



Studies on the Effect of Low Glycemic Index for Multi-Whole Grain Formulated Flour Samples in Type 2 Diabetic Patients

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Abstract

Different types of corns are used as staple food in Bangladesh, core source of nutrients from foodstuffs for metabolic energy. Ready to eat or processed food stuffs that contains totally different macro and micronutrients such as Tocopherol, Thiamine, Riboflavin, Pyroxene, Mg and Zn etc. within the recipes for sample preparation, were incorporated different whole grains of wheat, wheat bran, rye, maize, soya, barley, chickpeas and plantain husk in numerous ratios. Developed flours were subjected to nutritionally active diet for diabetic patients, the extent of glucose when consumption of diets could be an essential issue. Protein, fat, crude fiber and energy values of developed multi grains combined and market flours were MFS- 1: (11.00%, 3.77%, 2.69%, 387.25); MFS- 2:(14.16%, 3.71%,3.21%, 385.73); MFS-3:(12.40%, 3.33%, 2.87%,385.24); MFS- 4: (11.31%, 2.16%, 2.45%, 382.83) and market flour samples CS-A: (12.04%, 2.05%,1.64%,358.37) and CS-B:(14.90%,2.06%,1.46%,350.82) respectively. Amongst, MFS- 3 sample resulted the preferences in hedonic sensory evaluation. Glycemic index (GI) resolved mistreatment normal methodology for MFS-3 and normal sugar. The GI worth of MFS- 3 sample (46.86) showed lowest postprandial aldohexose like compared to plain. once the analysis of all four mixed recipes compared to market samples, it showed that MFS- 3 sample possessed the simplest preferences because the different useful diet for type- 2 diabetic patients. Aims of the analysis works were recipe preparation of samples, product acceptances and determination of Glycemic Index (GI) for four mixed multi-wholegrain flours compared with 2 market multi-grain flours within the market.



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Introduction

Seeds or grains of cereals are include at Poaceae or Gramineae. It's variety are available in several regions, together with triticale, oats, rye, maize etc. On the universal basis, wheat is known as significant yields, approximately over fifty percent of the earth's cereal production. Various similarities of structural are observed amongst all of the cereals associated encompass a foetus, having the chromosomes for a totally new species, associated a reproductive structure, that is jam-choked with starch grains. Cereals have a protracted history of use by humans. Cereals and cereal merchandise are a crucial supply of energy, sugar, super molecule and fiber, likewise as presence of a variety of trace mineral for example antioxidant, a number of vitamin B, metallic element Zinc etc. Prevention of diabetic disorder, a possible role for fiber within the hindrance of diabetic disorder was advanced above 30 years back and consuming a significant amount of cereal fiber has systematically been related to reducing the risk diabetic disorder.¹ Montonen *et al.*,² intentional the intake of wholegrain and fiber of over 4000 men and girls, and also the ensuing incidence of type-2 diabetic disorder during 10-year follow-up. And an inverse association was found amongst wholegrain consumption and risk of type-2 diabetic complaint, with a RR between the best and lowest quartiles of wholegrain consumption of 0.65, i.e. a dropping forty two percent in risk. The reduction risk of type-2 diabetic disease was additionally related to cereal fiber (RR 0.39). In a study, management of diabetic disease rumored on the proof base, a powerful part of a higher- saccharide higher-fiber diet in rising glycemic management for subjects with kind one or two diabetes³ and fiber intake related to better glycemic management in subjects with type-1 diabetes.⁴ Wheat bran is helpful toward providing biological process regularity and ending constipation as a result of it's terribly high in dietary fiber. The organic process advantages of wheat bran principally undisputed. However, a cup (58g) of wheat bran will supply vital organic process pluses. One cup contains ninety nine of the American counseled daily allowance of fiber, 9 grams polymeric amino acids, and thirty fourth percentages of the RDA for Iron. It additionally high in macromolecules, Vitamin B₃, vitamin B₆, Mg, P, Zn, Mn and low in fat, no cholesterol, and no sugar or sodium. Cereals supply most B-vitamins⁸,

particularly vitamin B₃, vitamin B₂ and B₆. A recent RCT incontestable that, within the subjects with kind a pair of diabetic disease, an excess-fiber meal (having twenty five gram soluble fiber and twenty five gram insoluble fiber) decreased glucose and internal secretion quite a meal of equal amounts macronutrients and energy content, containing moderate amounts of fiber.⁵ Investigation with GI food, shown the advance in glycemic management once subjects with diabetic disease replaced high- glycemic index (GI) foods mixed thru low-Glycemic index foods, like whole-grain, little polished cereal merchandise.⁶ In a randomized crossover study⁷ incontestable that a low-GI diet helps to enhanced glycemic management additionally LDL-Cholesterol is decreasing and normalizing fibrinolysis action related to a high-GI diet, similarly for macronutrients structure and quantity of dietary fiber. Dis *et al.*,⁹ resulted that the low glycemic index foods are related to improved hindrance and management of metabolic and vessel diseases. A group of investigators¹⁰ evaluated the consequences of barley flour, crude cinnamon, and their mishmash on blood sugar, hormone in endocrine, lipid profile, and animal tissue hormones in streptozotocin-induced diabetic rats. The cinnamon and barley mixture diet caused improvement in insulin-positive cells of duct gland tissue. Irregular groups¹¹ of diabetic patients for check with management meals, taken when nightlong quick, ascertained the result on the glycemic response of bread, the quantitative relation of whole cereal grains to polished flour. Bread containing a high proportion of whole cereal grains reduced the postprandial glucose profile in diabetics as a result of they were additional slowly digestible. In another study,¹² Cake prepared by partial substitution of flour with mango pulp and mango leather flours at totally different combination (control, 5, 10, 20, or 30 present) were examined for the physico-chemical, nutritionary and organoleptic characteristics, the result showed high dietary fiber with low fat, reaction and expected glycemic index compared with the management.

Materials and Methods

Materials

Whole Grains are available in Bangladeshi local Market. The raw materials of food stuffs were bought from different market such as- New Market, Savar and Kawranbazar, Dhaka. Most of the wheat

were used for human consumption and since of its distinctive properties, an oversized vary of ingredients and foods were created, together with alimention, spelt, couscous, cracked wheat or bulgur wheat and wheat starch. The maize kernel had four main parts – the germ, the endosperm, the pericarp and the tip cap. Whole grains, like wheat and oats, have a hard outer layer, after processing, this layer becomes a byproduct, and is called bran. This bran is composed with nutrition and sources of many dietary benefits. Soybean is employed within the New World for edible fat, primarily within the producing of processed food product, tho' several investigators championed the crop as an answer for human food wants and tested the crop for that resolution. Isabgol is the husk of the seeds of the plant *Plantago ovato* which is water soluble in nature and expands to become mucilaginous. After drying, sample Milling into fine powder by auto grinding mill, the powder samples were storage into an air tight jar in freezer (about 4^oc) until further analysis. The multi-wholegrain flour samples were processed using blender as per formulation (MFS-1, MFS-2, MFS-3 and MFS-4). All chemicals were analytical grade of Merck (Germany) and media was obtained from Oxoid (Basingstoke, UK) for analysis of the formulated mixed multi wholegrain flour samples.

Methods

Proximate Composition such as Moisture, Protein, Fat, Fiber, Minerals and total Carbohydrate of the

samples were determined by the procedures of AOAC¹³ 2000, after mixing of processed study samples were determined. Ethical permission were received from Bangladesh Ethical committee member during study.

Sensory Evaluation

Besides any food having high nutritional value, it is acceptable to people by means of its good color, flavor, taste and aroma. When a food fulfill all these quality positively, it becomes most acceptable food product to the people. Sensory evaluation test of Routies (roasted dough sheet) which containing the four type samples were subjected in order to identify the most desirable invention for consumption. Thirty persons were selected from the Ispahani Food Ltd, production section, Konabari, Gazipur and Nutrition and Food Engineering department, dept., DIU, Bangladesh. Hedonic rating 9 point Scale was used for evaluation of the preference in appearance, flavor, taste and total acceptability. The peoples were taught to evaluate each sample first by smelling along and then by tasting.

Determination of Glycemic Index

Glycemic index was determined by using 100g anhydrous glucose have to each individual and blood glucose was determine 15 minutes interval up-to 08 times as standard, next day, again 100g carbohydrate was made by MFS- 3 flour and fed to each individual and blood glucose was determine 15

Table 1. Proximate Composition of Different Samples

Parameters	CS- A	CS- B	MFS- 1	MFS- 2	MFS- 3	MFS- 4
Moisture (%)	9.98	11.64	2.97	2.49	7.15	7.15
Total Ash (%)	1.35	1.77	2.53	2.52	2.45	2.17
Acid Insoluble Ash (%)	0.21	0.15	0.15	0.16	0.15	0.11
Protein (%)	12.03	14.75	11.00	14.16	12.40	11.31
Fat (%)	2.06	2.05	3.77	3.71	3.33	2.16
Carbohydrate (%)	71.73	66.67	77.29	73.91	71.78	74.75
Crude Fiber (%)	1.65	1.47	2.69	3.21	2.87	2.45
Cholesterol (mg/100g)	61.24	132.06	109.83	81.57	67.04	80.89
Fe(mg/100g)	2.36	7.67	3.36	2.95	1.99	2.10
Na(mg/100g)	5.98	24.98	21.00	284.83	21.91	126.62
Mg(mg/100g)	93.42	110.49	-	71.42	139.42	55.41
Ca (mg/100g)	19.22	19.73	79.30	4.85	20.85	7.94
Energy (Kcal/100g)	343.343	343.79	385.25	366.73	365.24	363.44

minutes interval up-to 08 times. Blood glucose levels were plotted on Curve and GI was determined by calculating Area under Curve (AUC).

Results and Discussions

The proximate analysis of four different multi whole grain flour formulations and two commercially available flour samples CS- A and CS- B of Bangladesh origin were analyzed and shown in the Table 1.

From the Table 1 , the prepared samples proximate values were MFS- 1: (11.00%, 3.77%, 2.69%, 387.25); MFS- 2: (14.16%, 3.71%,3.21%, 385.73); MSF-3: (12.40%, 3.33%, 2.87%, 385.24); MFS- 4: (11.31%, 2.16%, 2.45%, 382.83);and marcentizing

flour samples CS-A: (12.04%, 2.05%,1.64%,358.37) & CS-B:(14.90%, 2.06%, 1.46%,350.82) respectively.

In comparison with testing all formulations, major nutrients of all samples were showed an appreciable quantity of protein, fat, crude fiber, carbohydrate, cholesterol and micronutrients in the Figure-1

9-point Hedonic scale was used for sensory evaluating was colour, flavour, taste and overall acceptability of samples. Amongst MFS- 3 sample obtained the most preferences.

Figure-2 showed MFS-3 mixed sample was the highest remarks where color, test, aroma and acceptability were better in all combination from evaluation of panelists.

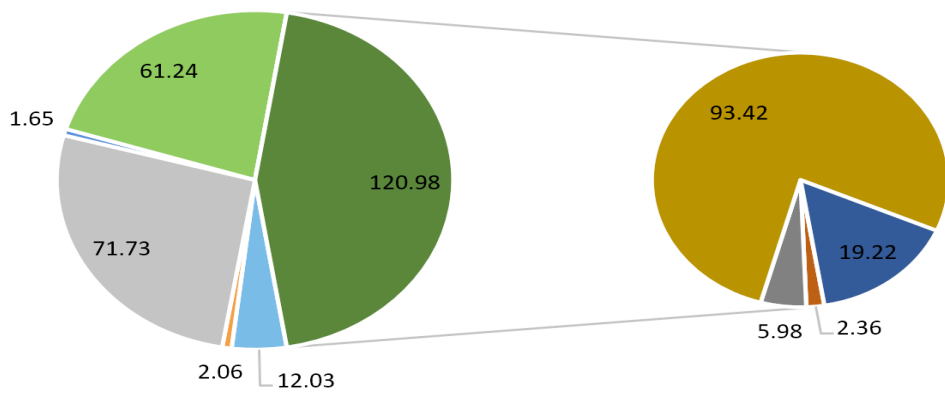


Fig. 1: Major Nutritional Composition

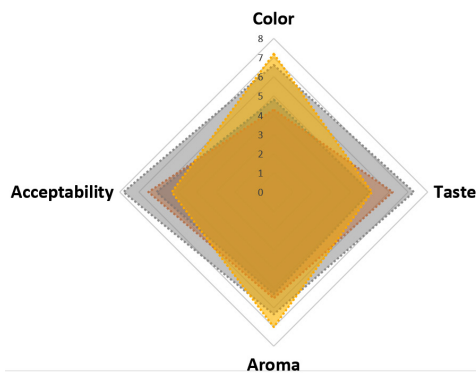


Fig. 2: Sensory Evaluation of the Study Samples

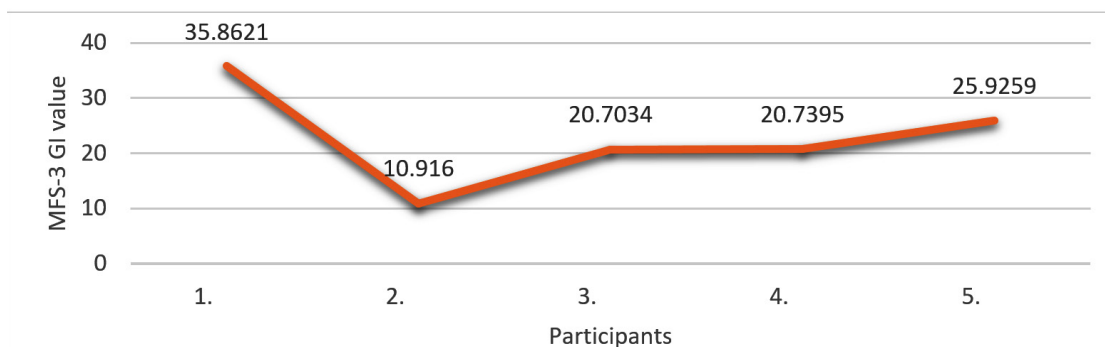


Fig. 3: Glycemic Index Value of MFS-3

Table 3: Glycemic Index Value of MFS-3 Sample

Partici-pants	MFS-3 GI value	Average GI Value	Remarks
1.	35.8621	22.8294	Low GI
2.	10.9160		
3.	20.7034		
4.	20.7395		
5.	25.9259		

Glycemic index was determined using 100 g anhydrous glucose as standard and 100g bread sample made by MFS- 3 flour given to each individual and blood glucose was determine 15 minutes interval up-to 08 times among five participants. Blood glucose levels were plotted on Curve and GI was determined by calculating Area under Curve (AUC). Average glycemic index was calculated summing all individuals GI and dividing them with the number of individuals in table-3.

In the table 3, the Glycemic Index of MFS-3 formulated samples results were conducted among

5 participants and the average GI values was 22.83, recommended the highest acceptable products for diabolic patients.

Conclusions

Bangladesh is a developing country, Diabetics is a very serious disease and a rapid number of people are suffering from this disease in our country. And the daily diet is a critical factor for maintaining diabetes in all ages, but due to the lack of proper distribution of micro and macronutrients in food to people are not well balanced with diet. A diet complete in proper ratio of protein, fiber, carbohydrate is a prerequisite for proper management of diabetes management and low glycemic index food or diet is food that can be taken as a normal food but it will slow down blood glucose hike in after the consumption of food. The purpose in this study to development of low Glycemic index multi wholegrain flour for not only diabetic person, this product is acceptable for all age people. This product is high nutrition and high energy value supplementary food sources. The result of this study will be highly inspired people to utilize multi wholegrain flour in food preparation particularly bread, bread are consumed by all ages people and to full fill nutrition and energy value.

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