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# COMMUNICATIONS

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## INFLUENCE OF SOME HERBS ON CONCENTRATION OF GLUCOSE IN HUMAN SERUM

A. A. AGHAJANYAN *

*Chair of Biochemistry YSU, Armenia*

In the current study the influence of water and ethanolic extracts of plants on the concentration of glucose in human serum has been investigated. Plants growing both on soil and hydroponic have been investigated. The results show that ethanolic extracts decrease glucose concentration in human serum more in comparison with water extracts. It can be observed that ethanolic extracts of soil herbs and hydroponic plants influence on glucose concentration in the same way. The studies have been carried out in human serum *in vitro*.

***Keywords*:** herbs, soil, hydroponics, human serum, glucose concentration.

**Introduction.** The most informative indicator of carbohydrate exchange condition is glucose level in blood. Permanent receipt in an organism of glucose is necessary as the main source of energy for nervous system and erythrocytes. When glucose concentration in blood decreases below the critical level the functioning of brain is disturbed, therefore in case of painful hypoglycemia there can be a coma [1]. Due to interrelation of aerobe and glycolitic splitting, carbohydrates create mach energy, which is spent for metabolic processes. Blood glucose is determined by a balance between insulin and counter regulatory hormones (e.g. glucagon, catecholamines, glucocrticoids and growth hormone) [2]. Glucose in muscles is reserved in the form of glycogen, and turns into fats in fatty cells. Other part of glucose of the general blood groove is absorbed by insulin-dependent tissues [3]. At the normal rate of food and the balanced diet, concentration of sugar in blood is maintained due to synthesis and catabolism of glycogen. At surplus of glucose in blood liquid from tissues of organism gets to blood, kidneys work with loading to bring out liquid from organism, which results in thirst and dehydration. It is one of the diabetes symptoms. At diabetes there is an important question of an insular hyperglycemia. Insulin deficiency in blood leads to the disturbance of storage mechanism of glucose in the form of glycogen, there is a surplus of glucose. As a result, its level considerably increases [4, 5]. If after the formation of glycogen in liver the concentration of glucose in blood remains high, fatty cells turn its surplus into fat, which leads to obesity. Obesity is associated with chronic inflammation, which is believed to contribute to the pathogenesis of type 2 diabetes [6, 7].

* E-mail: ana2011@mail.ru

For a patient with diabetes of the 2nd type it is necessary to take a medicinal preparation, which reduces the amount of sugar in blood which stimulates the production of own insulin, increases the sensitivity of target-cells in relation to glucose and reduces the absorption of glucose in an intestines gleam [8–10]. It is shown that NF-kB-Inducing Kinase (NIK) promotes glucagon activation and glucose production. Therefore, over activation of liver NIK in obisety promotes hyperglicemia and glucose intolerance by increasing the hiperglycemic response to glucagon [11].

The purpose of this paper is to study the influence of plant extracts on the concentration of glucose in human serum.

**Materials and Methods.** As a research object the human serum with 10.0 *mmol/L* glucose concentration has been chosen. This index is quite high. 5% extracts of the following plants have been used: *Ocimum basilicum* L., *Perilla frutencens* L., *Mentha piperita* L., *Salvia officinalis* L. and *Humulus lupulus* L. Researches were conducted on the plants, which were grown on soil and on hydroponics. Sprouts of these herbs were transplanted in conditions of a classical hydroponics (seating density is plant/$cm^2$). As substrate for plants particles of volcanic slag with diameter of 3–15 *mm* served, nutrition of plants was carried out by nutritious solution of Davtyan [12]. The concentration of glucose was determined by an enzymatic colorimetric method.

**Results and Discussion.** The influence of water and ethanolic extracts of these plants on the concentration of glucose in human serum has been studied. The results are presented in Tab. 1 and 2. We have discovered that water extracts of the plants, which grow up on hydroponics, influence on concentration of glucose more favorably in comparison with soil plants. We found out that *Salvia officinalis* of hydroponics decreases glucose concentration approximately for 1.7 times by both water and ethanolic extracts.

*Table 1*

*The influence of plant extracts on glucose concentration in human serum* (water extract)*

| Herbs | Organs | The influence of plant extracts on glucose concentration, *mmol/L* ($p<0.05$) | |
|---|---|---|---|
| | | soil | hydroponics |
| *Ocimum basilicum* L. | leaves | 12.8 ±0.8 | 10.8 ±0.7 |
| *Perilla frutencens* L. | leaves | 11.2 ±0.7 | 10.5 ±0.7 |
| *Mentha piperita* L. | leaves | 9.2 ±0.6 | 7.6 ±0.5 |
| *Salvia officinalis* L. | leaves | 7.9 ±0.5 | 6.0 ±0.4 |
| *Humulus lupulus* L. | cones | 9.5 ±0.6 | 8.5 ±0.5 |
| Mixture of plants | | 8.6 ±0.5 | 7.4 ±0.5 |

* Glucose concentration in human serum is 10.0 *mmol/L*.

The obtained data show that *Ocimum basilicum* L. and *Perilla frutencens* L. increase glucose concentration in serum. This increase can be connected with the high content of sugar in these plants. In future studies it is important to research the content of glucose in these plants. More often mixture of plants is used for treatment of diseases. Our results show that the mixture of these herbs reduces the concentration of glucose in human serum for 1.2 times. It proves that the use of

mixed plants is more effective. In literature there are facts that *Mentha piperita* L. is used for treating diabetes, however it is applied in the mixture of other herbs [13]. Though the influence of these plant extracts on the level of the total cholesterol in human serum, preference is also given to hydroponic plants [14].

*Table 2*

*The influence of plant extracts on glucose concentration in human serum* (40% ethanolic extract)*

| Herbs | Organs | The influence of plant extracts on glucose concentration, *mmol/L* ($p<0.05$) | |
|---|---|---|---|
| | | soil | hydroponics |
| *Ocimum basilicum* L. | leaves | 6.9 ±0.4 | 6.6 ±0.4 |
| *Perilla frutencens* L. | leaves | 8.2 ±0.5 | 8.3 ±0.5 |
| *Mentha piperita* L. | leaves | 8.0 ±0.5 | 6.9 ±0.4 |
| *Salvia officinalis* L. | leaves | 7.0±0.5 | 6.0 ±0.4 |
| *Humulus lupulus* L. | cones | 9.2 ±0.6 | 7.6 ±0.5 |
| Mixture of plants | | 7.6 ±0.5 | 6.8 ±0.4 |

* Glucose concentration in human serum is 10.0 *mmol/L.*

Comparing ethanolic and water extracts it is possible to note that ethanolic extracts of soil plants considerably reduce glucose concentration in serum in comparison with the water extracts. Water extracts of *Ocimum basilicum* L. and *Perilla frutencens* L. increase the concentration of glucose (Tab. 1), however at ethanolic extraction a decrease in concentration is observed in case of *Ocimum basilicum* L. for 1.4 and *Perilla frutencens* L. for 1.2 times. Comparing soil ethanolic extracts and water extracts of hydroponic plants it is possible to suggest that they have identical influence on the concentration of glucose.

The study of gluconeogenesis from the point of view of biology and medicine it was proved that the high need of alcohol sharply inhibits the process of gluconeogenesis in the liver, as a result of which the content of glucose in blood decreases [15]. It is important to note that hypoglycemia has negative effect especially on the brain function. Proceeding from the received results it is possible to note that at rather high level of glucose concentration it is recommended to use 40% ethanolic extracts of herbs.

**Conclusion.** In conclusion one can propose that the plants, which have been investigated, can increase permeability of cellular membranes for transporting glucose in cells and activate synthesis of the enzymes hecsokinase and phosphor-fructokinase, which regulate catabolism of glucose, and enzyme glycogensintase of synthesis of glycogen.

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