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Impact of Incorporation of Soyfibre and Processed Soyflour on the Sensory Quality, Nutrient Content and Glycemic Index of Rawa Idli

KEYWORDS: Diabetes, glycemic index, soyfibre, soyflour

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ABSTRACT *Glycemic index (GI) has proven to be a useful nutritional concept, providing insight into the relationship between foods and chronic diseases. Objective of present work was to study the impact of addition of soyfibre and processed soyflour on the sensory quality, nutrient content and GI of rawa idli. Idli was prepared using semolina and curd. Its three variants incorporating soyfibre, roasted soyflour and defatted soyflour (15%), respectively, having 50g available carbohydrate, were developed and subjected to sensory analysis. Estimation of moisture, ash, crude fibre, protein and fat was done. GI of test meals was calculated. All the rawa idlis had good acceptability. Soyfibre added idli was like plain idli in sensory attributes. Roasted soyflour added product had highest fat and protein. There was a significant difference between nutrient content of idlis ($p<0.05$). Plain idli had highest GI (66.50%). Soyfibre added rawa idli had lowest GI (37.22). Addition of soy in rawa idli significantly reduces the GI.*

Introduction

A major risk factor of increasing prevalence of diseases, i.e., obesity, resulting hyper insulinemia and insulin resistance is the on-going nutrition transition with progressive shifts to a westernized diet high in saturated fat and sugars (Popkin 2002) and a high glycemic index (GI) diet. High GI diet may increase insulin secretion which in turn, may induce insulin resistance and predispose individuals to type 2 diabetes mellitus (Ludwig 2002) and associated chronic diseases. Diet and nutrition are the major environmental factors that may play pivotal role in onset of chronic diseases. Poor food intake consequently results in lower nutritional status (Jain et al. 2013a). Nutrition and health knowledge may influence dietary behavior that further becomes dietary patterns and influences individual's nutrient intake (Jain et al. 2013b). Dietary modification is a primary preventive strategy for chronic illnesses.

A diet having high fibre, low fat and low GI has been a corner stone of managing non communicable diseases. GI is a method of classifying foods based on the blood glucose response after food consumption. On a glycemic scale of 0 to 100, the GI compare carbohydrate weight for weight in individual foods providing a physiologic rather than structural basis for ranking glycemic potential (Onwulata et al. 2010).

Rawa idli is a common snack frequently consumed by Indian population. Due to its general likeability and lack of information on its GI value directed the selection of this product for GI estimation. Soybean is an excellent source of dietary fibre, vegetable protein, complex carbohydrates, polyunsaturated fat, soluble fibres and phytoestrogens (isoflavons) that may be beneficial in prevention of hyperglycemia (Jenkins et al. 2003). It appears from several studies that soy based diets may provide benefits in conditions associated with impaired glucose tolerance, hyperlipidemia and reduce insulin sensitivity (Kang et al. 2006). Thus in present study an attempt was made to investigate the impact of addition of soyfibre, roasted soyflour and defatted soyflour on the sensory quality, nutrient content and glycemic index of rawa idli.

Materials and Methods

Formulation and standardization of rawa idli

The various ideas and techniques of rawa idli preparation were recorded and screened. This stage led to taking up of various trials to prepare rawa idli keeping available carbohydrates as 50g. In preliminary trials wheat semolina and curd in different proportions were incorporated to standardize the products. Out of them, rawa idli was prepared from combination of 65g wheat semolina, 100g curd, 2g chemical leavener and 3.5g soybean oil was most acceptable. This product formed the foundation of remaining test products. The standardized recipes were (i) plain rawa idli [T_1], (ii) rawa idli with Soyfibre [T_2], (iii) rawa idli with roasted Soyflour [T_3] and (iv) rawa idli with defatted Soyflour [T_4] (table 1).

Sensory evaluation

A semi trained panel of 15 judges was selected using triangle difference test to conduct sensory evaluation. Nine point hedonic test and 5 point composite scoring test (Jellinek 1985) were used to study the organoleptic quality of standardized rawa idlis.

Nutrition analysis

Moisture, ash and crude fibre were determined (Raghuramula et al. 1983). Protein estimation was carried out by Biuret method and fat content was analysed by Bloor method.

Determination of GI

Study subjects

Twelve healthy, non smoking, non alcohol consuming, female subjects were recruited. Informed consent from subjects was taken. Subjects were in the age group of 20 – 23 years had body mass index in the range of 18.5 – 25.0 kg/m^2.

Experimental procedures

In first session, study subjects consumed reference food (R) (glucose dissolved in 200 ml of water). Than four test meals were given. Each test session was completed on a separate morning with at least 4 days interval between subsequent sessions. The test or reference meals were served at fixed

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time in morning after 12 hours overnight fast. On each test day a baseline finger prick blood sample was obtained and analysed for blood glucose using "Arkray blood glucose test meter" (Super Glucocard II; GI 1640). Following consumption of the reference or test food, additional blood samples were collected at 30, 60, 90 and 120 minutes.

GI determination

A two hour blood glucose response curve was constructed and the incremental area under the glucose response curve (IAUC) was calculated. The GI value for each test food was calculated for each subject by dividing the two hour blood glucose. IAUC value for the reference food and multiplying by 100 to obtain a percentage score (Wolever 1991). The final reported value for each test food is the mean GI value for that food in the group of 12 subjects.

Statistical analysis

Mean and standard deviation were calculated for each suitable studied variable. The t-test was used to determine the significant difference between the nutrient content and GI of two test meals. Analysis of variance (ANOVA) test for multiple comparison was used to assess significant difference between the nutrient and GI of all test foods. Significance was assumed at $p<0.05$.

Results and discussion

Sensory quality characteristics of rawa idlis

Rawa idli without soybean (T_1) was found to have highest mean likeability score (7.53) on the basis of hedonic scale. In modified form of idlis T_2 had highest mean acceptability score (7.33) and T_3 got lowest mean acceptability score (6.76). Since all the modified products had scores around 7, it can be interpreted that they were liked moderately. Roasting imparts a pleasant flavour to the food products but probably this is not acceptable in idli as it is a bland product. This could be the reason for T_3, scoring comparatively lower on the hedonic scale. Sensory scores of various attributes, viz., appearance, colour, texture, aroma, taste and aftertaste ranged between 3.26 to 4.69 in all products (T_1 to T_4). Yadav (2003) developed various recipes using soybean, viz., cookies, katori chat, namkeen puri, etc. Overall acceptability of all the products was good.

Nutrient content of rawa idli

Higher ash content was found in soy incorporated idli (table 2). Soybean is rich source of minerals, i.e., calcium, phosphorus and iron. Hence, its addition in rawa idli increases the mineral content which is eventually responsible for high ash content. ANOVA showed significant difference ($p<0.05$) in moisture, ash, crude fibre, protein and fat content between all the test recipes. Further t-test was applied to assess significant difference between two products. All rawa idlis were significantly different from each other for their moisture and ash content. Crude fibre content of plain rawa idli was significantly different ($p>0.05$) from Soyfibre added rawa idli and roasted Soyflour added rawa idli (table 4). Protein content of plain rawa idli was significantly different from roasted and defatted Soyflour added rawa idli. Significant difference in fat content was found between the all soy added rawa idli except T_3 v/s T_4. Yadav (2003) developed food products from processed soybean. Her results of crude fibre were similar to the results of present study. High fibre content of Soyfibre fortified idli indicates the suitability of this product for diabetic diet, for their beneficial effect in lowering the GI. Roasted Soyflour added idli had highest protein content. Addition of Soyflour to rawa idli increases their protein content. Consumption of soy and soy added foods have been reported to improve plasma lipid profiles (Merz et al. 2006). From the results obtained, it is concluded that incorporation of Soyfibre and processed Soyflour improved the nutritional quality of rawa idli. Jain et al. (2013c) stated that nutrition inadequacy represents a potential health threat to everyone especially elderly population. Hence these processed rawa idlies are suitable for all age groups and provide adequate nutrition.

Determination of GI

Test meal T_2 produced a large rise (table 3) in blood glucose during first 30 minute followed by T_1, reference food, T_4 and then T_3. The four test meals varied in their peak blood glucose concentration at 30 minute, 60 minute, 90 minute and 120 minute after ingestion of food. Among all the meals plain idli (T_1) produced large glycemic response followed by T_2, R, T_4 and the T_3. The IAUC of reference food was 489.62 and GI has been standardized and considered to be 100. In test meals T_1 had highest IAUC and GI score whereas T_2 had lowest IAUC and GI score. Hence, rawa idli with Soyfibre had lower GI value and it may be considered beneficial for diabetic patients. There was a significant difference among the four mean GI values. Numerous evidences suggested that lower GI of food positively affect human health (Dickinson & Brand-Miller 2005). Results of present study illustrated that different processing of soybean (Soyfibre, roasted Soyflour and defatted Soyflour) remarkably influenced the GI value of rawa idli.

Conclusion

All modified rawa idlis were equally acceptable as plain rawa idli. Nutritional analysis revealed that defatted Soyflour added rawa idli had highest protein and fat content whereas Soyfibre added rawa idli had highest crude fibre content. The results of current study demonstrate that soy products have low GI scores. Improvements in selection of ingredients may further improve glycemic responses of soy foods. Incorporation of soy in daily diet could help to alleviate the problems of chronic illness prevalent in urban areas of developing countries.

Table 1 Composition of standardized rawa idlis

Ingredients	Amount (g)			
	T_1	T_2	T_3	T_4
Semolina	66.5	64.0	61.5	64.5
Curd	100.0	100.0	100.0	100.0
Soyfibre	-	15.0	-	-
Roasted Soyflour	-	-	15.0	-
Defatted Soyflour	-	-	-	15.0
Chemical leavener	2.0	2.0	2.0	2.0
Soybean oil	3.5	3.5	3.5	3.5

Table 2 Mean nutrient content of standardized rawa idlis

	Mean ± SD			
Nutrient (%)	T_1	T_2	T_3	T_4
Moisture	64.72 ± 0.03	63.93 ± 0.02	61.50 ± 0.02	60.82 ± 0.04
Ash	1.67 ± 0.02	3.33 ± 0.01	2.81 ± 0.03	3.39 ± 0.02
Crude fibre	0.49 ± 0.07	2.91 ± 0.03	1.54 ± 0.02	1.62 ± 0.06
Protein	1.18 ± 0.09	1.13 ± 0.08	2.06 ± 0.08	1.18 ± 0.26
Fat	3.45 ± 0.07	4.10 ± 0.14	5.25 ± 0.35	3.87 ± 0.17

Table 3 IAUC and GI of test meals and reference meal

		Mean ± SD	
S. No	Test meals	IAUC	GI
1	T_1	325.08 ± 41.88	66.50 ± 2.13
2	T_2	184.55 ± 25.12	37.72 ± 1.86
3	T_3	274.97 ± 43.55	56.03 ± 2.24
4	T_4	288.82 ± 32.69	46.73 ± 1.89
5	R	489.62 ± 67.50	100.00 ± 0.00

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REFERENCE

1. Dickinson, S., & Brand-Miller, J. (2005). Glycemic index, postprandial glycemia and cardiovascular disease. Current Opin Lipidol, 16(10), 69-75. | 2. Jain, M., Mittal, P., Jain, P. & Gupta, K. (2013b). Association of cardio metabolic risk factors and obesity with lifestyle of adults. Journal of International Academic Research for Multidisciplinary, 1(9), 545-556. | 3. Jain, M., Purnima, Jain, P. & Gupta, K. (2013b). Appraisal of nutrition and health related knowledge, attitude and practices of rural and urban elderly using a gender lens. Indian Journal of Gerontology, 27(3), 519-29. | 4. Jain, M., Goel, P., Jain, P. & Gupta, K. (2013c). Nutrition and health appraisal of rural elderly women using mini nutritional assessment. Journal of the Indian Academy of geriatrics, 9, 65-69. | 5. Jellinek, G. (1985). Sensory evaluation of food: Theory and practice. Chichesten, Sussex: Ellis Horwood Limited. | 6. Jenkins, D. J. A., Kendall, C. W. C., Marchie, A., Jenkins, A. L., Augustin, L. S. A., Ludwig, D. S., Barnard, N. D. & Anderson, J. W. (2003). Type 2 diabetes and the vegetarian diet. American Journal of Clinical Nutrition, 78(suppl), 610S-16S. | 7. Ludwig, D. S. (2002). The glycemic index: Physiological mechanisms relating to obesity, diabetes and cardiovascular disease. Journal of the American Medical Association, 287(18), 2414-23. | 8. Kang, M. J., Kim, J. I., Yoon, S. Y., Kim, J. C. & Cha, I. J. (2006). Pinitol from soybeans reduces postprandial blood glucose in patients with type 2 dibetes mellitus. Journal of Medicinal Food, 9(2), 182-86. | 9. Merz, C. N. B., Johnson, B. D., Braunstein, G. D., Pepine, C.J., Reis, S. E., Paul-Labrador, M., Hale, G., Sharaf, B. L., Bittner, V., Sopko, G., Kelsey, S. F. & for the Women's Ischemia Syndrome Evaluation Study Group (2006). Phytoestrogens and lipoproteins in women. Journal of Clinical Endocrinology and Metabolism, 91(6), 2209-13. | 10. Onwulata, C. I., Thomas, A. E., Cooke, P. H., Phillips, J. G., Carvalho, C. W. P., Ascheri, J. L. R. & Tomasula, P. M. (2010). Glycemic potential of extruded barley, cassava, corn and quinoa enriched with whey proteins and cashew pulp. International Journal of Food Properties, 13, 338-59. | 11. Popkin, B. M. (2002). An overview on the nutrition transition and its health implications: The Bellagio meeting. Public Health Nutrition, 5(1A), 93-103. | 12. Reguramula, N., Madhavannain, K. & Sundram, S. K. (1983). A manual of laboratory techniques. Hyderabad: National Institute of Nutrition. | 13. Wolever, T. M. S., Jenkins, D. J. A., Jenkins, A. L. & Josse, R. G. (1991). The glycemic index: Methodology and clinical implications. American Journal of Clinical Nutrition, 54(5), 846-54. | 14. Yadav, R. (2003). Development of food products from processed soybean (Glycine Max IS-335) and their acceptability evaluation studies. (Unpublished MSc. Dissertation). Banasthali Vidyapith, Rajasthan. |