(RESEARCH ARTICLE)

Sensory evaluation of Gurmar based Mathri developed by different cooking methods

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Abstract

Gymnema (*Gymnema sylvestre*) contains phytoconstituents as well as anti-diabetic agents such as polypeptide (gurmarin) and triterpene saponins (gymnemic acids and gymnemasaponins) which are responsible to treat diabetic patients. Various types of medicinal herbs have been used in Indian kitchens to make traditional snack foods. Mathri is one of them. In this study, traditional mathri has been formulated by using different levels of the gurmar (5%, 10% and 15%) to enhance their nutritional values. The main objectives of this study were (1) to develop the mathri by incorporating different levels of gurmar through baking and frying cooking methods (2) to optimize the gurmar-based mathri by sensory evaluation using 9-point Hedonic scale method, (3) to compare the cooking methods based on score value of overall acceptability. The observations found that different levels of gurmar used in fried mathri showed significant results on all sensory attributes while nonsignificant results showed for colour, appearance, texture, and crispness in baked mathri. Samples contained 5% gurmar based baked and fried mathri were highly acceptable and were optimized. The results also revealed that, the average value of overall acceptability by baking method was 6.65 while by frying method it was 7.225. It can be concluded that gurmar-based snacks can be adopted as good choice for diabetics.

Keywords: Gurmar; Gymnema; Mathri; Baking; Frying; Sensory

1. Introduction

Medicinal herbs have been employed as a holistic approach since ancient times to treat a variety of metabolic and endocrinological diseases, one of them is diabetes mellitus. It is one of the main global health problems and most common non-communicable disease in developed countries. Around 1200 medicinal plants used as folklore medicine to treat diabetes mellitus due to their hypoglycemic properties [3]. In addition to being used to treat diabetes, some medicinal herbs with hypoglycemic qualities are also employed as a key component in Indian cooking to improve flavor [2]. One of them is Gymnema" (*Gymnema sylvestre*)" derived from the Hindi word "Gurmar" means "sugar destroyer or sweet destroyer" the important medicinal plants widely used in India to treat diabetic patients due to great antidiabetic property [3,8,10]. Several studies have revealed that gurmar contains number of phytoconstituents as well as anti-diabetic agents such as polypeptide (gurmarin) and triterpene saponins (gymnemic acids and gymnema saponins) that are responsible for the taste suppression of sweet compounds, without affecting other taste elements [3].

Though, since ancient time, different types of traditional snack food have been consumed by Indian people, one of them is mathri the popular Indian snack [5] in which refined wheat flour, salt, spices, and condiments, shortening agents, and oil for frying are used as basic ingredients [12]. But, in recent trend consumers are turned to health and nutrition aspect along with taste of food products. The incorporation of these herbs in traditional snacks as health ingredient, fulfilled these health requirements.

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Several researchers have examined the effects of many therapeutic herbs, that are incorporated in development of variety of snacks [5, 7, 11,12]. But studies related to incorporation of anti-diabetic herbs in snacks are limited. To the best of our knowledge, no literature research has been reported on sensory properties of gurmar based snacks by baking and frying cooking methods. The data obtained from the study would provide good insight on gurmar based snacks food (mathri) to consumers. Therefore, by keeping the above-mentioned points this study was aimed with following objectives:

- To develop the mathri by incorporating different levels of gurmar through two different cooking methods (baking and frying)
- To optimize the final products by using nine- point Hedonic scale method.
- To compare the cooking methods based on sensory property (overall acceptability) of gurmar based mathri.

2. Materials and Methods

2.1. Raw materials used for preparation of mathri

Basic ingredient (refined wheat flour, shortening agent, ajwain, common salt, and refined oil) were procured from local market of Jabalpur and gurmar leaves were acquired from Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur (M.P.). For this study, gurmar leaves powder was used with acceptable incorporation levels, as 5%, 10% and 15% level, while other ingredients were taken in fixed proportions to prepare mathari.

2.2. Standardization of raw materials for preparation of mathari

The primary substance used to make mathari was refined wheat flour. The samples of mathri were prepared by two cooking methods (frying and baking) using the technique outlined by [4]. For the preparation of mathari, the following ingredient were taken: refined wheat flour, shortening (Ghee), refined sunflower oil, salt, ajwain, water and varying amount of gurmar powder, as shown in tables (1a to 1b).

Table 1 A Formulation of gurmar based Mathri (For frying)

Ingredients→ Samples ↓	Refined wheat flour (g)	Gurmar (g)	Shortening (g)	Refined sunflower oil (ml)	Ajwain (g)	Salt (g)	Water (ml)
Control sample (0% Gurmar) MGF1	200	0	40	75	4	8	120
Gurmar 5% MGF2	200	10	40	75	4	8	120
Gurmar 10% MGF3	200	20	40	75	4	8	120
Gurmar 15% MGF4	200	30	40	75	4	8	120

Table 1 B Formulation of gurmar based Mathri (For baking)

Ingredients→ Samples↓	Refined wheat flour (g)	Gurmar (g)	Shortening (g)	Ajwain (g)	Salt (g)	Water (ml)
Control sample (0% Gurmar) MGB1	200	0	40	4	8	120
Gurmar 5% MGB2	200	10	40	4	8	120
Gurmar 10% MGB3	200	20	40	4	8	120
Gurmar 15% MGB4	200	30	40	4	8	120

2.3. Preparation of mathri by frying and baking methods

The necessary amounts of all the dry components (refined wheat flour, ajwain, and regular salt) as indicated in tables (1a and 1b) were thoroughly mixed to prepare mathri. After that, shortening was added and vigorously rubbed in. To create hard dough, water was then added and well kneaded. For ten minutes, the dough was let to rest [12]. A wooden rolling pin was used to roll out the dough into a uniformly thick sheet that was about 2 mm thick. A fork was used to puncture the dough sheet, and cookie cutters were used to cut it into star-shaped pieces. After that, a muslin towel was placed over each raw mathri to prevent the surface from drying off.

2.3.1. Frying Method

For deep-frying, refined sunflower oil was heated to 120°C in a pan. Mathri were cooked between 120°C and 140°C over medium heat. To get rid of extra oil, they were placed on kitchen napkin paper. The samples were kept in an airtight box for additional analysis once they had cooled to room temperature [4].

2.3.2. Baking Method

Apart from placing the unbaked mathri on a tray after cutting, the entire process was identical to the frying approach. For thirty minutes, the tray was placed in an electrical bake oven set to 160°C. After being taken out of the oven and allowed to cool to room temperature, the sample was placed in an airtight box for additional examination [9,4]

2.4. Optimization of mathri by sensory evaluation (Nine-point hedonic scale)

Sensory evaluation was used to optimize all baked and fried mathri samples [5]. The nine-point hedonic scale method was used to optimize the samples. The sensory attributes (color, appearance, taste, flavor, texture, crispness, and overall acceptability) were as follows: 1 meant "dislike extremely," 2 "dislike very much," 3 "dislike moderately," 4 "dislike slightly," 5 "neither like nor dislike," 6 "like slightly," 7 "like moderately," 8 "like very much," and 9 "like extremely" [6]. For sensory evaluation, ten experts were chosen as panelist. The cooking methods were then ranked according to the overall acceptability of each product.

2.5. Statistical analysis

Sensory attributes were statistically analysed by using ToolPak Software. Single factor ANOVA, was employed with 5% level of significance.

3. Results and Discussion

3.1. Sensory evaluation

The results of mean score values of sensory attributes of gurmar based baked and fried mathri revealed in fig. 1 and fig. 2 respectively.
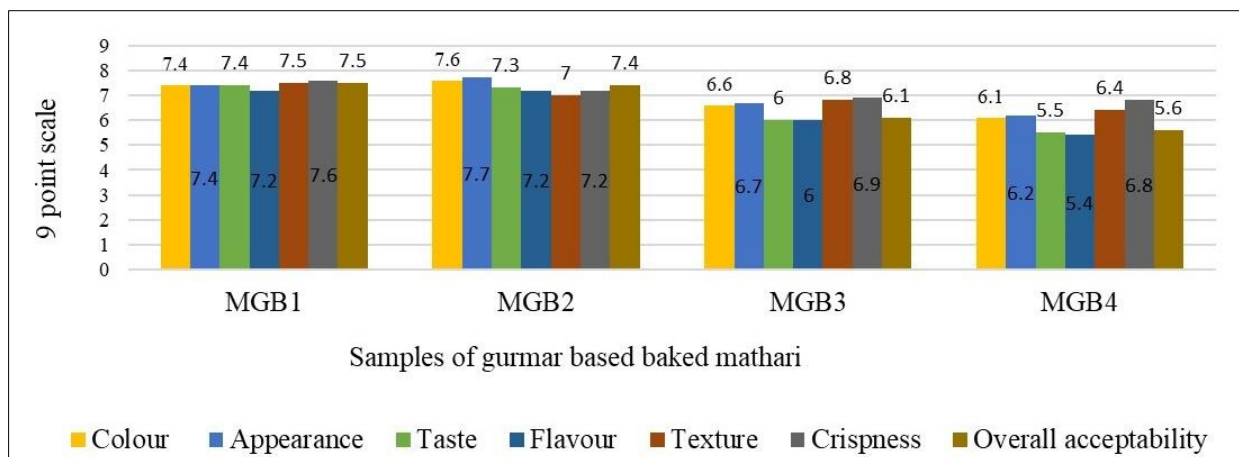
Figure 1 Mean score value of sensory attributes of gurmar based baked mathri

From Fig. 1, baked mathri MGB2 best in colour and appearance (7.6 and 7.7 respectively) than other sample, for taste MGB1 was best (i.e., 7.4), flavor of MGB1 and MGB2 were best and have same results (7.2). Texture, crispness and overall acceptability were found maximum in MGB1 (control sample) and within the gurmar based samples MGB2 have maximum scores in taste, flavor, texture, crispness, and overall acceptability (i.e., 7.3, 7.2, 7, 7.2 and 7.4 respectively) than other samples (MGB3 and MGB4). Fig 1 also revealed that maximum mean scores of sensory attributes of baked mathari observed in control sample (MGB1) and within the gurmar based samples, MGB2 (i.e., 5% gurmar contained) has best results than other proportion (MGB3 and MGB4). Similarly, Sukhwal and Vyas (2015) [9] studied the sensory evaluation of curry leaves and amla enriched baked mathri, and they found that 5g curry leaves power enriched mathri showed highest score value than 2.5 g (curry leaves and amla, each) and control samples.
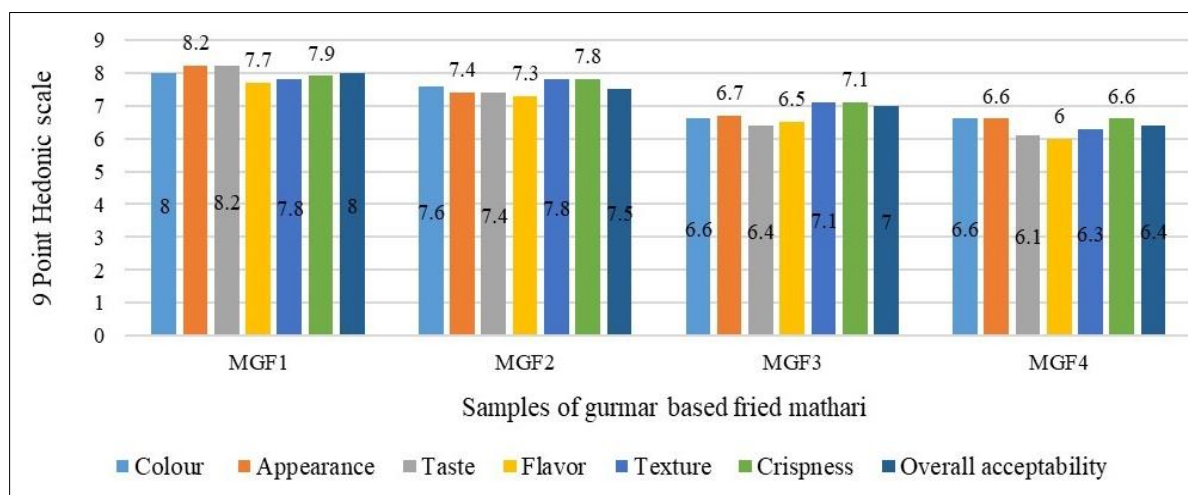

Figure 2 Mean score value of sensory attributes of gurmar based fried mathri

From fig. 2, observation found that MGF1 (control sample) was best than all other gurmar based fried mathri. And MGF2 (5% gurmar enriched fried mathri) showed highest acceptable as compared to 10% (MGF3) and 15% gurmar (MGF4) based fried mathri, for all sensory attributes, viz: colour (7.6), appearance (7.4), taste (7.4), flavor (7.3), Texture (7.8), crispness (7.8) and overall acceptability (7.5). Similarly, Kadbhane et al. (2019) [5] discovered that 7g of tandulaja powder based fried mathri had the maximum acceptability, while Verma and Jain (2012) [12] found that fried mathri with fresh leafy vegetables had the highest overall acceptability. In contrast to other degrees of arbi leaf powder incorporation in the samples, Rani et al. (2017) [7] discovered that 5% dried arbi leaf powder incorporated deep-fried mathri was particularly acceptable. A 10% level of fried mathri made with green gram flour was the most palatable among the other versions [1].

From above figures (1 and 2), we observed that the sensory attributes of 5% gurmar enriched mathri (for baked and fried, both) showed highest sensory score values as compared to 10% and 15% gurmar based mathri, while 15% gurmar based mathri have least acceptable. Similar type of trend also found for green leafy based fried mathri [12].

Table 2 P value (at 5% level of significance) for various sensory attributes of gurmar enriched baked and fried mathri **(*Groups of 0%, 5%, 10%, and 15% gurmar)**

Sensory Attributes → Gurmar based mathri* ↓	Colour	Appearance	Taste	Flavor	Texture	Crispness	Overall acceptability
Baked	0.079966	0.0748	0.0302	0.0382	0.3621	0.5823	0.05
Fried	0.014255	0.007551	0.005677	0.0194	0.02835	0.04579	0.049928

From above table-2, it was also observed that the mean score value of sensory attributes (Colour, Appearance, Taste, Flavor, Texture, Crispness and Overall acceptability) of fried mathri (control sample and its variations), showed statistically significant difference ($p < 0.05$) while sensory score value of Colour, Appearance, Texture, and Crispness showed insignificant result in baked mathri.

3.2. Optimized fried and baked mathri samples after sensory evaluation

After the optimization of samples of mathri by sensory evaluation, it was found that the 5% gurmar based sample (MGB2) and (MGF2) were highly acceptable.

3.3. Ranking of cooking methods (Baking and Frying)

The results of overall acceptability showed that, the average value for baking and frying of gurmar based mathari were 6.65 and 7.225, were respectively.

Table 3 ANOVA (Single factor) for cooking methods of gurmar based mathri

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	6.6125	1	6.6125	2.365127	0.128121	3.963472
Within Groups	218.075	78	2.795833			
Total	224.6875	79				

Table-3 represents that there was no significant difference ($p > 0.05\%$) between two methods of cooking for making mathri.

4. Conclusion

Gurmar (*Gymnema sylvestre*), the Hindi word means "sugar destroyer or sweet destroyer" widely used to treat diabetic patients due to great antidiabetic property. It contains number of phytoconstituents as well as anti-diabetic agents such as polypeptide (gurmarin) and triterpene saponins (gymnemic acids and gymnemasaponins) that are responsible for the taste suppression of sweet compounds, without affecting other taste elements. This study aimed to develop the mathri by using the level of 0%, 5%, 10% and 15% gurmar with two cooking (baking and frying) methods and optimize these samples through nine- point Hedonic scale method, as well as to compare the effect of frying and baking methods. This study revealed that different levels of gurmar used in fried and baked mathri showed significant results on all sensory attributes except that colour, appearance, texture, and crispness in baked mathri. Results with 5% gurmar showed the highest acceptability than other levels (10% and 15%) for both cooking methods (baking and frying). Therefore, MGB2 and MGF2 have been selected as optimized samples. Given that it demonstrated the best results in terms of overall acceptability, this product not only good for health but may also possibly option to open new business opportunities.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no potential conflict of interests.

Statement of informed consent

Written informed consent was obtained from all participants included in the study.

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