

Development and Organoleptic Evaluation of Baked Products Incorporated with Selected Traditional Hypoglycemic Agent

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Abstract

Diabetes is the new epidemic in developing India. Slight modification of diet according to the disease not only helps the patients to control diabetes but also fulfills the daily need of nutrients for the body. Along with the balanced diet, natural hypoglycemic foods also prove very beneficial in decreasing the elevated levels of blood glucose and also have no side effects as compared to synthetic hypoglycemic drugs. There are various natural plant products having distinct hypoglycemic character which can be used and incorporated in daily diet to reduce elevated blood sugar levels. Out of all common ones, the potent hypoglycemic agents i.e. fenugreek seeds (*Trigonella foenum graecum*), bitter melon (*Momordica charantia*), jamun seeds (*Eugenia jambolana*), tulsi leaves (*Occimum sanctum*) and guar-gum (extracted from cluster beans i.e. *Cymopsis tetragonaloba*) were chosen to develop baked products commonly consumed daily viz. biscuits and buns from each traditional hypoglycemic agent (THA). The acceptable level of incorporation of THA varied in baked products ranging from 4% to 20%. All the developed food preparations were organoleptically evaluated by a panel of 30 non insulin dependent diabetics using nine point hedonic scales. Biscuits were well accepted by the panel members as the mean scores for overall acceptability of the biscuits developed from various hypoglycemic agents ranged from 6.2 to 8.2, thus fell between the category of 'liked moderately to liked extremely'. The guar-gum biscuits were 'liked extremely' (8.2) by the diabetics, followed by jamun biscuits (7.7) which were 'liked very much'. Following, tulsi biscuits, methi biscuits and bitter melon biscuits were 'liked moderately' scoring 6.7, 6.3 and 6.2, respectively. Thus guar-gum biscuits were highly acceptable whereas methi biscuits and bitter melon biscuits were least accepted. Same as biscuits, guar-gum buns had the highest mean overall acceptability score (8.7) and were 'liked extremely' by the diabetics. Next was jamun bun and was 'liked very much' followed by tulsi bun which was 'liked moderately', having mean scores as 7.6 and 6.4, respectively. The least acceptability was noted for methi bun (5.6) and bitter melon bun (5.5) and was 'liked slightly'. Overall acceptability of biscuits and buns incorporated with traditional hypoglycemic agents was found to be more than 60 per cent.

Keywords: Traditional hypoglycemic agent; Hedonic scale; Organoleptic evaluation; Non insulin dependent diabetes mellitus.

Introduction

Diabetes is a disease being brought to the fore in developing countries through the demographic and epidemiological transitions

associated with the advent of urbanization, industrialization and mechanization. Non insulin dependent diabetes (type 2) has been labeled as life style disease, metabolic disease, vascular disease or simply cardiovascular disease.[1] Several studies indicate that 'diabetic lane' has gradually transformed into an 'Express Highway' just because of changing life trends.[2] Diabetes in any form is one of the most daunting challenges. Because of its relationship with other diseases, it proves more dreadful. Uncontrolled hyperglycemia for longer duration gives rise to a number of complications which can be categorized into micro and macro vascular diseases. Diabetes is a disease that should be prevented and/or controlled, as it cannot be cured completely.

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The approach for the treatment of diabetes has been radically changed in the recent decades.[3] Due to advanced technologies, diabetes is now one step closer to control by means of diet management, insulin/hypoglycemic drugs and exercise along with other life style changes. In fact, the success of treatment of diabetes mellitus largely depends upon effective motivation of the patients, for which education is the best way. Education has now become an integral part of managing diabetes and has proved to improve the various outcomes.

Along with the balanced diet, natural hypoglycemic foods also prove very beneficial in decreasing the elevated levels of blood glucose and also have no side effects as compared to synthetic hypoglycemic drugs. Presently, the world is moving from synthetic to the use of natural products for remedial purpose, so as to avoid severe side affects. Since ancient times, herbal medications are more in practice in India, than the synthetic ones for the treatment of common to severe ailments.[4]

There are various natural plant products having distinct hypoglycemic character which can be used and incorporated in daily diet to reduce elevated blood sugar levels.[5] Out of all common ones, the potent hypoglycemic agents i.e. fenugreek seeds (*Trigonella foenum graecum*), bitter gourd (*Momordica charantia*), jamun seeds (*Eugenia jambolana*), tulsi leaves (*Occimum sanctum*) and guar-gum (extracted from cluster beans i.e. *Cymopsis tetragonaloba*) were chosen to develop baked products commonly consumed in daily diet viz. biscuits and buns from each source.

Materials and Methods

Procurement of traditional hypoglycemic agents

Five types of hypoglycemic agents were selected for product development i.e. methi seeds, bitter gourd, jamun seeds, tulsi leaves and guar-gum were procured from the local market in a single lot to avoid the varietal difference.

Preparation of traditional hypoglycemic powder

- (i) *Methi seeds*: As methi has inherent bitter taste and pungent flavour, therefore methi seeds were soaked for 8 hours. After soaking, excess of water was discarded and was dried in the sun. Then it was grinded in domestic grinder to obtain its fine powder.
- (ii) *Bitter gourd*: Bitter gourd or karela was sliced by using clean and dry slicer. Kerala slices were sun dried for 48 hours and then grinded in domestic drier to get fine powder.
- (iii) *Jamun*: Whole jamun were sun dried for 72 hours and after that jamun were rubbed between the hands to remove the outer dry covering and pulp. Dry jamun seeds were grinded in a domestic grinder to obtain a fine powder.
- (iv) *Tulsi*: Tulsi leaves were washed and shade dried for 24 hours. Dried leaves were rubbed between the hands to obtain the powder.
- (v) *Guar-gum*: Guar-gum seeds were available in market. To incorporate it into recipes, seeds were converted into fine powder.

Development and standardization of baked products incorporated with traditional hypoglycemic agents

Standardization of recipes was done by repeated trial method. Adjustment of quantity of hypoglycemic agents was done to obtain the maximum acceptability. Products were prepared with a varying quantity of THA till the taste was noted acceptable by the panel of judges. The quantity of various hypoglycemic agents finally standardized to be added in biscuits were as follows: methi seeds powder 10%; bitter gourd powder 5%; jamun seeds powder 15%; tulsi leaves powder 20% and guar-gum powder 20%. The quantity of various hypoglycemic agents finally standardized to be added in buns were as follows: methi seeds powder 8%; bitter gourd

powder 4%; jamun seeds powder 12%; tulsi leaves powder 16% and guar-gum powder 16%.

Organoleptic evaluation of baked products incorporated with traditional hypoglycemic agents

After standardization, the acceptability of the prepared products was tested by the panel of 30 non insulin dependent diabetics who were registered at Govt. Sardar Patel Medical College and hospital, Bikaner as outdoor patients. All subjects belonging to the middle income group were taken for the study. Further, those subjects were chosen who were residing in urban area of the Bikaner city (Rajasthan).

The selection of subject was based on the duration of disease. Only those subjects were chosen for the study that were suffering from type 2 diabetes mellitus i.e. non insulin dependant diabetes mellitus for the last five years and were only on oral hypoglycemic drugs for the treatment of the disease and not on insulin. Experience, knowledge, willingness and sincerity on the part of panel members

were also considered.

Acceptability was evaluated by sensory method. The quality in terms of sensory attributes was assessed by using 9 point hedonic scale[6] and score card was developed to assess various attributes like colour, odour, appearance, texture, taste and overall acceptability. The objective of the study was explained prior to test and suitable environment was provided to the panel members for the best results.

Results and Discussion

Sensory evaluation

Baked products biscuits and buns incorporated with traditional hypoglycemic agents (THA) were found to be organoleptically acceptable. However, the acceptable level of incorporation of THA varied in different food preparations.

Biscuits

Biscuit is a bakery product made from

Table 1: Mean scores for organoleptic characteristics of Biscuits incorporated with traditional hypoglycemic agents

| Sources | Colour | Appearance | Odour | Texture | Taste | Overall acceptability |
|--------------|------------|------------|------------|------------|------------|-----------------------|
| Methi | 7.3 ± 0.17 | 7.4 ± 0.17 | 6.4 ± 0.21 | 7.4 ± 0.22 | 5.4 ± 0.20 | 6.3 ± 0.18 |
| Bitter gourd | 7.4 ± 0.17 | 7.4 ± 0.16 | 4.6 ± 0.18 | 7.4 ± 0.18 | 4.4 ± 0.19 | 6.2 ± 0.16 |
| Jamun | 7.6 ± 0.20 | 7.7 ± 0.21 | 7.5 ± 0.19 | 8.0 ± 0.22 | 7.7 ± 0.24 | 7.7 ± 0.20 |
| Tulsi | 4.2 ± 0.13 | 4.3 ± 0.12 | 7.1 ± 0.14 | 7.5 ± 0.14 | 6.6 ± 0.15 | 6.7 ± 0.17 |
| Guar-gum | 8.1 ± 0.23 | 8.8 ± 0.20 | 8.0 ± 0.25 | 8.1 ± 0.27 | 7.9 ± 0.23 | 8.2 ± 0.20 |

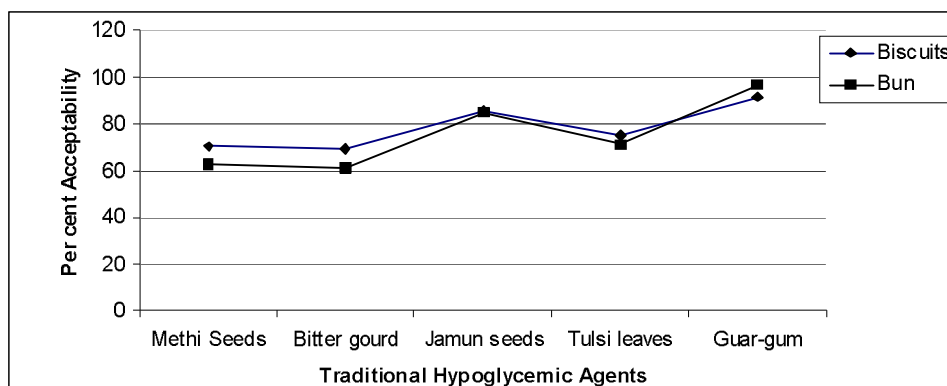


Fig. 1: Per cent Acceptability of Biscuits and Buns incorporated with selected traditional Hypoglycemic Agents

leavened dough. Biscuits were well accepted by the panel members as the mean scores for overall acceptability of the biscuits developed from various hypoglycemic agents ranged from 6.2 to 8.2, thus fell between the category of 'liked moderately to liked extremely'. The guar-gum biscuits were 'liked extremely' (8.2) by the panelists, followed by jamun biscuits (7.7) which were 'liked very much'. Following, tulsi biscuits, methi biscuits and bitter gourd biscuits were 'liked moderately' scoring 6.7, 6.3 and 6.2, respectively (Table 1). Thus guar-gum biscuits were highly acceptable whereas methi biscuits and bitter gourd biscuits were least accepted (Fig 1).

Discussing the various attributes of evaluation separately, it was noted that guar-gum biscuits scored the maximum for colour (8.1), appearance (8.8), odour (8.0), texture (8.1) and taste (7.9) falling in the range of 'liked very much to liked extremely'. Whereas minimum scores were obtained by the tulsi biscuits for colour (4.2) and appearance (4.3) and by bitter gourd biscuits for odour (4.6) and taste (4.4) and were 'neither liked nor disliked'. Although methi and bitter gourd biscuits scored the minimum for texture (7.4) but were 'liked very much' by the panel members. Kochhar[7] also developed biscuits for NIDDM subjects. Fenugreek seeds, jambu seeds and fresh bitter gourd were cleaned, dried and powdered and all the three were mixed in an equal proportion with refined wheat flour to make salty biscuits. The biscuits prepared were organoleptically acceptable and fell in the category of 'liked moderately' in terms of color, appearance, odour, texture and overall acceptability scores.

Buns

Bun is an important part of the diet of majority of the world's inhabitants. Same as biscuits, guar-gum buns had the highest mean overall acceptability score (8.7) and were 'liked extremely' by the panelists. Next was jamun bun and was 'liked very much' followed by tulsi bun which was 'liked moderately', having mean scores as 7.6 and 6.4, respectively (Table 2). The least acceptability was noted for methi bun (5.6) and bitter gourd bun (5.5) and was 'liked slightly'.

The scores of sensory attributes revealed that guar-gum bun were 'liked extremely' by the panel members and scored the highest for the all the sensory attributes ranging from 8.4 to 8.7. Whereas tulsi bun scored the lowest for colour (3.2) and appearance (3.4). In terms of odour (4.3) and taste (3.9), bitter gourd bun and for texture (7.0) methi bun had the lowest scores.

Nearly 25 gm of methi seeds powder is recommended for daily intake, to be effective in controlling hyperglycemia but due to its strong bitter taste 8-10% of methi seeds powder was added in baked products. The acceptability was noted to be low due to its bitter taste. Like methi products, acceptability of bitter gourd products was also noted to be less than other hypoglycemic agents due to its bitter taste. The products developed from jamun seeds powder were 'liked very much' by the panel members as the mean acceptability scores for all the products ranged between 7.5 to 7.7. Jamun biscuits and buns had maximum acceptability (7.7). The products prepared from tulsi leaves powder were 'liked moderately' by the subjects with the mean acceptability score as 6.4 to 6.7. Due to the prominent green colour, minimum acceptability was noted. Guar-gum is obtained from the seeds of cluster

Table 2: Mean scores for organoleptic characteristics of Bun incorporated with traditional hypoglycemic agents

| Sources | Colour | Appearance | Odour | Texture | Taste | Overall acceptability |
|--------------|------------|------------|------------|------------|------------|-----------------------|
| Methi | 6.5 ± 0.13 | 6.4 ± 0.12 | 6.0 ± 0.12 | 7.0 ± 0.18 | 5.0 ± 0.12 | 5.6 ± 0.14 |
| Butter Gourd | 6.5 ± 0.17 | 6.6 ± 0.16 | 4.3 ± 0.12 | 7.2 ± 0.14 | 3.9 ± 0.13 | 5.5 ± 0.15 |
| Jamun | 7.5 ± 0.16 | 7.2 ± 0.13 | 7.6 ± 0.16 | 7.2 ± 0.17 | 7.8 ± 0.13 | 7.6 ± 0.13 |
| Tulsi | 3.5 ± 0.14 | 3.4 ± 0.10 | 7.3 ± 0.14 | 7.3 ± 0.15 | 6.5 ± 0.11 | 6.4 ± 0.13 |
| Guar-gum | 8.4 ± 0.22 | 8.5 ± 0.16 | 8.5 ± 0.16 | 8.5 ± 0.16 | 8.7 ± 0.15 | 8.7 ± 0.15 |

beans. As it does not transfer any particular color, odour and taste to the products, the acceptability was noted as 'liked extremely'. Guar-gum bun obtained maximum score of 8.7. Overall acceptability of biscuits and buns incorporated with traditional hypoglycemic agents was found to be more than 60 per cent (Fig 1).

Conclusion

All the baked products developed by incorporating different traditional hypoglycemic agent (THA) were found to be organoleptically acceptable by the diabetic panel. The acceptable level of incorporation of THA varied in different preparations ranging from 4% to 20%. The overall acceptability of products by the addition of guar-gum was noted to have the maximum acceptability and was 'liked extremely' by the panel members. Whereas the products developed from methi seeds powder and bitter gourd powder were noted to have the least acceptability due to their bitter taste and specific odour imparted to the products. The acceptability of jamun seeds products were 'liked very much' by the panelists. Although, the tulsi leaves products had good acceptance in the terms of taste but due to its dark green colour in the products, it scored the minimum for colour and appearance which in turn affected the overall acceptability of the products. Tulsi products were noted to be 'liked moderately'. Overall acceptability of Biscuits and Buns incorporated with traditional hypoglycemic agents was more than 60 per cent.

Recommendations

Traditional hypoglycemic agents possesses hypoglycemic properties and its incorporation

in various baked products was found to be organoleptically acceptable, so diabetic patients can easily incorporate THA into there commonly consumed food preparations to have maximum hypoglycemic effects. The present study opens the following avenues for the further research to assess the hypoglycemic index of the products developed from the different traditional hypoglycemic agents and to develop the products from less common hypoglycemic agents like neem leaves, bael patra, rauwalfia flower etc. and to find their acceptability.

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