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ANTI-RADICAL AND MEDICINAL PROPERTIES OF THE OLTIN VODIY FOOD ADDITIVE

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Abstract
This article presents several plants, their chemical composition, the method and results of determining the antiradical properties of the dietary supplement "Oltin vodiy" obtained from these plants, as well as its medicinal properties in the treatment of certain diseases.

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Introduction. The *Oltin Vodiy* food supplement is based on plants containing biologically active substances beneficial to human health and minerals essential for life, such as oats, fenugreek, fenugreek, and mountain juniper, and is widely used in diabetes, metabolism, including carbohydrate metabolism, normalization of urinary system functions, treatment of diseases such as gastrointestinal diseases, and improvement of general biochemical processes [1, 2].

One of the plants included in the *Oltin Vodiy* food supplement, fenugreek (Satureia), is recognized as a medicinal plant and is widely used, for example, in France and Germany as an antibacterial and anthelmintic agent. In addition, fenugreek is used in traditional medicine for tachycardia, dizziness, headache, gastrointestinal tract diseases [3], cystitis, flatulence, rhinitis, and acute respiratory infections. The aqueous extract of fenugreek has insecticidal activity. Essential oil is used to treat stomach diseases and is also used in aromatherapy. Carvacrol extracted from jujube has an antifungal effect. According to scientific studies, jujube oil has active antioxidant properties, increases the concentration of beneficial unsaturated fatty acids in the brain and reduces the risk of developing cancer. The above-ground part of jujube contains biologically active compounds such as carvacrol, cymene, borneol, cineol, which destroy the shell of staphylococcus and similar bacteria. Also, the energy value of 100 g of jujube is 272 kcal. This is equivalent to 65 g of protein or carbohydrates, 29.25 g of fat. Jujube contains 2% essential oil, vitamins (B3, A, B6, C), a wide range of macro- and microelements, tannins. In addition, it contains phytoncides, mineral salts and resins. The smell of jujube depends on the following substances: Simol is a fragrant essential oil that is used in perfume compositions. Cineol is a component of the essential oil, has a camphor odor and antiseptic properties. Borneol is also a component of perfumery. Carvacrol is a natural antibiotic belonging to the phenol group [4].

At the same time, Summer savory helps in the fight against alcohol addiction. As a healing agent for women, it is useful for the normal course of menstruation, eliminates amenorrhea and algomenorrhea, as well as menorrhagia, and helps in the treatment of cystitis. In addition, Summer savory fights stomach and intestinal cramps, has an expectorant effect, diaphoretic, diuretic and antibacterial effects, helps to overcome all types of inflammatory processes, maintains the body in a constant norm, neutralizes harmful oxygen radicals. The chemical compounds contained in Summer savory are beneficial for the nervous system of children, improve brain function, normalize energy metabolism, calm and improve heart function, cleanse blood vessels of cholesterol, and help treat children with whooping cough. In traditional medicine, Summer savory is also used as an appetite stimulant and anti-edema agent. Tea made from Summer savory is used to treat and prevent colds. Along with the beneficial properties of Summer savory, there are also some negative aspects. For example, it should be used with caution in peptic ulcer disease, atrial fibrillation, cardiosclerosis, thyroid disease and some allergic diseases. It can also cause miscarriage in pregnant women due to the contraction of the uterine muscles. Summer savory also helps in the fight against alcohol addiction. As a healing agent for women, it is useful for the normal course of menstruation, fights amenorrhea and algomenorrhea, as well as menorrhagia, and helps in the treatment of thrush and cystitis. In addition, Summer savory fights stomach and intestinal cramps, has an expectorant effect, diaphoretic, diuretic and antibacterial effects, helps to overcome all types of inflammatory processes, maintains the body in a constant norm, neutralizes harmful oxygen radicals.

The compounds in Summer savory are beneficial for the nervous system of children, improve brain function, normalize energy metabolism, calm and improve heart function, cleanse blood vessels of cholesterol, and help treat children with whooping cough. In traditional medicine, Summer savory is also used as an appetite stimulant and anti-edema agent. In addition, Summer savory tea is used to treat and prevent colds.

Oatmeal and porridge made from it are considered important for health and are one of the dietary foods. Oatmeal is also recommended for people suffering from acute diseases of the digestive system. It cleanses the intestines of toxins. Due to the high content of fiber, oatmeal not only normalizes intestinal function, but also reduces blood sugar and cholesterol levels. It is rich in useful substances such as magnesium, potassium, calcium, phosphorus and zinc. These substances are important in the formation and development of bones and muscle tissue, so doctors and healers recommend giving children oatmeal porridge.

Ziziphora (Ziziphora, Ziziphora pedisellara L) is a perennial plant belonging to the Labdalest family, about 40 cm tall. It blooms in June-July. Its seeds ripen in July-August. Its fruits ripen in August-September. It grows in mountainous regions on mountain slopes, on rocky brown soil at an altitude of up to 2400 meters above sea level. It is used to prepare various dishes, salads, and is widely used in the food industry. It is medicinal and surpasses black pepper and bay leaf in its taste. The above-ground part of the plant is mainly used. It contains up to 1.2% essential oil, triterpene saponins, ursol, oleanol, chlorogen, flavonoids and other substances. The essential oil includes phenols, cineole, pinene, boneol. Wormwood is a medicinal plant that has been used for a very long time and is found almost everywhere in the world. Wormwood tincture is used as an expectorant, analgesic for colds, sedative, and anthelmintic. It is used for upper respiratory tract, lung diseases, bronchitis, pulmonary tuberculosis, women's diseases, shortness of breath, heart palpitations, pain around the heart, gastrointestinal diseases, oral and gum diseases, and in the treatment of chronic alcoholism. In German traditional medicine, wormwood tincture is used to treat whooping cough, tracheitis and bronchitis, bronchial asthma, and various gastrointestinal diseases. In Tibetan traditional medicine, it is used for eye diseases, cancer, nervous diseases, and diseases caused by metabolic disorders. In modern medicine, animal experiments have shown that the presence of thymol and other substances in the grasshopper destroys the “cocci” flora. It helps lower blood pressure and also reduces tapeworms in the intestines. It reduces the amount of cholesterol in the blood and prevents its accumulation in the aortic wall and liver. Although grasshopper does not directly affect blood sugar levels, it is used as a supplement to medicinal plants used in the treatment of diabetes. [5; 518-529 b].

Juniper (*Common juniper – Juniperus communis* L.) has been used since ancient times due to its numerous medicinal properties. It possesses softening, strong dissolving, and drying effects and is beneficial for diseases caused by cold, phlegm, and dampness, such as paralysis, tremors, numbness of the limbs, dropsy, and tingling sensations. It is also used against various diseases of the head, ears and mouth, lungs and pleura, uterine disorders, as well as many skin injuries and chronic wounds.

The young shoots of juniper contain essential oils, while its cone berries contain sugars, tannins, coloring substances, essential oils, and other compounds. In traditional medicine, infusions made from juniper leaves and berries are used for diseases of the lungs and respiratory tract, including bronchiectasis, lung abscess, and chronic pneumonia; for inflammation of the oral mucosa; for gastrointestinal disorders; and for diseases of the kidneys and urinary tract. A decoction prepared from the cone berries is used as a mouth rinse for gum and oral cavity diseases, leading to healing. Crushed cone berries mixed with sesame oil are used for hearing impairment. Powder obtained from young shoots is inhaled to relieve headaches. The essential oil is effective in wound treatment. Cedrol isolated from the essential oil inhibits bacterial growth and accelerates wound healing. Therefore, in scientific medicine, a five-percent solution of the cedrol fraction in sesame oil is used to treat purulent, slow-healing, post-frostbite wounds and osteomyelitis (bone infection) [5].

If one rests for 1–2 days under a juniper tree during its flowering period, patients suffering from severe, acute, chronic, purulent, pulmonary and respiratory tract diseases, as well as gastrointestinal disorders—especially infectious diseases—may recover rapidly. When gastric juice secretion is reduced, and in diseases of the liver and biliary tract, insomnia, nervous system disorders, joint, gout, and skin diseases, as well as ringworm, itching, and scabies, washing with an infusion of juniper leaves or fruits provides beneficial effects.

In some European countries, juniper is used in the treatment of acute and chronic diseases of the bladder and kidneys, gastrointestinal, liver and biliary tract disorders, as well as gout and skin diseases. In addition to being used separately, juniper leaves and fruits are included in the composition of many complex medicinal preparations. For example, when used as part of combined therapies for the treatment of diabetes mellitus, it also shows good results.

In medicine, juniper fruits are widely used as a diuretic, for promoting the expulsion of kidney and bladder stones, as an expectorant, and as an agent that improves digestion. Juniper oil is applied externally for rheumatic joint pain. Baths prepared from a decoction of the cone berries are recommended for skin rashes in individuals with allergic predisposition. The fruits are rich in essential oils, which contain pinene, camphene, sabinene, borneol, cadinene, as well as organic acids, resins, juniperin pigment, and flavonoid glycosides [6].

For the treatment of diabetes mellitus, one tablespoon of crushed fruits is added to 200 ml of boiling water and infused for one hour. After straining, taking one tablespoon three times daily before meals produces positive results.

In recent years, considerable attention has been paid to the study of free radicals, their types, and their effects on various organisms. Free radicals mainly originate from reactive forms of oxygen and nitrogen [7] and may be generated in living organisms under the influence of various endogenous systems, physical and chemical factors, or pathophysiological conditions. Free radicals can adversely affect proteins, lipids, and DNA, leading to cell damage and, consequently, to the development of certain diseases [8].

The defense system of living organisms against such free radicals consists of the activity of oxidoreductase enzymes and various reactions involving low-molecular-weight antioxidants. These antioxidants include hormones, chelating compounds, water- and fat-soluble vitamins, thiol-containing amino acids, flavonoids, polypeptides, carotenoids, and others [1]. These compounds inhibit the formation of free radicals; therefore, they are referred to as antiradical agents and antioxidants. The "*Oltin Vodiy*" food supplement is a natural source of the above-mentioned antioxidants.

Materials and Methods. The antiradical activity of the *Oltin Vodiy* food supplement was determined using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging method. The obtained results are presented in Table 1 and Figure 1.

Evaluation of antiradical activity by the DPPH method. Decolorization of the purple 2,2-diphenyl-1-picrylhydrazyl (DPPH) solution enables the detection of certain pure antioxidant compounds capable of donating a hydrogen atom or an electron. The stable DPPH• radical is a reagent commonly used in spectrophotometric analysis [9].

In this experiment, the method proposed by Blois [10] for assessing the inhibition of DPPH• free radicals was applied with minor modifications. A 0.812 mM DPPH• solution in ethanol was prepared in a 100 ml volumetric flask, wrapped in aluminum foil, and kept in the dark at room temperature for 30 minutes. Then, 3 ml of the DPPH solution and 200 µl of ethanol (blank sample) were added to a 4 ml quartz cuvette, placed in a spectrophotometer, and the absorbance (D_1) was measured at a wavelength of 517 nm every 30 seconds for 10 minutes using a K7000 spectrophotometer manufactured by YOKE (China).

To obtain the ethanolic extract of the sample, 1 g of the sample was boiled for 20 minutes in 25 ml of 96% ethanol in a 50 ml round-bottom flask equipped with a reflux condenser, using an ultrasonic bath with a power of 100 W. The extract was cooled, and the volume required for analysis was filtered through a 0.45 µm syringe filter. To evaluate the antiradical activity of the sample, 100, 150, 250, and 300 µl of the extract were mixed with 3 ml of the DPPH solution, and the absorbance at 517 nm (D_2) was measured under the same conditions. Ethanol was added to adjust the total cuvette volume to 3.2 ml. The antiradical activity of the samples was calculated using the following formula:

$$ARA\% = \frac{D_1 - D_2}{D_1} \cdot 100\%$$

Here, **D_1** represents the optical density of the control solution, and **D_2** represents the optical density after the addition of the extract.

Discussion of the results. The results of the study showed that the *Oltin Vodiy* food extract exhibited significant antiradical activity (ARA%) at all tested concentrations (300, 250, 150, and 100 µl). Although the activity varied depending on concentration, it did not change over time (Table 1).

Table 1.

Measured absorbance values and antiradical activities of the blank and test samples added to the DPPH solution.

Time, sec	D_1	D_2 (300 mcl)	ARA%	D_2 (250 mcl)	ARA%	D_2 (150 mcl)	ARA%	D_2 (100 mcl)	ARA%
0	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
60	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
120	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
180	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
240	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
300	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
360	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
420	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
480	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
540	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86
600	1,02	0,482	52,75	0,582	42,94	0,704	30,98	0,95	6,86

As can be seen from the table, at 0 minutes (initial evaluation), the ARF% values of the extract were 52.75%, 42.94%, 30.98%, and 6.86%, respectively. These results indicate that the *Oltin Vodiy* food supplement extract at concentrations of 300 and 250 µl exhibits rapid antiradical activity, reflecting the

presence of a fast antioxidant reaction. Such values are considered high among plant extracts and confirm that this product is a strong natural source of antioxidants.

To calculate the IC_{50} value—the concentration required to inhibit 50% of the DPPH solution—the absorbance (D_2) and antiradical activity (ARF%) values measured at 10 minutes in each experiment were used. Based on these data, a graph was constructed, and the IC_{50} value was determined from the function of the fitted trend line (Figure 1).

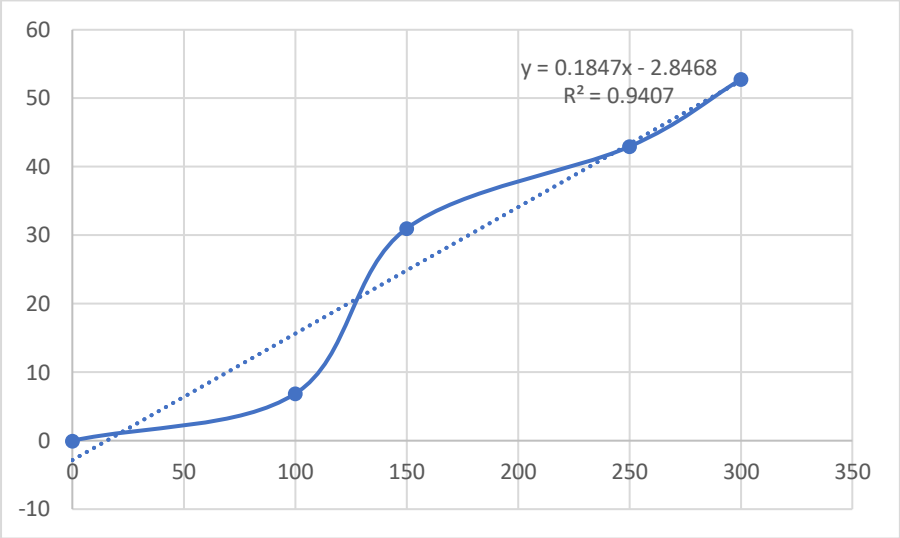


Figure 1. Graph showing the relationship between the ARA% values determined at 10 minutes and the corresponding volumes of the sample.

The volume (IC_{50}) corresponding to 50% ARA% was calculated from the trend line equation plotted on the graph, $y = mx + b$, using the formula $x = (y - b) / m$:

$$IC_{50} = \frac{(50 - 2.8468)}{0{,}1847} = 255{,}29\ mcl$$

Conclusion, the *Oltin Vodiy* food supplement demonstrated high antiradical activity; in particular, its IC_{50} value was determined to be 255.29 µl. This finding indicates that the *Oltin Vodiy* food supplement, which possesses a chemical composition rich in various biologically active compounds and minerals, is superior to a number of synthetic preparations for the treatment and prevention of the above-mentioned diseases.

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