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DETERMINATION OF BIOLOGICAL ACTIVITY OF AMARANTH

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Annotation
In this article, the optimal ratio of β-carotenoids in the Andizhan variety of the Amaranth L family, introduced into the conditions of Uzbekistan, was determined using a spectrometric method. From the obtained results, it was established that the content of the Andizhan variety, bred in local conditions, is 11.7 mg / g. This result served as the basis for determining the biological, i.e. antioxidant activity of this variety. Medicinal plants are the main raw materials for obtaining low-toxic and promising drugs.

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Introduction: Currently, the relevance of using non-traditional food raw materials, namely medicinal plants, as food additives has increased significantly. Medicinal plants are widely used as food additives in medicine, veterinary science, and the food industry. These include wild medicinal plants such as nettle, sorrel, yarrow, ivy, thistle, and amaranth, as well as others with medicinal properties [1]. Among such plants is the Andizhan variety, which belongs to the Amarantaceae L family, introduced to the conditions of Uzbekistan. Amaranth is one of the plants that have been used by people for almost 4,000 years, and there are many of its species suitable for tropical and subtropical climatic conditions. Amaranth leaves contain such macro- and microelements as pectins, ascorbic acid, polyphenols, flavonoids, vitamins (A, S, E), betacyanin pigments, lipids, K, Ca, Mg, Fe, Mn, Na, Li, P, B, Fe, Ba, Ni, Co [2]. Currently, domestic producers have developed a technology for biologically active food products with high-added anti-inflammatory, bactericidal, expectorant, hepatoprotective, and antioxidant activity based on local raw materials with high nutritional value [3]. Various preparations, syrups, dry extracts, and biologically active additives - herbal teas are developed based on medicinal plants. One such medicinal plant is the amaranth plant, which has a rich chemical composition. Currently, the pharmaceutical industry and practical medicine use preparations containing pigments based on components obtained from plant materials. In addition, local producers are developing several biologically active additives based on different parts of the Araman plant. The main active components of this plant are polyene compounds, phenolic compounds, and carbohydrates [4].

The aim of the work: one of the common methods used to determine the amount of β-carotenoids in the amaranth plant of the Andizhan variety, belonging to the Amaranthus L family, introduced into the conditions of Uzbekistan, and to determine the antioxidant activity of extracts from this plant - the antioxidant activity of the tested substances in vitro is the ability to inhibit the reaction of adrenaline autoxidation and simultaneously the formation of active oxygen species (ROS). was assessed for prevention.

Experimental part: the optical density of the solutions was measured on an EMC-30PC spectrophotometer (Germany). The object of the study was crushed dry amaranth plant of the Andizhan variety of the Amarantaceae L family. The experiments used the method recommended in the State Pharmacopoeia XIV (RF) [5].

Discussion of the obtained results. There are several methods for determining the amount of the main active components in drugs and dietary supplements. These substances can be determined using thin-layer chromatography (TLC), spectrophotometry, and high-performance liquid chromatography (HPLC). In European countries, the qualitative and quantitative indicators of the objects being tested are determined by thin-layer chromatography (TLC), and in Russia and some CIS countries - by spectrophotometry. In our country, the standardization of the main active components of drugs and biologically active compounds is carried out in accordance with the requirements of the state standard. As a result of the studies, when measuring the amount of β-carotenoid contained in the amaranth plant grown in local conditions, using spectrophotometry with hexane extraction, the highest indicator corresponded to the Product-Extractant ratio of 1:5. The results of the experiment are presented in the table below.

Table 1

Results of extraction of β-carotenoids of Andijan amaranth variety in various solvents

Extractant	Product-Extractant ratio	Size, mm	Extraction time, min	β-carotenoid quantity,мг
Hexane	1:5	1,0	30	10,8
	1:5	**1,0**	**60**	**11,7**
	1:5	1,0	90	10,4
	1:5	0,5	30	6,3
	1:5	0,5	60	7,6
	1:5	0,5	90	9,5
Ethanol 70%	1:5	1,0	30	4,8
	1:5	1,0	60	5,2
	1:5	1,0	90	6,1
	1:5	0,5	30	7,3
	1:5	0,5	60	9,5
	1:5	0,5	90	10,7
Ethanol 96%	1:5	1,0	30	2,8
	1:5	1,0	60	4,2
	1:5	1,0	90	7,9
	1:5	0,5	30	6,8
	1:5	0,5	60	6,4
	1:5	0,5	90	9,3

From the results presented in the table above, it is evident that β-carotenoids in amaranth were extracted with hexane, 70%, and 96% ethanol, hexane extraction was optimal, and the highest yield was achieved with an extraction time of 60 minutes and a raw material grinding of 1 mm, i.e. 11.70 mg%.

In this study, a method based on the inhibition of the adrenaline autoxidation reaction was used to determine the antioxidant activity of amaranth extract in vitro [6].

It is known that scientists have used various methods to study the antioxidant activity of plant extracts. For example, Russian scientists led by E. L. Gerasimova determined the antioxidant activity of medicinal plant extracts by potentiometric titration using potassium hexacyanoferrate (III) - red blood salt. A group of scientists led by E.I. Ryabinina determined the antioxidant activity of aqueous extracts of 6 different local medicinal plants using a method based on the adrenaline inhibition reaction. These scientists proposed a new time criterion for assessing antioxidant activity and proved that the induction period in the analysis of adrenaline autoxidation in the inhibition reaction is accepted as a value determining the antioxidant activity of plant extracts [7]. Since phenolic compounds are known to protect cellular components from free radicals, the antioxidant properties of the amaranth leaf extract were assessed by inhibiting the adrenaline autoxidation reaction in vitro and preventing the formation of oxygen species. Optimum adrenochrome formation as a result of adrenaline autoxidation was observed at 3, 5, and 10 minutes, and the highest optimal indicator was considered to be the antioxidant indicator.

Table 2

Indicators of antioxidant activity (AA%) of amaranth variety “Andijan”.

№	Extract measurement time, minutes	Test sample (1mg/ml)	Etalon (1mg/ml)	
		Amaranth leaf	Quercetin	Gliclazide
1.	3	90,87 %	**20,8**	5,3
2.	5	95,7 %	28,0	8,3
3.	10	89,0 %	35,1	11,0

This plant is recognized as a promising source of industrial, food, and medicinal substances. In pharmaceuticals and modern medicine, amaranth is valued for its richness of vitamins and other biologically active compounds. In particular, squalene, which has a high level of biological activity in the plant, is widely used as an antitumor and immunostimulating agent. It can be said that as a result of our experiments, it was established that the amount of antioxidants in amaranth is higher in formed leaves than in unformed ones.

Conclusion: As a result of the studies, it was established that when using hexane as a solvent for the extraction of β-carotenoids from the Andijan variety of amaranth grown in local conditions, the raw material: extractant ratio is 1:5, the degree of grinding of the raw material is 1 mm, the extraction time is 60 minutes.

The antioxidant activity of the plant extracts studied above was determined by the method of inhibiting the adrenaline autooxidation reaction in vitro. As a result of the research, it was found that the antioxidant activity of all samples exceeds 10%, that is, they have antioxidant activity.

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