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Baria Krunal Bhupedrabhai
College of Food Processing Technology and Bio-energy, AAU, Anand, Gujarat, India

Dr. Govind P Tagalpallewar
Associate Professor, College of Agriculture, AAU, Jabugam, Gujarat, India

Kedar Damle
Assistant Professor, College of Food Processing Technology and Bio-energy, AAU, Anand, Gujarat, India

Dr. RB Modi
Associate Professor, College of Food Processing Technology and Bio-energy, AAU, Anand, Gujarat, India

Dr. Akashamrut M Patel
Assistant Professor, College of Food Processing Technology and Bio-energy, AAU, Anand, Gujarat, India

Corresponding Author:
Baria Krunal Bhupedrabhai
College of Food Processing Technology and Bio-energy, AAU, Anand, Gujarat, India

Survey and standardization of recipe for making *Mohanthal* based on market survey

Baria Krunal Bhupedrabhai, Govind P Tagalpallewar, Kedar Damle, RB Modi and Akashamrut M Patel

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Abstract
This study focuses on the standardization of *Mohanthal*, a traditional Indian sweet popular in Gujarat and Rajasthan, through a systematic market survey and sensory-textural evaluation. A comprehensive survey was conducted across seven prominent sweet shops in Anand, Gujarat, to document traditional preparation practices including ingredient usage, roasting parameters, and syrup consistency. Samples collected from each shop (MM_1-MM_7) were evaluated for sensory quality using a nine-point hedonic scale and for texture profile using a Texture Analyzer (TA-XT Plus). The sensory panel assessed attributes such as color, appearance, flavour, texture, and overall acceptability. Among the samples, MM_3 scored highest in overall acceptability and exhibited desirable textural qualities, such as lower hardness and chewiness, suggesting a soft, cohesive, and consumer-preferred structure. Texture Profile Analysis (TPA) revealed significant variations among the samples in parameters like hardness, cohesiveness, springiness, gumminess, and chewiness, which were closely tied to ingredient ratios and process conditions. The findings underscore the need to standardize processing variables to ensure consistent product quality. The study provides valuable insights for artisanal and commercial producers aiming to enhance *Mohanthal*'s sensory and mechanical attributes while preserving its traditional identity.

Keywords: *Mohanthal*, Traditional Indian sweet, Sensory evaluation, Texture profile analysis, Standardization, Gujarat, hedonic scale, Market survey, Food texture, Sweetmeat formulation

Introduction
Food is an integral part of human life. Many of the food items in a diet are included for health purpose and some due to good taste. In India, sweets possess an essential role in diet mostly due to good taste and considered not only for sharing happy moments but also used as traditional offerings to various deities in the country. They are an important part of different festivals and socio-cultural ceremonies. Some sweets are specifically prepared on a particular festival for example, *Gujiya* on Holi, *Sattu* on Shravani Teej, *Rabdi* and *Malpua* on Hariyali Amavasya etc. A wide variability among sweets depicts rich cultural heritage and food diversity spread among several districts in various states of India. Recipe of every sweet is different from, each other either through difference in ingredients or method of preparation. These variations are inculcated traditionally among local people (Jain, 2020) [6]. Traditional sweets are essentially made with three or four essential ingredients: oil, milk, cereal flours, wheat, and legumes, especially Bengal gram (*Cicer arietinum*). With the help of the aforementioned components, sweetmeat producers can offer a wide range of sweetmeats on the market thanks to their inherited talent and experience and their ability to make little, impactful adjustments to the processing environment. For instance, although the ingredients of goods like *Laddu, Sohn papri, Mysore pak, Mohanthal*, and *Besan burfi* all made with Bengal gram flour, or besan are similar, but their textures are very different. A number of these traditional dairy products unique to each region have been described, surveyed, and recorded. *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 flavour 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

Materials

Bengal gram flour (Coarse grinded) and sugar was sourced from the local market in Anand, Gujarat, India. Amul pure ghee (special grade) was used as the fat component.

Market Survey for *Mohanthal* Making Process

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. Visit local *Mohanthal* manufacturer located at Anand city and nearby, observe their production processes and collection of data as per prepared questionnaire. the following parameters will be considered during the survey.

1. Ingredients added in making *Mohanthal*
2. Roasting time
3. Roasting temperature
4. °Brix of syrup

Sensory evaluation

Sensory evaluation of the procured *Mohanthal* samples was carried out by semi-trained faculty of College of Food Processing Technology and Bio-Energy using 9-point hedonic scale and descriptive sensory evaluation technique. The judges were asked to evaluate and describe various product attributes viz. colour and appearance, flavour, body and texture, sweetness and overall acceptability.

Texture profile

Texture profile analysis of the samples of *Mohanthal* was carried out using Texture Analyzer, TA-XT plus Stable Micro System, England (Bourne, 1978) [2]. 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 30oC 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), springiness (no units), gumminess (Newtons), and chewiness (Newtons) were computed from the force-time graph as described.

Results and Discussion

Market survey for *Mohanthal* making process

The comprehensive market survey conducted across seven *Mohanthal* manufacturing shops in and around Anand city, Gujarat, provided detailed insights into the traditional and contemporary methods employed for *Mohanthal* making by these manufacturers. The details of surveyed shops, including Keval Rasoiya Service (Bhavarlal), Mahalakshmi sweet & Farshan Mart, Gopal Sweet & Farshan Mart, Kamal Sweet and Namkeen, Shreeji Sweets and Farshan, Milan Sweets, Gokul Farshan & Sweets, were selected to ensure a diverse representation of *Mohanthal* making practices. A wide array of parameters related to the *Mohanthal* making process includes types of flour used, flour to ghee to milk ratios, roasting time and temperature combinations, and Brix levels of the sugar syrup were captured. The market *Mohanthal* samples from the different shops were coded as MM_1, MM_2, MM_3, MM_4, MM_5, MM_6, and MM_7 during the survey. The various parameters surveyed on the basis of prepared questionnaire was mentioned in the below tables (Table 3.1, Table 3.2, Table 3.3).

Table 1: Parameters used for *Mohanthal* making

Samples Parameters	MM 1	MM 2	MM 3	MM 4	MM 5	MM 6	MM 7
Ratio (Besan: Ghee: Milk)	1:1:0.5	1:0.9:0.5	1:0.6:0.2	1:0.8:0.5	1:1:0.4	1:0.9:0.5	1:0.8:0.4
Mixing Ratio (Besan: Ghee: Milk)	1:0.2:0.2	1:0.2:0.2	1:0.2:0.2	1:0.2:0.2	1:0.25:0.25	1:0.25:0.2	1:0.3:0.2
Roasting temperature (°C)	125-130	130-132	122-125	131-135	125-128	122-127	135-138
Roasting time (min.)	40	42	50	39	41	45	48
Holding time (min.)	30	30	45	20	30	30	30

Table 2: Parameters used for Syrup preparation for *Mohanthal* making

Samples Parameters	MM 1	MM 2	MM 3	MM 4	MM 5	MM 6	MM 7
Ratio (Sugar: Water)	4:1	3:1	2.25:1	2.5:1	2:1	3:1	2:1
Cooing temperature for syrup (°C)	110-113	115-117	108-110	101-110	113-119	105-110	115-123
°Brix of sugar syrup (°Bx)	75	79	74	74.8	78.3	75	74

Table 3: Packaging material used and selling price for the market *Mohanthal*

Packing material used for packing	LPB	LPB	LPB	LPB	LPB	LPB	LPB
Selling price of *Mohanthal* (Rs./kg)	600	600	700	650	780	600	550

LPB = Laminated Paperboard Box

Fig 1: Market Survey of the *Mohanthal* making Process

Standardization of *Mohanthal* Making Process

The study examined the prevailing production practices of *Mohanthal* at the market level through structured observations and interviews with manufacturers using a pre-validated questionnaire. Based on the collected data, seven experimental samples (MM_1 to MM_7) were formulated in the Food Processing Technology (FPT) laboratory using key parameters identified from the survey (refer to Tables 3.1 and 3.2). These samples were prepared for comparative sensory evaluation and Texture Profile Analysis (TPA) with the objective of standardizing the formulation and preparation process of *Mohanthal*. The formulation with the highest overall acceptability score was identified as the optimized recipe. The standardization was based on triplicate sensory evaluations performed by a semi-trained panel using a nine-point hedonic scale. The panellists evaluated key attributes colour and appearance, body and texture, flavour and taste, and overall acceptability expressing preferences on a scale from "dislike extremely" to "like extremely". The results of the sensory evaluation are presented in Table 3.4, providing a clear basis for identifying the most acceptable formulation among the surveyed variants.

Table 4: Sensory scores of the Market *Mohanthal* (MM) Samples

Sample Code	Colour & Appearance	Body & Texture	Flavour & Taste	Overall Acceptability
MM_1	7.50 ± 0.69	7.55 ± 0.76	7.55 ± 0.68	7.20 ± 0.63
MM_2	7.65 ± 0.82	7.65 ± 0.88	7.25 ± 0.79	7.40 ± 0.70
MM_3	8.00 ± 0.82	8.40 ± 0.52	8.00 ± 0.67	8.30 ± 0.48
MM_4	6.80 ± 0.63	7.00 ± 0.67	7.10 ± 0.57	6.80 ± 0.63
MM_5	7.00 ± 0.67	7.40 ± 0.52	7.20 ± 0.63	7.10 ± 0.32
MM_6	7.45 ± 0.50	7.57 ±0.52	7.18 ± 0.33	7.25 ± 0.38
MM_7	7.68 ±0.63	7.81 ± 0.64	7.43 ±0.41	7.49 ± 0.41
SEm±	0.22	0.22	0.19	0.17
CD (0.05)	0.61	0.61	0.54	0.47
CV%	9.22	8.96	8.16	7.14

Results: Each observation is mean ± SD of three replicates (n=3), CD = Critical difference; CV% = coefficient of variance; SEm = Standard error of mean

The sensory evaluation of Market *Mohanthal* (MM) samples (MM_1-MM_7) revealed notable variations across all sensory attributes, including colour and appearance, body and texture, flavour and taste, and overall acceptability score. Among the all samples, MM_3 achieved the highest sensory scores across all parameters, with an overall acceptability of 8.30 ± 0.48, indicating superior sensory quality. MM_7 also performed well, particularly in body and texture (7.81 ± 0.64) and overall acceptability (7.49 ± 0.41), suggesting favourable consumer appeal. In contrast, MM_4 received the lowest scores, particularly for colour and appearance (6.8 ± 0.63) and overall acceptability (6.8 ± 0.63), reflecting comparatively lower sensory performance. The other samples (MM_1, MM_2, MM_5, MM_6) showed moderate acceptability, with scores ranging from 7.10 to 7.40 for overall acceptability. These findings suggest that while most samples met acceptable sensory standards, MM_3 stood out as the most preferred sample, likely due to its balanced and appealing sensory characteristics.

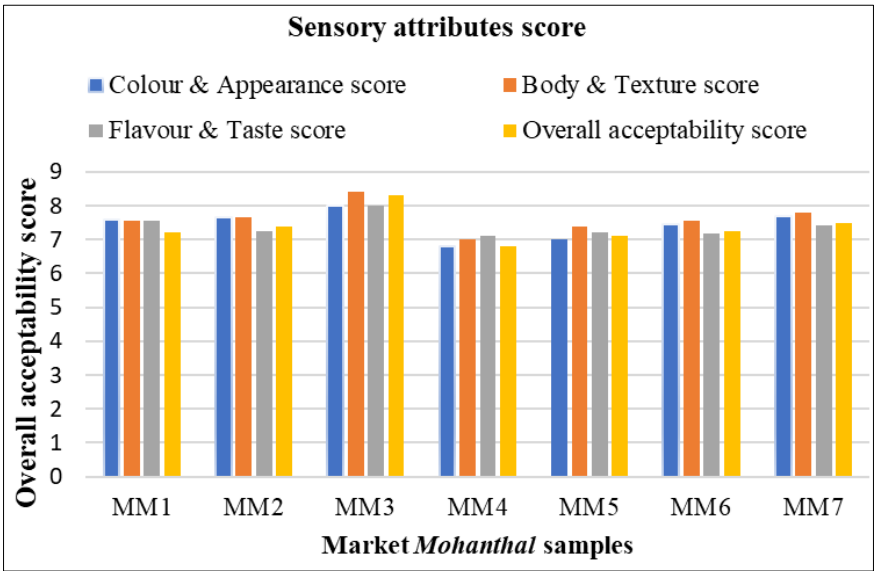

Fig 2: Variation in sensory scores of MM samples

The remaining samples exhibited moderate acceptability. MM_2, MM_6, and MM_7 demonstrated relatively consistent scores, with overall acceptability values of 7.40 ± 0.70, 7.25 ± 0.38, and 7.49 ± 0.41, respectively. Notably, MM_7 showed balanced scores across all parameters and was closer in preference to MM_3. MM_1 and MM_5 had lower mean scores compared to MM_2, MM_6, and MM_7, indicating average sensory performance. This variation in sensory perception may be attributed to differences in ingredient composition, processing techniques, or storage conditions among the market samples. Statistical analysis revealed significant differences among the samples, with the critical difference (CD) at 5% level being 0.6138, 0.6095, 0.5384, and 0.4696 for colour & appearance, body & texture, flavour & taste, and overall acceptability, respectively. The coefficient of variation (CV%) ranged from 7.13% to 9.21%, indicating acceptable consistency in sensory data. The standard error of mean (SEm ±) values was relatively low, ensuring reliability of the scores. Overall, MM_3 emerged as the most acceptable sample, suggesting a favourable formulation and preparation method, which could serve as a benchmark for quality improvement in other market variants of *Mohanthal*. So, based on the sensory evaluation data, MM_3 is considered the best sample due to its highest scores in body and texture, flavour and taste, and overall acceptability attributes. MM_7 is also representing a good score, particularly for colour and appearance attributes. However, the comprehensive performance of MM_3 across all evaluated sensory attributes like body and texture, flavour and taste and overall acceptability score as compare to MM_7 (Fig. 3.2) hence it suggests that the sample MM_3 observed the best quality *Mohanthal* among all other samples. From survey it was found that the process flowchart adopted by shop no. 3

(sample MM_3) for manufacturing of *Mohanthal* is depicted in Fig. 3.3.

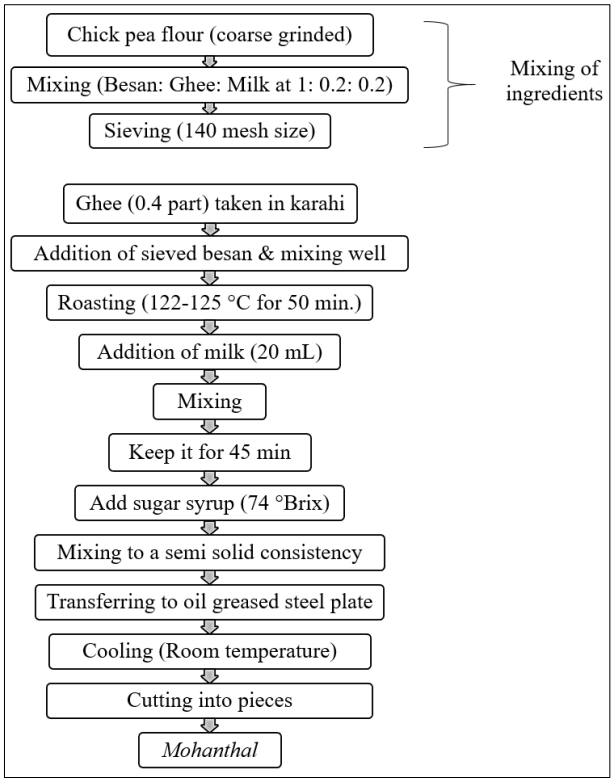

Fig 3: Process flowchart adopted by shop no. 3 for manufacturing of *Mohanthal*

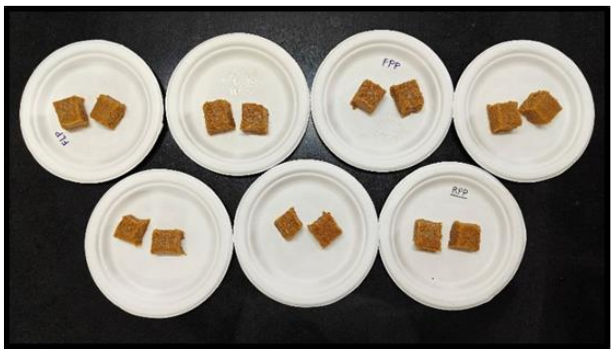

Fig 4: Market prepared *Mohanthal* samples

Textural characteristics of *Mohanthal*

The Texture Profile Analysis (TPA) of Market *Mohanthal* (MM) samples (MM_1 to MM_7) revealed significant variation across all five key textural parameters: hardness, cohesiveness, springiness, gumminess, and chewiness. These differences reflect variations in formulations and processing techniques among different sources. Hardness values ranged from 17.87 ± 0.29 N (MM_3) to 20.80 ± 0.24 N (MM_2), with MM_2 being the firmest, likely due to reduced moisture or higher binding agent content. In contrast, the softer texture of MM_3 may be attributed to higher fat content, which generally reduces structural stiffness (Bourne, 2002) [3]. Cohesiveness varied between 0.53 ± 0.00 in MM_3 and 0.602 ± 0.00 in MM_2, suggesting stronger internal bonding and better ingredient integration in MM_2. Higher cohesiveness is linked to improved structural uniformity and resistance to disintegration (Larmond, 1976; Szczesniak, 2002) [7, 9]. Springiness ranged from 0.62 ± 0.01 in MM_3 to 0.65 ± 0.01 in MM_2 and MM6, indicating good elastic recovery in these samples. This property is typically influenced by the interactions among protein, moisture, and fibre content (Salvador & Fiszman, 2004) [8]. Gumminess, calculated as hardness × cohesiveness, was lowest in MM_3 (9.46 ± 0.17 N) and highest in MM_2 (12.51 ± 0.18 N), suggesting MM_2 had a denser texture that required more energy for disintegration. Chewiness, derived from gumminess × springiness, followed a similar trend, ranging from 5.83 ± 0.18 N (MM_3) to 8.18 ± 0.23 N (MM_2). This implies that MM_2 was firmer and required more mastication effort, while MM3 offered easier chewability potentially more suitable for sensitive consumers like children or the elderly (Borwankar, 1992; Chen & Rosenthal, 2015) [1, 5]. Overall, MM_2 demonstrated the highest mechanical integrity across all parameters, whereas MM_3 presented a softer, more consumer-friendly texture.

Table 5: Textural characteristics of Market *Mohanthal* (MM) Samples

T.C.	Hardness (N)	Cohesiveness	Springiness	Gumminess (N)	Chewiness (N)
MM_1	19.57 ± 0.12	0.55 ± 0.00	0.64 ± 0.01	10.79 ± 0.10	6.87 ± 0.15
MM_2	20.80 ± 0.24	0.60 ± 0.00	0.65 ± 0.09	12.51 ± 0.18	8.18 ± 0.23
MM_3	17.87 ± 0.29	0.53 ± 0.00	0.62 ± 0.01	9.46 ± 0.17	5.83 ± 0.18
MM_4	18.70 ± 0.37	0.54 ± 0.00	0.63 ± 0.01	10.05 ± 0.16	6.30 ± 0.07
MM_5	19.43 ± 0.25	0.56 ± 0.00	0.64 ± 0.01	10.81 ± 0.08	6.95 ± 0.01
MM_6	20.43 ± 0.29	0.57 ± 0.00	0.65 ± 0.01	11.64 ± 0.16	7.61 ± 0.16
MM_7	19.80 ± 0.49	0.55 ± 0.00	0.63 ± 0.01	10.90 ± 0.28	6.91 ± 0.22
Sem±	0.22	0.00	0.01	0.12	0.11
CD (0.05)	0.67	0.01	0.02	0.37	0.35
CV%	1.96	0.49	1.49	1.95	2.87

Results: Each observation is mean ± SD of three replicates (n=5), CD = Critical difference; CV% = coefficient of variance; SEm = Standard error of mean, T.C.= Texture characteristics

Conclusion

The present study offers a comprehensive assessment of traditional *Mohanthal* preparation practices through a systematic market survey and empirical analysis of sensory and textural properties. The findings highlight substantial variations among manufacturers in terms of ingredient selection, roasting parameters, and processing techniques, all of which significantly influence the final product's quality. Among the evaluated samples, MM_3 emerged as the most preferred in sensory acceptability, attributed to its favorable textural attributes such as lower hardness, chewiness, and a soft yet cohesive body. Texture Profile Analysis (TPA) further confirmed the distinct mechanical behaviours across samples, reinforcing the need for standardized production protocols. The data-driven approach adopted in this study not only enabled identification of the most desirable formulation characteristics but also laid a foundation for consistent quality improvement in both artisanal and commercial *Mohanthal* production. Standardization of the recipe based on consumer-preferred sensory and textural traits can significantly enhance product appeal, shelf stability, and market competitiveness. Future work may include exploring

ingredient substitutions for health-oriented variants, optimization for extended shelf life, and incorporation of modern preservation techniques without compromising traditional authenticity.

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