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INVESTIGATION OF HYPOGLYCEMIC ACTION OF THE EXTRACT MADE OF DANDELION (TARAXACUM OFFICINALE) ROOTS AND RHIZOMES

Abstract. hypoglycemic action of the extract made of *Taraxacum officinale* roots and rhizomes is examined in the experiment on rats in the dose of 0,1 g/kg with a single use against the ground of glucose tolerance test. *Taraxacum officinale* extract on 60% extract agent is found to possess more pronounced hypoglycemic action both in comparison with other *Taraxacum officinale* extracts and the mixture “Arphasetin” registered and allowed for administration in Ukraine. It enables to study its pharmacological properties further with the purpose to be introduced in practical medicine as a sugar-reducing agent.

Key words: *Taraxacum officinale*, extract, glucose tolerance test, hypoglycemic (sugar-reducing) action.

Introduction. In spite of a progressive development of medicine diabetes mellitus (DM) remains one of the social-medical issues both in Ukraine and in the majority of countries of the world. The pathology ranks third in the structure of mortality rate after cardiovascular and oncological ones with annual increase of sickness rate to 3 % [8].

During 13 years occurrence of the pathology in Ukraine 54,5 % has increased, and sickness rate — 82 % as much. The following 20 years the WHO will assess the number of DM patients to grow to 592 millions of people, that is, it will 55 % increase more [1, 4].

Oral sugar-reducing drugs are of a top priority for type 2 DM (insulin-independent) patients. They are mostly synthetic by their nature. All of these drugs possessing a good therapeutic effect have side effects and are expensive [5].

Therefore, the studies are directed to the search and finding of new oral drugs, which possessing a good therapeutic effect will have less side effects.

In recent years the scientific search of pharmacological agents of a plant origin, their investigation and introduction into the official medicine has increased in range. Advantages of pharmacological agents of a plant origin are their

low toxicity, mild action, inability to be accumulated, administration for a long time in combination with other drugs of a plant origin and chemotherapy, possibility to be indicated for patients of any ages irrespective of the degree of DM severity, and lower costs in comparison with synthetic agents [2]. One of such plants is dandelion (*Taraxacum officinale*), its roots and rhizomes are used as medicinal raw material.

Objective. To study pharmacological properties of extracts made of *Taraxacum officinale* roots and rhizomes with the aim to determine possible hypoglycemic action under conditions of glucose tolerance test through the peritoneum with a single administration of the examined agents.

Materials and methods. The extracts made of the roots and rhizomes of *Taraxacum officinale* were used for the study. To obtain the extracts made of the roots and rhizomes of *Taraxacum officinale* the medicinal raw material was infused on 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 96% ethyl alcohol.

A daily therapeutic dose of the extracts for people is 0,02 - 0,04 g/kg [3]. Applying specific sensitivity coefficients introduced by Yu.R. Rybolovlev and his method of calculation of a human dose for a rat: 0,02 g/kg / 0,45 =X

g/kg/1,89, a conventional therapeutic dose is determined to be 0,08 - 0,2 g/kg [7]. The dose of extracts chosen for the experiments was 0,1 g/kg.

The only pharmacological agent of a plant origin with evidenced sugar-reducing activity registered and allowed to be used in Ukraine, the mixture "Arphasetin" was chosen as a drug of comparison (produced by Ltd "Liktravy", Zhytomyr) in the form of extract in the dose of 24 ml/kg [9].

The amount of dose of the mixture "Arphasetin" for rats was determined as 24 ml/kg for extracts, and on the basis of the instruction for use specific sensitivity coefficients and methods of calculation of a human therapeutic dose for a rat were made according to Yu.R. Rybolovlev (a therapeutic dose of the extract for a man with an average body weight of 70 kg per day is 300–400 ml/70 kg=5,ml/kg, and further: $5,7/0,45=X/1,89=24$ ml/kg) [7].

Determination of hypoglycemic action of *Taraxacum officinale* extracts in comparison with the extract of "Arphasetin" mixture with their single administration was made on the pattern of acute hyperglycemia in rats with the body weight of 180-220 g (7 animals in every group), caused by intraperitoneal introduction of glucose in the dose of 3 g/kg.

The experimental animals were distributed in the following way: 1 group of animals with simulated pathology, the following groups of animals received the examined *Taraxacum officinale* extracts: 2 group – on 10 % extract

agent, 3 group - on 20 % extract agent, 4 group - on 30 % extract agent, 5 group - on 40 % extract agent, 6 group – on 50 % extract agent, 7 group – on 60 % extract agent, 8 group – on 70 % extract agent, 9 group – on 80 % extract agent, 10 group – on 90 % extract agent, 11 group – on 96 % extract agent, 12 group of animals received the drug of comparison (the extract of "Arphasetin" mixture).

In animals from all the groups blood was taken from the caudal vein to determine the initial glucose level. After that the experimental groups (from 2 to 11) were introduced to the examined extracts intraperitoneally on 1% starch paste in the dose of 0,1 g/kg, the extract of "Arphasetin" mixture (12 group) in the dose of 24 ml/kg, the control group of animals received an equivalent amount of drinking water intraperitoneally. 1 hour later glucose solution in the dose of 3 g/kg was introduced to all the rats. After that blood was taken from the caudal vein of all the animals in order to determine glucose level 15 minutes after its introduction. Glucose concentration in the blood was determined by means of glucose oxidase method with the help of the set of reagents produced by "Felicet-Diagnostics" firm [6].

Results and discussion. Intraperitoneal introduction of glucose in the dose of 3g/kg resulted in development of acute hyperglycemia manifested by a reliable increase of glucose level in all the groups of animals in comparison with the initial findings (Table).

Table

Effect of a single introduction of the extracts made of the roots and rhizomes of *Taraxacum officinale* on glucose level in the blood of rats with normal glucose level under conditions of glucose tolerance test

Groups of animals	Initial glucose level	15 minutes after pathology simulation	Hypoglycemic action
	C, mmol/L	C, mmol/L	%
Control (glucose)	4,40±0,12	10,01±0,37*	
10% extract + glucose	4,17±0,27	7,70±0,36*#	23,08
20% extract + glucose	4,34±0,16	7,04±0,58*##	29,67
30% extract + glucose	4,33±0,28	6,90±0,32*##	31,07
40% extract + glucose	3,94±0,14	6,94±0,25*##	30,67
50% extract + glucose	4,57±0,28	7,57±0,37*##	24,38
60% extract + glucose	3,79±0,24	5,63±0,51*##	43,76
70% extract + glucose	3,11±0,14	6,06±0,24*##	39,46
80% extract + glucose	3,53±0,26	6,26±0,55*##	37,46
90% extract + glucose	4,30±0,24	8,0±0,49*#	20,08
96% extract + glucose	4,10±0,12	7,79±0,37*#	22,18
Mixture «Arphasetin» + glucose	4,14±0,27	8,56±0,36*#	14,49

Notes: * - p<0,05 in comparison with the initial data;

- p<0,05 in comparison with simulated pathology;

* - p<0,05 in comparison with the mixture «Arphasetin»

Thus, glucose level in the blood of animals receiving glucose load increased 2,28 times in the simulated pathology, in animals receiving the extracts on an average glucose level increased the initial data 1,7 times (thus, when the extract on 10% extract agent was introduced, glucose level in the blood increased 1,85 times, 20% - 1,62 times, 30% - 1,59 times, 40% - 1,76 times, 50% - 1,66 times, 60% - 1,49 times, 70% - 1,95 times, 80% - 1,77 times, 90% - 1,86 times, 96% - 1,9 times respectively). At the same time, the lowest difference was found in the groups of animals receiving *Taraxacum officinale* extracts made on 60% ethyl alcohol (1,49 times). When the drug of comparison "Arphasetin" was used glucose level was 2,07 times higher than that of the initial level.

Under effect of a single introduction of *Taraxacum officinale* extracts in the dose of 0,1 g/kg glucose level in the blood compared with the control pathology on an average 1,45 times decreased. The data were reliably similar with the use of all the concentrations of *Taraxacum officinale* extracts (thus, with introduction of the extract on 10% extract agent glucose level in the blood 1,3 times decreased, 20% - 1,42 times, 30% - 1,45 times, 40% - 1,44 times, 50% - 1,32 times, 60% - 1,78 times, 70% - 1,65 times, 80% - 1,6 times, 90% - 1,25 times, 96% - 1,28 times respectively). The best result was found with the introduction of *Taraxacum officinale* extract on 60% extract agent which decreased glucose level 1,78 times as much in comparison with that of pathology. When the drug of comparison "Arphasetin" (the drug of the study) was used glucose level 1,17 times decreased in comparison with the untreated animals.

It should be noted that sugar-reducing activity of the drug of comparison on the base of "Arphasetin" mixture (14,49 %) with a single introduction in the dose of 24 ml/kg is 5,59% less in comparison with the lowest index of the examined agent - *Taraxacum officinale* extract on 96 % extract agent (20,08 %).

According to the data of the experiment sugar-reducing activity after introduction of *Taraxacum officinale* extracts on 60% extract agent is 43,76 % 15 minutes after glucose introduction, which is 3,02 times more than that of the reference drug "Arphasetin".

A comparative analysis of sugar-reducing activity of the examined drugs enables to conclude that *Taraxacum officinale* extract possesses a considerable hypoglycemic action

with a single introduction in the dose of 0,1 g/kg in comparison with the simulated pathology and reference mixture "Arphasetin".

It should be noted that according to the expression of sugar-reducing properties 60% extract of *Taraxacum officinale* has advantages over other extracts and the drug of comparison.

Conclusions: 1. A hypoglycemic action of alcohol extract of *Taraxacum officinale* with a single introduction is proved against the ground of glucose tolerance test.

2. *Taraxacum officinale* extract on 60 % extract agent possesses more pronounced hypoglycemic action in comparison with other *Taraxacum officinale* extracts and the mixture "Arphasetin" registered and allowed for administration in Ukraine.

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