THE ROLE OF NATURAL SYRUPES IN INFANT NUTRITION

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ABSTRACT

In the framework of the state "Concept of the development of the food industry until 2025", new approaches to the theory of balanced nutrition of children appeared [1].

Under modern environmental conditions and the development of the production of synthetic food additives, the range of products intended for infant nutrition should not only have high biological and food values, but also be dietary and carry out preventive functions. Besides, it is necessary to develop energy-saving technologies for food production for infant based on available sources of raw materials rich in valuable natural components, such as pectin substances, fiber, amino acids, vitamins, minerals that can support and also remove radionuclides and salts of heavy metals from the organism [2-4].

The aim of the research is to study the nutritional value and dietary properties of infant nutrition using sorghum stem extract.

As noted in the reports discussed at WHO meetings published in 2010, advertisements for foods containing high levels of fat, sugar, and salt shape children's eating habits. These data confirm significant violations of the principles of rational nutrition in children of preschool and primary school age, which leads to the development of diseases such as diabetes, obesity and metabolic disorders [5, 6].

Currently, the need for local infant products is not satisfied. At the same time, the provision of infant nutrition in the Republic is of great social importance in connection with the need to improve children's health. Thus, the tasks of both improving the technology for obtaining individual infant nutrition products and the reasonable expansion of the range of non-traditional recipes aimed at covering the shortage of irreplaceable components in infant nutrition become relevant.

One of the ways to expand the range of products is the production and use of syrups, including as a sugar substitute: glucose-fructose-sucrose, glucose-fructose, fructose, glucose. Optimal is the use of syrups from a technological and economic point of view. A worthy example is sugar sorghum syrup, the studies of which are given in this paper. The advantage of using this syrup in the production of infant nutrition is due to its chemical composition, studied functional and technological properties, the presence of proven agricultural cultivation techniques, a wide range of plants [7].

Dr. Douglas Shar from the USA notes that sugar sorghum syrup has a light aroma and is useful in almost all recipes that use sugar or glucose syrups. Unlike treacle and honey, with a characteristic strong aroma that inhibits other floral aromas, sorghum syrup sweetens the product and helps to reveal the aroma of the inherent product used in the recipe [8, 9].

The main advantages of the mixture of sorghum syrup (sucrose-glucose-fructose):

- quickly and easily digested by the organism;
- restores strength and releases the necessary energy;
- easy to pass by the kidneys;
- promotes an increase in glycogen in the liver and muscles (the main supply of carbohydrates in the body of each person) [9,10,11].

According to the spectrum of sugars, sorghum syrup is similar to invert sugar (sugar split into monosugars, invert) and even to natural honey, it is not sugared due to the presence of fructose [9].

Objects and research methods. In the course of this work, we used modern methods of physicochemical analysis.

The researches were conducted on the basis of regulatory documents and the developed methodology. When performing the work, the methods given in International normative standarts and local standarts were used.

The object of the research was the stems of sugar sorghum varieties "Karabash" and "Uzbekistan 18". On April 14, 2019, at one of the plots, we sowed the seeds of sugar sorghum of the varieties "Karabash" and "Uzbekistan 18". When growing seeds, we found that the growth and development of sugar sorghum depends not only on the growing season, but also on growing conditions, such as type of soil, seed placement depth, and germination energy.

Results and its discussion. In our studies, the growth and development of varieties of sugar sorghum "Karabash" and "Uzbekistan 18" proceeded approximately the same way, as the sowing was carried out on the same day. Phenological observations of the growth and development of sugar sorghum varieties "Karabash" and "Uzbekistan 18" are presented on average in table. 1.

Table 1

Phenological observations of the growth and development of sugar sorghum during the growing season at 100 thousand pcs. seed/1 ha

№	Varieties	Development phases and dates							
		Sowing	Full shoots	Stooling	Mowing	Bloom	Milk ripeness	Full ripeness	Vegeta-tion period
I	Karabash	14.04	26.04	16.05	4.06	5.07	11.07	26.08	103
II	Uzbekistan 18	14.04	27.04	19.05	17.06	23.07	13.08	5.09	144

The data given in table 1. show that the growing season on average corresponds to the biological characteristics of the variety. The vegetation period by varieties with sifting of 100 thousand units/ha was: "Karabash" - 103 days, and "Uzbekistan 18" - 144 days. The duration of interphase periods of the development of sugar sorghum plants was studied at a sowing rate of 100 thousand units/ha. Analyzing the interphase period on average for the "sowing-seedling" period, "Karabash" - 12 days for sifting of 100 thousand units/ha, "Uzbekistan 18" - 13 days for 100 thousand units/ha.

"Shoots - stooling" - for all sowing rates, the number of days was: "Karabash" - 20 days, "Uzbekistan 18" - 22 days. "Uzbekistan 18" had a longer period, "shoots-stooling" in comparison with the variety "Karabash" for 2 days.

2) "Stooling - mowing" - a long period compared with "shoots - stooling" for varieties amounted to: "Karabash" - 20 days, "Uzbekistan 18" - 29 days. So, "stooling - mowing" at a sowing rate of 100 thousand units/ha, the grade "Uzbekistan 18" is extended by 9 days compared to the variety "Karabash".

3) The interfacial period "mowing - bloom" the number of days by variety was: "Karabash" - 36 days at 100 thousand units/ha, "Uzbekistan 18" - 30 days at 100 thousand units/ha.

4) The interfacial periods "bloom - milk ripeness" and "milk –wax ripeness" - the number of days by variety was: "Karabash" - 21 days at 100 thousand units / ha, "Uzbekistan 18" - 54 days at 100 thousand units/ha.

Thus, as our studies showed, the total number of days of the interphase period by variety was: "Karabash" at 100 thousand units/ha — 103 days, "Uzbekistan 18" at 100 with thousand units/ha - 144 days. Duration of interphase periods of development of sugar sorghum varieties "Karabash" and "Uzbekistan 18" are presented in table 2. To obtain sugar syrup, stem samples were taken in the phase of milk-wax ripeness. Stem samples were taken manually, the selected samples were weighed on a laboratory electric balance, manually peeling the peel from the pulp.

Sorghum sugar syrup, i.e. a thick extract was obtained by extraction with hot distilled water at a temperature of 72-78° C in a digester, followed by concentration of the liquid extract in a vacuum drying complex and evaporation of the concentrated extract in a water bath. The solids in the thick extract (syrup) were determined using a refractometer, and the carbohydrate composition was determined using a sugar meter. The results of the studies are shown in table 2.

Table 2
Duration of interphase periods of sugar sorghum plant development

№	Experience Options	Development phases and dates of their onset, days							
		Sowing rate, thousand units ha/(C)	Sowing - shoots	Shoots - stooling	stooling - mowing	Mowing – bloom	Bloom – milk ripeness	Milk-wax ripeness	total quantity days of interfacial periods
I	Karabash	100	12	20	20	30	6	15	103
II	Uzbekistan 18	100	13	22	29	26	31	23	144

The physicochemical properties of the obtained sugar syrup (extract) from the sorghum variety Karabash and Uzbekistan 18 are studied. The results are presented in table 3.

Table 3
Indicators of syrup from various varieties of sorghum

№	Varieties	The mass of the peel, g	The pulp of the mass, g	Solid in extract,%	Carbohydrates in extract,%	The yield of extract, g
1	Karabash	818	1059	36,74	28	740
2	Uzbekistan 18	805	1104	28,18	24	740

Table 4
The main physical and chemical properties of concentrated sugar syrup of sorghum varieties "Karabash" and "Uzbekistan 18".

№	Indicators	Result
1	Appearance	Honey-forming liquid without precipitation
2	Smell	Specifically, without smell
3	Taste	Specifically, sweet
4	Color	Light-brown
5	Transparency	The same concentration, no precipitation
6	Solubility	Soluble in hot water
7	Mass fraction of solids, % no less	70-75
8	pH of 1% aqueous solution of the finished product	6,0-6,5
9	Mass fraction of ash,% no more	1,0-1,5
10	Oxymethylfurfural	Is absent

Conclusions. As a result of the research:

- the technological properties of stalks of sugar sorghum of local zoned varieties grown in Uzbekistan were studied, on the basis of which a method for producing new sugar syrup was developed, the technical and economic indicators of the production of sugar syrup from sorghum were studied;
- the chemical composition and organoleptic characteristics of sugar syrup from the sorghum varieties "Karabash" and "Uzbekistan 18" were investigated;
- sugar syrup from sugar sorghum of the varieties "Karabash" and "Uzbekistan 18" can replace beet sugar in the composition of fruit purees, sweet baby and diet preserves intended for baby food, which will enrich the product with sugars (mainly fructose), vitamins, biologically active substances necessary for children.

References

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