

Case Study

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Assessment of Quality of *Peda* Samples Sold in Kamareddy District - A Case Study

Srikanth Keerthi^{1*}, Vyshnavi Manthani² and G. Swarnalatha³

¹Department of Dairy Technology, ²Department of Dairy Microbiology, ³Department of Dairy Chemistry, College of Dairy Technology, PVNR TVU, Kamareddy, India

*Corresponding author

ABSTRACT

Keywords

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Present study was carried out to assess the chemical composition, microbial count and sensory characteristics of laboratory and market *peda* samples collected from local vendors of Kamareddy district. A significant variation in moisture, fat, protein, ash, total sugar and acidity content ranged from 14.430 to 16.227%, 14.057 to 17.837%, 14.193 to 16.807%, 2.907 to 3.117%, 45.087 to 51.357% has been observed. The moisture, fat and protein content were higher and total sugar, acidity was lower in laboratory samples when compared with market samples. The Total plate count, Yeast and mold and Coliform count showed highly significant difference ($P < 0.01$) among laboratory (T_0) sample when compared with market *peda* samples. The coliform count was nil in T_0 . In sensory characteristics *viz.* color and appearance, body and texture, flavor, sweetness and overall acceptability showed significant ($P < 0.01$) difference between *peda* samples. Therefore it is concluded laboratory samples were superior to Market samples in all aspects.

Introduction

India produces about 155.5 million tons of milk annually, out of which about 50-55 % of milk produced is being converted into variety of traditional Indian dairy products of which 6.5% of milk is used for manufacture of *khoa* mostly in private and unorganized sector (Prasad *et al.*, 2012 and Jadhav *et al.*, 2011).

Traditional dairy products (TDP) and sweets are an integral part of Indian heritage and have great social, religious, cultural, medicinal, and economic significance. They have been developed with the culinary skills of home

makers and sweet makers (*Halwais*), over a long epoch (Gotarne *et al.*, 2015).

Khoa is a heat desiccated Indian dairy product used as a base material for a variety of sweetmeats like *burfi*, *peda*, *gulabjamun* etc. *Peda* is an indigenous *khoa* based heat desiccated milk sweet prepared by heating mixer of *khoa* and sugar with addition of natural and/ or artificial color and flavor until the desired characteristics texture and flavor develops (Kavita *et al.*, 2015). Buffalo milk is preferred over cow and goat milks for preparation of *khoa* based sweets (*peda*, *kalakand* etc), because it gives soft and uniform body with smooth, compact and homogeneous texture to

the finished product (Kamle *et al.*, 2015). The consumption of TDP is likely to grow at an annual growth rate of more than 20 per cent. The manufacture of *peda* is mostly restricted to *halwais*. Since *peda* has lower moisture content it has a better shelf life. *Peda* is whitish yellow in color and has a coarse grainy texture. Its quality is determined by chemical composition, body and texture, appearance and microbial quality (Gavhane *et al.*, 2014). Therefore the present study was thus carried out to evaluate the chemical, microbial and sensory qualities of *peda* samples collected from Kamareddy city.

Materials and Methods

Collection of raw material

The whole fresh and clean buffalo milk was procured from local chilling centre, kamareddy. Good quality sugar was obtained from the local market.

For standardization of buffalo milk (fat 6% and SNF 9%) Nandini butter and spray dried Nestle skim milk powder were used. The low density polyethylene packaging material was purchased from local market.

Preparation of laboratory *peda*

Laboratory *peda* (T_0) was prepared from Standardized Buffalo milk (6% fat and 9% SNF). Milk was concentrated by heating and continuous stirring, upto 67 % total solids for making *khoa*. *Khoa* was then kept for 15 min and cooled to $25\pm 3^\circ\text{C}$. *Khoa* and sugar (30%) were taken in a nonstick pan and heated at 90°C till pat formation with continuous stirring and kneading at 50°C till the dough become suitable to make *peda*. Dough was portioned and converted into round balls by rolling between the palms and final shape was given to *peda* by pressing in dies.

Collection of market samples

The market *peda* samples were collected within two to three hours of their preparations from popular sweet shops of Kamareddy city and packed in cardboard boxes of rectangular shape ($10 \times 12 \text{ cm}^2$). The cardboard boxes were packed and sealed in polyethylene bags to prevent gain or loss of moisture during transport. The samples were tempered to room temperature before analysis of different quality parameters. They were designated as T_1 , T_2 , T_3 and T_4 to maintain the privacy of the source.

Chemical analysis

The Laboratory and Market *peda* samples were chemically analyzed for moisture (IS: 2785, 1964), fat (IS: 1224, Part II, 1977), acidity (IS, 18 Part (XI) (1981), protein (Meneffee and Overman, 1940), ash (A.O.A.C 1975), total carbohydrate content was obtained by difference method.

Microbial analysis

Microbiological parameters of Laboratory and Market *peda* samples were determined by using standard procedure for Total plate count by method cited in (ISI: 5402, 1969) by using Tryptone Dextrose Agar medium, Yeast and Mould count by method cited in (ISI: 5403, 1969) by using Potato Glucose Agar medium and Coliform count by (Chalmers, 1955) by Mac Conkey's broth medium.

After incubation at 37°C for 24hrs, the microorganisms were identified on the basis of colony characteristics. Results were expressed as Cfu per gm of sample.

Sensory evaluation

Sensory evaluation of Laboratory and Market *peda* were carried out by a panel of five

judges selected from the faculty of college of Dairy Technology by using “9 point Hedonic scale” developed by Gupta (1976).

Statistical analysis

The data were subjected to analysis of variance (ANOVA), using by completely randomized design for chemical, microbial and sensory analysis was computed as described by Steel and Torrie, (1980).

Results and Discussion

The Results obtained from the present study on chemical, microbiological and sensory characteristics of freshly prepared laboratory and market samples of *peda* are depicted in Tables 1-3.

Chemical composition

The results of three replicates were chemically analyzed and compared statistically among the different samples as presented in Table 1.

Moisture content

The moisture content of laboratory *peda* sample (T₀) 16.227 was slightly higher than that of the market samples viz., T₁, T₂, T₃ and T₄ ranged from 14.430 (T₄) to 15.917 (T₂) as shown in Table 1. The standard of *khoa* under the Prevention of Food Adulteration Act (1954) required that it should not contain more than: 28.0% moisture. However, the results of present findings are accordance with earlier workers Dastur and Lakhani (1971) supported this standard after examining vendor's *khoa* in Poona city. The dealers of *khoa* however complained that, such a low moisture level was not practicable in the trade since good-quality sweets could not be prepared from such an over-desiccated product (Rajorhia and Srinivasan 1974). Similar observations were also made by Sharma *et al.*, (2012), who

reported that the moisture content of milk cake was slightly higher in control samples 26.70±1.61% than market samples as 23.60±3.35 and 25.90±6.97%.

It could be observed from the Table that the moisture content of all *peda* samples were differed significantly (P<0.01). The variation in the moisture content might be mainly due to the difference in method of manufacture, extent of desiccation, amount of sugar added, difference in chemical composition of base material used. The present findings are accordance with Kavita *et al.*, (2015), who reported that there is significant difference between the laboratory and market *peda* samples of Raipur city and also Patel *et al.*, (2006), analyzed five *peda* samples from different cities of Gujarat state for chemical attributes and reported significant differences in moisture content.

Fat content

The fat content of market *peda* samples T₁, T₂, T₃, and T₄, ranged from 14.057 (T₄) to 16.183 (T₂) and laboratory *peda* sample 17.837 (T₀) was found to be highly significant (P<0.01) as presented in Table 1. The difference in the fat content of *peda* samples might be attributed to the variation in the type of milk used (buffalo/cow) and their fat content, amount of sugar added and duration of desiccation. The present study was in alignment with Kavita *et al.*, (2015) concluded that there is significant difference was found between the laboratory and market made *peda* samples, Sharma and Zariwal (1978) and Patel (1996), who also reported large variation in the fat content (14.92 to 23.92%) of market samples of *peda*.

Protein, ash content

The Protein and ash content was also found to be highly significant (P<0.01) among the treatments. The highest protein content was

observed for laboratory *peda* sample (T₀) 16.807 and market *peda* samples varied from 14.193(T₁) to 15.917 (T₂).

The Ash content of market *peda* samples was higher for the T₂ and T₄ (3.117) when compared with other samples T₁ (2.909) and T₃ (2.757) and laboratory *peda* sample 3.043 (T₀). Our findings correlate with the reports of Rajorhia and Srinivasan (1979), who studied that the lactose, milk proteins and ash contents in *khoa* samples also showed fairly wide variations. The type of milk used, extent of desiccation and addition of adulterants would cause such disparity.

Total sugars

The Total sugars of market *peda* samples T₁, T₂, T₃ and T₄, ranged from 51.357% (T₄) to 47.787% (T₂) and laboratory *peda* sample has 45.087% (T₀), highly significant difference (P<0.01) was observed among the samples but T₁ and T₃ at par with each other as presented in Table 2.

The significant difference in the Total sugars of *peda* samples could be due to the amount of sugar added and time of desiccation, composition of base material used during its preparation. Similar kind of relationship was observed in the preparation of *milk cake* by earlier workers Sharma *et al.*, (2012), who observed that the sucrose content of market samples as 29.34 in zone I and 25.40 in zone II was higher than 24.52 in control samples which corroborate our observations.

Acidity

The acidity of market *peda* samples T₁, T₂, T₃ and T₄, ranged from 0.633% (T₂) to 0.540 % (T₄) was higher than laboratory *peda* sample 0.50% (T₀). Highly significant difference (P<0.01) was observed among the samples but T₁ and T₂ at par with each other as depicted in

Table 2. The data found to be close to the research work conducted by Kavita *et al.*, (2015), also found significant difference in the acidity of *peda* samples might be the result of use of either milk with different acidity or amount of sugar added and degree of heat treatment used during its preparation.

Microbial analysis

The Total Plate count, Yeast and mold, and Coliform count were done for laboratory and market *peda* samples and the results are presented in Table 2.

The Total plate count, Yeast and mold and Coliform count of laboratory *peda* sample 3.240, 3.410 and nil respectively (T₀) was lower than the market *peda* samples T₁, T₂, T₃, and T₄ were 4.187 to 4.860, 4.127 to 3.777 and 2.110 to 1.930 respectively. Highly significant difference (P<0.01) was found among the treatments. The difference in the TPC of *peda* samples might be mainly due to unhygienic conditions prevailing during manufacture and quality of raw material used during preparation of *peda*.

Spoilage of dairy products by molds is of frequent occurrence in India is due to the prevailing tropical climate and high humidity. Since the mold spores are transmitted through air, they are ubiquitous in nature Karthikeyan, N and Pandiyan, C (2012).

The difference in the coliform count of *peda* samples could be due to uncleaned hands of workers, poor quality of milk, unhygienic conditions of manufacturing unit, inferior quality of material used, water supplied for washing the utensils and post processing contamination. Our findings were correlated with the reports of Kumar and Sinha (1989), Grewal and Tiwari (1990) and Kulshrestha (1990).

Table.1 Average chemical composition of laboratory and market made *peda* samples

Treatments	Moisture	Fat	Protein	Ash	Total Sugars	Acidity
T ₀	16.227 ^a	17.837 ^a	16.807 ^a	3.043 ^b	45.087 ^d	0.500 ^d
T ₁	15.790 ^{bc}	15.260 ^c	14.193 ^e	2.907 ^c	50.723 ^{bc}	0.563 ^c
T ₂	15.917 ^b	16.183 ^b	15.917 ^b	3.117 ^a	47.787 ^c	0.540 ^{cd}
T ₃	14.830 ^c	15.100 ^d	15.373 ^d	2.757 ^d	50.777 ^b	0.603 ^b
T ₄	14.430 ^d	14.057 ^e	15.763 ^c	3.117 ^a	51.357 ^a	0.633 ^a
F-Values	322.132 ^{**}	27027.746 ^{**}	14297.341 ^{**}	63.723 ^{**}	2249.875 ^{**}	41.051 ^{**}
SE(m)	0.0427	0.0086	0.0079	0.0194	0.0561	0.0082
CD (5%)	0.13	0.03	0.03	0.06	0.18	0.03

** Highly significant P (<0.01)

Table.2 Average microbial count of laboratory and market made *peda* samples

Treatments	Total plate count (log ₁₀ .cfu/g)	Yeast and mould count(log ₁₀ .cfu/g)	Coliforms (log ₁₀ .cfu/g)
T ₀	3.240 ^e	3.410 ^e	0.000 ^e
T ₁	4.187 ^a	3.777 ^d	1.930 ^d
T ₂	3.860 ^d	4.070 ^b	2.020 ^c
T ₃	4.107 ^c	4.030 ^c	2.110 ^a
T ₄	4.163 ^b	4.127 ^a	2.053 ^b
F-Values	3379.307 ^{**}	789.360 ^{**}	13292.589 ^{**}
SE(m)	0.0068	0.0105	0.0079
CD (5%)	0.02	0.03	0.02

** Highly significant P (<0.01)

Table.3 Average sensory scores of laboratory and market made *peda* samples

Treatments	Colour and appearance	Body and texture	Flavour	Sweetness	Overall acceptability
T ₀	8.990 ^a	8.750 ^a	8.703 ^a	8.680 ^a	8.780 ^a
T ₁	8.070 ^e	8.183 ^c	7.963 ^d	8.173 ^c	8.100 ^c
T ₂	8.717 ^b	8.270 ^b	8.127 ^b	8.227 ^b	8.337 ^b
T ₃	8.283 ^c	8.017 ^d	8.097 ^c	7.960 ^e	8.087 ^{cd}
T ₄	8.137 ^d	7.933 ^c	7.833 ^e	8.067 ^d	7.993 ^d
F-Values	1486.768 ^{**}	636.897 ^{**}	1140.412 ^{**}	394.000 ^{**}	2993.573 ^{**}
SE(m)	0.0103	0.0127	0.0099	0.0139	0.0058
CD (5%)	0.03	0.04	0.03	0.04	0.02

** Highly significant P (<0.01)

Higher bacterial contamination was found in all market samples when compared with laboratory sample. This can be attributed mainly lack of hygienic practices followed during manufacture of product. However considering the impact of consumption of such contaminated products on public health, the HACCP should be applied during the manufacturing process. The analysis from raw material to final product indicate that, though microbiological quality of *khoa* may be satisfactory at the time of production, it deteriorated by the time it is available for sale in the market (Bhat *et al.*, 2000)

Therefore observing proper hygienic conditions, like thorough washing of hands by food handlers, using clean utensils, etc. could reduce the chances of contamination to a greater extent. The application of HACCP would yield the desired result of improving the safety of food. However adequate education, awareness programs and extension programs on the subject needs to be undertaken and training programs organized for food handlers so that the health of the consumers is not at risk (Godbole *et al.*, 2013).

Sensory characteristics

The sensory scores for laboratory and *market peda* samples are represented in Table 3.

Colour and appearance

Color and appearance score of market and laboratory *peda* samples T₁, T₂, T₃ and T₄ ranged from 8.717 to 8.070 and T₀ 8.990 out of 9 point hedonic scale. The mean color & appearance value differed significantly (P<0.01) among samples. Difference in the color & appearance score might be due to wide variation in raw material, amount of sugar added (during heat treatment reaction between sugar and amino acid produce maillard browning), method (direct & indirect) and duration of heat treatment used for manufacture of *peda*. Sharma *et al.*, (2001) recorded that increase in fat percentage in *khoa* resulted in improvement in its color.

Body and Texture:

The mean score for body and texture of laboratory and market *peda* samples varied highly significant (P<0.01). The values derived from the study ranged from 8.270 (T₁) to 7.933 (T₄) for market samples and laboratory *peda* (T₀) has 8.750. It might be due to wide variation in chemical composition particularly fat and sugar levels. These findings agreed with the result of Londhe and Pal (2007), who reported that significant effect on the body and texture score of brown *peda* with increase in the level of fat in milk and sugar, but to a certain extent and Kavita *et al.*, (2015), who also concluded that there is highly significant difference among all the samples.

Flavour

The Laboratory *peda* 8.703 (T₀) showed significant (P<0.01) variations among the market samples 8.127 (T₂) to 7.833 (T₄). The highest flavor score were obtained for laboratory *peda* sample which might be due to the higher fat content. These finding are supported by Reddy (1985), who reported that an increase in flavor score of plain *peda* with the increase in fat content.

Sweetness

The average score for sweetness varied significantly (P<0.01) among the samples. The market *peda* samples T₁, T₂, T₃ and T₄, ranged from 8.227 (T₂) to 7.960 (T₃) and Laboratory *peda* (T₀) has 8.680. The mean sweetness value was highly significantly among the samples. The highest sweetness in this *peda* samples might be and time of desiccation, composition of base material. The reports also suggested by Desale *et al.*, (2007) studied the effect of compositional variables on the quality of *peda*. Their findings suggest that maximum sensory scores were obtained for the *peda* containing 30% sugar, 15% moisture and 25% fat. In current findings acceptable sensory quality for sweetness was obtained for all types of *peda*.

Overall acceptability

The values obtained for market *peda* samples T₁, T₂, T₃, T₄, ranged from 8.337 (T₂) to 7.993 (T₄) and Laboratory *peda* has 8.780 (T₀). The mean overall acceptability significantly differed (P<0.01) among the samples but T₁ and T₃ were at par with each other. Difference in the overall acceptability might be due to wide variation in color & appearance, body & texture, flavor, Sweetness and also variation in chemical composition of market and laboratory *peda* samples.

A wide variation was observed among laboratory and market *peda* samples. It is generally found that halwa is prepared the samples of product from admixed milk of low quality or it may be due to the variation in their method of preparation and varying levels of sugar and moisture content.

It is recommended to local vendors should keep in view the public health importance of consumer; the strict hygienic preventive measures should be practiced during pre and post-preparation handling, storage and marketing of the finished products to reduce the microbial load in the finished products, so as to increase quality of the product. It is concluded from present findings that laboratory samples were Superior in all respect of chemical, microbial and sensory quality to that of market Samples.

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