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The use of amaranth and non-steamed buckwheat in gluten-free products

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Abstract

The diet of children with gluten intolerance should include a sufficient amount of gluten-free grain-based products that provide children with carbohydrates, including dietary fiber, vegetable proteins, fats, B vitamins, and mineral matters. This study is aimed at studying the content of the main food substances (proteins, fats, carbohydrates, as well as the total content of mineral matters, expressed by the parameter – ash content) in amaranth flour and flour from native buckwheat. Studies have shown that amaranth flour has a high protein content-13.4%, lipids-5.1%, and ash content - 2.8%. Flour from native buckwheat contains protein-7.5%, lipids-3.6%, the ash content of buckwheat flour was 1.4%. The carbohydrate content of both samples is approximately at the same level of 56-58%. Specialized products made from amaranth and buckwheat can become a source of deficient macro-and microelements, high-grade protein and other biologically valuable compounds.

Keywords: amaranth, gluten-free products, gluten intolerance, grain-based baby food, non-steamed buckwheat.

Аннотация

В питание детей с непереносимостью глютена должны быть включены в достаточном количестве продукты на зерновой основе не содержащие глютен, обеспечивающие детей углеводами, в том числе пищевыми волокнами, растительными белками, жирами, витаминами группы В, минеральными веществами. Данное исследование направлено на изучение содержания основных пищевых веществ (белков, жиров, углеводов, а также общее содержание минеральных веществ, выраженное параметром – зольность) в амарантовой муке и муке из нативной гречневой крупы. Исследования показали, что амарантовая мука имеет высокое содержание белка - 13,4%, липидов - 5,1%, а также зольности - 2,8%. Мука из нативной гречневой крупы содержит белка – 7,5%, липидов - 3,6%, зольность гречневой муки составила 1,4%. Содержание углеводов у обоих образцов находится примерно на одном уровне 56 –

58%. Специализированная продукция из амаранта и гречихи, может стать источником дефицитных макро- и микроэлементов, полноценного белка и других биологически ценных.

Ключевые слова: амарант, безглютеновая продукция, непропаренная гречиха, непереносимость глютена, продукты детского питания на зерновой основе.

Introduction

Nutrition plays a leading role in ensuring human health and is of particular importance in childhood, when the body intensively processes growth and development, forming organs and systems, improving their functions.

Diet therapy is an integral part of the treatment of diseases of the digestive organs of childhood. A strict lifelong diet is the main treatment for food intolerance to gluten, including celiac disease. The effectiveness of the treatment of gluten intolerance directly depends on the adherence to a gluten-free diet, which is often violated due to the limited range of recommended foods and dishes, especially for children [1].

The diet of children with gluten intolerance should include a sufficient amount of gluten-free grain-based products that provide children with carbohydrates, including dietary fiber, vegetable proteins, fats, B vitamins, mineral matters (potassium, magnesium, selenium, etc.). It is fundamentally important to avoid eating bread, bakery and confectionery products, pasta, wheat, semolina, oatmeal, pearl barley, and products that contain "hidden" gluten used as a food additive in the production process [1].

Amaranth is one of the oldest agricultural crops. The main countries producing and consuming amaranth are the United States, Mexico, China, Canada, Argentina and Peru. Amaranth is a rich source of protein, lipids, beta-carotene, vitamins, minerals, and dietary fiber. Amaranth starch is unique in its high solubility and digestibility compared to wheat, rice and oat starch. Amaranth does not contain gluten, and the amount of protein with a full set of amino acids is about 30% higher than that of traditional cereals. In addition to its nutritional value, worldwide research has identified amaranth as a source of biologically active compounds with antioxidant and antimicrobial properties, as well as antidiabetic, antihyperlipidemic, and antihypercholesterolemic effects [2].

Amaranth starch is mainly composed of amylopectin (93.6–95.2%). Starch granules are small in size relative to the starch of other cereals. These properties give starch a higher resistance to the action of amylase, as well as high solubility and digestibility [3].

Amaranth starch also has a high glycemic index, which contributes to a faster recovery after physical activity inherent in the child's body [4].

In Russia, buckwheat is the second most consumed cereal crop after rice – this is due to long-established culinary traditions. According to Rosstat, over the past 3 years, the average gross harvest of buckwheat was about 1 million tons / year, which is more than 35% of the total production in the world, while it is important to note that in many EU countries buckwheat is not grown.

In the production of steamed buckwheat, a grain processing process is used, including steaming, followed by drying and cooling, which leads to a deterioration in the nutrient composition of the cereal, unlike the native one, where the main nutrients and vitamins are not affected by heat treatment. Flour made from non-steamed buckwheat contains more vitamins (C, B1, B2, PP, P and vitamin E), mineral matters and natural antioxidants that are necessary for the human body. Buckwheat flour contains microelements necessary for the body: iron, phosphorus, copper, magnesium, potassium, zinc and others. It is characterized by high nutritional and biological value, rich in fiber and mineral matters. Buckwheat products are particularly valuable in dietary terms, as they contain essential amino acids and hard-to-digest carbohydrates. The use of flour from non-steamed buckwheat in the production of food products improves the work of internal organs [5].

Compared to other cereals, buckwheat proteins have a higher biological value due to the high content of lysine with an amino acid coefficient of protein digestibility of 99.45

The purpose of this study was to determine the main food substances: proteins, fats and carbohydrates, as well as the total content of mineral matters, expressed by the parameter – ash content in 100 g of finished products from buckwheat and amaranth flour.

Materials and methods of research

The content of the main nutrients and ash content in amaranth flour grade 1 according to TU 9293-004-77872064-2011; buckwheat groats kernel (non-steamed) grade 1 according to TU 10.61.32-004-06861298-2018.

Humidity was determined according to GOST 9404-88. Ash content according to GOST 32933-2014 (ISO 5984: 2002). The study of the content of proteins, fats and carbohydrates was carried out by the method of infrared spectroscopy on the SpectraStar analyzer.

Results

As a result of the conducted studies, data were obtained on the content of the main food substances (proteins, fats, carbohydrates, and ash content) in amaranth flour, as well as flour from native buckwheat (Table 1).

Table 1

Chemical composition of amaranth flour and non-steamed buckwheat

№	Product Name	Humidity, %	Protein, %	Lipids, %	Carbohydrates, %	Ash content, %
1	Amaranth flour	7,8	13,4	5,1	58,3	2,8
2	Flour from non-steamed buckwheat	14,4	7,5	3,6	56,1	1,4

As can be seen from the table, amaranth flour has a high protein content of 13.4%, which corresponds to other studies [6] confirming that the amount of protein in amaranth grains is greater than in traditional cereals, including gluten-free ones. Amaranth and buckwheat flour are characterized by a high content of lipids: 5.1% and 3.6%, respectively. There is also a high content of the total amount of minerals-2.8% in amaranth flour and 1.4% in non-steamed buckwheat. The carbohydrate content of both samples is approximately at the same level of 56-58%.

Conclusion

The results of this study confirmed the prospect of using buckwheat and amaranth flour as the main components, which has a high nutritional and biological value. The absence of gluten, as well as high levels of protein, amino acids, saturated and unsaturated fatty acids, mineral matters, and biologically active elements make amaranth and non-steamed buckwheat an important source of nutrition for gluten intolerance.

Expanding the range of domestic specialized gluten-free products, including through the use of new types of gluten-free raw materials, is an actual scientific and practical task, the solution of which will optimize the approach to the organization of nutrition of patients with gluten intolerance, increase the compliance of treatment, improve the quality of life of the patient and his family. The consumption of specialized products allows to reduce the frequency and severity of deficient states of the nutrients necessary for the body.

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