

Exploring the use of wheat-based low glycemic composite flour

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ABSTRACT

The present study was conducted on development and quality evaluation of low glycemic composite flour for making Missi Roti. It was found that all the diabetics consumed Missi Roti but the type of grain selected and proportion used varied. Composite flour was developed by combining wheat with Bengal gram in the proportion of 3:2 and with Bengal gram and barley in the proportion of 3:1:1. After several trials of different proportions for preparing Missi Roti, its acceptability was assessed (scores >7) by a selected panel of judges on nine-point hedonic scale. A recipe of Missi Roti was standardized for its carbohydrate content (40 g carbohydrate per serve), cooked weight, cooking time and water required for preparing the dough. Developed composite flour provided 62-74 per cent of energy from carbohydrates and was the good source of fibre (0.9-2.4%). Protein quality of the composite flour was better than plain flour (6.8-15.5 and 18.3 NDPCal% respectively). Developed flour was stored in 1 kg capacity bags for three months. Shelf life parameters revealed that free fatty acids and peroxide increased steadily with storage but did not exceed the safe limits. Acceptability of Roti remained same for wheat and its blends. Nutritional status of diabetic and normal subjects revealed that majority (43%) of them were in the category of over-weight and obesity; waist-hip ratio confirmed the abdominal obesity (>0.85) in the females. Glucose tolerance test was conducted with 40 g glucose and test recipe Missi Roti with chutney on diabetic and normal subjects at 1, 0, 0.5, 1, 1.5 and 2 hours after feeding to determine the glycemic index (GI) of composite flour in comparison to plain flour. Blend of wheat with Bengal gram and barley was the best as its GI was lowest. The acceptability of wheat + Bengal gram + barley composite was for longer duration up to 3 months and its GI was lowest. Therefore, for commercial purpose this blend is recommended.

Keywords: Composite flour; glycemic index; Missi Roti; quality evaluation

INTRODUCTION

Diabetes mellitus is metabolic disorder with impaired carbohydrate, protein and fat metabolism. It is due to insufficient insulin or impaired insulin response. It is mainly divided into type I, type II and gestational type of diabetes mellitus.

Type II diabetes mellitus is basically known as non-insulin dependent diabetes mellitus (NIDDM). It is associated with the problem of carbohydrate, fat and protein metabolism.

Diet is the corner stone in the management of the disease. Glycemic index (GI) is the ranking of the carbohydrates in the foods; high GI diets should be replaced with low GI diets for better management of

the disease. Roti is the main preparation of a meal in India. Diabetics as well as normal subjects are advised to consume Missi Roti for lower blood glucose response and weight reduction. Bijlani et al (1993) suggested that wheat, barley and Bengal gram in equal proportions are suitable supplement for prevention and treatment of the disease.

Ancient medical text prescribes addition of barley in cereal-pulse mixture for maintaining blood glucose in diabetics (Burkitt and Trowell 1977). However, these proportions are not known. Therefore, there is a need to develop such proportion which is acceptable to prepare Roti. The preparation, which is main dish of a meal having low GI, can definitely be helpful to control the disease. The present study was conducted to find out utilization of composite flour for

diabetics, develop low glycemic composite flour based on commonly consumed food grains, nutrient composition and shelf life of the flour, sensory quality of Roti prepared from fresh and stored flour, nutritional status of the subjects and glycemic index of composite flour.

MATERIAL and METHODS

Information about consumption, composition and preparation was collected from Ratangarh of Churu district and Udaipur city of Rajasthan.

Missi Roti was standardized for carbohydrate content (40 g/serve), serving size, cooked weight, cooking time, water required for the dough making and acceptability.

The quality of the developed flour was tested for its nutrient composition and shelf life. The nutrient composition (Raghuramulu et al 2003) including protein quality (Brock 1961) of the fresh flour was evaluated. Shelf life of the flour was tested by physical examination and estimation of moisture and rancidity at monthly interval for a period of three months.

The quality of flour was also tested for its acceptability using nine-point hedonic scale in the preparation of Roti at monthly interval. Fasting and post-prandial blood glucose level after feeding 40 g glucose was estimated at 0, 0.5, 1, 1.5 and 2 hours prior to feeding the test recipe.

One serving of Roti of wheat and its blends with Kachari chutney (15 g) containing 40 g carbohydrate was served to diabetics and normal subjects to find out the glucose response.

Glycemic index of the test recipes was calculated. The data were analyzed by applying appropriate statistical tests as per the objectives of the study.

RESULTS and DISCUSSION

Present study was an attempt to develop low glycemic composite flour for Missi Roti. Results of the survey revealed that all diabetics were consuming composite flour but type of grains and proportions were different. Composite flour was developed by combining wheat with Bengal gram in the proportion of 3:2 and with Bengal gram and barley in the ratio of 3:1:1.

After several trials of different proportions for preparing Missi Roti, its acceptability was studied (scores >7) by selected panel of judges using nine-point hedonic scale. A recipe of Missi Roti was standardized for its carbohydrate content (40 g carbohydrate/serve), cooked weight, cooking time and water required for preparing the dough.

Developed composite flour provided 62-74 per cent of energy from carbohydrates and was a good source of fibre (0.9-2.4%). protein quality of the composite flour was better than plain flour (6.8-15.5 and 18.3 NDPcal% respectively) (Table 1).

Developed flour was stored in 1 kg capacity bags for three months. Shelf life parameters revealed that free fatty acids and peroxide increased steadily with storage, but did not exceed the safe limits (Table 2). Acceptability of Roti remained same for wheat and its blends. Nutritional status of diabetic and normal subjects revealed that majority (43%) of them were in the category of over-weight and obesity; waist-hip ratio confirmed the abdominal obesity (>0.85) in the females.

Glucose tolerance test was conducted with 40 g glucose and test recipe of Missi Roti with chutney on diabetic and normal subjects at 1, 0, 0.5, 1, 1.5 and 2 hour after feeding to determine the glycemic index (GI). Blend of wheat with Bengal gram and barley was the best as its GI was lowest (Table 3). It might be due to addition of Bengal gram in the flour.

Pulses contain substantially higher percentage of resistant starch and fibre than cereals, which in turn, delay the gastric emptying time and help to reduce glucose response of Roti of the food (Sumathi et al 1995, Arora and Srivastava 2002, Pathak et al 2000). GI of the flour was not significantly different between diabetic and non-diabetic subjects. The acceptability of wheat + Bengal gram + barley composite was for longer duration up to 3 months and its GI was lowest, therefore, for commercial purpose this blend is recommended.

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Table 1. Nutrient composition of the flour (100 g)

Type of flour	Nutrient/100 g flour							
	Moisture (g)	Protein (g)	Fat (g)	Ash (g)	Fibre (g)	Carbohydrates (g)	Energy (Kcal)	Protein quality (NDPcal%)
Wheat	9.3	13	1.3	0.98	0.9	74	362	13.6
Wheat + Bengal gram	9.9	21	2.45	1	2.4	62.9	359	20.6
Wheat + Bengal gram + barley	8.9	18	2	1	2.0	67	361	20.9

Table 2. Effect of storage period on keeping quality parameters of flour

Component	Storage period (months)			
	0	1	2	3
Overall acceptability (n = 10)				
Wheat	7.47±0.17	7.40±0.14	7.50±0.14	7.20±0.12
Wheat + Bengal gram	7.50±0.10	7.33±0.23	7.33±0.13	7.10±0.13
Wheat + Bengal gram + barley	7.37±0.12	7.47±0.20	7.27±0.12	7.07±0.16
Moisture (%)				
Wheat	9.3	8.3	7.3	5.8
Wheat + Bengal gram	9.9	10.8	7.9	6.4
Wheat + Bengal gram + barley	8.9	9.3	7.2	5.7
Peroxide value				
Wheat	ND	0.6	0.7	3
Wheat + Bengal gram	ND	0.6	0.6	3
Wheat + Bengal gram + barley	ND	0.9	1	3
Acid value				
Wheat	ND	0.6	0.7	0.7
Wheat + Bengal gram	ND	0.7	0.7	0.9
Wheat + Bengal gram + barley	ND	0.8	0.8	0.8
Alcoholic acidity				
Wheat	ND	1.1	1.3	1.6
Wheat + Bengal gram	ND	1.7	1.7	2.3
Wheat + Bengal gram + barley	ND	1.6	1.8	2.2

ND = Not detected

Table 3. Glycemic index of Missi Roti prepared from different flours among diabetic and normal subjects

Flour	Glycemic index		
	Diabetic	Normal subjects	Overall
Wheat	116±66.27	56±16.02	86±41.14
Wheat + Bengal gram	75±12.68	42±11.46	59±12.07
Wheat + Bengal gram + barley	48±13.80	52±28.78	50±21.29

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