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# Sensory and physico-chemical qualities of market samples of Peda in Chennai city, India

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#### Abstract

The present study was conducted to assess the sensory and physico-chemical qualities of peda (khoa) sourced from different areas in and around Chennai. On conducting organoleptic evaluation using 9-point hedonic scale the peda samples were described as being "neither liked nor disliked" to "like moderately". The average total solids content of different brands of peda (khoa) ranged between 71.68 and 83.48 %, fat between 9.86 and 19.94%, protein between 9.52 and 13.47 % and the acidity values between 0.35 and 0.56 %. The sensory attributes for different peda obtained from the market varied significantly (p< 0.05) in their colour and appearance scores, ranging for 5.85 - 7.00. Significant difference was observed in body and texture scores for peda, which ranged from 5.86-6.81 (p< 0.05). Overall acceptability and flavour ranged between 5.88 - 6.78 and 6.0 - 6.81 respectively (p< 0.05). The fat percentage of all the samples was lower than the FSSAI norms (minimum of 37%) fixed for khoa. Hence, continuous monitoring and stringent measures need to be taken by approved regulatory authorities.

Keywords: peda (khoa), physico-chemical quality

#### 1. Introduction

India is emerging as a mega dairy market of 21st century. In India, the dairy sector plays an important role in the country's socio-economic development, and constitutes an important segment of the rural economy. India produces about 176.35 million tons of milk annually, out of which about 50% is converted into various traditional dairy products. Tamil Nadu is one of the leading milk producing States and ranked 9<sup>th</sup> in the list of top 10 highest milk producing states in India. Khoa is the major product produced by heat desiccation of milk. It is made of either dried or whole milk thickened by heating it in an open iron pan (Londhe and Pal, 2007)<sup>[13]</sup>. Khoa is used as a base material for production of peda, burfi and gulabjamun.

Peda (khoa) is a sweet from the Indian subcontinent, usually prepared in thick, semi-soft pieces. The main ingredients are khoa, sugar and traditional flavourings including cardamom seeds, pistachio nuts and saffron. Peda is therefore indigenous khoa based heat desiccated milk sweet prepared by heating a mixture of khoa and sugar with addition of natural and/ or artificial colour and flavour until the desired characteristic texture and flavour develop. The colour varies from a creamy white to caramel. Variant spellings and names for this dessert include pedha, penda (in Gujarati) and pera. About 50% of milk out of total production is converted to various traditional dairy products. Khoa is used as base material for production of peda. The quantity of peda produced in India far exceeds any other indigenous milk based sweets. Peda is more popular than all other khoa based sweets. The reason is that peda is considered as being a pure food and offered as "Prasad" during religious worships in Hindu temples as well as during religious celebrations.

Bajaj *et al.* (2013) <sup>[2]</sup> studied the physico-chemical, microbiological and sensory attributes of khoa from market samples and concluded that there were variations in the fat and protein levels. Banjare *et al.* (2015) <sup>[4]</sup> studied the chemical, textural and sensory quality attributes of market and laboratory made peda samples. They concluded that there is a wide variation in chemical, textural and sensory profile between the market and laboratory made samples, which may be due to variation in method of preparation and varying levels of sugar and moisture content. However, little investigation has been carried out to evaluate the sensory and physico-chemical qualities of peda sold in Chennai markets. The present study was thus carried out to

evaluate the sensory and physico-chemical qualities of peda samples collected from Chennai city.

# Materials and Methods

# **Collection of Samples**

Seventy two branded samples of peda (khoa) were collected from various areas in and around Chennai over a period of one year. Utmost care was taken to transport the samples to the laboratory in an aseptic manner at optimum temperature by using appropriate insulated containers. The samples were appropriately labelled to maintain the privacy of the source. The samples were tempered to room temperature before analysis of different quality parameters.

# **Sensory evaluation**

The organoleptic qualities of peda (khoa) were assessed by subjecting the samples to sensory scores of colour and appearance, body and texture, flavour and overall acceptability by three experts and four trained taste panel members drawn from the Madras Veterinary College, Chennai- 600 007 on a nine point hedonic scale (1= disliked extremely, 2=disliked very much, 3=disliked moderately, 4=disliked slightly, 5=neither liked nor disliked, 6=liked slightly, 7=liked moderately, 8=liked very much, 9=liked extremely), developed by Amerine *et al.* (1965) <sup>[1]</sup>. The panel members were also requested to give criticism where applicable for each attribute for the sample.

**Estimation of total solids:** Total solids were estimated (Hot air oven method) as per FSSAI laboratory manual 1- FSSAI manual of methods of Analysis of foods- Milk and Milk products, 2015 (Page no.59).

**Estimation of protein :** Protein was estimated (Kjeldahl method) as per FSSAI laboratory manual 1- FSSAI manual of methods of Analysis of foods- Milk and Milk products, 2015 (Page no.61).

**Estimation of fat:** Fat was estimated (Rose-Gottlieb method) as per FSSAI laboratory manual 1- FSSAI manual of methods of Analysis of foods- Milk and Milk products, 2015 (Page no.61,96).

**Estimation of titrable acidity:** Titrable acidity was estimated (Titration method) as per FSSAI laboratory manual 1- FSSAI manual of methods of Analysis of foods- Milk and Milk products,2015 (Page no.82).

**Statistical analysis**: The data obtained were analyzed statistically by applying one way ANOVA test in IBM SPSS (US) software (version 20) and interpreted as per the Snedecor and Cochran (1994)<sup>[16]</sup>.

# **Results and Discussion**

Sensory Quality of Market Peda: The sensory scores for market peda samples are represented in Table 1.

# **Colour and appearance**

The analysis of variance for colour and appearance revealed highly significant (P < 0.01) difference between P1 and other commercial brands of peda (khoa), whereas no significant difference was observed between P2, P3, P4, P5 and P6 samples. Out of the six brands analysed, P1 recorded the lowest score of 5.85 and P4 was awarded the highest score of 7.00 on the 9-point hedonic scale. On a 9-point hedonic scale, the values referred to as the brands being neither liked nor disliked to liked moderately (5= neither like nor dislike, 6=like slightly, 7=like moderately and 8=like very much). These results differed from the findings reported by Banjare et al. (2015a)<sup>[4]</sup> and Shinde et al. (2015)<sup>[15]</sup> who reported colour and appearance score of 11.5-13.5 out of 15.0 and 8.75 out of 9.0 respectively. Colour and appearance values and their sensory preferences tend to vary from place to place and from individual to individual. In the case of peda (khoa), the colour and appearance is generally based on the local preference of the public residing in a particular location. The colour and appearance also tend to vary based on the source of milk, the amount of sugar added and also on the time the milk is heated.

# Body and texture

The values of body and texture of different commercial brands of peda (khoa) ranged from 5.86 to 6.81 and there was highly significant (P  $\leq$  0.01) difference between the different commercial brands of peda (khoa) whereas no significant difference was observed between P2, P3 and P5. With respect to this parameter also, P1 and P4 brands recorded the lowest and highest scores respectively. However the values obtained by Banjare *et al.* (2015a)<sup>[4]</sup> ranged from 25.50 to 33.50, out of a maximum score of 35 and the results obtained differed widely from the score of 8.67 reported by Shinde *et al.* (2015)<sup>[15]</sup>. Body and texture scores of peda tend to vary based on the quality of the milk used and the time taken for product preparation.

# Flavour

The mean  $\pm$  SE values of flavour of different commercial brands of peda (khoa) i.e. P1, P2, P3, P4, P5 and P6 are 6.00  $\pm 0.23$ , 6.81  $\pm 0.23$ , 6.68  $\pm 0.07$ , 6.56  $\pm 0.11$ , 6.15 $\pm 0.21$  and 6.25 $\pm 0.20$  respectively. The values of flavour of different commercial brands of peda (khoa) ranged between 6.00 and 6.81. The statistical analysis revealed significant (P $\leq 0.05$ ) difference between the different commercial brands of peda (khoa) whereas no significant

Table 1: Sensory evaluation of six different commercial brands of peda using 9-point hedonic scale (Mean ± S.E.)@

Brand	P1	P2	P3	P4	P5	P6	F Value
Colour and appearance	$5.85^{b} \pm 0.11$	6.85 <sup>a</sup> ±0.09	6.95 <sup>a</sup> ±0.09	7.00 <sup>a</sup> ±0.13	6.65 <sup>a</sup> ±0.15	6.80 <sup>a</sup> ±0.18	10.03**
Body and Texture	5.86° ±0.18	6.63 <sup>ab</sup> ±0.22	$6.53^{ab} \pm 0.16$	6.81 <sup>a</sup> ±0.09	$6.48^{ab} \pm 0.18$	$6.20^{bc} \pm 0.16$	3.71**
Flavour	6.00 ° ±0.23	6.81 <sup>a</sup> ±0.23	6.68 <sup>ab</sup> ±0.07	$6.56^{abc} \pm 0.11$	6.15 <sup>bc</sup> ±0.21	$6.25^{abc} \pm 0.20$	2.88*
Overall acceptability	$5.88^{b} \pm 0.17$	$6.78^{a} \pm 0.17$	$6.73^{a}\pm0.11$	$6.76 \ ^{a} \pm 0.08$	$6.38^{a} \pm 0.16$	6.40 <sup>a</sup> ±0.15	5.47**

Note: @Average of six replicates

\*\*different superscripts in a row differ highly significantly ( $P \le 0.01$ )

P1 denotes peda sample from organized sector 1

P2 denotes peda sample from organized sector 2

P3 denotes peda sample from private sector 1

P4 denotes peda sample from private sector 2 P5 denotes peda sample from private sector 3 P6 denotes peda sample from private sector 4

<sup>\*</sup>different superscripts in a row differ significantly ( $P \le 0.05$ )

difference was observed between P4 and P6. With respect to this attribute, though P1 recorded the lowest score as was the case with other sensory attributes, P2 recorded the highest score, replacing P4 from the top spot. The results were almost in tune with those obtained by Bandekar *et al.* (1998) <sup>[3]</sup> who recorded flavour scores using a 9-point hedonic scale between 5.85 and 7.15 but significantly lower than that reported by Shinde *et al.* (2015) <sup>[15]</sup>. Flavour values mainly depend on individual preferences. In addition, the quality of milk used, quantum of sugar added and the time of heat treatment also play a very important role.

## **Overall acceptability**

With respect to the overall acceptability of the different brands of peda, P1 was awarded the lowest score of 5.88, while P2 recorded the highest value of 6.78, closely followed by P3 and P4 with values of 6.73 and 6.76 respectively. There was a highly significant (P  $\leq$  0.01) difference between the different commercial brands of peda (khoa) whereas no significant difference was observed between P2, P3, P4, P5 and P6. On a 9-point hedonic scale the values referred to as the products being neither liked nor disliked to liked moderately (5= neither like nor dislike, 6=like slightly, 7=like moderately). Wanjari et al. (2016)<sup>[17]</sup> also recorded scores with such variation on a 9- point hedonic scale i.e., 7.13, 7.44, 8.19 and 6.76 for the east, west, north and south regions of Bhandara district. However Shinde et al. (2015)<sup>[15]</sup> reported overall acceptability score of 8.66 on a 9- point hedonic scale, but the main difference lies in the fact that this score was recorded in laboratory sample, whereas this trial was conducted with market samples. As peda is prepared based on the local preferences and various combinations of milk, heat treatments are in vogue there are bound to be differences in the organoleptic evaluation scores. Market samples will tend to vary widely with respect to sensory parameters, as they cater to the general public whose aspirations for the product differ from region to region.

# Chemical attributes of different commercial brands of peda (khoa)

The mean  $\pm$  SE values of total solids, fat and protein for different commercial brands of peda (khoa) are presented in Table 2.

### Total solids (%) in peda (khoa)

The total solids values (%) of different commercial brands of peda (khoa) i.e. P1, P2, P3, P4, P5 and P6 are 79.89  $\pm$  0.92, 80.98 $\pm$ 1.23, 71.68  $\pm$ 0.74, 78.63  $\pm$ 0.77, 83.48 $\pm$ 2.34 and 80.07  $\pm$ 1.16, respectively. There was a highly significant ( $P \leq 0.01$ )

difference between the different commercial brands of peda (khoa) whereas no significant difference was observed between P1, P2 and P6. Similar values for total solids were reported by Kumar and Srinivasan (1982) <sup>[11]</sup>, Kurand *et al.* (2011) <sup>[12]</sup>, Kakade *et al.* (2013) <sup>[10]</sup> and Gate *et al.* (2014) <sup>[6]</sup>, while Gavhane *et al.* (2014) <sup>[7]</sup> recorded total solids level of 81.62 % in peda prepared by using buffalo milk and Banjare *et al.* (2015a) <sup>[4]</sup> recorded values which ranged from 76.67% to 87.78%. All the samples of peda (khoa) recorded total solid values higher than those prescribed by FSSAI (55%) for khoa. As sugar is added to khoa for preparation of peda, the total solids content are bound to be higher than those prescribed for khoa by the FSSAI.

#### Fat (%) in peda (khoa)

The fat values (%) of different commercial brands of peda (khoa) i.e. P1, P2, P3, P4, P5 and P6 are  $11.87 \pm 0.31$ ,  $17.02 \pm 1.43$ ,  $19.94 \pm 0.93$ ,  $14.86 \pm 0.54$ ,  $9.86 \pm 0.78$  and  $12.00 \pm 0.88$ , respectively. There was a highly significant ( $P \le 0.01$ ) difference between the different commercial brands of peda (khoa) whereas, no significant difference was observed between P1, P5 and P6; P2 and P4. As per FSSAI the minimum fat percentage in khoa should be 37 % on dry matter basis. In this study, none of the samples of peda were in tune with the minimum requirement.

Londhe *et al.* (2012) <sup>[14]</sup> recorded a fat percentage of 16.15 g /100g in brown peda samples, while Gavhane *et al.* (2014) <sup>[7]</sup> recorded fat level of 18.40 % in peda prepared by using buffalo milk and Jha *et al.* (2014) <sup>[9]</sup> recorded 18.5 %, which were generally higher than the values obtained in this study (except for brand 3). Similarly Shinde *et al.* (2015) <sup>[15]</sup> reported 21.11 % and Gotarne *et al.* (2015) <sup>[8]</sup> recorded fat values of 19.11 % in peda samples prepared in laboratory. Banjare *et al.* (2015a) <sup>[4]</sup> analysed the fat content of laboratory and market peda marketed in Raipur city and recorded values which varied widely from 12.26% to 22.58%.

# Protein (%) in peda (khoa)

The protein values (%) of different commercial brands of peda (khoa) i.e. P1, P2, P3, P4, P5 and P6 are  $10.37 \pm 0.41$ ,  $12.29 \pm 0.44$ ,  $13.47 \pm 0.08$ ,  $10.97 \pm 0.10$ ,  $9.52 \pm 0.34$  and  $10.62 \pm 0.26$ , respectively. Statistical analysis revealed highly significant ( $P \leq 0.01$ ) difference between the different commercial brands of peda (khoa) whereas no significant difference was observed between P4 and P6. Standards with respect to protein percentage have not been fixed. However, from a nutritional point of view, the samples would deem to have sufficient protein percentage.

Table 2: Chemical attributes of six different commercial brands of peda (Mean  $\pm$  S.E.)<sup>@</sup>

Brand	P1	P2	P3	P4	P5	P6	F Value
Total Solids	$79.89^{ab}\pm0.92$	80.98 <sup>ab</sup> ±1.23	71.68 <sup>c</sup> ±0.74	78.63 <sup>b</sup> ±0.77	$83.48^{a}\pm2.34$	$80.07^{ab}\pm1.16$	9.17**
Fat	11.87 ° ±0.31	17.02 <sup>b</sup> ±1.43	19.94 <sup>a</sup> ±0.93	$14.86^{b} \pm 0.54$	9.86 <sup>c</sup> ±0.78	12.00 <sup>c</sup> ±0.88	17.90**
Protein	10.37 <sup>cd</sup> ±0.41	12.29 <sup>b</sup> ±0.44	13.47 <sup>a</sup> ±0.08	10.97° ±0.10	$9.52^{d} \pm 0.34$	10.62° ±0.26	21.56**
Acidity	0.46 <sup>b</sup> ±0.09	0.35 ° ±0.01	0.56 <sup>a</sup> ±0.03	$0.40^{\circ} \pm 0.02$	$0.54^{a}\pm0.01$	0.46 <sup>b</sup> ±0.02	16.53**

<sup>@</sup>Average of six replicates

\*\*different superscripts in a row differ highly significantly ( $P \le 0.01$ )

P1 denotes peda sample from organized sector 1

P2 denotes peda sample from organized sector 2

P3 denotes peda sample from private sector 1

Londhe et al. (2012)  $^{[14]}$  reported a protein value of 12.56 g /100g in brown peda samples while Jha et al. (2014)  $^{[9]}$ 

P4 denotes peda sample from private sector 2 P5 denotes peda sample from private sector 3 P6 denotes peda sample from private sector 4

recorded protein values of lal peda as 17.2 %. Gavhane *et al.* (2014) <sup>[7]</sup> recorded protein level of 14.57 % in peda prepared

by using buffalo milk, which were higher than the values reported in the study. Similarly Shinde *et al.* (2015) <sup>[15]</sup> and Gotarne *et al.* (2015) <sup>[8]</sup> recorded protein values of 15.70 % and 15.21% in laboratory sample of peda, respectively.

# Acidity (%) in peda (khoa)

The values of acidity (% lactic acid) of different commercial brands of peda (khoa) i.e. P1, P2, P3, P4, P5 and P6 are 0.46  $\pm$  0.00, 0.35  $\pm$  0.01, 0.56  $\pm$  0.03, 0.40  $\pm$  0.02, 0.54  $\pm$  0.01 and 0.46  $\pm$  0.02, respectively. The results revealed highly significant ( $P \leq 0.01$ ) difference between the different commercial brands of peda (khoa) whereas no significant difference was observed between P1, and P6; P2 and P4; P3 and P5. This result was in tune with the results obtained by Kumar and Srinivasan (1982)<sup>[11]</sup>, Kurand *et al.* (2011)<sup>[12]</sup> and Banjare *et al.* (2015a)<sup>[4]</sup> while Bajaj *et al.* (2013)<sup>[2]</sup> reported acidity values that ranged from 0.24% to 0.87% in market samples. Wanjari *et.al.* (2016)<sup>[17]</sup> reported a titrable acidity average which did not vary widely and ranged from 0.68 to 0.70 % in east, west, north and south region of Bhandara district respectively.

With respect to the chemical attributes, though FSSAI has not specified specific norms for peda, the values fixed for khoa, were not met by any of the brands with respect to fat percentage. As regards the total solids content, all the brands surpassed the limits fixed by FSSAI, while the acidity levels were well within the maximum limits (0.9%). Peda (khoa) samples are kept in trays and sold to the public, depending on the requirement or need. As specific values are not fixed with respect to this sweet prepared from khoa, the chemical composition / other factors like date of manufacture, best before etc., are not available. Therefore there is a wide variation in the chemical composition between the different brands of peda. The reason for variation could also be attributed to the source of milk, the quantity of sugar added; the procedure adopted by the manufacturer and the addition of permitted dairy products such as skim milk powder etc.

#### Conclusion

The different types of peda samples collected from different areas of Chennai, showed wide variation in their physicochemical and sensory profile. This may be due to the variation in their method of preparation. The fat percentage of all the samples was lower than the FSSAI norms (minimum of 37%) fixed for khoa. Hence, continuous monitoring and stringent measures need to be taken by approved regulatory authorities.

#### References

- Amerine MA, Pangborn RM, Roessler EB. Principles of Sensory Evaluation of Food. Academic Press, New York, 1965, 602.
- 2. Bajaj SJ, Deshmukh YD, Shirfule AL, Deshmukh KP, Satav PD. Quality assessment of khoa marketed in Nanded city. International Journal of Green and Herbal Chemistry. 2013; 2(3):660-664.
- 3. Bandekar J, Kamat A, Thomas P. Microbiological quality of the dairy product pedha and its improvement using gamma radiation. J. food saf. 1998; 18:221-230.
- 4. Banjare K, Kumar M, Goel BK, Uprit S. Studies on chemical, textural and sensory characteristics of market and laboratory peda samples manufactured in Raipur city of Chhattisgarh. Oriental Journal of Chemistry. 2015; 31(1):231-238.
- 5. FSSAI- Manual of methods of analysis of foods- Milk and milk products, 2015, 59, 61, 82, 96 and 97.

- Gate KD, Ingole AS, Zinjarde RM, Gubbawar SG, Achat GB. Chemical study of khoa sold in Wardha city (MS). India. J. Soils and Crops. 2014; 24(1):165-168.
- Gavhane MS, Kamble NS, Desale RJ, Ghule BK, Mule PR. Studies on preparation of peda with ginger powder. Int. J. Food Agric. Vet. Sci. 2014; 4(2):64-68.
- Gotarne RR, Londhe GK, Korake RL. Optimization of levels of date powder and sugar in brown dates peda by response surface methodology. Animal Science Reporter. 2015; 9(3):95-104.
- Jha A, Kumar A, Jain P, Om H, Singh R, Bunkar DS. Physico- chemical and sensory changes during the storage of lal peda. J. Food Sci Technol. 2014; 51(6):1173-1178.
- Kakade NB, Atkare VG, Kute SR, Humane NN, Ingle PN. Physico-chemical study of khoa sold in Nagpur city. J. Soils and Crops. 2013; 23(1):111-115.
- 11. Kumar G, Srinivasan MR. A comparative study on the chemical quality of three types of khoa. Indian J. Dairy Sci. 1982; 35(1):56-61.
- Kurand MS, Shelke RR, Gubbawar SG and Nage SP. Quality of khoa sold in Washim district. Food Sci. Res. J. 2011; 2(2):200-204.
- 13. Londhe G, Pal D. Development in shelf life extension of *khoa* based sweets- an overview. Indian J. Dairy and Biosci. 2007; 18:1-9.
- 14. Londhe G, Pal D, Raju PN. Effect of packaging techniques on shelf life of brown *peda*, a milk-based confection. LWT-Food Sci. technol. 2012; 47:117-125.
- 15. Shinde AT, Lingayat NT, Jadhav BA, Korake RL. Effect of wheat bran on chemical composition and textural profile of peda. Asian J. Dairy Food Res. 2015; 34(3):193-197.
- Snedecor GW, Cochran WG. Statistical methods. 8<sup>th</sup> Edition, Oxford and IBH Publishing Co., Calcutta, 1994.
- Wanjari BS, Gubbawar SG, Asekar SS, Sardare SS, Jadhav GN. Chemical quality of khoa sold in Bhandara district. International Journal of Researches in Biosciences, Agriculture and Technology. 2016; 4(2):1-3.