Volume 2, Issue 5, May 2024 ISSN (E): 2938-3765

BIOLOGICAL AND NUTRITIONAL VALUE OF SORGHUM BY AMINO ACID COMPOSITION IN CERTAIN DISEASES

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Abstract
For several thousand years, sorghum seeds have been a valuable staple food in warm climatic zones. One of the varieties of sorghum is "Dzhugara" (white dzhugara), is being used in the diet of the population of Uzbekistan, especially in the Aral Sea zones, due to drought and salt tolerance, this product is the main type of grain in the diet of the indigenous population. In the scientific literature there are numerous studies devoted to the use of sorghum only as a fodder crop, and there are no studies devoted to the use of this product in dietetics and the study of the biological value of local varieties in Uzbekistan. The author conducted studies to study the amino acid composition of sorghum grain of the "Dzhugara" variety and showed its preventive and dietary properties due to the high content of essential amino acids methionine in the amount of 9.051139 ± 0.0234 mg / gm and leucine in the amount of 6.8521±0.0245 mg/ gm, the so-called lipotropic substances, which are necessary especially for diabetes mellitus, chronic liver disease, obesity and metabolic syndrome.

Keywords: Amino acid, ash, biological, dietary, dzhugara, diseases, grain, moisture, porridge, protein, sorghum.

Introduction

Sorghum (Dzhugara-lat. Sorghum) is a genus of annual and perennial herbaceous plants of the Cereals or Poaceae family. Sorghum seeds have been a valuable staple food in warm climatic zones for several thousand years. Whole grains are eaten boiled like rice or fried like popcorn. If you grind it to cereals or flour, then you can prepare baked goods, porridge and flour dishes.
Includes about 30 species that grow in Asia, Africa, South and North America, Europe and Australia. A number of sorghum species are grown as a cultivated plant - grain, industrial and fodder. Thanks to breeding processes, today there are hybrid varieties that are very productive and have large grains. They grow low and ripen evenly, this of which is "Dzhugara" (white dzhugara), used in the diet of the population of Uzbekistan, especially in the Aral Sea zones, due to drought and salt tolerance, this product is the main type of grain in the diet of the indigenous population.
The aim of the study was to assess the amino acid composition of local varieties of "Dzhugara" and its biological value.

Research Methods

Each seed sample was taken in separate parts from different parts of the sample in 3-4 doses. The selected seeds were carefully crushed in a mortar, then transferred into pre-dried and weighed weighing bottles and, covered with lids, were weighed on an analytical balance. Drying of seed samples was carried out in a drying cabinet at 100-105 ° C for 4 hours. After the specified time had elapsed, the weighing bottles were quickly removed from the cabinet, covered with lids, and placed in a desiccator for 10-15 minutes. The cooled and weighed weighing bottles were again placed in a drying oven for 30 min, then removed, cooled and weighed. This was repeated until constant weight was reached.

Constant weight was considered achieved when the difference between weighings did not exceed 0.001 g.

The moisture content of seeds in% (X) was calculated by the formula:

$$X = \frac{(P_1 - P_2) \times 100}{P}$$

where P_1- is the weight of seeds in gm before drying;

P_2 - weight of seeds in gm after drying;

P- is the weight of seeds, in gm. The average of two parallel determinations was taken as the final result. Discrepancies between parallel determinations did not exceed 0.3%.

The ash content was determined by burning a sample in a muffle at a temperature of 600-800 ° C, for 2-3 hours, until the presence of organic substances in the ash, in the form of black particles, disappeared (31). The ash content was determined by the difference between the crucible weight before and after calcining in a muffle, expressed as a percentage of the initial sample, according to the formula:

$Z = M_1 - M_2 \times 100 / H$, where

M_1 - weight of the crucible with a sample before drying, gm.

M_2 - weight of the crucible with a sample after drying, gm.

H - weight of the sample, gm.

Determination of the protein content in seeds was carried out by the standard method. The work used a coffee grinder, analytical balance (0.0001), filter paper, conical funnel, FEC, sodium hydroxide, Signet salt, Nessler's reagent, distilled water, concentrated sulfuric acid, concentrated hydrogen peroxide. To determine the protein content in the isolated fractions, an aliquot of them was taken into a heat-resistant flask (from 5 to 10 ml). Concentrated sulfuric acid H2SO4 (p 1.84 g / cm3) was poured into heat-resistant flasks, to a sampled sample or to an aliquot of the fraction taken. The flasks were placed in a sand bath, setting the temperature to 400 ° C. At the same time, it is necessary to avoid violent boiling. Distilled water was carefully poured into cooled flasks along the walls and quantitatively transferred into a volumetric flask with a capacity of 50 ml. After cooling, the volume in the flasks was brought to the mark and mixed thoroughly. From a volumetric flask, after mineralization, to determine the protein content by nitrogen, an aliquot was taken, depending on the expected protein content. At a high nitrogen content in the samples, dilution was carried out. To the selected aliquot, up to half the volume of distilled water was added. Then the solution was neutralized. And added 1 ml of Nessler's reagent. The solutions in the flasks were brought to the mark with water and mixed thoroughly. In this case, the solutions should be completely transparent. 15 minutes after painting, the solutions were colorimetric on an electro-photocolorimeter KFK-3. Protein extraction was carried out on a magnetic stirrer with 0.2 H

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webofjournals.com/index.php/5

sodium hydroxide in a ratio of 1:10. Cell debris was removed by centrifugation in a RS-6 refrigerated centrifuge within 30 minutes at 6000 rpm the obtained transparent supernatant (supernatant solution) was precipitated with ammonium sulfate with stirring on a magnetic stirrer. The resulting extract was left in the refrigerator for 16 hours to form the protein. Then the extract was centrifuged at 6000 rpm for 30 min in a refrigerated centrifuge. The resulting precipitate was collected and dissolved in a minimum volume of 0.2 H sodium hydroxide.

Dialysis (desalting) of the obtained protein solutions was carried out in running water for 24 hours in cellophane bags in glass containers. The property of cellophane bags for dialysis differs in that the cellophane bags soaked in water for two hours have the property of passing substances with a molecular weight of less than 10 000 Da.

The protein solutions desalted after dialysis were lyophilized at a temperature of -35 ° C and a high vacuum created by a vacuum pump. In a colorocryostat (a freezer containing ethyl alcohol cooled to -35 ° C) in round-bottom flasks (0.5 ml) with thin section No. 29, protein solutions were frozen in an even layer, then placed on a freeze dryer "INEY". Drying takes place within 6-8 hours. The synthesis of FTC (phenylthiocarbomail) derivatives of free amino acids was carried out according to the method of Steven A., Cohen Daviel .

The identification of FTK - amino acids was carried out on an Agilent Technologies 1200 chromatograph on a 75x4.6 mm Discovery HS C18 column. Solution A: 0.14M CH3COONa + 0.05% TEA pH 6.4, B: CH3CN. Flow rate 1.2 ml / min, absorption 269nm. Gradient% V / min: 1-6% / 0-2.5min; 6-30% / 2.51-40min; 30-60% / 40.1-45min; 60-60% / 45.1-50min; 60-0% / 50.1-55min.

Research results. The data of the physical and chemical composition of the grain "Dzhugara" are presented in tables 1,2,3

Table 1. Moisture content of grain "Dzhugara"

No.of the bottle	Weight of the bottle, gm	Weight of the weighing bottle with the initial sample, gm	Sample, gm	Weighing results after drying	Dry matter,%	Average value,%
Experiment **1**	13,9923	15,8640	1,8717	15,6287±0,221	12,57±0,21	12**,57**±0,03
Experiment 2	16,3697	19,1381	2,7684	18,7899±0,312	12,57±0,23	
Experiment 3	13,9924	15,8647	1,8716	15,6288	12,60±0,24	

Table 2. Ash content of grain "Dzhugara"

Crucible No.	Crucible weight, gm	Crucible weight with initial sample, gm	Weight, gm	Weighing results after shrinkage, gm	Ash weight, gm	Average value, %
Experiment **1**	16,8819	19,5086	2,6267	16,9149±0,231	1,25±0,02	1,39±0,15
Experiment 2	16,9278	19,9604	3,0326	16,9700±0,234	1,39±0,02	
Experiment 3	17,0817	**19,1838**	2,1021	17,1144±0,243	1,55±0,03	

Table 3. Total protein content in the grain of "Dzhugara"

Sample	Weighing, gm	Aliquots, ml	FEK 400 nm	Protein, * %	Average value,%
Experiment **1**	0,9093	0,5	0,479±0,021	8,79±0,02	8,56±0,05
Experiment 2	0,9832	0,3	0,411±0,012	8,49±0,012	
Experiment 3	0,4520	0,2	0,121±0,002	8,42±0,02	

Specialists of agricultural scientific departments of foreign countries studied the nutritional value, amino acid composition and content of vitamins in fodder crops .

According to the data, the carbohydrate content is about 60-75%. Proteins make up 8-13% and fats 3-6%. Consequently, the protein content in the grain of "Dzhugara" is on average 8.56 ± 0.05 grams per 100 grams (table 3) . The obtained data of the amino acid composition of the grain of "Dzhugara" are presented in table 4.

Table 4. Amino acid composition of "Dzhugara" grain, in mg / gm protein

Amino acids	Dzhugara grain
	Concentration mg / gm
Aspartic acid	4,270186±0,0211
Glutamic acid	14,7823±0,03021
Series	1,870174±0,0022
Glycine	4,235944±0,0123
Cysteine	17,5236±0,1342
Threonine	3,178958±0,0143
Arginine	7,968174±0,0223
Alanine	5,139898±0,0125
Proline	4,048639±0,0133
Tyrosine	1,717233±0,0023
Valine	5,206096±0,0034
Methionine	9,051139±0,0234
Isoleucine	3,07016±0,0112
Leucine	***6,8521*** *±0,0245*
Histidine	3,466842±0,0122
Phenylalanine	2,52847±0,0021
Lysine HC1	2,485776±0,0013
Total	**97,40172**±0,2352

The highest concentration of amino acids is glutamic acid in the amount of 14.7823 ± 0.03021 mg / gm of protein in grain. By acting and stimulating the nervous system, glutamic acid qualitatively affects the metabolism. In addition, without its participation, the synthesis of other amino acids is impossible, so we can say that most of the cells in our body are somehow built with the participation of glutamic acid. It is also noticed that glutamine is able to increase the secretion of growth hormones, which is especially important for adolescent children. Glutamic acid plays an important role in the metabolism of nitrogen-containing biochemicals. It is also a neurotransmitter amino acid, an important member of the excitatory amino acid class. The binding of glutamic acid to specific receptors of neurons leads to their excitation.

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The greatest value for the body is the high content of essential amino acids methionine in the amount of 9.051139 ± 0.0234 and leucine in the amount of 6.8521 ± 0.0245 mg / gm, the so-called lipotropic substances.

CONCLUSION:

1.Grain sorghum of the "Dzhugary" variety used in the nutrition of the local population of Uzbekistan has a high-value protein content in the amount of 8.56 ± 0.05 grams per 100 grams of grain.

2.The results of the study of the amino acid composition of sorghum grain of the "Dzhugary" variety shows its preventive and dietary properties due to the high content of essential amino acids methionine in the amount of 9.051139 ± 0.0234 and leucine in the amount of 6.8521 ± 0.0245 mg / gm, the so-called lipotropic substances, especially in diabetes mellitus, chronic liver disease, obesity and metabolic syndrome.

3.The high concentration of cysteine amino acids in the amount of 17.5236 ± 0.1342 mg / gm of protein in the grain of "Dzhugara" indicates its effect in the prevention of diabetes. Cysteine plays a key role in the formation of insulin and immunoglobulins (antibodies).

4.The content of glutamic acid in the amount of 14.7823 ± 0.03021 mg / gm of protein in grain is capable of increasing the secretion of growth hormone, which is especially important for children and adolescents.

5.The rich spectrum of amino acids in the grains of "Dzhugara" in the amount of 7.968174 ± 0.0223mg / gm has a high dietary value, especially in diseases such as glomerulonephritis, chronic liver diseases, diabetes mellitus, characterized by metabolic disorders due to a decrease in proteins and fatty degeneration .

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