ЎЗБЕКИСТОН РЕСПУБЛИКАСИ
ОЛИЙ ВА ЎРТА МАХСУС ТАЪЛИМ ВАЗИРЛИГИ

ФАРҒОНА ДАВЛАТ УНИВЕРСИТЕТИ

FarDU. ILMIY XABARLAR-

1995 йилдан нашр этилади
Йилда 6 марта чиқади

— 5-2020 —

НАУЧНЫЙ ВЕСТНИК. ФерГУ

Издаётся с 1995 года
Выходит 6 раз в год

М У Н Д А Р И Ж А

Аниқ ва табиий фанлар

МАТЕМАТИКА

КИМЁ

БИОЛОГИЯ, ҚИШЛОҚ ХЎЖАЛИГИ

Ижтимоий-гуманитар фанлар

ИҚТИСОДИЁТ

ТАРИХ

АДАБИЁТШУНОСЛИК

УДК: 615.322:543.872

ХУРМО ЭКСТРАКТЛАРИНИНГ АНТИОКСИДАНТЛИК ХУСУСИЯТЛАРИНИ ЎРГАНИШ

LEARNING THE ANTIOXIDANTS FEATURES OF PERSIMMON FRUIT EXTRACTS

ИЗУЧЕНИЕ АНТИОКСИДАНТНЫХ СВОЙСТВ ЭКСТРАКТОВ ХУРМЫ

I.Askarov[1], A.Khozhikulov[2]

[1] **I.Askarov** – *Andijan State University, Doctor of Chemical Sciences, Professor.*

[2] **A.Khozhikulov** – *Andijan State University, teacher.*

Аннотация

Мақолада инсон организмидаги кислород алмашинувининг бошқарилишида антиоксидантларнинг роли ва маҳаллий хурмо навлари мева экстрактларининг антиоксидантлик хусусиятларини ўрганиш бўйича маълумотлар келтирилган.

Annotation

The article presents information on the role of antioxidants in the regulation of oxygen metabolism in the human body and studies of the antioxidant properties of extracts of fruits of local persimmon varieties.

Аннотация

В статье представлены сведения о роли антиоксидантов в регуляции кислородного обмена в организме человека и результаты исследования антиоксидантных свойств экстрактов плодов местных сортов хурмы.

Таянч сўз ва иборалар: *кислородли оксигеназа, оксидловчи стресс, эркин радикаллар, антиоксидантлар, фермент ва витаминлар, гликлазид, кверцетин, шоколад хурмо экстракти, Королёк-Хиакуме хурмо экстракти.*

Keywords and expressions: *oxygen oxygenase, oxidative stress, free radicals, antioxidants, enzyme and vitamins, gliclazide, quercetin, chocolate persimmon extract, Korolek-Hiakume persimmon extract.*

Ключевые слова и выражения: *кислородная оксигеназа, окислительный стресс, свободные радикалы, антиоксиданты, ферменты и витамины, гликлазид, кверцетин, экстракт шоколадной хурмы, экстракт хурмы Королёк-Хиакуме.*

Introduction. Doctors, chemists and biochemists constantly monitor the oxygen exchange in the human body. This is due to the fact that oxidative stress in the human body occurs when the balance between the biochemical mechanisms of oxygenase use is imbalanced. Removal of oxidative stress is achieved with the help of biologically active substances (BAS), in particular antioxidants. Antioxidants stop the rapid growth of oxidative processes, form inactive radicals and remove them from the body [1,2].

Because free radical molecules lack one or more electrons, they aggressively attack healthy molecules and cause chain reactions. Free radicals usually accumulate in cell membranes and begin to destroy them, which leads to the gradual destruction and death of cells in our body [3,4,5].

Antioxidants act as specific free radical donors, stopping the formation of free radicals, donating their electrons and not converting them into free radicals. As a result of the oxidation of cells in the body, it slows down or even stops completely[3,4,5].

Enzymes are the main antioxidant defense that breaks down reactive oxygen species. They convert reactive oxygen species to hydrogen peroxide and less aggressive radicals, and then convert them to water and simple useful oxygen [6].

Vitamins and substances of a vitamin nature, acting as a secondary antioxidant defense, destroy aggressive radicals and prevent the development of a chain reaction, which leads to the formation of new radicals that eliminate excess energy. These vitamins or vitamin-rich substances include water-soluble vitamins - C, P-vitamins (bioflavonoids - rutin, quercetin, citrine, hesperidin, ascorutin), fat-soluble vitamins - vitamin A, beta-carotene, E, K, amino acids containing sulfur (glutathione, cysteine, methionine), C-cytochrome, chelates, alcohol in micro doses, trace elements such as selenium and zinc [6].

Antioxidants are substances that prevent food from being oxidized by oxygen in the air. In this process, antioxidants are consumed in the oxidation process, i.e. they are broken down by the oxygen in

the air. Therefore, the more antioxidants a product contains, the longer its shelf life. But adding a lot of antioxidants can negatively affect food composition [7,8,9].

Experimental part. For the experiment, water extracts of persimmon varieties ***Diospyros kaki (ChP)*** chocolate persimmon and ***Diospyros kaki (KKh)*** Korolek-Khiakume were obtained, which are localized in the Andijan region. The solubility and conditions of analysis of the tested drugs are shown in Table 1.

Table 1

Tested drugs

№	Drugs	Solubility	***In vitro*** mg / ml
1	X_1-Diospyros kaki(ChP)	water	100/250/500/750/1000
2	X_2-Diospyros kaki(KKhp)	water	100/250/500/750/1000
3	X_3-Diospyros kaki(KKhj)	water	100/250/500/750/1000
4	Quercetin	water + 30% alcohol	100/250/500/750/1000
5	Gliclazide	water	100/250/500/750/1000

The antioxidant activity of the studied drugs was determined by photochemical tests and was assessed by several methods.

The antioxidant activity of the drugs was carried out by inhibiting the autooxidation reaction of adrenaline ***in vitro***, as well as inhibiting the formation of free oxygen form. The method is based on inhibition of the adrenaline autooxidation reaction, the formation of adrenaline in ROS (reactive oxygen species) over time in vitro and autoimmune oxidation (%).

To do this, we took 2,0 ml of 0,2 M sodium carbonate buffer (Na_2CO_3-$NaHCO_3$) with pH=10,65, took 56 mg/ml of 0,18% solution of epinephrine (epinephrine) hydrochloride and added to it 30 mg / ml of antioxidant the preparation and optical density of solutions were tested on a Cary 60 UV-Vis Agilet Technologies spectrophotometer in a 10 mm cuvette with a wavelength of 347 nm for 30 seconds to 10 minutes with rapid stirring. The amount of the investigated extract (concentration 1 mg in 1 ml) was used as a standard, and 0,2 M 2,0 ml of buffer, 0,18% 56 mg / ml (5,46 mM) of adrenaline were used as a control sample.

Antioxidant activity was expressed as a percentage depending on the inhibition of adrenaline autooxidation and was calculated using the following formula

$$AA = \frac{(D_1 - D_2)\cdot 100}{D_1}, \%.$$

D_1 – Optical density of the epinephrine hydrochloride solution added to the buffer;

D_2 – Optical density of the investigated extract and epinephrine hydrochloride added to the buffer.

Statistical data were checked using the Student's t test and the Original 6.1 USA program.

Analysis of the results obtained. The control of solutions of the studied drugs was carried out using a solution of adrenaline hydrochloride in 5 different concentrations added to a 0,2 M buffer solution of sodium carbonate (Na_2CO_3-$NaHCO_3$) pH=10,65 and a mixture of the investigated extracts and adrenaline hydrochloride added to the buffer at 5 different concentrations. The optical density of the solutions was tested on a Cary 60 UV-Vis Agilet Technologies spectrophotometer in a 10 mm cuvette with a wavelength of 347 nm. The results of spectrophotometric analyzes are shown in Table 2.

Prepared using bidistillate water from the initial concentrated solution to be tested, i.e. 10% (900 ml bidistillate water per 100 mg / ml test solution), 25% (750 ml bidistillate water per 250 mg / ml test solution), 50% (500 ml of bidistillate water for 500 mg / ml of test solution), 75% (250 ml of bidistillate water for 750 mg / ml of test solution) and 100% (1000 mg / ml of test solution) of 5 different concentrations of the studied drugs.

The antioxidant activity of the studied drugs was calculated based on the values of the optical density of the samples according to the following formula

$$AA = \frac{(D_1 - D_2)\cdot 100}{D_1}, \%.$$

For example, in this way

$$AA = \frac{(D_1 - D_2)*100}{D_1} = \frac{(0{,}29208 - 0{,}2541)*100}{0{,}29208} = 13{,}00\ \%$$

The results of the identified calculations are presented in Table 2.

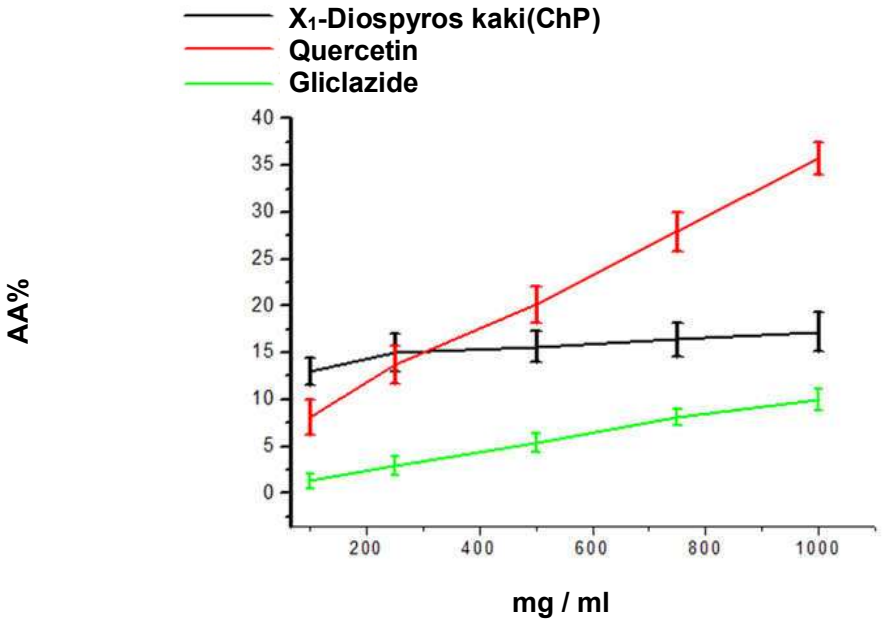
Table 2

Spectrophotometric analysis and antioxidant activity (AA%) of the studied drugs

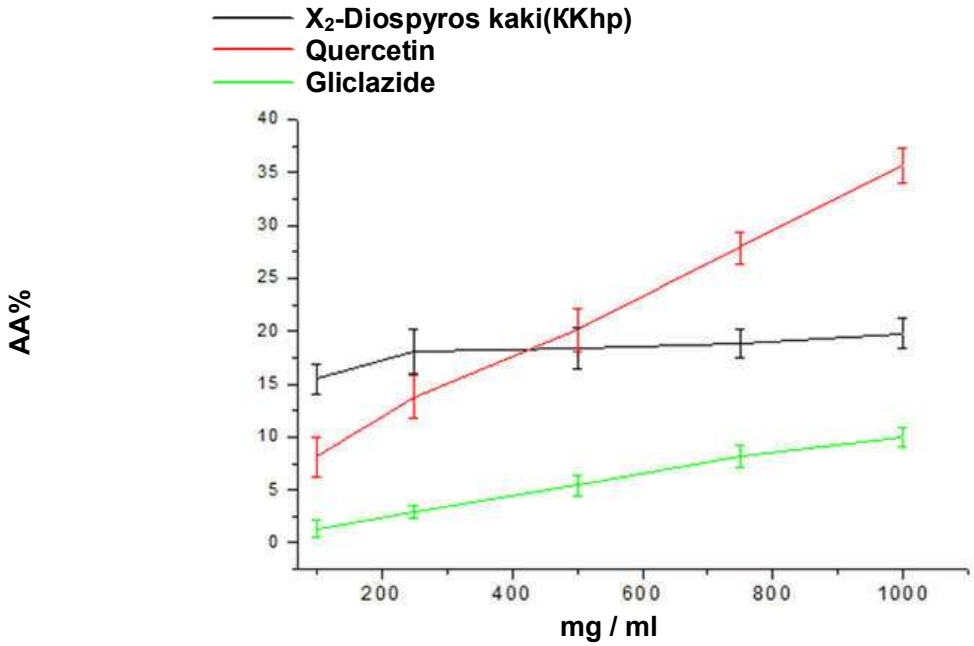
№	Substance	Control (D_1)	Experience (D_2)	$AA_{\%}$
	X_1 -*Diospyros kaki(ChP)*			
1	X_1 (10%) 100 mg/ml	0,29208	0,2541	**13,00**
2	X_1 (25%) 250 mg/ml	0,24964	0,2122	**14,99**
3	X_1 (50%) 500 mg/ml	0,19449	0,1640	**15,68**
4	X_1 (75%) 750 mg/ml	0,21651	0,1810	**16,40**
5	X_1 (100%) 1000 mg/ml	0,28018	0,2319	**17,23**
	X_2 - *Diospyros kaki(KKhp)*			
1	X_2 (10%) 100 mg/ml	0,21561	0,1822	**15,49**
2	X_2 (25%) 250 mg/ml	0,23685	0,1940	**18,09**
3	X_2 (50%) 500 mg/ml	0,20312	0,1657	**18,42**
4	X_2 (75%) 750 mg/ml	0,22234	0,1804	**18,86**
5	X_2 (100%) 1000 mg/ml	0,28612	0,2294	**19,82**
	X_3 -*Diospyros kaki(KKhj)*			
1	X_3 (10%) 100 mg/ml	0,23611	0,1970	**16,56**
2	X_3 (25%) 250 mg/ml	0,27326	0,2247	**17,77**
3	X_3 (50%) 500 mg/ml	0,29455	0,2384	**19,06**
4	X_3 (75%) 750 mg/ml	0,36258	0,2918	**19,52**
5	X_3 (100%) 1000 mg/ml	0,36806	0,2927	**20,47**
	Gliclazide	0,17980	0,1430	**10,0**
	Quercetin	0,67247	0,5348	**37,4**

For a comparative analysis of the antioxidant activity of the controlled drugs, the following substances were used; as gliclazide, which is used in pharmaceuticals and medicine, as well as quercetin, which is used as BAD (biological active additive) in the food industry.

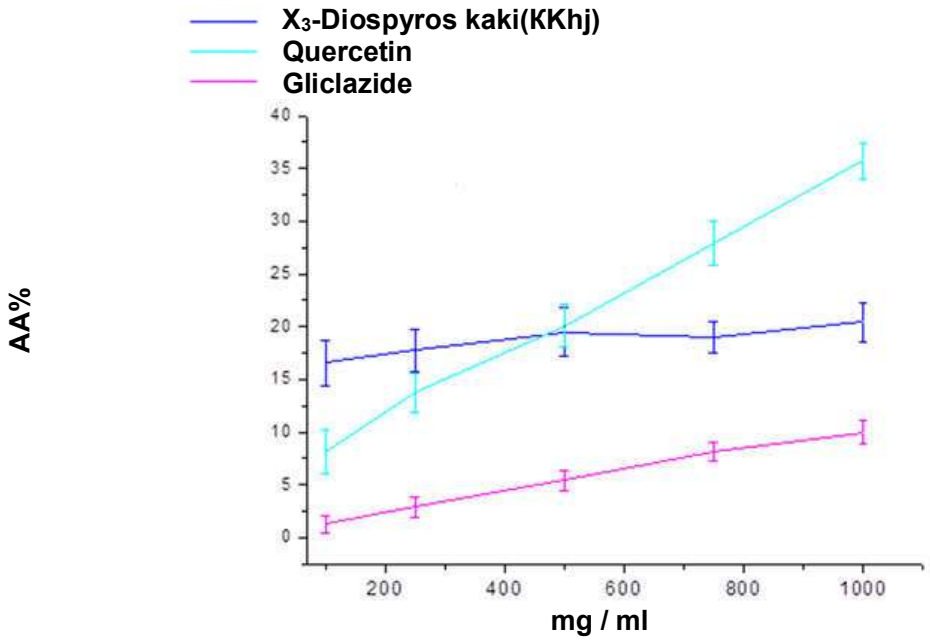
The graphs of the concentration dependence of AA activity to 5 different concentration solutions of the tested drugs are shown in Figure 1 for X_1, in Figure 2 for X_2 and in Figure 3 for X_3.



Picture 1. Antioxidant properties of X_1-Diospyros kaki (ChP)



Picture 2. Antioxidant properties of X_2-Diospyros kaki (KKhp)



Picture 3. Antioxidant properties of X_3-Diospyros kaki (KKhj)

CONCLUSIONS

1. As a result of scientific research carried out by us in the laboratory of Metabolism of the Institute of Biophysics and Biochemistry of the National University of Uzbekistan, extracts of fruits of local varieties ***Diospyros kaki (ChP)*** chocolate persimmon and ***Diospyros kaki (KKh)*** Korolek-Khiakume have high antioxidant properties.

2. The activity of AA drugs was explained by the inhibition of the autooxidation of adrenaline ***in vitro*** and the formation of free oxygen forms.

3. The antioxidant properties of the preparations – X_1, X_2, X_3 were evaluated by comparison with the antioxidants quercetin and gliclazide as standard antioxidants.

4. It was found that the AA activity of low-concentration solutions of all tested drugs was higher than that of gliclazide, and the AA activity of high-concentration solutions was closer to that of quercetin.

5. As a result of tests, the AA activity of two different persimmon fruits showed that the AA activity of the ***Diospyros kaki (KKh)*** Korolek-Khiakume persimmon solution was higher than that of the ***Diospyros kaki (ChP)*** chocolate persimmon solution.

6. For comparative analysis, even when studying the AA activity of two different extracts from the same fruits of the persimmon ***Diospyros kaki (KKh)*** Korolek-Khiakume, that is, fruit peel powder and fruit juice extracts, it was found that the AA activity in fruit juice was higher than fruit peel powder extract. This indicates that the amount of antioxidants in fruit juice is higher than in its fruit peel.

References:

1. Prida A.I., Ivanova R.I. "Natural antioxidants of polyphenolic nature (antiradical properties and prospects for use)". Food ingredients. Raw materials and additives. 2004. № 2.

2. Ryabinina E.I., Zotova E.E., Vetrova E.N., Ponomareva N.I., Ilyushina T.N. "A new approach to assessing the antioxidant activity of plant materials in the study of the process of adrenaline autooxidation." Chemistry of plant materials. 2011. № 3.

3. Ryzhikova M.A., Farkhutdinova R.R., Sibiryak S.V., Zagudillin Sh.Z. "Influence of aqueous extracts from medicinal plants on the processes of free radical oxidation." Experimental and Clinical Pharmacology. 1999. T. 62, № 2.

4. Khasanova S.R., Plekhanova T.I., Gashimova D.T., Galiakhmetova E.Kh., Klysh E.A. “Comparative study of the antioxidant activity of plant collections”. VSU Bulletin. Series: Chemistry. Biology. Pharmacy. 2007. № 1.

5. V. Gutteridge, T. Westermarck, B. Halliwell “Oxygen damage in biological systems” / Free radical, Aging and Degenerative Disease. Ed. By Yohson Y. New York, 1986.

6. Berezovsky V.M. "Chemistry of vitamins" / -M .: Food industry, 1973.

7. Zhungietu G.I. "Storage of food and feed with preservatives." Reference book. - Chisinau: Publishing house "Kartya Moldoveneaske", 2015.

8. Madrakhimov G.N., Khadzhikulov A.S., Khakimova L.A. "Antioxidants in food and their properties", Materials of the International Scientific and Technical Conference. N. 2019.

9. H.E. Seifried, S.S. McDonald, D.E. Anderson, P. Greenwald, J.A. Milner “The antioxidant conundrum in cancer”. (англ.) // Cancer research. — 2003. — Vol. 63,no.15.

(References: S.Yu.Zaitsev− Doctor of Biological Sciences, Head of the Analytical Biochemistry Group of the All-Russian Institute of Animal Husbandry named after L.K.Ernst)