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TECHNOLOGY AND PROPHYLACTIC EFFICIENCY OF NATURAL HYPOGLYCEMIC FOOD SUPPLEMENT

ТЕХНОЛОГИЯ И ПРОФИЛАКТИЧЕСКАЯ ЭФФЕКТИВНОСТЬ НАТУРАЛЬНОЙ ГИПОГЛИКЕМИЧЕСКОЙ ПИЩЕВОЙ ДОБАВКИ

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Abstract. The article the issue of diabetes (type 2) on preventive use of vegetal hypoglycemic agents is discussed. It represents the method of adoption of a natural hypoglycemic food supplement that provides high Bioavailability in the hypoglycemic substances used by the used plant nutrition (F. Myrtile, C. Phaseoli, R. Araliu, H. Eqisett, Fr. Rose, H. Hiperrici Fl. Chamomilla).

The used products of diabetic purpose are described with the usage of this hypoglycemic supplement. In the supplementation the high bioavailability of substances of hypoglycemic activity is achieved by the extraction of water–borne substances, adding obtained extract on the active wheat bran and their lyophilic drying. The results of the prophylactic efficacy analysis of the supplement are presented on the example of laboratory animals (white rats). The advantage of hypoglycemic supplementation, which is developed by proposed method is proved in comparison with the usage of dry vegetable powders.

Four groups of trial animals participated in the research. I — control, II, III and IV, which were artificially diseased with diabetes — with 0,1% of alcoholic solution of Dithizone. The II group was fed with a product containing a new additive, the III one with the same product without the additions, and the IV — with the same product plus the addition of the dry powder of the vegetable set.

Аннотация. В статье рассмотрен вопрос профилактики диабета (типа 2) с помощью натуральных, растительных гипогликемических средств. Предложен метод получения натуральной пищевой добавки высокой доступности гипогликемических веществ на основе растительного сбора (F. Myrtile, C. Phaseoli, R. Araliu, H. Eqisett, Fr. Rose, H. Hiperrici Fl. Chamomillae). Описаны продукты диабетического назначения с применением предложенной добавки. Высокая биодоступность гипогликемических веществ полученной добавки обеспечивается тем, что после экстракции водорастворимых веществ растительного сбора, экстракт наносили на пшеничные отруби и производили лиофильную сушку.

Представлены результаты анализа профилактической эффективности разработанного средства на примере лабораторных животных. Исследовали 4 группы лабораторных животных. I группа — контроль, II, III и IV группах вызывали искусственный диабет 0,1%-ным спиртовым раствором дитизона. II группа получала продукт с новой гипогликемической добавкой, III — тот же продукт без добавки и IV группа тот же продукт с добавкой сухого порошка растительного сбора. Показана более высокая профилактическая эффективность предложенной пищевой добавки по сравнению с сухим порошком вышеуказанных растении.

Keywords: prevention of diabetes, hypoglycemic plants, diabetic products.

Ключевые слова: профилактика диабета, гипогликемические растения, диабетические продукты.

In the world today, there is a wide spread of metabolism disorders such as diabetes, obesity, dyslipidemia and metabolic syndrome in the human body. According to the World Health Organization, the number of people with diabetes registered in the world by 2015 is 5–6% of the population, and the total number of people who carry this risk is 25% and is characterized by an increasing tendency.

The main prophylactic and healing factor in this part of the population is nutrition. During lightweight forms of disorder, the food is the only medical treatment of this disease, the food is also a basic medication in the form of medium gravity, and in severe cases it is an essential addition to medicinal therapy.

As it is known that in the normal blood glucose constant maintaining more than 40 regulatory factors, their main part is hormones. The second type of diabetes mellitus is a heterogeneous disease, so its successful treatment is the simultaneous effect on all the branches of his pathogenesis.

Effective way to improve the effectiveness of diabetes mellitus diabetes and the reduction of subsequent hyperglycemic exposure along with the use of lowclichetic and low–sensional products is the creation of natural food additives of hypoglycemic activity and widely introduced in diabetics [1–2].

In 1922, S Golip's opinion was that the plants, which are unlike pets, have sugarcane regeneration with other substances called glycokinines. They believe that they are characterized by insulin–like action [3], (1–2).

Glycokinines are divided into the following groups:

1. Hypoglycemic agents containing anabolic effect — Active substances: Arginine and Guanidine (Beans *Phaseolus*), Creatine and Strahidrin (Lucerna — *Medicago sativa* L.), Inosite

(Almond — *Amygdalus dulcis* Mill, Greek walnut — *Juglan regia* L., Dandelion *Taraxacum officinale* Webb).

2. Substances containing insulin–like substances: Glycoside Myrtilline (bilberry *Vaccinium myrtillus*), alkaloid galegyne (Gallagia *Galega officinalis* L.), Non–Vitamin Glycosides (*Aralia mandshurica* Rupr., Ginshen — *Panax ginseng* C.), lactone (velvet — *Tagetes patula* L., bitter pumpkin family plants — *Momordica charantia*, *M. mixta* Roxb., *M. cochichinensis* Lour.), Alkaloid Winkamine (Siro — *Vinca minor* L.)

3. Lectins — are contained in the seeds of fabaceous plants, they are characterized with insulin–like actions. They stimulate the synthesis of nucleic acids, proteins, enzymes, increase the ability to utilize the glucose by the cell, facilitating the release of insulin from the pancreas.

4. Beta–cell stimulating substances of the underlying gland: Burdock — *Arctium lappa* L., Nitweed — *Hypericum perforatum* L., Dandelion *Taraxacum officinale* Webb), Plantain — *Plantago maior* L., Bot Chicory — *Cycoriul intybus* L.

5. Spices and edible vegetables and some fruits that are characterized by stimulating stomach activity: Onion — *Allium cepa* L., Garlic — *Allium sativum* L., Bale leaf — *Laurus nobilis* L., potato, cabbage, salad, cranberries, strawberries, carrots.

6. Plants to regenerate the pulmonary insulin apparatus: linen seeds — *Linum usitatissimum* L., Turta — *Morus alba* L., lime — *Tilia cordata* L., Greek walnut leaves — *Juglans regia* L., red clover — *Trifolium pretense* L.

7. Plants collecting vitamins, antioxidants, microelements: Sweetbrier — *Rosa cinnamomea* L., Pomegranate — *Punica granatum* L., Strawberry — *Fragaria Vesca* L., Nettle — *Urtica dioica* L, Cranberry — *Rubus idaeus* L., Millet — *Panicum miliaceum* L., Spinach — *Spinacea oleracea* L.

8. Plants containing substances acting on parasympathetic nervous system: Joradaslam — *Paeonica officinalis* L., Cinnamon Tree — *Cinnamomum camphorae* L., Motherwort — *Leonurus cardiac* L.

9. Plants that are characterized by anti–inflammatory, antiseptic, sweat and diuretic actions: Horsetail — *Equisetum arvense* L., Chamomile — *Chamomila recutita* L., Red Currant — *Vaccinium vitis idaea* L. Elder — *Sambucus nigra* L. Aloe — *Aloe*.

From different groups of plants listed above may be composed of different sets of hypoglycemic and anabolic action.

A vegetative set characterized by a strong hypoglycemic effect are that contains: Blueberries — F. Myrtile, Bean Peel — C. Phaseoli, Aralia — R. Araliu, Eight — H. Eqisett, Ascils — F. Rose, Kraszana — H. Hiperrici and Chamomile — Fl. Chamomillae (3).

This set effectively reduces the presence of glucose in the blood as experimentally provoked (experimental animals), as well as clinically expressed diabetes. Other antidepressant sets are also known, which include supplementation of nutrients, nuts, grapes, water and fat in vitamins, microelectronics and other biologically active substances.

These plants are used in food technologies as finely shredded dry powders. We believe that the use of vegetable powders containing biologically active substances is characterized by a number of advantages, including the negative sides as well.

The positive side is that the use of dry powders in food technologies is very convenient in practical terms. The issue of biomass access to the active ingredient of these plants is under question. It is known that the biologically active substances of plant origin are localized in the cell cytoplasm of the plant cell and covered by the cell wall, which is a strictly organized complex of cellulose, hemicellulose and pectinine substances. The probability of cell wall crack is very low when grinding the dry plant. There is also a shortage of this in the technological process of product processing and in the process of digestion, since the human organism does not contain the enzymes of the polysaccharide complex of vegetative cell walls. This may be partially affected by the bacterial enzymes in the large intestine, but there is also a low probability of releasing biologically active substances from the vegetable cell. That is why, our aim was to get the dry concentrate of

biologically active ingredients of the high bioavailability hypoglycemic herb in the body, which, in addition to being convenient in terms of dosage and application in the technological process, as well as the active substances in it almost completely (100%) will release in the digestive system. So, we made a decision to get the maximum extraction of biologically active ingredients from the vegetative set of hypoglycemic action, after that we would mix the obtained extract with any filler, for example, wheat bran, from which it would be easy to release in the digestive system and finally to work in the best way to keep the biologically active ingredients in an unchanged manner.

At the first stage of the technological process of hypoglycemic concentration, it is necessary to create appropriate conditions for the maximum extraction of biologically active substances of hypoglycemic action from the plant. In order to achieve this goal, we delayed the herb mixture in fivefold water for 2.5 hours, every half an hour we make water cool suddenly, then heat and cool again. With the increase in temperature gradient between the plant's interior and extract, the difference in pressure between the inside of the vegetative cell wall and the external areas increases the degree of diphthey of biologically active substances in the out–of–the–cell area. It is established that conducting extraction in these conditions increases the degree of extraction of biologically active substances from 50% (without the traditional extraction method — cooling) up to 80%.

The gained extract was filtered, mixed with wheat bran in ratio 3:1 and dried in sublimation (frozen −40 °C, vacuum — 80 micron and ultimate temperature of 370 c) and grinded. Figure 1 provides a technological scheme for making hypoglycemic herbal concentrates.

Table 1 presents the chemical composition of the received hypoglycemic concentration. Received hypoglycemic set contains 6.1 ± 0,2% active substances. It is rich in food fibers (44.15 ± 0.75%), contains proteins (14.1 ± 0.27%) and certain quantities (20,75% ± 0.13). This is a starch that contains wheat bran that is used to get a hypoglycemic concentration. The high content of starch (20%) in a seemingly hypoglycemic concentration is not a real risk for diabetics because, as shown below, the content of hypoglycemic supplementation does not exceed 5% in minced meat products. In the case of hyperglycemic supplementation, the starch content in the product is only 20% of 5%, or only 1%, which is not a problem for diabetes.

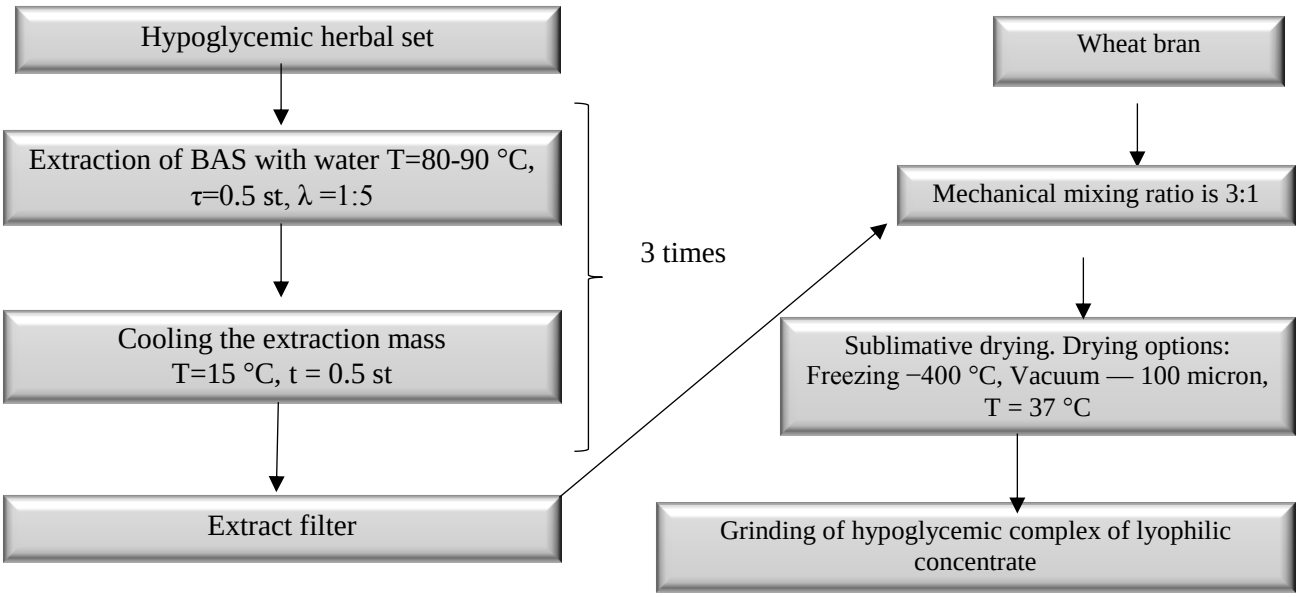

Figure 1. Technological scheme of hypoglycemic food supplement

Concentration of these supplements in diabetic products varies from 5 to 10%, accordingly, starch content in these products varies from 1 to 2%.

Using a concentrated hypoglycemic plant concentrate, a wide assortment of diabetic food products has been developed: Diabetic bread, buns, pizza, khachapuri, hard biscuits, Easter cake, honey cake, cracker, cottage cheese and Topinambur cake, nuts and hazelnuts. The use of liquid extract of the hypoglycemic vegetable set is developed by the diabetic drinking soft drinks technologies on the Georgian mineral waters base. The above technologies have been developed within the scope of scientific grant projects — "Diabetic Purpose and Fossil Production Technologies" — GNSGF / ST 07 / 7-256 and "Development of Technologies of New Generation Diabetic Foods" — AR 201 / 10-150 / 12 # 30/25 (www.rustaveli.org.ge — Success Stories — Development of Technologies of New Generation Diabetic Foods). He above mentioned diabetic pharmaceutical products have undergone clinical apathy in Georgia. Iverieli Endocrinology, Center of metabolism and dietology and Kutaisi ecclesiastical hospital — St. David Aghmashenebeli ecclesiastical xenon. As a clinical appeal they have proven effective preventive effect of new products and are recommended to introduce them in diabetic meals.

Table 1.

HYPOGLYCEMIC HERBAL SET BIOLOGICALLY ACTIVE SUBSTANCES
CHEMICAL COMPOSITION OF HYPOGLYCEMIC FOOD SUPPLEMENT

Name of substances	*Substance content,%*
Water	7.1±0.32
Hypoglycemic B.A.S.	6.1±0.02
Food fibers	44.15±0.75
Starch	20.75±0.13
Proteins	14.1±0.27
Fats	9.65±0.05
Ash	4.15±0.05

Technologies for semi–finished products of cooked diabetic sausage and minced meat for diabetic purposes are also processed with the usage of lyophilic concentrate of hypoglycemic vegetation. Prophylactic efficacy of developed diabetic meat products is tested on the white rats at the experimental laboratory.

The effect of "diabetic sausages" has been studied in the experimental model of diabetes mellitus on glucose content.

Four groups of animals were used for experimentation, each in animal number n = 4. The sample of diabetes model was created by substance Dithizone, for this purpose 0.1% of alcohol was produced. It is also found, that the 0.5 ml dose of Dithizone did not cause the change of glucose in the blood, and 1.5–2 ml and more made the animal unsuitable for the experiment. So, the optimal dose was 1.0 ml. In the blood of animals, the blood glucose was determined by a glucometer "AcouCheck–Performa". Blood glucose determination was made twice a day: in the morning and after 2 hours after receiving the food.

The First group was intact, control group. In the rats of group II, III and IV we have artificially treated diabetes. The animals of the II group were fed with food that contained concentrations of hypoglycemic herb. I and III group were fed with the same food without hypoglycemic supplements. The IV group was fed by the same food with the addition of the dry powder of the vegetable set.

In the morning, the glucose was 4.2 mmol/l (75.6 mg %). The quantity of glucose was 4.4 mmol/l (2,5.2 mg %) after 2 hours after receiving food. Such observation occurred within 3 days and the data was stable. Three days later the new food products were given. After a glucose reaction in blood, it turned out that the number of glucose was not changed. Thus, new food products do not cause a change in the amount of glucose in the blood.

The animals of group II were injected 1.0 ml of the pre-prepared 0.1% Alcohol solution of Dithizone. The injection lasted for 3 days, once a day. After completion of the injection period, the animals were checked in the blood glucose, which was increased, i. e. the lightweight hyperglycemia is formed, 5.2 mmol/l (100 mg %) after 2 hours after receiving 5.2 mmol/l (93.6 mg %) of the fast. From the 4th day, only a new kind of food is served and blood glucose in the blood every other day, the results are the following:

The 5th day, on an empty stomach — 5.2 mmol/l (93.6 mg %), 5.5 mmol/l (98 mg %) after 2 hours after receiving food.

The 7th day, on an empty stomach — 5 mmol/l (90 mg %), 5.2 mmol/l (93.6 mg %) after 2 hours after receiving food.

The 9th day, on an empty stomach — 4.8 mmol/l (86.4 mg %), after 2 hours after receiving food 5.0 mmol/l (90 mg %).

The 11th day is 4.6 mmol/l (82.8 mg %), after 2 hours after receiving food 4.8 mmol/l (86.4 mg %).

So, after the introduction of new types of food products, hyperglycemia decreased by 5.5 mg to 4.8 mg.

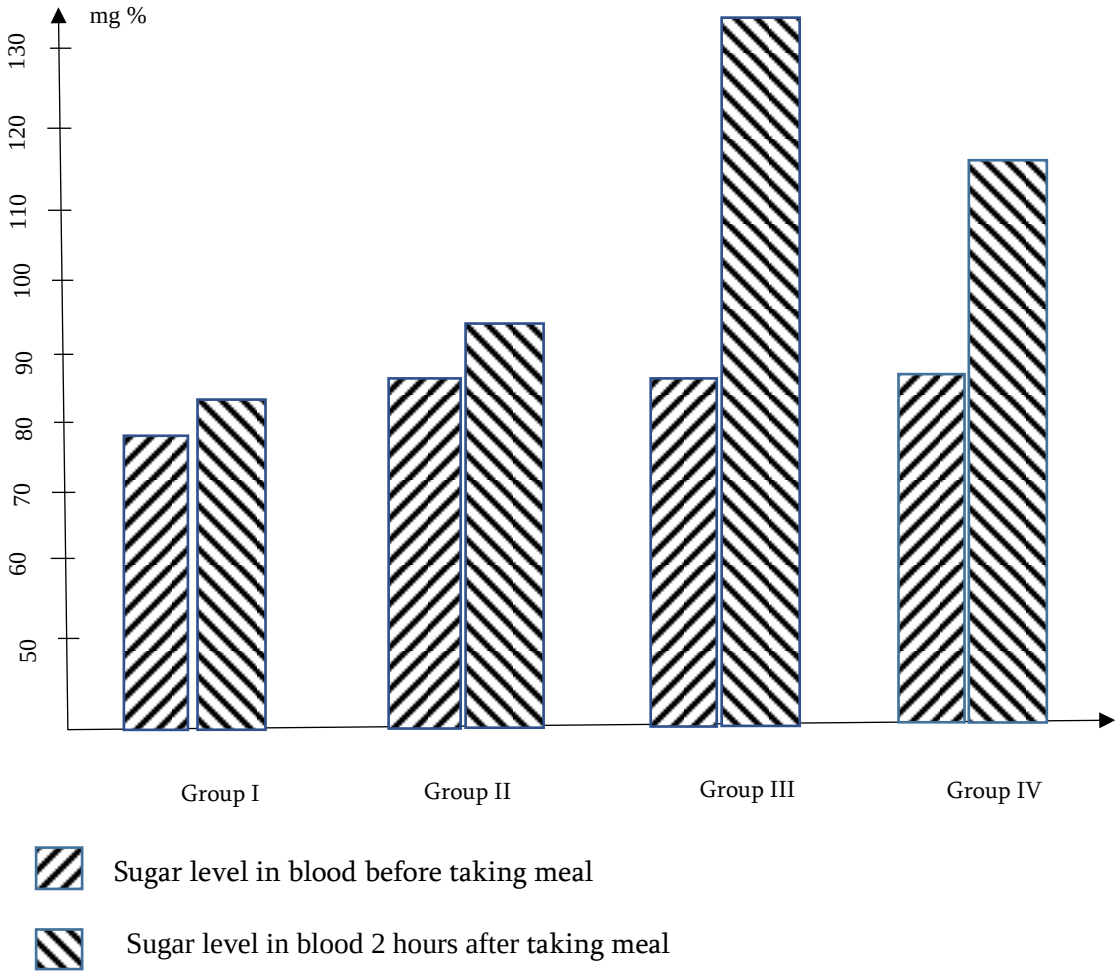

Figure 2. Prophylactic efficacy of Hypoglycemic herbals

The animals of group III were injected 1.0 ml of the pre-prepared 0.1% Alcohol solution of Dithizone ones a day in the morning for three days. After that the hyperglycemia occurred like the second group. From the fourth day, unlike the second expertise group, the third group was not given a new kind of food, i. e. the animals of this group were fed by default.

As a result, hyperglycemia caused by the Dithizone remained unchanged. The level of glucose was increased steadily in the blood and it did not return the norm, i. e. the data of the first experimental group of animals. Similar experiments were carried out on the IV group of animals.

The general picture of the results of the survey is presented on the column graph.

Thus, the hyperglycemia caused by Dithizone in the second group of animals is almost returning to the finitial–first control group of animal data, or norms, resulting in the provisional effectiveness of the test product. The drawing also shows the advantages of the taken hypoglycemic supplement in comparison with the dry powder of vegetable set.

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