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THE EFFECT OF THE DIETARY SUPPLEMENT «ASPRULANCE» ON DIABETES MELLITUS

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Abstract

The article analyzes data on diabetes mellitus, one of the most common endocrine diseases in the world, and the growing number of patients. The main attention was paid to the origin of this disease, its dependence on metabolic processes, including the study of carbohydrate metabolites. The biological activity of the food additive Asprulance was studied in experimental animals. Changes in the amount of glucose, glycogen, hemoglobin and glycated hemoglobin were studied and the corresponding conclusions were presented.

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Diabetes mellitus is one of the most common and progressive endocrine diseases in the world. According to the International Diabetes Federation (IDF Diabetes Atlas), the number of people with diabetes worldwide in 2019 was 470.2 million, in 2021 - 529 million, and according to research results - 628.6 million in 2045, 2050 and by the end year, their number will reach 1.31 billion. The Ministry of Health of Uzbekistan reported that in 2019, diabetes was diagnosed in more than 245 thousand patients in our country, of which 2,300 were children and about 1,000 adolescents. According to screening results, the prevalence of type 2 Diabetes mellitus in Uzbekistan has increased 1.6 times over the past 14 years, and according to the latest data (2017), this figure among people over 35 years of age is 7.9%[1,2].

The origin of diabetes is associated with metabolic disorders, which leads to a deterioration in the physiological state of the body; oxidative stress caused by the disease increases the sources of free radical formation and potentiates the mechanism of their harmful effects and causes tissue damage.

There are insulin-dependent and insulin-dependent types of diabetes. For the insulin-dependent type, insulin is recommended. On the other hand, medications are prescribed for the insulin-dependent type. Today, in medicine, there are some side effects of drugs used to treat this disease (Maninil, Diabeton, Glidiab, Bovaglexen, Gliclazide, Metformin, etc.). That is, conditions such as hypoglycemia, headache, nausea, vomiting, abdominal pain, diarrhea, sleep disorders, blurred vision are observed.

In folk and traditional medicine, in the prevention and treatment of such pathological conditions, secondary metabolites, usually secreted by plants, protect the body from oxidative stress and neutralize the reactive form of oxygen, regulate the redox properties of cells, and protect the body. from early aging and cell apoptosis[10].

Polyphenols not only monitor oxidation processes, but also, due to their antioxidant and hypoglycemic properties, have a wide spectrum of action, which makes it possible to create drugs. Therefore, the search for biologically active polyphenols and the creation of effective drugs and nutritional supplements based on them are very important.

Research results. Determination of the biological activity of the food additive “Asprulance”, prepared on the basis of walnut and peach leaves, in the prevention and treatment of diabetes and recommending it as a food additive.

Day by day, the attention and demand for using natural means, including food supplements, capable of replacing chemical drugs in the prevention of diabetes and the treatment of patients with the disease are increasing. In order to achieve the goal in this regard, it is necessary to find medicinal plants in the field of folk medicine, to determine their chemical composition, as well as biologically active substances with antioxidant properties, to study their effects and, based on the results, to develop new natural remedies and food recommending additives is one of the current issues.

Literature review: The research analyzed a number of literature that studied diabetes, its causes, prevention and treatment, as well as others, including the emergence of favorable conditions for the development of lipid peroxidation in diabetes mellitus, an increase in the level of oxidative substrates and glutathione, superoxide dismutase, the formation of natural antioxidant systems such as catalase, glutathione peroxidase (GP), the occurrence of life-threatening cell disorders and its death have been studied[3].

In diabetes, free radicals (FR) can bind molecules of various organs together and stick together, resulting in rough and wrinkled skin. Prolonged oxidative stress accelerates apoptotic processes in various tissues. LPO products and other proapoptotic proteins are released from the cytoplasm into the intercellular space of the liver parenchyma and, in turn, play the role of specific signaling molecules ("mediators of apoptosis") [4].

The antioxidant effects of drugs used for the pathogenetic treatment of diabetes may be associated with a decrease in oxidative stress in direct interaction with free radicals , the activity of metabolites, activation of antioxidants, and adequate correction of hyperglycemia [5].

In vitro studies have determined the ability of gliclazide to capture superoxide anions, as well as hydroxyl radicals. There are medications that increase insulin sensitivity and have anticoagulant properties. Thus, the gliclazide preparation reduces the production of NADH free radicals and increases the activity of the catalase enzyme. The presence of antioxidant activity is considered as one of the mechanisms of therapeutic action of gliclazide [6].

Based on data on the effect of antidiabetic drugs, a group of researchers studied the mechanism of action of antioxidant drugs that reduce glucose levels in vitro using chemiluminescence, which occurs due to oxidation by peroxide radicals [7].

When evaluating the overall antiradical activity, the authors showed that gliclazide turned out to be the most active of all the studied drugs. Diabenol has been found to be active against peroxyl and hydroxyl radicals and superoxidanion [8].

Experimental part. The research was conducted in May-June 2024 in the laboratory of the Institute of Biophysics and Biochemistry of Uzbek National University named after Mirzo Ulugbek in accordance with the "Rules of Application". experimental animals".The model of alloxan diabetes (AD) was chosen for experiments. The studies were divided into the following groups.

1. Intact group
2. Diabetes group
3. Diabetes group + Gliclazide
4. Diabetes + dietary supplement "Asprulance"

Glucose was determined using an enzymatic colorimetric test, a GOD-POD kit (Cypress Diagnostics, Belgium). The blood of laboratory animals was used as the object of the study.

During the research period, 16 white laboratory rats were used, weight and glucose levels were measured in animals and distributed into groups. The day before the infection of the model, the animals were not fed and given a 4% solution of ascorbic acid (vitamin C), mainly because it prevents the death of animals with early hyperglycemia. The drug Alloxan was sent to the animals. The method of low-sensitivity (chronic) alloxan diabetes. 8 mg/100 g of alloxan monohydrate was dissolved in 0.9% NaCl solution and 0.5 ml was administered intraperitoneally to each animal for 8 days [9]. Animals in the Diabetes mellitus model were given honey water and boiled bovine brain to prevent their death from hyperglycemia.

All male rats were sorted and weighed before induction of an experimental diabetes model. After the introduction of the Diabetes mellitus model, the weight of animals was measured, according to which animals with a diabetic model lost a little weight, which is associated with a toxic effect

Table 1

The weight of the animal before and after the induction of diabetes

№	Groups	n	Separation time	After calling DM
1	intact group	2	271±6.78	282±4.52
2	Diabetes group	2	273±7.04	257±5.67*
3	Diabetes group+Gliclazide	2	279±5.69	275±6.85
4	Diabetes + "Asprulance"	2	287±6.17	257±7.46*

Note: - statistical analysis of the variability of differences between the control group and the blood pressure+drug group *p<0.0++5

The period between the moment of separation and the day of the ambulance call is 14 days, after which treatment was carried out.

Oxidative stress caused by hyperglycemia activates mechanisms that damage beta cells, and as a result, diabetes mellitus develops in a quick picture. These results show that the Diabetes mellitus model is being formed. Against the background of Diabetes mellitus, activation of gluconeogenesis, an increase in the amount of glucose as a result of the breakdown of glycogen in the liver and a decrease in the amount of protein are observed [7].

Table 2

Changes in glucose levels in experimental rats with a diabetes model (mmol/l).

№	Groups	n	Days			
			1	15	21	28
1	intact group	2	4.5±0.45	4.8±0.54	4.8±0.23	4.8±0.52

2	Diabetes group	2	4.7±0.82	12.9±0.87	13.5±0.57*	13.3±0.74
3	Diabetes group+Gliclazide	2	5.1±0.67	12.5±0.91	11.2±0.82	7.3±0.97
4	Diabetes + "Asprulance"	2	4.9±0.68	12.9±0.86	10.6±0.45*	8.8±0.97

Before the model's call (1 day), after the model's call (15 days), after the administration of drugs (21 and 28 days)

Note: - variability of differences in statistical analysis between the control group and the blood pressure+drug group *p<0.05.

Initially, after chronic administration of alloxan, glucose levels in animals sharply increased, and abrupt changes in body weight, polyuria, hypodynamics and cognitive changes were observed in animals. No drastic changes were observed in animals of the intact and control groups, however, when drugs were administered to the AD + drug groups for 8 days, glucose levels decreased and the effect of the dietary supplement Asprulance was reflected in experiments (table 2).

Table 3

Glycogen content in the liver and muscle tissues of experimental rats with diabetes

№	Groups	n	liver	muscles
			mg%	
1	intact group	2	1324.5±5.55	217.64±3.18
2	Diabetes group	2	980.33±4.41	229.36±8.71*
3	Diabetes group+Gliclazide	2	1186.59±5.48	221.97±6.97*
4	Diabetes + "Asprulance"	2	1214.41±12.68	228.26±14.83*

Note: - statistical analysis of the difference between the control group and the blood pressure+drug group *p<0.05;

Since erythrocytes cannot synthesize proteins, they are the most convenient model for monitoring the process of destruction and restoration of important structures that support the vital activity and integrity of the cell. Erythrocytes do not have mitochondria, so they use glucose as an energy material. Under normal conditions, 90% of the glucose produced is used for anaerobic glycolysis, and the remaining 10% is used for pentophosphate. Glycated hemoglobin determines the level of Hb in the blood for a long time (up to 3 months). This type of Hb is formed as a result of a slow process between Hb and glucose in the blood serum (this process occurs spontaneously, i.e. without the participation of enzymes). The glycosylation of Hb and its amount depend on the average amount of glucose over the lifetime of a red blood cell. Among the three types of glycosylated Hbs, HbA1a, HbA1b and HbA1c, only the latter HbA1c can be quantified in diabetes and allows us to draw conclusions about the degree of its prevalence [8].

Table 4

The amount of glycated hemoglobin and hemoglobin in experimental diabetic blood.

№	Groups	n	glycated hemoglobin %HbA1c	Hemoglobin g/dl
1	intact group	2	4.5±0.29	12.75±0.85
2	Diabetes group	2	7.85±0.47	9.85±0.90
3	Diabetes group+Gliclazide	2	6.67±0.85*	11.57±0.95*
4	Diabetes + "Asprulance"	2	7.01±0.69**	10.49±0.99**

The amount of glycated hemoglobin and hemoglobin in experimental diabetic blood. Note: - variability of differences in statistical analysis between the control group and the blood pressure+drug group *p<0.05;** p<0.01

Conclusion.

- In the experimental diabetes model, the weight of the animals decreased and a large amount of urine was released;
- when prescribing antioxidant drugs, an increase in the amount of glycosylated hemoglobin in the blood of experimental animals with diabetes mellitus was observed by 1.7 times compared with the intact group;
- The drug Asprulans had a normalizing effect on lipid metabolism, while a stronger effect of Asprulans than gliclazide was confirmed.

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