Brief Communications

The Glycemic Index of a New Bread Brand (Biobread)

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Abstract

Objective: Wheat bread is a traditional food in the Arab Middle East countries. In these countries, as well as in other countries of the world, the prevalence of type II diabetes mellitus is high. The consumption of low Glycemic Index (GI) foods may provide a variety of health benefits including control of blood glucose and lipids. The purpose of this study was to measure the serum glucose response of a new bread (Biobread), which is produced from whole wheat and other ingredients, and compare it with the traditional Arabic type bread made from white flour.

Methods: The study was performed in the laboratory of Department of Nutrition and Food Technology, University of Jordan, Amman-Jordan. A group of 8 adult healthy volunteers (4 men, 4 women) participated in this study. They were fed the commercially prepared Biobread and white bread. The GI (mean ± SEM) was calculated by standard methods.

Results: The glucose response of the Biobread was lower than that of the traditional white bread giving a GI value of 70.2 ± 8.5.

Conclusion: The Biobread can be classified as a relatively low- GI food item. There seems to be an effect of the added ingredients on the blood glucose response, particularly the rye and soybean flour incorporated in Biobread.

Keywords: glycemic index, white bread, Biobread.

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Introduction

The postprandial blood glucose response has implications for the diabetic patients. Low-GI foods in place of conventional or high-GI foods resulted in medium-term glycemic control in patients with diabetes.[1]

It has been shown that the long-term consumption of a diet with a high glycemic load (GL = GI x dietary carbohydrate content) is a significant independent predictor of the risk of developing type II diabetes [2,3] and cardiovascular disease. [4]

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The GI has been used as a method of ranking blood glucose responses which is reflected on their use in diabetic diets. [5,6] Glucose and white bread have been used as standard foods with which the glycemic responses of foods are compared. White bread was thought to be a better reference food since it forms the staple food for different communities in the world.

The rise of prevalence of type II diabetes mellitus among populations of the Middle East, which are recently undergoing rapid social and lifestyle change, is a matter of great medical concern. [7, 8] The prevalence among some urban Arabic populations is among the highest in the world. [8,9] It is reported that dietary fiber of wheat bread, and inclusion of soybean and rye flour may result in lowering the glycemic index of bread. [10, 11] Wheat products, including different types of bread, constitute the main dietary component in Middle Eastern diets including Jordan.[12-14] The objective of this study was to evaluate the serum glucose response of a new brand of bread (Biobread) based on whole wheat flour with the inclusion of rye flour, soy powder, linseed powder, wheat bran, dried soaked wheat and flavoring herbs (fennel, anise, and caraway).

Materials and Methods

Biobread is bread which is commercially produced in Britain and has been introduced to the local Jordanian market. As written on the Nutrition Information, Biobread is a mixture of whole wheat flour, soaked and dried wheat, wheat bran, rye flour, soy powder, linseed powder, and the seeds of fennel, anise, and caraway.

The study was conducted in the Department of Nutrition and Food Technology, Faculty of Agriculture, University of Jordan. The proximate analysis of the Biobread and white bread was done in triplicate samples. The glycemic index of Biobread was calculated with the participation of a group of 8 healthy volunteers (4 men and 4 women, 21-56 years old with a body mass index of 24 kg/m^2).

Before the beginning of the study, subjects were informed about its nature and purpose. The study took 3 days: in the morning of the first day after an overnight fast, finger prick blood samples were obtained from the subjects using manual lancets and collected in fresh heparinized capillary tubes. Blood glucose was determined using the hexokinase method (Boehringer Mannhein Gmbh, D-68298 Mannhein, Germany). On the second and third days of the study, after overnight fasting, each subject ingested a 50-g available carbohydrate portion of Biobread and white bread consequently. Each bread sample was eaten within 7-min and consumed with 200-ml of water. Blood samples were collected and glucose was determined at zero, 30, 60, 90 and 120 min after starting the test meal. The Glycemic Index (GI) of each subject was calculated for Biobread using the Wolever *et al* [15] method as follows:

GI = (Area Under blood-glucose Curve (AUC) for Biobread / Area Under blood- glucose Curve for white bread) × 100

The mean (±SEM) of GI in all subjects was calculated.

Results and Discussion

Table (1) shows the proximate analysis of Biobread and white bread samples. The average protein content was 15.23% for the Biobread and 13.17% for the white bread samples.

Tables (2) and (3) give the blood glucose test results in subjects consuming white bread and Biobread, respectively, during the study period of 120 min. Figures (1) and (2) show the curves for white bread and Biobread, respectively, and Figure (3) presents the areas under the curves of Biobread and white bread during the study period of 120 min.

The GI of Biobread, taking white bread as a reference, was 70.2±8.5 (mean ± SEM) (Table 4).

Table (1): Proximate analysis of Biobread and white bread (per100g).

Bread type	Moisture (g)	Ether extract (g)	Crude protein (g)	Ash (g)	Crude fiber (g)	NFE (g) *	Energy (Kcal) **
Biobread	29.6	2.5	15.2	1.7	1.2	49.8	282.7
White bread	32.7	2.1	13.2	1.6	0.6	49.8	270.9

**** NFE: Nitrogen-Free Extract.***

***** Energy is calculated from the ether extract, crude protein and NFE multiplied by the corresponding Atwater factors.***

Table (2): The blood glucose levels in subjects consuming white bread at 0, 30, 60, 90 and 120 min.

				Blood glucose level (mg / dl)			
Subject	**Sex**	**Age**	**Fasting**	**white bread (30 min)**	**white bread (60 min)**	**white bread (90 min)**	**white bread (120 min)**
1	M	45	97	115	129	109	107
2	M	50	100	112	126	110	108
3	F	65	93	112	124	102	95
4	F	45	84	105	122	97	86
5	F	48	106	127	133	109	106
6	F	60	85	105	125	94	88
7	M	27	88	107	118	96	88
8	M	21	95	111	127	105	96
Mean			**93.5**	**111.75**	**125.5**	**102.75**	**96.75**
± SD			**7.62**	**7.15**	**4.50**	**6.45**	**9.18**

Table (3): The blood glucose levels in subjects consuming Biobread at 0, 30, 60, 90 and 120 min.

					Blood glucose level (mg / dl)			
Subject	**Sex**	**Age**	**Random**	**Fasting**	**Biobread (30 min)**	**Biobread (60 min)**	**Biobread (90 min)**	**Biobread (120 min)**
1	M	45	114	101	110	127	115	107
2	M	50	90	108	112	125	117	108
3	F	65	117	93	116	127	95	93
4	F	45	92	86	89	110	84	84
5	F	48	123	110	119	130	115	110
6	F	60	119	107	115	129	115	106
7	M	27	112	102	110	127	120	88
8	M	21	109	95	110	128	110	95
Mean				**100.25**	**110.125**	**125.375**	**108.875**	**98.875**
± SD				**8.35**	**9.16**	**6.39**	**12.62**	**10.09**

Table (4): The glycemic index of Biobread for different subjects participating in the study.

Subject	*Sex*	*Age*	*AUC White*	*AUC Bio*	*GI*
1	*M*	*45*	*111.667*	*86.667*	*77.6*
2	*M*	*50*	*86.667*	*50.000*	*57.7*
3	*F*	*65*	*100.000*	*98.333*	*98.3*
4	*F*	*45*	*121.667*	*40.000*	*32.9*
5	*F*	*48*	*85.000*	*56.667*	*66.7*
6	*F*	*60*	*117.500*	*62.500*	*53.2*
7	*M*	*27*	*95.000*	*73.333*	*77.2*
8	*M*	*21*	*97.500*	*105.000*	*107.7*
Mean			***101.875***	***71.563***	***70.2***
± SD			***13.720***	***23.395***	***24.3***

Figure (1): The blood glucose responses to white bread at 0-120 min.

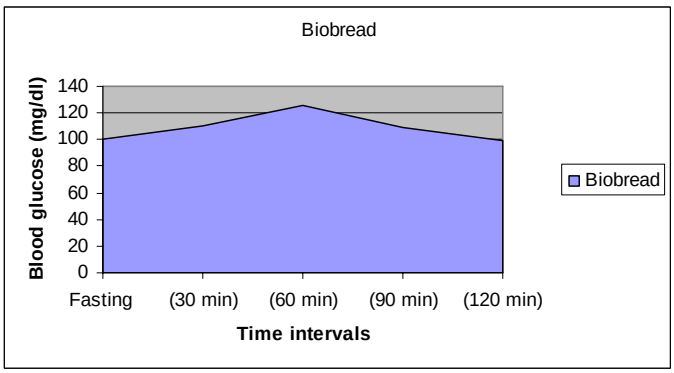

Figure (2): The blood glucose responses to Biobread at 0-120 min.

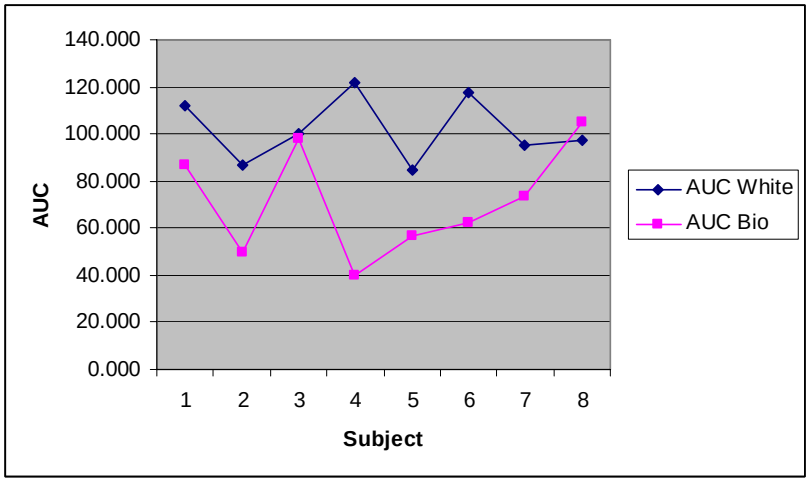

Figure (3): The Area Under Curve (AUC) of Biobread and White bread at at 0-120 min.

This indicates that Biobread gave a lower blood glucose response as compared with the white bread, showing that Biobread did not raise the blood glucose to the same extent that the white bread did.

There are many factors which may affect the glucose responses of different foods. The rate of gastric emptying, digestion, and absorption could be the major factors which govern blood glucose concentrations. [16-19] Digestion and absorption of carbohydrates may be influenced by the total dietary fiber content of the food [20], the particle size of the food [21], and the ratio of amylose to amylopectin. [22] Amylopectin is more rapidly digested and absorbed than amylase. [20] In the developed bread (Biobread), rye, soy powder and linseed are claimed to be ingredients added to whole wheat flour and wheat bran. Amylose content in rye and soybean is higher than that in wheat, whereas amylopectin content is higher in wheat. This could partly explain the relatively low GI of Biobread.

Additionally, the high fiber content, contributed mainly by wheat, might have an effect on the duration of gastric emptying, which affects the rise pattern of blood glucose level due to the slow release of nutrients into the small intestine. [19, 23] The fiber content of Biobread was found to be higher than that of the white bread (Table 1). The results of the present study is in agreement with those of many authors who investigated this effect. [5,20,21,24]

It seems also that the coarse particle size of fiber may be a factor on the obtained low GI of Biobread. Besides the chemical composition, the preparation methods of foods may play a role in their GI values. In the preparation of Biobread, it is claimed that soaked wheat (dried and ground) was included. It is documented that the cooking, processing and preparation methods may be more important in predicting glycemic indexes than the chemical components. [24-26] The soaking of wheat, as apparently practiced in the present study, may have had an effect on its physiological characteristics. The possible breakdown of phytic acid bonds may have an effect on blood lipids and mineral bioavailability. [27, 28] The contribution of soaking to the glycemic response may not be excluded in the present study.

In conclusion, the Biobread, made from whole wheat flour and many other components including herbs, may have lowered the blood glucose response to around 30% of that of white bread. The importance of this finding in diabetic patients requires further investigation.

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المؤشر السكري لنوع جديد من الخبز (الخبز الحيوي)

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الملخص

هدف الدراسة: خبز القمح هو الخبز المستهلك تقليديا في بلدان المشرق العربي، التي يزداد فيها، كما يزداد في بلدان أخرى من العالم، انتشار مرض السكري من النوع الثاني. وإن استهلاك الأطعمة ذات المؤشر السكري المنخفض يحقق للجسم فوائد متعددة من أهمها ضبط سكر وشحوم الدم. وتهدف هذه الدراسة إلى قياس استجابة سكر الدم جراء تناول نوع من الخبز المطور حديثاً والمعروف بـ (الخبز الحيوي)، والذي ينتج من دقيق القمح الكامل ومكونات أخرى، ومقارنته بالخبز العربي التقليدي المصنوع من دقيق القمح الأبيض.

طرق البحث: تم إجراء هذه الدراسة في مختبر قسم التغذية والتصنيع الغذائي، الجامعة الأردنية، عمان–الأردن. وشارك فيها 8 متطوعين أصحاء (4 رجال و 4 نساء). قمنا بإعطاء المتطوعين 50 غم من كربوهيدرات النوعين المذكورين من الخبز، وحسبنا المؤشر السكري (المتوسط ± الخطأ المعياري) باستخدام طرق مرجعية.

النتائج: كانت الاستجابة في سكر الدم للخبز الحيوي أقل من تلك التي للخبز الأبيض التقليدي، مع مؤشر سكري قيمته 70.2 ± 8.5.

الاستنتاجات: يمكن أن نخلص من هذه الدراسة إلى أن المؤشر السكري كان منخفضاً نسبياً للخبز الحيوي. ويبدو أن ثمة تأثيرا ايجابيا للمكونات المضافة على استجابة سكر الدم، وبخاصة إضافة دقيق الشيلم ودقيق فول الصويا.

الكلمات الدالة: المؤشر السكري، الخبز الأبيض، الخبز الحيوي.