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Determination of Antioxidant Activity of Jeruasalem Artichoke (Helianthus Tuberosus L.) Plant

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Annotation: In this article, the chemical composition and the antioxidant activity of the root fruit extract of the jerusalem artichoke (Helianthus tuberosus L) grown in Uzbekistan are studied. As a result of the analysis, the antioxidant activity of the sample is determined by the inhibition of the autoxidation reaction of adrenaline in vitro, until the free form of oxygen is formed prevented.

Keywords: Jerusalem artichoke (helianthus tuberosus L), vitamin, inulin, pectin, antioxidant, diabetes, pancreatitis, hypertension.

INTRODUCTION. Today, every person in our country who is not indifferent to their health strives for a healthy diet. Our goal is also to study natural methods of treating diseases occurring in the human body and to increase the immune system, to study the chemical composition and beneficial properties of medicinal plants grown in our country.

Many compounds in plants have the property of binding free radicals (chain-breaking antioxidants), which have a high reactivity as hydrogen or electron donors, and many compounds with antioxidant activity have the property of neutralizing and reducing the formation of free radicals [1].

Antioxidants are biologically active substances that fight harmful oxygen radicals in the body, protect the body from many diseases and improve life.

Radicals are molecules with a high reactivity that are formed during chemical reactions with oxygen in the human body. Antioxidants can cross cell membranes, transport nutrients, stimulate metabolism, and build immunity. Antioxidants are found in large quantities in spinach, carrots, beets, cabbage, onions, bell peppers, , pumpkin, eggplant, and green vegetables. Also, fruits and berries such as raspberries, plums, currants, citrus, cherries, melons, pomegranates, and grapes are

considered to have high antioxidant properties.[2].

Based on the above data, samples of the root extract of the ground pear plant were tested for antioxidant activity.

LITERATURE REVIEW AND METHODS. In the mid-20th century, ground pear began to be cultivated in our country as a food for wild animals and as an ornamental plant in city parks and recreation areas. This frost-resistant and easy-to-care-for plant has flowers in a basket, a height of 1.5 to 2 meters, and a pear-shaped root crop. But its tubers, which are not only tasty, but also useful, are considered valuable, and grow even on low-fertility and saline soils. However, the main advantage of this plant is not the simplicity of cultivation, but the abundance of beneficial properties of the earthen pear[3].

Due to the high silicon content (8% in dry weight), the root of this plant is useful for the joints and soft tissues of the body. The use of earthen pear helps to restore and protect the health of joints and increases the elasticity of the skin. The root of the earthen pear contains a sufficient amount of folic acid and vitamin E. These substances have a beneficial effect on the female reproductive system. The root crops of the plant appear in the markets of Uzbekistan in the fall. Pear is rich in vitamins, fiber, inulin, pectin, and fructose, as well as the minerals iron, calcium, potassium, magnesium, copper, phosphorus, zinc, and silicon [4].

The tuber of the earth pear contains 19-30% inulin, 2-3% protein, 1-2.5% protein, 0.5-1% fat, 11.5% fiber, AEM (Non-nitrogenous extractive substances) 15-25%, ash 1-2.5%. The green mass contains 26-29% dry matter, 2.5-3.5% protein, 2.5-3% protein, 0.32-0.58% fat, fiber 3.5-5.1%, AEM (Non-nitrogenous extractive substances) -96.3-21.6%, ash -2.1-2.7%. [5].

Earth pear is used to treat diabetes, pancreatitis, intestinal inflammation and hypertensive heart disease. People who consume the earth pear root dissolve stones and salts in the body and normalize it. [6].

The inulin and fiber contained in the pear reduce the absorption of glucose from food in the gastrointestinal tract. The human body removes acetone and other ketone toxic substances. In the blood, short fructose fragments of inulin and organic acids (malic, fumaric, malonic, citric, succinic, etc.) also perform antioxidant and antitoxic functions and improve the general condition of the patient. Fructose formed during the breakdown of inulin can enter all cells without the participation of insulin and completely replace glucose in metabolic processes. In addition, short fragments of inulin are deposited in the cell wall, helping glucose to enter tissue cells, thereby moderately reducing blood sugar levels. In addition, since the pear contains zinc, silicon, potassium and elements important for insulin synthesis, the production of insulin by the pancreas increases. It prevents the development of diabetic nephropathy, retinopathy and diabetic foot syndrome in patients who include the consumption of ground pear root in their daily diet [7].

RESULTS AND DISCUSSION. Determination of antioxidant activity of ground pear root sample.

Ground pear root sample in water was evaluated by the method of inhibition of adrenaline autooxidation reaction in vitro, that is, the ability to inhibit the adrenaline autooxidation reaction and at the same time prevent the formation of active oxygen species (ROS). The antioxidant activity of the tested samples is expressed in percentage (AF%) of inhibition of adrenaline autooxidation. [8].

To prepare the sample extract, we boiled 0.75 g of ground pear root sample in 50 ml of water for 10 minutes. The obtained extract was filtered through a 0.45 μm syringe filter and used for analysis.

To do this, 3 ml of 0.2 M carbonate buffer (Na_2CO_3-$NaHCO_3$, pH=10.65) and 0.15 ml of 0.18% adrenaline tartrate solution were added, mixed rapidly, and the optical density D_1 was determined in a 10 mm thick cuvette every 30 seconds for 10 minutes in a K7000 (YOKE, China)

spectrophotometer at a wavelength of 347 nm.

0.045 ml of the tested plant extract, 3 ml of buffer solution and 0.15 ml of 0.18% adrenaline tartrate solution were taken, mixed in the above method, and the optical density was measured at a wavelength of 347 nm (D_2).

Table 1. Measured optical densities of adrenaline and samples.

Time, sec	Adrenalin D_1	sample (D_2)	vitamin C (D_2)
0	0,07	0,066	0,029
30	0,137	0,13	0,076
60	0,204	0,191	0,135
90	0,27	0,253	0,197
120	0,334	0,312	0,259
150	0,397	0,369	0,318
180	0,456	0,423	0,373
210	0,51	0,476	0,427
240	0,562	0,522	0,476
270	0,61	0,567	0,523
300	0,652	0,61	0,565
330	0,692	0,648	0,604
360	0,727	0,683	0,638
390	0,759	0,713	0,669
420	0,787	0,74	0,696
450	0,812	0,764	0,722
480	0,834	0,785	0,742
510	0,853	0,804	0,761
540	0,868	0,82	0,777
570	0,882	0,835	0,791
600	0,894	0,846	0,804

In the experimental part, the antioxidant activity of the samples tested was tested at time intervals of 0/30/60/90/120/150/180/210/240/270/300/330/360/390/420/430/450/480/510/540/570/600 seconds. Accordingly, the antioxidant properties of the samples were expressed in percentages.

The antioxidant activity of the tested samples was expressed in percentages (AF%) in terms of inhibition of adrenaline autooxidation and was calculated by the following formula:

$$AF = \frac{(D_1 - D_2) \cdot 100}{D_1}$$

Here, the optical density of the adrenaline tartrate solution added to buffer D_1, the optical density of the sample extract and adrenaline tartrate added to buffer D_2.

Table 2. Inhibition of KFSH over time by aqueous extracts of plants with determined antioxidant activities

Tested extract	AF, %	
	sample	Vitamin C
1-minute	6,37	33,82
3-minute	7,24	18,20
5-minute	6,44	13,34
10-minute	5,37	10,06
Average	**6.35**	**18.85**

During our study, the antioxidant activity of the tuber of the Jerusalem artichoke localized in the climatic conditions of the Andijan region was studied using the method of inhibition of the autoxidation reaction of adrenaline in vitro. The antioxidant activities of the studied tuber of the Jerusalem artichoke sample were 6.37% in the 1st minute, 7.24% in the 3rd minute, 6.44% in the 5th minute and 5.37% in the 10th minute. The average inhibition of KFSh of the aqueous extract of the Jerusalem artichoke for 10 minutes, whose antioxidant activities were determined, was 6.35%. From the results of the analysis, we can say that it was experimentally determined that the Jerusalem artichoke has antioxidant activity.

SUMMARY. Literature and scientific sources on the chemical composition, medicinal properties and use in folk medicine of the Jerusalem artichoke (Helianthus tuberosus L) plant were studied. As a result of the analysis, antioxidant activity was determined in the root of the earthen pear grown in Uzbekistan. In conclusion, we can say that one of the main tasks is to develop ways to prevent and treat various diseases that plague humanity through the use of medicinal and polysaccharide-rich plants such as earthen pear, in conjunction with modern medicine.

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