The significant ($p < 0.05$) variation was noted in case of pH as like that of acidity. According to the pH range the *chakka* samples arranged in descending order as GS₄ > GS₂ > GS₃ > GS₅ > GS₁.

Meshram, (2014) [11] made investigation on sensory evaluation of commercial dahi, in this they concluded that better control of pH by dahi processors would result in more favorable sourness levels, which may increase consumer acceptability.

Microbial quality *chakka* sold in Shirol tehsil of Kolhapur district.

Standard plate count

The average SPC, expressed as log/g varied from 1.31×10^6 log/gm (GS₄) to 1.51×10^6 log/gm (GS₁). The SPC recorded in samples of *chakka* under study were GS₂ (1.47×10^6 log/gm), GS₃ (1.34×10^6 log/gm) and GS₅ (1.44×10^6 log/gm). It is revealed that the SPC found in the samples of GS₃ and GS₄ were at par with each other ($p < 0.05$). The highest SPC was observed in sample GS₁ and lowest in

sample GS₄.

These results are in line with the findings in study of Kolpe *et al.* (2010), who reported SPC from 18.25 to 23.25×10^6 g⁻¹ of control sample for *shrikhand* prepared to evaluation of chemical, microbial and sensory quality of papaya *shrikhand*. SPC from 3.31 to 7.34×10^7 /ml of branded dahi sold in various market of Pakistan, reported by Younus *et al.*, (2002) [32].

Yeast and mould count

Sample GS₁ showed maximum (1.90×10^6 log/gm) count and which is microbiologically inferior. While sample GS₄ showed least (1.77×10^6 log/gm) count and microbiologically better than other samples. However, the YMC count of sample GS₂, GS₃ and GS₅ are statistically at par with each other. The average values of YMC ranges between 1.77×10^6 log/gm (GS₄) to 1.90×10^6 log/gm (GS₁) and the variation was found to be statistically significant. All the *chakka* samples were showing variation in counts.

Variation of YMC was reported by Sharma and Zariwala (1978) [24] i.e. 1 to 800×10^3 cfu/gm of sample from market *shrikhand* stored at 10 and 37°C respectively. Whereas, Obande and Azua, (2013) [14] found highest YMC in Nono (a fermented milk product) and yoghurt sold in Nigeria having count of 9.20 and 1.07×10^6 per gm, respectively. The presence of yeast and mould were also reported by Phadatare (2009) [19] in *lassi*, Shekh *et al.* (2009) [25] in dahi. Yeast and mould may get in product from utensils, human hands, atmosphere, starter culture, etc. during handling and repeated transfer.

Coliform count

Sample GS₁ showed maximum ($1.19 \pm 0.02 \times 10^2$ cfu/g) coliform count. Sample GS₃ and GS₅ also showed coliform counts $1.13 \pm 0.07 \times 10^2$ cfu/gm, $1.07 \pm 0.08 \times 10^2$ cfu/gm, respectively whereas remaining two (GS₂ and GS₄) samples were free from coliform organisms and hence safe for consumption. ISI prescribed the maximum limits of 10 coliform cfu/g of *chakka*.

Improperly cleaned utensils had also been shown to contribute to the bacterial load. Subsequent contaminations could have been taken place conceivably under conditions of improper handling and storage. Similar observations were also recorded by Obande and Azua (2013) [14].

Salmonella detection in market *chakka* samples

All samples were free from salmonella contamination. Therefore, it can be stated that the *chakka* sold Shirol tehsil of Kolhapur district was safe for consumption.

A similar finding was also reported by Kumbhar *et al.* (2009) [10] in market *lassi*. However, Okonkwo (2011) [15] found Salmonella count in Nono a fermented milk based food sold in Nigeria.

Table 1: Flavour Score (*) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Score	7.23 ^a	7.65 ^c	7.51 ^b	7.89 ^d	7.33 ^a
SE	± 0.07	± 0.11	± 0.12	± 0.09	± 0.07
SEm	0.04				
CV	0.98				
CD ($p < 0.05$)	0.11				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 2: Colour and Appearance Score (*) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Score	7.58 ^a	8.21 ^d	7.72 ^{ab}	7.98 ^c	7.45 ^a
SE	±0.22	±0.11	±0.06	±0.08	±0.10
SEm	0.05				
CV	1.37				
CD ($p < 0.05$)	0.16				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 3: Body and Texture Score (*) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Score	7.79 ^c	7.81 ^c	7.34 ^a	8.05 ^d	7.57 ^b
SE	±0.12	±0.09	±0.16	±0.10	±0.23
SEm	0.05				
CV	1.37				
CD ($p < 0.05$)	0.16				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 4: Overall Acceptability Score (*) of *Chakka* Samples Sold In Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Score	7.53 ^a	7.89 ^b	7.52 ^a	7.96 ^b	7.45 ^a
SE	±0.02	±0.03	±0.11	±0.08	±0.10
SEm	0.04				
CV	0.92				
CD ($p < 0.05$)	0.10				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 5: Moisture Content (%) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	67.62 ^{ab}	67.50 ^a	67.98 ^d	67.86 ^c	67.56 ^a
SE	±0.13	±0.10	±0.47	±0.14	±0.19
SEm	0.03				
CV	0.09				
CD ($p < 0.05$)	0.09				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 6: Fat Content (%) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	13.03 ^a	13.24 ^b	13.38 ^{bc}	13.58 ^d	13.15 ^b
SE	±0.13	±0.14	±0.17	±0.08	±0.15
SEm	0.06				
CV	0.93				
CD ($p < 0.05$)	0.18				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 7: Protein Content (%) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	10.89 ^a	11.31 ^c	11.40 ^c	11.64 ^d	11.09 ^b
SE	±0.21	±0.04	±0.11	±0.26	±0.12
SEm	0.05				
CV	0.83				
CD ($p < 0.05$)	0.14				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 8: Lactose Content (%) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	2.52 ^{bc}	2.41 ^b	2.27 ^a	2.48 ^b	2.63 ^d
SE	±0.08	±0.06	±0.04	±0.15	±0.03
SEm	0.03				
CV	2.69				
CD ($p < 0.05$)	0.10				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 9: Ash Content (%) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	1.24 ^a	1.30 ^{ab}	1.40 ^c	1.50 ^d	1.28 ^a
SE	±0.06	±0.10	±0.05	±0.08	±0.007
SEm	0.03				
CV	4.20				
CD ($p < 0.05$)	0.08				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 10: Total Solid Content (%) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	31.90 ^a	32.25 ^b	32.52 ^c	32.80 ^d	32.20 ^b
SE	±0.07	±0.12	±0.09	±0.30	±0.16
SEm	0.07				
CV	0.43				
CD ($p < 0.05$)	0.21				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 11: Acidity (%LA) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	1.85 ^c	1.60 ^b	1.67 ^c	1.51 ^a	1.75 ^d
SE	±0.07	±0.03	±0.03	±0.04	±0.05
SEm	0.02				
CV	2.69				
CD ($p < 0.05$)	0.06				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 12: pH of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	4.32 ^a	4.68 ^d	4.58 ^c	4.76 ^e	4.45 ^b
SE	±0.03	±0.08	±0.08	±0.07	±0.05
SEm	0.03				
CV	1.23				
CD ($p < 0.05$)	0.08				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 13: Standard Plate Count (log/gm) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	1.51 ^e	1.47 ^{cd}	1.34 ^{ab}	1.31 ^a	1.44 ^c
SE	±0.04	±0.02	±0.03	±0.02	±0.04
SEm	0.01				
CV	1.60				
CD ($p < 0.05$)	0.03				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$

Table 14: Yeast and Mould Count (log /gm) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	1.90 ^c	1.84 ^b	1.82 ^b	1.77 ^a	1.83 ^b
SE	±0.03	±0.07	±0.03	±0.06	±0.04
SEm	0.02				
CV	2.32				
CD ($p < 0.05$)	0.06				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$.

Table 15: Coliform Count ($X 10^2$ cfu /gm) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	1.19 ^c	Nil	1.13 ^b	Nil	1.07 ^a
SE	±0.02	Nil	±0.07	Nil	±0.08
SEm	0.02				
CV	5.38				
CD ($p < 0.05$)	0.05				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$.

Table 16: Salmonella Count ($X 10^1$ cfu /gm) of *Chakka* Samples Sold in Shirol Tehsil of Kolhapur District

Particular	Chakka samples				
	GS ₁	GS ₂	GS ₃	GS ₄	GS ₅
Mean values	Nil	Nil	Nil	Nil	Nil
SE	Nil	Nil	Nil	Nil	Nil
SEm	Nil				
CV	Nil				
CD ($p < 0.05$)	Nil				

*Means of four replications within row followed by the same letter are not significantly different at $p < 0.05$.

Conclusions

- From the result it is concluded, that on the basis of organoleptic evaluation, chemical quality and microbial counts studied here, GS₄ sample of *chakka* was significantly superior over the other samples under study.
- There was significant variation in respect of fat, protein, lactose and total solids content in all of the *chakka* samples examined.
- Salmonella count in *chakka* sold in Shirol tehsil of Kolhapur district is nil hence it is safe for consumption.

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