

Ezhned M.A.,*Assistant, Department of Pharmaceutical Botany and Pharmacognosy, Higher State Educational Establishment of Ukraine "Bukovinian State Medical University", 2nd Karmeliuk lane, 4, apt.16, Chernivtsi, Ukraine, 58003, mariee287@gmail.com,***Hroshovyi T.A.,***Doctor of Pharmaceutical Sciences, Professor, Department of Management and Economics of Pharmacy with Drug Technology, State Higher Educational Establishment of Ukraine "I.Y.Horbachevskiy Ternopil State Medical University", Ternopil, Ukraine***Horoshko O.M.***Candidate of Pharmaceutical Sciences, Associate Professor, Higher State Educational Establishment of Ukraine "Bukovinian State Medical University" Chernivtsi, Ukraine*

INVESTIGATION OF A HYPOGLYCEMIC ACTION OF EXTRACTS MADE OF TARAXACUM OFFICINALE ROOTS AND RHIZOMES

Abstract. *sugar-reducing action of the extract made of Taraxacum officinale roots and rhizomes in the dose of 0,1 g/kg in case of a single administration against the ground of glucose tolerance test is studied. The extract of Taraxacum officinale is found to possess 60% as much pronounced hypoglycemic action of the extraction agent in comparison with other extracts of Taraxacum officinale and the medicinal herbal tea "Arphasetin", registered and permitted to be used in Ukraine. It enables to study its pharmacological properties further in order to use it in practical medicine as a sugar-reducing means.*

Key words: *Taraxacum officinale, extract, glucose tolerance test, 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 the world countries. The pathology occupies the third position in the structure of mortality after cardio-vascular and oncological ones with its annual growth to 3% [8].

During 13 years in Ukraine the pathology has increased to 54,5 %, and sickness rate — to 82 %. According to the WHO prognosis the number of patients suffering from DM will be 592 million of people in the following 20 years, that is 55% increase [1, 4].

Oral sugar-reducing drugs that are mainly synthetic in nature are number one choice for patients with type 2 DM. Although all these drugs produce good therapeutic action, they cause a lot of side effects and are expensive at the same time [5].

Therefore, the investigations are directed to search and find new oral drugs possessing good therapeutic effect and less side effects.

In recent years the range of scientific search for new medicinal herbal means, their examination and introduction into official medicine has become wider. Advantages of medicinal herbal agents are the following: they are less toxic, possess mild action, are not accumulated, can be used for a long time in combination with other medicinal herbal preparations and chemotherapy;

they can be indicated for patients of any age irrespective of DM severity; they are cheaper as compared to synthetic means [2]. One of such plants is *Taraxacum officinale*, and its roots and rhizomes are used as raw materials.

Objective: to study pharmacological properties of the extract made of the roots and rhizomes of *Taraxacum officinale* in order to determine possible hypoglycemic action under conditions of glucose tolerance test by means of single intraperitoneal introduction of glucose.

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

A daily therapeutic dose of extracts for the man is 0,02 - 0,04 g/kg [3]. Applying Yu.R. Rybolovliev's specific sensitivity coefficients and his method of dose calculation for the man to the dose for a rat: $0,02 \text{ g/kg} / 0,45 = X \text{ g/kg} / 1,89$, we have determined that conditional therapeutic dose for a rat is 0,08 - 0,2 g/kg [7]. The dose taken for the experiment was 0,1 g/kg.

The only medicinal herbal preparation with evidenced sugar-reducing activity registered and permitted in Ukraine "Arphasetin" was used as a drug of comparison (the producer — Ltd "Liktravy", Zhytomyr) in the form of tincture in the dose of 24

ml/kg [9].

The value of the dose of the medicinal herbal tea "Arphasetin" for rats 24 ml/kg is determined for tinctures, and on the basis of the instruction for use the specific sensitivity coefficient and the method or therapeutic dose calculation for the man per dose for a rat was made according to Yu.R. Rybolovliev (therapeutic dose of the tincture for the man with an average body weight 70 kg is 300–400 ml/70 kg=5,7ml/kg daily followed by: $5,7/0,45=X/1,89=24$ ml/kg) [7].

Hypoglycemic action of *Taraxacum officinale* extracts in comparison with the infusion "Arphasetin" in case of their single administration was studied on the pattern of acute hyperglycemia in rats with the body weight 180-220 g (7 animals in each group), caused by intraperitoneal introduction of glucose in the dose of 3g/kg.

The experimental animals were distributed in the following way: 1 group of animals with simulated pathology, the following groups of animals received the extracts of *Taraxacum officinale*: 2 group – on 10 % extraction agent, 3 group - on 20 % extraction agent, 4 group - on 30 % extraction agent, 5 group - on 40 % extraction agent, 6 group - on 50 % extraction agent, 7 group - on 60 % extraction agent, 8 group - on 70 % extraction agent, 9 group - on 80 % extraction agent, 10 group - on 90 % extraction agent, 11

group - on 96 % extraction agent, 12 group of animals received the drug of comparison (infusion of "Arphasetin" medicinal herbal tea).

Blood was taken from the caudal vein of all the animals to determine the initial level of glucose. After that the experimental groups (from 2 to 11) were exposed to intraperitoneal introduction of the examined extracts on 1% starch glue in the dose of 0,1 g/kg, infusion of the herbal medicinal tea "Arphasetin" (12 group) in the dose of 24 ml/kg, the control group was intraperitoneally introduced to an equivalent amount of drinking water. Glucose solution was introduced to all the animals 1 hour later in the dose of 3 g/kg. Then 15 minutes later blood was taken from the caudal vein of all the animals. Glucose concentration in the blood was determined by means of glucose oxidase method with the set of reagents produced by the firm "Filicite-Diagnostics" [6].

Results. Intraperitoneal introduction of glucose in the dose of 3 g/kg resulted in the development of acute hyperglycemia manifested by reliable increase of glucose level in all the groups of animals compared to the initial data (Table 1).

Thus, glucose level in the blood of animals receiving glucose tolerance test was 2,28 times higher than that of the simulated pathology. In animals receiving extracts glucose level was in an average 1,7 times as much as initial data (thus, in

Table 1

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

Groups of animals		Initial glucose level	15 minutes later after simulating pathology	Hypoglycemic action
		C, mmol/L	C, mmol/L	%
1.	Control (glucose)	4,40±0,12	10,01±0,37*	
2.	10% extract + glucose	4,17±0,27	7,70±0,36*#	23,08
3.	20% extract + glucose	4,34±0,16	7,04±0,58*##	29,67
4.	30% extract + glucose	4,33±0,28	6,90±0,32*##	31,07
5.	40% extract + glucose	3,94±0,14	6,94±0,25*##	30,67
6.	50% extract + glucose	4,57±0,28	7,57±0,37*##	24,38
7.	60% extract + glucose	3,79±0,24	5,63±0,51*##	43,76
8.	70% extract + glucose	3,11±0,14	6,06±0,24*##	39,46
9.	80% extract + glucose	3,53±0,26	6,26±0,55*##	37,46
10.	90% extract + glucose	4,30±0,24	8,0±0,49*#	20,08
11.	96% extract + glucose	4,10±0,12	7,79±0,37*#	22,18
12.	Medicinal herbal tea "Arphasetin" + glucose	4,14±0,27	8,56±0,36*#	14,49

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

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

* - p<0,05 in comparison with medicinal herbal tea "Arphasetin".

in case of introduction of the extract on 10% extraction agent glucose level was 1,85 times as much, on 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 smallest difference was found in the group of animals which received the extract of *Taraxacum officinale* obtained on 60% ethyl alcohol (1,49 times as much). With the use of "Arphasetin" as a preparation of comparison glucose level was 2,07 times as much as the initial level.

Under the influence of a single administration of *Taraxacum officinale* extracts in the dose of 0,1 g/kg glucose level in the blood in comparison with the control pathology 1,45b times decreased; the findings were analogically reliable with the use of all the concentrations of *Taraxacum officinale* extracts (thus, in case of introduction of the extract on 10% extraction agent glucose level was 1,3 times less, on 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 obtained with the use of *Taraxacum officinale* extract on 60% extraction agent which reduced glucose level in 1,78 times compared to the pathology. With the use of "Arphasetin" (the preparation of the study) glucose level decreased in 1.17 times compared with untreated animals.

Discussion. It should be noted that sugar-reducing activity of the medicinal herbal tea "Arphasetin" (14,49 %) in case of a single introduction in the dose of 24 ml/kg is 5,59% less than the smallest index of the examined preparation - *Taraxacum officinale* extract on 96 % extraction agent (20,08 %).

By the findings of the experiment sugar-reducing activity of *Taraxacum officinale* extract on 60% extraction agent is 43,76 % 15 minutes after glucose introduction, which is in 3,02 times more than the reference drug "Arphasetin".

A comparative analysis of sugar-reducing action of the examined preparations enables to conclude that *Taraxacum officinale* extract possesses a considerable hypoglycemic activity in case of a single introduction in the dose of 0,1 g/kg

in comparison with the simulated pathology and reference herbal medicinal tea "Arphasetin".

It should be noted that 60% *Taraxacum officinale* extract possesses the highest sugar-reducing properties than other extracts and the drug of comparison respectively.

Conclusions: 1. Hypoglycemic action of alcohol *Taraxacum officinale* extract in case of a single introduction against the ground of glucose tolerance test is evidenced.

2. 60% *Taraxacum officinale* extract possesses the highest sugar-reducing properties than other extracts and the drug of comparison "Arphasetin" registered and permitted in Ukraine.

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