Characterization of *Mohanthal* – A traditional sweet from Gujarat, India

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Abstract: *Mohanthal* is a popular sweet consumed in Gujarat state of India. In order to characterize the typical attributes of this traditional sweet, samples were collected from Ahmedabad, Anand, Vadodara and Palanpur cities of Gujarat and evaluated for sensory, physico-chemical, textural and microbiological characteristics. Wide variations in the composition of the market samples were found to exist. Moisture, fat, protein, lactose, sucrose, ash, other carbohydrates and free fatty acid contents of the market samples were in the range of 8.64-13.86, 18.21-28.12, 8.27-13.00, 0.00-12.10, 19.00-29.56, 0.81-1.81, 17.61-32.95% and 0.85-1.56 % (oleic acid). Microbial analysis showed moderate standard plate counts (SPC) 3.0 – 4.0 log(cfu/g) and yeast and mould counts 1.0 – 2.3 log(cfu/g) in market samples of *Mohanthal*. Sensory attributes of highly preferred *Mohanthal* sample were: light brown to medium brown colour with rectangular shape, soft, cohesive and firm body with little crumbliness, small grains preferred over smooth texture, pleasant, nutty, roasted and caramelized flavor with rich ghee flavour. There is a need for further study to optimize a process for the preparation of *Mohanthal* so that dairy industry can produce this besan and milk solids based sweet on a large scale. This overall characterization of *Mohanthal* will also help in any further works to be taken up on *Mohanthal* for example cottage level manufacture, mechanization, setting of standards etc.

Keywords: *Mohanthal*, Characterisation, Gujarat, Market survey, Traditional sweet, Composition, Textural characteristics

Introduction

India is a country known for its rich cultural heritage of various social and historical aspects including food and cuisines. It is a home to hundreds of varieties of sweetmeats on whose taste generations of people grew up. Many of traditional products find mention in oldest relics, which are popular even today (Pagote and Rao, 2012). Naturally, such sweet items have embedded in the psyche of the people here and continue to do so even in Indian diaspora abroad. But many of them could not withstand the onslaught of western products' publicity and became overshadowed so much so, that recent and present generations are blissfully unaware that so many varieties of sweets indeed existed in earlier years! It is only recently that the government realized the need to survey and document Indian traditional products, otherwise these products might be lost forever. Further, documentation of such products creates awareness among people in other parts of the country and may spur their commercial production as well. As such, Government of India lays emphasis on promoting indigenous technologies and encourages patent protection. It is in this direction that Indian Council of Agricultural Research has mandated Institutes to survey and characterize traditional Indian dairy products and National Dairy Research Institute is a part of such nationwide endeavour. This is possible by techniques like survey works, which were used by many workers earlier to characterize products like basundi, khoa, sweets etc. Such studies help to define the typical characteristics of products and will be of immense help in patenting processes. These results will serve as a base platform for the future works on the product. Also, the industry may think of manufacturing and marketing the traditional products because of their consumer appeal.

During our survey, we observed that traditional sweetmeats are basically prepared using three or four base materials such as milk, cereal flours, wheat/legumes particularly Bengal gram (*Cicer arietinum*) and fat. Using the above ingredients, the sweetmeat manufacturers are able to provide large variety of sweetmeats in

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the market place with their inherited art/skill and effective subtle changes in processing conditions. For example, the products like Laddu, Sohn papri, Mysore pak, *Mohanthal* and *Besan* burfi prepared using Bengal gram flour (*besan*) have similar ingredients, but the textures of these products are entirely different. Several of these region-specific traditional dairy products have been surveyed, characterized and documented. Mysore pak was launched by Karnataka Milk Federation and today it is one of the major revenue earners for the organization. In spite of such efforts, many products still remain unknown to other parts of the country. There is a need to document and preserve such traditional products. Several products have their origin in specific areas like Mysore pak (Mysore), Dharwad peda (Dharwad), Mathura peda (Mathura), kunda (Belgaum), basundi, khoa jalebi and shrikhand (Maharashtra), payasam (Karnataka and Kerala) etc. *Mohanthal* is one such region specific milk sweet.

Mohanthal is a traditional sweet product popular in Gujarat and some parts of Rajasthan. Mohan refers to 'Lord Krishna' and Thal refers to 'thali or plate'. *Mohanthal* is offered to Lord Krishna at various festivals. It is also a favourite at weddings. *Mohanthal* may be categorized under 'Cereal and pulses based dairy product'. Other Cereal and pulses based dairy products are: Mysore pak, doda burfi, pinni, kheer, payasam, halwasan etc. The history of *Mohanthal* origin is obscure and only a few scattered literatures are available related to *Mohanthal*. Traditionally *Mohanthal* is prepared at house hold levels and also by *halwai's*. It is observed on the basis of preliminary observations that the product *Mohanthal* is famous for its rich pleasant roasted flavor along with the rich ghee aroma. It is marketed in the form of small rectangular shaped pieces. The product showed wide variation from shop to shop. *Mohanthal* produced and marketed by local *halwai's* has a limited shelf life of 1-2 weeks.

Materials and Methods

Procurement of *Mohanthal* samples

Mohanthal is prepared in many households in Gujarat. It is also being sold in various sweet shop outlets in towns and cities. Based on survey work, and through various sources and media, well known manufacturers of *Mohanthal* were identified for the study. In all sixteen samples of *Mohanthal* were procured from selected cities namely Ahmedabad (C-1), Anand (C-2), Vadodara (C-3) and Palanpur (C-4). Four samples of *Moahnthal* from reputed manufacturers from each city were collected. As good number of product manufacturing units was present in these cities, they were able to meet local market demand as well as supply the product to nearby regions too. A few selected samples from well-known manufacturers were brought to Southern Regional Station of ICAR-NDRI in their packaging containers and evaluated for sensory, textural, microbial and physico-chemical parameters.

Sensory evaluation

Sensory evaluation of the procured *Mohanthal* samples was carried out by semi-trained faculty of Dairy Technology Section of the institute using 9-point hedonic scale and descriptive sensory evaluation technique, in hygienic and well ventilated laboratory. The judges were asked to evaluate and describe various product attributes viz. colour and appearance, flavour, body and texture, sweetness and overall acceptability.

Analytical

Texture profile

Texture profile analysis of the samples of *Mohanthal* was carried out using Texture Analyzer, TA-XT plus Stable Micro System, England (Bourne, 1975). The instrumental test protocols maintained were: Option: return to start; Test mode : compression; Pre-test speed: 1 mm/s; Test speed : 5 mm/s; Post-test speed: 5 mm/s; Target mode : Distance; Distance: 10 mm; Time : 5 sec; Trigger type: Auto (Force); Trigger force : 5 g; Break Mode : Off; Advanced option: ON; Probe: P/75 plunger probe

Mohanthal sample, gently patted into cubes of 20 x 20 x 20 mm and tempered at 30°C for about an hour, was kept positioned centrally over the platform of Texture Analyser and the computer was allowed to execute the program to run the test, then the sample was compressed (50% compression) by the plunger twice (resembling two bites) and the force exerted back by the sample onto the plunger was sensed by the machine generating a two peak force – time curve. Different textural parameters like hardness (Newtons), cohesiveness (no units), spinginess (no units), gumminess (Newtons), and chewiness (Newtons) were computed from the force-time graph as described by Patel and Rao (2013).

Proximate composition

The market samples of *Mohanthal* were thoroughly mixed using pestle and mortar and the homogeneous mass was used for all the analyses. The nuts embedded on the surface as well as silver coating, if any were carefully removed before grinding. The following physico-chemical estimations were made by the methods mentioned: moisture content-gravimetric method (BIS, 1981), fat content-Mojonnier method (AOAC, 2005), ash content - gravimetric method (AOAC, 2005), total protein - Kjeldahl method (AOAC, 2005), lactose and sucrose - volumetric method (BIS, 1981), and other carbohydrates- by difference, FFA – Thomas et al. (1954).

Colour

The properly mixed sample of *Mohanthal* was stuffed into scratchless petriplate (Diameter: 3 cm) and the bottom surface exposed to scanner (Hewlett-Packard Scan jet 5370c). The scanned image was opened in Adobe Photoshop and colour parameters

measured as described by and Vyawahare and Rao (2011). Browning Index (BI), Yellowness Index (YI) and Whiteness Index (WI) were computed as described by Yam and Papadakis (2004).

Microbiological

All the market samples of *Mohanthal* were analyzed for standard plate count (SPC) and yeast and mould count by BIS (1981) method (pour plate method).

Statistical

The data of various attributes of sixteen *Mohanthal* samples from different markets were statistically analyzed employing one way ANOVA along with Tukey test using SPSS software, to know the variations in samples between markets.

Results and Discussion

The market samples collected from different cities are shown in Fig.1 and their sensory descriptions are given in Table 1. It may be seen that many samples are mixed and garnished with nuts. Natural colour of *Mohanthal* was observed to be light to medium

brown, however, added colour and silver foil coatings are adopted by some manufacturers for consumer appeal. As a traditional practice as well as for typical body and textural attribute, *Mohanthal* is always sold in rectangular or cubical shaped.

Chemical composition of *Mohanthal*

The fat content of *Mohanthal* collected from different markets varied from 18.21 – 28.12% (Table 2), with an average for all markets of 23.74%, and statistical analysis indicated a significant variation between the markets. All other constituents also varied significantly ($P < 0.05$), the protein content ranging from 8.27 – 13.00, lactose 0.00 – 12.10, sucrose 19.00 – 29.56, moisture 8.64 – 13.86 and ash 0.81 – 1.81, % respectively. These variations in the samples from market to market could be attributed to the following reasons: 1) *halwais* use *besan* of different ages; as per *halwais*, fresh *besan* gives different texture and taste than stored one 2) use of milk solids other than skim milk powder and khoa 3) extent of roasting is arbitrary and manually controlled depending on the time availability and personal preferences; 4) sugar syrup concentration varies, because sugar and water are not weighed properly and used in arbitrary quantities. It is also boiled for

Table 1 Descriptive sensory characteristics of market samples of *Mohanthal* collected from different markets

Sensory attributes	markets			
	C-1	C-2	C-3	C-4
Colour and appearance	Light orange; brown to dark brown in colour, garnished with almonds & pista etc.	Light yellow to reddish brown colour, smooth to granular appearance, coated with few pieces of nuts	Golden yellowish to dark brown in colour, garnished with nuts & silver foils	Light yellow to brown in colour, smooth appearance, no garnishing
Body and texture	Soft & slightly chewy body, cohesive, smooth to slightly grainy texture	Slightly soft to hard body, moist to dry, slightly granular & crumbly	Slightly soft to hard, brittle & crumbly body	Smooth to slightly granular texture dry, hard, brittle & crumbly body
Flavour	Pleasant, cooked to caramelized, ghee flavor, less raw <i>besan</i> flavor Compare to other	Good, nutty & caramelized, ghee flavor	Raw <i>besan</i> flavor to ghee flavor, lacks in typical caramel flavor	Raw <i>besan</i> flavor to cooked roasted ghee flavor
Sweetness	Slightly less to optimum sweet	Optimum to slightly more sweet	Slightly less to optimum sweet	Optimum to slightly more sweet
Overall acceptability	Most Preferred (1 st Rank)	(2 nd Rank)	(3 rd Rank)	Least Preferred (4 th Rank)

Fig. 1 Market Samples of *Mohanthal* from different cities of Gujarat

such times as per convenience and 5) Use of other optional ingredients like nuts.

The variation in the moisture content of *Mohanthal* among manufacturers within a particular city may be due to the difference in their manufacturing techniques, sugar syrup concentration and the marketing requirements. The lower or higher moisture content may also be responsible for its higher or lower storage life. The fat content obtained in *Mohanthal* was comparable to the fat content found in the various other heat desiccated dairy products such as peda (Patel and Gandhi 1980; Vijayakhader and Patel 1983; Miyani 1988; Patel 1996; Ray et al. 2002), burfi (Rastogi et al. 1966; Miyani et al. 1982; Garg and Mandokhot 1987), kalakand (Moulick et al. 1996), kunda (Kulkarni et al. 2001) and milk cake

(Madhava Rao et al. 2003; Kumar et al. 2016) the values ranging from 3.3-28.54 %. During analysis of market samples of *Mohanthal* for lactose, it was found that some of the samples did not contain any lactose or had in it in very minor level which was not easily detectable. This may be due to the reason that milk or khoa was not used in those samples because milk solids are the only source of lactose in nature (Nickerson, 1974). But in a few samples, lactose was found very high, around 12.10%, which indicates that skim milk powder may have been used. The 'other carbohydrates' content of *Mohanthal* mainly comes from bengal gram flour (*besan*), which is one of the major ingredients of *Mohanthal*. Free fatty acids (FFA) are the measure of the fatty acids liberated from the triglycerides due to fat degradation occurring in the product prior to or after manufacturing. It is responsible for the

Table 2 Chemical composition* of *Mohanthal* collected from different markets

Constituent	Markets				Range for all markets, n=16	Average of all markets
	C-1	C-2	C-3	C-4		
Moisture (%)	12.22±0.98 ^d	9.98±0.80 ^b	10.99±0.54 ^c	9.25±0.51 ^a	8.64-13.86	10.61±1.33
Fat (%)	25.70±2.04 ^c	24.66±3.15 ^{bc}	22.77±2.47 ^{ab}	21.80±3.35 ^a	18.21-28.12	23.74±3.17
Protein (%)	9.53±1.72 ^{ab}	10.47±1.15 ^{bc}	9.21±0.82 ^a	11.02±1.33 ^c	8.27-13.00	10.05±1.47
Sugar (%)	22.13±2.27 ^a	26.35±2.27 ^c	24.41±2.09 ^b	27.62±1.33 ^c	19.00-29.56	25.13±2.89
Lactose (%)	1.45±2.63 ^{ab}	0.00±0.00 ^a	3.95±4.37 ^b	4.50±5.14 ^c	0.00-12.1	2.48±4.05
Ash (%)	1.11±0.18 ^a	1.44±0.28 ^b	1.25±0.36 ^{ab}	1.40±0.20 ^b	0.81-1.81	1.29±0.29
Other	27.85±2.80 ^a	27.11±3.76 ^a	27.44±4.69 ^a	24.41±6.78 ^a	17.61-32.95	26.69±4.85
Carbohydrates (%)						
FFA (% oleic acid)	1.14±0.22 ^{ab}	1.09±0.07 ^a	1.27±0.19 ^b	1.13±0.20 ^{ab}	0.85-1.56	1.16±0.18
pH	6.47±0.04 ^b	6.42±0.04 ^{ab}	6.38±0.10 ^a	6.39±0.10 ^a	6.25-6.53	6.41±0.08

Values in a row with different superscripts are significantly different between markets (cities) at $p \leq 0.05$, *mean values $\pm$ SE, n=4

Table 3 Textural characteristics* of *Mohanthal* collected from different markets

Textural Characteristics	Markets				Range for all markets, n=16	Average of all markets
	C-1	C-2	C-3	C-4		
Hardness (N)	4.64±0.56 ^a	10.40±1.84 ^b	9.17±1.25 ^b	14.63±3.49 ^c	3.44-20.24	9.71±4.18
Cohesiveness	0.132±0.020 ^b	0.071±0.014 ^a	0.140±0.022 ^b	0.077±0.008 ^a	0.051-0.178	0.105±0.035
Springiness	0.203±0.021 ^a	0.225±0.015 ^b	0.200±0.017 ^a	0.197±0.031 ^a	0.158-0.265	0.206±0.020
Gumminess (N)	0.610±0.095 ^a	0.720±0.105 ^a	1.274±0.184 ^b	1.127±0.318 ^b	0.464-1.562	0.932±0.328
Chewiness (N)	0.123±0.021 ^a	0.161±0.023 ^b	0.256±0.046 ^d	0.215±0.042 ^c	0.088-0.325	0.188±0.057

Values in a row with different superscripts are significantly different between markets (cities) at $p \leq 0.05$

*mean values $\pm$ SE, n=4

development of rancidity during storage. The pH of all the market samples ranged from 6.25 to 6.53. The highest pH was found in C-1 market samples, which was significantly ($p \leq 0.05$) higher than C-3 and C-4 market samples. There was significant ($p \leq 0.05$) difference found among samples from same market (Table 2).

Textural characteristics of *Mohanthal*

The instrumental textural attributes varied widely depending on the market as well as the manufacturer. Hardness of *Mohanthal* varied from 3.44 – 20.24 N and cohesiveness from 0.051 – 0.178 (Table 3). The variations in the textural attributes are indicated by standard error values. The least hardness was observed in C-1 (Ahmedabad samples) (4.64 N) and the highest in C-4 (Palanpur samples) (14.63 N). It was noticed that cohesiveness, springiness, gumminess and chewiness values were much less than those of other similar dairy products (Chawla et al. 2011). This can be attributed to the presence of roasted *besan* particles. Raw *besan* particles have a very good water binding ability and strength, but on roasting, they lose the water binding, hence impart typical brittleness desirable to *Mohanthal* coupled with presence of sugar (Wani and Kumar, 2014). The variation in hardness may be ascribed to the variation in moisture, fat and total sugar content of the samples. Samples of C-1 city contained maximum amount of moisture and maximum amount of fat amongst others and could

probably be correlated with minimum hardness. During TPA testing procedure, after first bite of TPA, *Mohanthal* lost its original shape and texture and became little bit floury, which shows brittle nature of the product and lower cohesiveness value in C-2 and C-4 samples.

Sensory and physico-chemical characteristics of *Mohanthal*

Mohanthal is generally rectangular or cubical in shape with a thickness of about 2.0-3.0 cm. It resembles 'coloured' burfi sold in the market, but with a higher thickness. The colour is light brown to medium brown. This of course depends on the extent and uniformity of roasting during manufacture. When cut, it could be found that the interior of the pieces was uniformly brown. The colour was measured instrumentally in terms of Browning Index (BI), Yellowness Index (YI) and Whiteness Index (WI) all of which are related inversely with each other. Higher BI values indicated more brown colour caused by roasting of *besan* during manufacture and resulted in lower WI values. However, YI values have more to do with added colour. Further, added colour might decrease WI values. But, interestingly consumers still like added colours because of more visual appeal. The body of *Mohanthal* is firm, but slightly brittle, crumbling when pressed hard. However, because of roasted *besan*, the body is grainy thus imparting chewiness in mouth. The taste of *Mohanthal* is pleasantly sweet, slightly caramelized and has typical roasted *besan* flavour. There

was not much variation in the flavor of *Mohanthal* collected from different markets, but those brought from C-1 (Ahmedabad) had better quality.

Thus, the sensory attributes of *Mohanthal* were found to be typical of the product and had profound effect on the consumers' preference. These attributes are the result of compositional constituents and the processing methodology employed during manufacturing. All the market samples were more or less well accepted by judges, but some samples were more acceptable than others because of typical *Mohanthal* characteristics. The average colour and appearance, flavour, body and texture, sweetness and overall acceptance scores were: 8.01 ± 0.31 , 7.81 ± 0.44 , 7.75 ± 0.31 , 8.13 ± 0.14 and 7.84 ± 0.31 , respectively. All the colour and appearance values for the samples collected from different cities showed significant ($p \leq 0.05$) difference between cities (Table 2).

The wide range in values of colour and appearance score of samples collected from each city clearly revealed manufacturer to manufacturer variation. This may be due to lack of proper care during preparation, wide variations in ingredients, use of different type of garnishing and colouring materials and also poor packaging materials. In the present study, some of the observations were also described by sensory judges which included light yellow orange to dark brown colour, smooth to

granular appearance and no garnishing to well garnished with nuts and silver foil coat (Table 1). Similar variations were reported by Patel (1996) for market peda and Londhe (2006) for brown *peda* and Anon. (2006) for kunda. The variation in colour and appearance score of samples collected from each city was also attributed to level of ghee, sugar addition and moisture content of the product.

The wide range in values of body and texture score of samples collected from each city could be mainly ascribed to variation in moisture and fat contents. In the present study, judges described *Mohanthal* as having moist and soft to hard and dry, cohesive to brittle and crumbly body with small to medium grains and granular texture. All the flavor scores obtained for the samples collected from different cities showed significant ($p \leq 0.05$) difference (Table 5). The highest and lowest mean scores 8.35 and 7.46 were obtained from C-1 and C-4 cities, which were significantly ($p \leq 0.05$) different from other three cities, while mean score of C-2 and C-3 didn't show any difference. The wide range in values of flavour score of samples collected from each city clearly revealed shop to shop variation. This may be due to variation in preparation method and composition of the ingredients, particularly, *besan*, ghee and sugar levels in the final product. In the present study, some of the observations were also described by sensory judges, which included pleasant roasted ghee with caramelized and nutty flavour with added

Table 4 Colour parameters* of *Mohanthal* collected from different markets

Colour Parameters	Markets					Average of all markets
	C-1	C-2	C-3	C-4	Range for all markets, n=16	
Browning Index	186.82 ± 6.60^{ab}	185.54 ± 30.51^{ab}	189.81 ± 9.47^b	169.66 ± 26.85^a	140.00-222.00	182.96 ± 22.40
Yellowness Index	126.95 ± 5.05^b	126.41 ± 12.38^b	125.43 ± 3.48^{ab}	118.74 ± 10.43^a	107.00-139.60	124.38 ± 9.21
Whiteness Index	30.58 ± 1.12^{ab}	31.47 ± 3.72^{ab}	29.66 ± 1.83^a	32.89 ± 4.09^b	27.00-37.33	31.15 ± 3.17

Values in a row with different superscripts are significantly different between markets (cities) at $p \leq 0.05$; Colour parameters measured by computer vision *mean values $\pm$ SE, n=4

Table 5 Sensory acceptance scores* of *Mohanthal* collected from different markets

Sensory attributes	Markets				Range for all markets, n=16	Average of all markets
	C-1	C-2	C-3	C-4		
Colour and appearance	8.34 ± 0.30^c	8.06 ± 0.42^b	7.95 ± 0.42^b	7.69 ± 0.47^a	6.75-8.75	8.01 ± 0.31
Body and texture	8.08 ± 0.23^b	7.69 ± 0.42^a	7.74 ± 0.25^a	7.60 ± 0.36^a	6.75-8.50	7.75 ± 0.31
Flavour	8.35 ± 0.30^c	7.72 ± 0.39^b	7.73 ± 0.29^b	7.46 ± 0.42^a	6.75-9.00	7.81 ± 0.44
Sweetness	8.17 ± 0.20^b	7.99 ± 0.27^a	8.23 ± 0.21^b	8.13 ± 0.29^{ab}	7.75-8.50	8.13 ± 0.14
Overall acceptability	8.19 ± 0.18^c	7.80 ± 0.25^b	7.83 ± 0.33^b	7.54 ± 0.32^a	6.75-8.50	7.84 ± 0.31

Values in a row with different superscripts are significantly different between markets (cities) at $p \leq 0.05$

*mean values $\pm$ SE; maximum, 9.0, n=4

Fig.2 Flow chart of manufacture method of *Mohanthal* **Table 6** Microbiological counts* of market samples of *Mohanthal* collected from different cities of Gujarat

Microbial Count log(cfu/g)	Markets				Range for all markets, n=16	Average of all markets
	C-1	C-2	C-3	C-4		
Standard Plate Count	3.75±0.18 ^a	3.72±0.10 ^a	3.72±0.33 ^a	3.96±0.04 ^b	3.00-4.00	3.79±0.21
Yeast and Mould Count	1.83±0.11 ^a	1.96±0.21 ^a	1.86±0.39 ^a	1.96±0.22 ^a	1.00-2.30	1.90±0.18

Values in a row with different superscripts are significantly different between markets (cities) at $p \leq 0.05$, *mean values $\pm$ SE, n=4

cardamom. In some samples, raw *besan* flavor was also observed which was liked least. From overall acceptability scores, it was clearly revealed that city C-1 samples were better in comparison to other 3 cities in sensory attributes.

Ideal characteristics of *Mohanthal*

Sensory attributes of highly preferred *Mohanthal* sample include light brown to medium brown colour, soft bodied but enough firmer and cohesive to cut in rectangular pieces, holding its shape without becoming floury, and small *besan* grains preferred over smooth texture. It must have pleasant, nutty, roasted and caramelized flavor with ghee flavour but raw *besan* flavour is not preferable. Garnishing with nuts such as almonds and pistachio or addition of saffron, cardamom or nutmegs enhances visual appearance and flavour of product, respectively.

Microbiological quality of *Mohanthal*

All the food products sold in market contain microbes, because microorganisms enter the product at various stages during the processing and manufacture, and through packages from environment, if not packed properly. However, the number of microorganisms depends on the moisture content of the product, because at low water contents, they multiply slowly. In case of

Mohanthal, moisture is low and sugar content is high, so we expect lower counts than other dairy products. The average values for SPC of *Mohanthal* samples collected from C-1, C-2, C-3 and C-4 markets were 3.75, 3.72, 3.72 and 3.96 log(cfu/g), respectively. The highest SPC was found in C-4 (Palanpur). In general, there was significant ($p \leq 0.05$) difference found among samples from the same market (Table 6). Wide variations in SPC counts of market samples of plain peda were reported by earlier workers. Ghodekar et al. (1974), Kamat and Sulebele (1974), Dwarkanath and Srikanta (1977) and Garg and Mandokhot (1987) reported 2×10^3 - 3×10^5 , 6×10^2 - 1×10^7 , 7.6×10^2 - 5×10^3 and 1.1×10^3 - 5.6×10^3 per gm, respectively. The average values for yeast and mould count of *Mohanthal* samples collected from C-1, C-2, C-3 and C-4 markets were 1.83 ± 0.11 , 1.96 ± 0.21 , 1.86 ± 0.39 and 1.96 ± 0.22 log(cfu/g), respectively and the range was from 1.60 - 2.00, 1.60 - 2.30, 1.00 - 2.30 and 1.48 - 2.26 log(cfu/g), respectively. There was no significant ($p > 0.05$) difference in the samples found among the cities (Table 6). However, there was variation found in yeast and mould counts in samples collected from each market. Similar findings have been reported in khoa by Singh et al. (1975) in Mysore pak and kalakand by Dwarkanath and Srikanta (1977) and in burfi by Garg and Mandokhot (1984). Lower SPC and yeast and mould counts were found in all the samples of *Mohanthal* when compared to other traditional dairy products, which may be due to high roasting temperature employed during

Mohanthal preparation as well as low moisture of the product. The SPC and yeast and mould counts found in samples may be due to post processing contamination; unhygienic practices followed by manufacturers, using inappropriate packaging materials and long duration kept between manufacturing and packaging of product.

Ingredients and manufacturing aspects

Based on the survey work, the most common ingredients used for manufacture of *Mohanthal* were found to be *besan*, sugar, ghee and khoa. The critical factor agreed up on by all the *halwais* is the extent of roasting of *besan* during manufacture. *Besan* contains major constituents (17–22%) protein and (50%) carbohydrate (Saleh and Tarek, 2006). Roasting of *besan* releases compounds which provide relishing flavour, however more roasting results in charring of proteins and carbohydrates which may cause slight bitterness (Hodge et al. 1972). However, their proportions varied depending on the manufacturer. The method of preparation is shown in Fig. 2. The ingredients are mixed well till the mixture attains a bread crumb consistency. After proper mixing, the mixture is kept undisturbed for half an hour. This mixture is named *dhraho*. Ghee is taken in a separate vessel and heated till it melts completely. Then *dhraho* is added to the molten ghee and heated till the mixture develops a light brown colour and pleasant roasted flavor. The ghee *besan* mixture is then allowed to cool for some time. Sugar syrup (one thread consistency) is added to the prepared mixture and continuous mixing is done till it attains a semi solid form. Finally, the product is spread on a greased dish and garnished with nuts and cardamom. The product is then allowed to cool by keeping it overnight. Next day, the product is cut into pieces and served.

Conclusions

Mohanthal is a versatile traditional product of Gujarat state with sensory characteristics of its own. Use of pulse flour (*besan*) imparts its typical colour and flavor. The study of market samples of *Mohanthal* showed variations in its quality characteristics and quality of best *Mohanthal* has been described. Presence of SPC, yeast and mold counts in market samples indicated the lack of proper hygienic practices adopted for preparation and handling of the product. Results obtained during the present investigation are of great importance in determination of product quality. To add a new item in the food basket of the global consumers with uniform quality and improved safety, large scale production and marketing of this product can be taken up by organized sector. Consequently, optimization of process parameters will act as a pre-requisite to showcase this product as a typical Indian traditional product in various forums. Based on the results, industry can manufacture *Mohanthal* for commercial activity and popularize the product throughout the country for the benefit of consumers.

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