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DETERMINATION OF ANTIOXIDANT ACTIVITY OF THE FOOD ADDITIVE AS-DILL

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Annotation
The health of the population is the most valuable asset of the state. To preserve it, the pharmaceutical industry is tasked with providing the population with high-quality medicines. Based on the measures taken in this direction, some important practical results are achieved in organizing the development of competitive drugs based on natural raw materials. The antioxidant activity of the food additive "As-dill" has the property of acting on free radicals (O_2, OH^*, HO_2) and free radicals of unsaturated fatty acids (RO^*, RO_2). This scientific work aims to determine the antioxidant properties of the food supplement "As-Dill", developed based on dill seeds and Plantago leaves. As a result of the study, an analysis of the antioxidant properties of the food supplement "As-Dill" was carried out by determining the optical density using a spectrophotometric method, and the antioxidant activity of the food supplement was calculated. It was noted that the antioxidant activity of the food supplement "As-Dill" compared to Adrenaline decreased over time in optical density in vitro.

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Introduction. In the Republic, natural food additives derived from plants have been shown to possess the capacity to prevent and treat a variety of human diseases, including those affecting the digestive system, urolithiasis, the nervous system, and the musculoskeletal apparatus. Notably, these additives have demonstrated efficacy in the treatment of leukaemia, oncology, and infertility. The research community has made significant progress in the development of classification systems based on chemical composition, and a number of research tasks have been identified for scientific researchers. The present study aims to examine the antioxidant activity of the food additive "As-dill", which is derived from two plants with recognised anti-inflammatory properties: dill seeds and plantago major leaves [1-3].

Nowadays, one of the main goals of modern medicine is to replace synthetic drugs with harmless natural drugs.

In this regard, the new, natural food "As-Dill" developed by us has additional constipation, inflammation, spasmolytic, and regeneration properties.

The dietary supplement under consideration consists of Plantago major containing organic (especially citric) and phenolic (ferulic, caffeic, coumaric) acids, flavonoids (luteolin, quercetin, dihydroquercetin and their derivatives), amino acids, vitamin C; and dill seeds rich in organic acids (oleic, linoleic, palmitic, d-carbonic, apiolic, 3-hexanolic, transdihydrocarvonic, macro- and microelements). [4-6]

Based on the above properties, we have studied the antioxidant properties of the "As-Dill" food additive that neutralizes free radicals.

It is known that the average mass percentage of free oxygen molecules in the air is 21%, and its intermediates have a toxic effect on living organisms. In particular, breathing in a mixture containing 60% oxygen in the air used in resuscitation and intensive care for 2 hours will cause acute diffusion damage to the lung tissue. The oxidizing property of oxygen is formed by its active forms and metabolites that have a destructive effect on various biomolecules. The following radicals can be present in the body in the form of free radicals: OH^* - hydroxyl, HO_2^*-perhydroxyl, H_2O_2-hydrogen peroxide, RO^*-alkyl, etc. [7-10].

Free radicals cause more than a hundred diseases in humans, including atherosclerosis, arthritis, tissue ischemia and reperfusion injury, damage to the central nervous system, gastritis, cancer, and dangerous diseases such as Acquired Immune Deficiency Syndrome (AIDS). Antioxidants are needed to neutralize free radicals. Antioxidants react with free radicals in the biological system, reduce the damage caused by free radicals and protect against the indirect effects of free radicals [11].

Antioxidants are substances that inhibit oxidation: many chemical substances that neutralize the oxidizing effects of free radicals and other substances (flavonoids, water-soluble C, fat-soluble vitamins E, etc.), including natural products of the body and nutrients obtained from food.

Russian scientists led by Y. L. Gerasimova determined the antioxidant activity of tea and medicinal plant extracts by potentiometric titration using potassium hexacyanoferrate. Russian scientists under the leadership of Y.I. Ryabinina determined the antioxidant activity of aqueous extracts of six locally grown medicinal plants by autoxidation of adrenaline in the inhibition reaction. These scientists proposed a new time criterion for the assessment of antioxidant activity and proved that the induction period can be accepted as a value determining the antioxidant activity of plant extracts in the analysis of autoxidation of adrenaline in the inhibition reaction [12-13].

Materials and methods. The food additive As-Dill taken for analysis is evaluated by the method of inhibition of the autoxidation reaction of adrenaline under in vitro conditions, i.e. by its ability to inhibit the autoxidation reaction of adrenaline and at the same time prevent the formation of reactive oxygen species (ROS). The antioxidant activity of the examined sample is expressed in percentages (AF%) according to the inhibition of autoxidation of adrenaline.

Sample extract preparation: 0.75 g of plant sample was boiled in 50 ml of water for 10 minutes. The obtained extract was passed through a 0.45 μm syringe filter and used for analysis.

For this, 3 ml of 0.2 M carbonate (Na_2CO_3-$NaHCO_3$, pH=10.65) buffer and 0.15 ml of 0.18% solution of adrenaline tartrate were added, mixed quickly, and K7000 (YOKE, China) in a cuvette with a thickness of 10 mm) optical density D1 was determined in a spectrophotometer every 30 seconds for 10 minutes at a wavelength of 347 nm.

0.045 ml of the investigated plant extract, 3 ml of the buffer solution and 0.15 ml of the 0.18% solution of adrenaline tartrate were taken and mixed in the above manner, and the optical density at a wavelength of 347 nm was measured (D_2). A vitamin C solution with a concentration of 0.1 mg/ml was taken as a control.

Discussion of results. When determining the antioxidant activity of the samples by inhibiting the reaction of adrenaline autoxidation in vitro, the samples inhibited the formation of the free form of oxygen. The obtained samples were compared with the standard antioxidant ascorbic acid (vitamin C).

It is evident that Anethum graveolens s. and Plantago major plants are recognised as containing a significant quantity of phenolic compounds. A plethora of studies have demonstrated the biological activities of these plants, encompassing antioxidant, hepatoprotective, antimalarial, antibacterial, antihypercholesterolemic, antiatherosclerotic, hypoglycaemic, antimutagenic and anticancer properties. [2,14]

Polyphenolic compounds have been identified as a class of antioxidant substances, which have been demonstrated to act as protective agents against the development of diseases in the human body [15-17].

The antioxidant activity of the tested samples is expressed in percent (AA%) by the inhibition of autoxidation of adrenaline and was calculated by the following formula (Table 1):

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

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

Table 1.

Inhibition of active form of oxygen over time by aqueous extracts of plants with antioxidant activity (AA)

Control extract	AA, %
	As-Dill (D_2)
1-minute	22,87
3-minutes	15,63
5-minutes	7,513
10-minutes	-3,05
Average	10,74%

Conclusion. In the experimental section, the food additive "As-Dill" was obtained, and the antioxidant activity of adrenaline was determined by the autooxidation method in vitro. The study's findings revealed the temporal dynamics of the food additive's antioxidant properties. The results obtained demonstrate that the tested sample possesses antioxidant properties.

The antioxidant compounds present in the As-Dill food additive, derived from Plantago major leaves and dill seeds, have been shown to facilitate the healing of various injuries. The accessibility of these plants in numerous countries, coupled with their therapeutic benefits, suggests a rationale for the incorporation of various medicinal products derived from these plants as food additives, in conjunction with conventional treatment methods.

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