

## BIOLOGICAL VALUE OF DIETARY CARBOHYDRATES OF BOILED SORYZ (SORGHUM ORYZOIDUM) PRODUCTS

SENIOR LECTURER **VIORICA BULGARU**,  
*FOODSTUFF TECHNOLOGY DEPARTMENT, FACULTY OF TECHNOLOGY  
AND MANAGEMENT IN FOOD INDUSTRY,*

DR., UNIV. LECTURER **LIDIA COSCIUG**,  
*PUBLIC CATERING TECHNOLOGY AND ORGANIZATION DEPARTMENT,*

SENIOR LECTURER **RODICA SIMINIUC**,  
*PUBLIC CATERING TECHNOLOGY AND ORGANIZATION DEPARTMENT,  
FACULTY OF TECHNOLOGY AND MANAGEMENT IN FOOD INDUSTRY,  
TECHNICAL UNIVERSITY OF MOLDOVA*

IT IS IMPORTANT TO KNOW THE GLYCEMIC INDEX (GI) - A VALID INDEX OF THE BIOLOGICAL VALUE OF DIETARY CARBOHYDRATES. THE GLYCEMIC INDEX OR GLYCAEMIC INDEX (GI) IS A MEASURE OF HOW QUICKLY BLOOD GLUCOSE LEVELS (I.E., BLOOD SUGAR) RISE AFTER EATING A PARTICULAR TYPE OF FOOD. THE EFFECTS THAT DIFFERENT FOODS HAVE ON BLOOD GLUCOSE LEVELS VARY CONSIDERABLY. THE GLYCEMIC INDEX ESTIMATES HOW MUCH EACH GRAM OF AVAILABLE CARBOHYDRATE (TOTAL CARBOHYDRATE MINUS FIBER) IN A FOOD RAISES A PERSON'S BLOOD GLUCOSE LEVEL FOLLOWING CONSUMPTION OF THE FOOD, RELATIVE TO CONSUMPTION OF PURE GLUCOSE [1]. GLUCOSE HAS A GLYCEMIC INDEX OF 100.

FINALLY GLYCEMIC INDEX WAS CALCULATED AS:

$$GI = \frac{AS}{GS} 100; \quad (1)$$

where:

GI - glyceimic index of the food analyzed;

AS - surface area under the glyceimic curve of studied food;

GS - surface area under the glyceimic curve of glucose;

Glyceimic index charts often give only one value per food, but variations are possible due to variety, ripeness, cooking methods, processing, and the length of storage. Potatoes are a notable example, ranging from moderate to very high GI even within the same variety [2, 3].

The glyceimic response is different from one person to another, and also in the same person from day to day, depending on blood glucose levels, insulin resistance, and other factors [3].

Most of the values on the glyceimic index do not show the impact on glucose levels after two hours. Some people with diabetes may have elevated levels after four hours [3].

GI values can be interpreted intuitively as percentages on an absolute scale and are commonly interpreted as follows:

Classification	GI range	Examples
Low GI	<55	beans(white, black, pink, kidney, lentil, soy, almond, peanutwalnut, chickpea); small seeds (sunflower, flax, pumpkin, poppy, sesame); most whole intact grains (durum / spelt / kamut whet millet, oat, rye, rice, barley); most vegetables, most sweet fruits (peaches, strawberries, mangos); tagatos.
Medium GI	56–69	not intact whole wheat or enriched wheat, pita bread, basmati rice, unpeeled boiled potato, grape juice, raisins, prunes, pumpernickel bread, cranberry juice [4], regular ice cream, sucrose, banana.
High GI	>70	white bread (only wheat endosperm), most white rice (only rice endosperm), corn flakes, extruded breakfast, cereals, glucose, maltose, maltodextrins, potato, pretzels, parsnip, bagels.

The glycemic effect of foods depends on a number of factors, such as the type of [starch \(amylose versus amylopectin\)](#), physical entrapment of the starch molecules within the food, fat and protein content of the food and organic acids or their salts in the meal.

A low-GI food will release glucose more slowly and steadily, which leads to more suitable post-prandial (after meal) blood glucose readings.

Products with high glycemic index (> 70) are easily digested and absorbed into the body, causing a sudden increase and high blood glucose levels. Frequent states of hyperglycemia can lead to metabolic disorders, diabetes and obesity [5].

The paper presents results of experimental determinations of glycemic index of boiled soryz grains, groats and starch compared to glucose.

**MATERIALS. RESEARCH METHODS.**

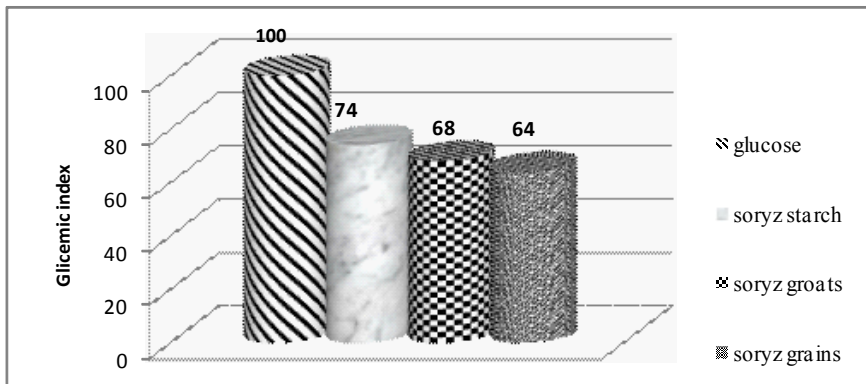
- As research materials were used:
- Soryz grains “Alimentar” boiled (about 120 min);

- Soryz groats (obtained by grinding during 3 minutes) boiled (about 40 min);
- Soryz starch boiled (1 minute);
- Pure glucose dissolved in distilled water.
- The glycemic index of samples tested was determined in vivo by monitoring the level of glucose in the blood of the participants in the experiment before and after the consumption of researched food products, according to ISO 26642: 2010 [6].

**RESULTS AND DISCUSSIONS**

Data obtained were used to build glycemic response curves of participants after consumption of the tested samples. Surface area under the curve was determined by mathematical method using AutoCAD through the program “Inquiry” that calculates the exact surface area. The glycemic index of boiled soryz grains, groats and soryz starch in relation to glucose is presented in Figure 1.

The experimental results have shown that soryz



**Fig. 1 The glycemic index of boiled soryz grains, groats and soryz starch in relation to glucose.**

groats have a higher glycemic index (68) than that of soryz grains (IG = 64). The data obtained allow the inclusion of soryz (*Sorghum Oryzoidum*) in the category of food with moderate GI (55-70). However, in moderate quantities it can be re-recommended by nutritionists for a healthy diet, unlike foods with high glycemic index (GI > 70) [7]. The glycemic index of cooked soryz grains and groats was lower than that of cereals such as: brown rice (GI = 76), white rice (GI = 79), semolina (GI = 94), belonging to the category of foods with high glycemic index [8].

Glycemic index value of soryz starch is lower as compared with glicemic index of other types of starch as corn or potato starch whose values are about 90-95. GI value (74) obtained for gelled soryz starch belong it to the category of foods with high glycemic index, but it is close to the delimitation of food with moderate glycemic index.

Obtained data come to complete the bibliographic information available with new varieties of cereal products and their glycemic index. It is useful and necessary for developing food rations for different population groups.

### CONCLUSIONS

The glycemic index of cooked soryz grains (64), groats (68) in relation to glucose values were close to 70, showing that it belongs to the category of moderate glycemic index foods. Foods with such glycaemic index are recommended by nutritionists for different population groups in a healthy diet. GI value of gelled soryz starch is 74 and belongs to the category of foods with high glycemic index, but it is lower than the GI value for starches commonly used in the food industry. Such high GI foods are relevant to sports nutrition for faster replenishment of muscle glycogen after exercise [9].

### REFERENCES

1. Glycemic Research Institute. Retrieved 2012-08-01.
2. Web.archive.org. Retrieved 2012-08-01.
3. FREEMAN, J. *The Glycemic Index debate: Does the type of carbohydrate really matter?* Diabetes Forecast, 2007.
4. <http://www.angelikachristie.com/glycemic-index>.
5. RUDY W. *Diabete*. Alpha Test, 2007.
6. ISO 26642:2010. Food products - Determination of the glycemic index (GI) and recommendation for food classification.
7. JEAN, A., RÉGINE, F. *Dizionario degli alimenti*. Scienza e tecnica, ed. Lavoisier, 2003.
8. <http://www.justwellness.org/public/pdf/tabela-indici-glicemici.pdf>
9. <http://www.fao.org/docrep/w8079E/w8079e0k.htm>

### REZUMAT

#### Valoarea biologică a carbohidraților dietetici ai produselor de soriz fiert (*sorghum oryzoidum*).

Indicele glicemic este considerat a fi un index valid al valorii biologice a glucidelor alimentare. El este un criteriu de clasificare a alimentelor care conțin carbohidrați, bazat pe efectul lor asupra concentrației de glucoză din sânge (glicemiei) în timpul celor două-trei ore de la ingestie. Alimentele cu indice glicemic ridicat (> 70) sunt digerate și absorbite mai ușor în organism, determinând o creștere bruscă și un nivel ridicat de glucoză din sânge. Stări frecvente de hiperglicemie pot conduce la tulburări metabolice, diabet și obezitate.

În lucrare sunt prezentate rezultatele determinărilor experimentale ale indicilor glicemici ale boabelor, crupelor și amidonului de soriz fierte în comparație cu glucoza. Datele obținute completează informațiile bibliografice existente despre valoarea biologică a glucidelor din varietăți noi de produse cerealiere, care vor fi utile și necesare în elaborarea rațiilor alimentare pentru diferite categorii de populație.

### ABSTRACT

#### Biological Value of Dietary Carbohydrates of Boiled Soryz (*Sorghum Oryzoidum*) Products.

The glycemic index is considered to be a valid index of the biological value of dietary carbohydrates. It is a criterion for the classification of foods containing carbohydrates based on their effect on blood glucose concentration during the two to three hours after ingestion. Foods with high glycemic index (> 70) are digested and easily absorbed into the body, causing a sudden increase and high blood glucose levels. Frequent states of hyperglycemia can lead to

metabolic disorders, diabetes and obesity.

The paper presents the results of experimental determinations of glycemic index of boiled soryz grains, groats and gelled starch compared to glucose. The obtained data complete the available bibliographic information with new varieties of cereal products and their glycemic index to be useful and necessary in developing food rations for different population groups.

#### РЕФЕРАТ

##### **Биологическая ценность диетических углеводов продуктов (*sorghum oryzoidum*).**

Гликемический индекс считается допустимым индексом биологической ценности пищевых углеводов. Он является критерием для классификации пищевых продуктов, содержащих углеводы, основанным на их влиянии на кон-

центрацию глюкозы в крови (гликемии) в течение двух-трех часов после приема пищи. Продукты с высоким гликемическим показателем (> 70) легче перевариваются и усваиваются в организме, что приводит к резкому и высокому росту уровня глюкозы в крови. Общие состояния гипергликемии могут привести к нарушению обмена веществ, диабету и ожирению.

В работе представлены результаты экспериментальных измерений гликемических показателей фасоли, круп и крахмала *sorghum oryzoidum* по сравнению с глюкозой. Данные дополняют существующую библиографическую информацию о биологической ценности углеводов из новых сортов зерновой продукции, которые будут полезны в подготовке продукции, необходимой для установления продовольственных нужд различных групп населения.