Journal of Chemistry of Goods and Traditional Medicine

J Chem Good Trad Med, Volume 3, Issue 4, 2024 Traditional Medicine

DETERMINATION OF ANTIOXIDANT PROPERTIES OF PLANTS CHUFA (CYPERUS ESCULENTUS) AND WHITE SORGHUM (SORGHUM CERNUUM)

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DOI: https://doi.org/10.55475/jcgtm/vol3.iss4.2024.342

Keywords:
Antioxidant, Chufa (Cyperus esculentus), Sorghum (Sorghum cernuum), biologically active substances, chemical composition

Abstract
In this article, the antioxidant activity of extracts obtained from the rhizomes of the Chufa plant (Cyperus esculentus) and Sorghum seeds (Sorghum cernuum) by the method of adrenaline autooxidation in vitro was studied. It has been verified that the studied samples inhibit the autooxidation reaction and adrenaline prevents the formation of free oxygen form in vitro.

How to Cite
Abdullayev, B. O., Asqarov, I. R., & Mominov , M. M. DETERMINATION OF ANTIOXIDANT PROPERTIES OF PLANTS CHUFA (Cyperus esculentus) AND WHITE SORGHUM (Sorghum cernuum). Journal of Chemistry of Goods and Traditional Medicine, 3(4). https://doi.org/10.55475/jcgtm/vol3.iss4.2024.342

Recent medical data shows that there are a number of diseases associated with free radicals. Most of these diseases are associated with oxidative stress, and the consumption of antioxidant substances is necessary to protect the body from such harmful effects. Free radicals usually accumulate in cells and begin to destroy them, causing the cells of the human body to gradually die. As a result, the body ages faster, and the decrease in immunity leads to the occurrence of various other diseases. The human body has an antioxidant defense system that functions with the help of primary antioxidant enzymes and secondary antioxidant vitamins. The accumulation of free radicals in the body disrupts the functioning of cells, resulting in the formation of many harmful molecules, and the body requires more antioxidants [1], [2].

Antioxidants stop the rapidly developing oxidation process by forming inactive particles and removing harmful free radicals from the body . In addition, antioxidants protect cells or cell membranes from harmful effects and reactions that lead to excessive oxidation. Based on the above data, samples of tiger nut root and white sorghum seed extracts in different ratios were tested for antioxidant activity in vitro [3].

LITERATURE ANALYSIS AND METHODS. Chufa (*Cyperus esculentus L.*) is a perennial plant, also known as groundnut or yogurt nut, resembling a weed. Tiger nut is an effective remedy for the liver, spleen and stomach. Tiger nut roots contain 4% protein, 20-35% fat, 20% starch and 28% sugar. Tiger nut contains vitamins B, C, A and E, sterols , β- carotene, as well as macro- and microelements[4], [5].

White sorghum (*Sorghum Pers.*) belongs to the family of cereals (grasses) and is a type of grain and forage crop. There are about 50 wild and cultivated species of sorghum. The most common annual species are grain sorghum (*Sorghum cernuum*; white sorghum, cocoon sorghum, etc.), sweet sorghum (*Sorghum saccharatum*), durarra sorghum (*Sorghum durra*), panicle sorghum (*Sorghum teshnisum*), sudangrass (*Sorghum sudanense*), grass sorghum (*Sorghum almum*). Sorghum's homeland is Central Africa, where it began to be grown around 4-3 thousand years BC. It is cultivated in Iran, India, China, the USA, Africa, Australia, Central Asia and southern Ukraine[6].

100 grams of sorghum grain contains 339 kcal of nutrients. In addition, sorghum contains vitamins B1 (26%), B2 (7%), B5 (7%) and B6 (25%). The grain contains 70% starch, 12% protein and 3.5% fat. Starch and alcohol are obtained from it. The stems of sugar varieties contain 10-12% cane sugar and 1.2-2.0% glucose, which are used in the canning industry[7].

RESULTS AND DISCUSSION To prepare the sample extract, 0.75 g of crushed plant samples (in the ratios of 2:1, 1:1, 1:2 between chufa roots and white sorghum seeds) were boiled in 50 ml of water for 10 minutes. The resulting extract was passed through a 0.45 μm filter for analysis. tartrate solution was added to 3 ml of sodium carbonate buffer (Na2CO3-NaHCO3, pH=10.65) , quickly mixed, and the optical density of D1 was measured in a 10 mm thick cuvette using a K7000 spectrophotometer (YOKE, China) at a wavelength of 347 nm every 30 seconds for 10 minutes.
0.045 ml of the plant extracts under study were taken, 3 ml of buffer solution and 0.15 ml of 0.18% adrenaline tartrate solution were added and mixed according to the above method; then the optical density was measured at a wavelength of 347 nm (D2). A vitamin C solution with a concentration of 0.1 mg/ml was used as a control.

Table-1.

Optical density of adrenaline, chufa and white sorghum samples.

Time, sec.	Adrenaline D_1	Control (Vitamin C)	2:1 (D_2)	1:2 (D_2)	1:1 (D_2)
0	0.068	0,012	0.075	0.09	0.069
30	0.133	0.052	0.144	0.158	0.126
60	0.194	0.112	0.202	0.219	0.177
90	0.25	0.174	0,248	0,272	0,218
120	0,301	0,227	0,284	0,317	0,251
150	0,343	0,272	0,313	0,354	0,278
180	0,379	0,308	0,334	0,384	0,299
210	0,409	0,337	0,352	0,407	0,316
240	0,433	0,36	0,365	0,426	0,329
270	0,452	0,378	0,376	0,439	0,34
300	0,468	0,392	0,385	0,451	0,349
330	0,48	0,405	0,393	0,459	0,357
360	0,49	0,416	0,399	0,466	0,363
390	0,498	0,425	0,405	0,471	0,37
420	0,504	0,433	0,41	0,476	0,375
450	0,508	0,441	0,416	0,48	0,38
480	0,512	0,448	0,42	0,483	0,385
510	0,515	0,454	0,424	0,485	0,389
540	0,517	0,46	0,428	0,488	0,393

570	0,518	0,465	0.432	0.49	0.397
600	0.52	0.47	0.435	0.491	0.401

$AF = \frac{(D_1 - D_2)\cdot 100}{D_1}$The antioxidant activity of the tested samples is expressed as a percentage (AF%) of adrenaline autooxidation inhibition and is calculated using the following formula:

Here D1 is the optical density of the adrenaline tartrate solution added to the buffer, and D2 is the optical density of the sample extract and adrenaline tartrate added to the buffer.

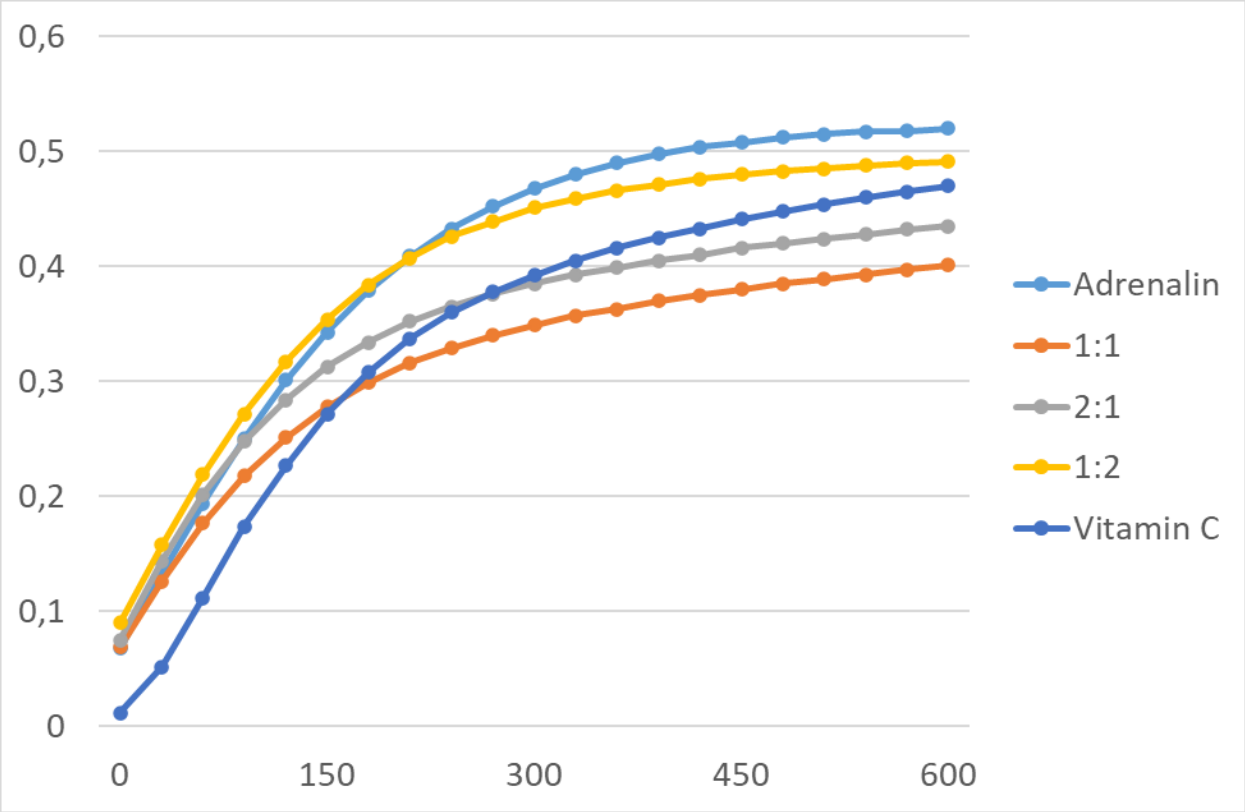


Figure 1. Dependence of antioxidant properties of samples on concentration.

Table-2.

Antioxidant activity of aqueous plant extracts during the inhibition time of the free radical concentration (FRC)

Tested extract	AF, %			
	Control (Vitamin C)	2:1	1:2	1:1
1- minute	11.20%	4.12%	-12.89%	8.76%
3- minutes	30.80%	11.87%	-1.32%	21.11%
5 minutes	39.20%	17.74%	3.63%	25.43%
10 minutes	47.00%	16.35%	5.58%	22.88%
Average	**32.05%**	10.46%	-1.25%	19.55%

To determine the antioxidant activity of the plant extracts of Chufa and White Sorghum, we collected samples from the rhizomes and seeds of these plants, crushed them and conducted laboratory analysis

in different ratios (2:1, 1:2, 1:1) over different time intervals. The results showed that the average ratio of 2:1 was 10.46%, 1:2 -1.25%, and the last ratio of 1:1 was 19.55%.

CONCLUSION. The chemical composition, medicinal properties and antioxidant characteristics of Chufa and White Sorghum plants were studied.

the antioxidant activity of the plant leaf extract was determined by the method of adrenaline autooxidation in conditions in vitro , and the antioxidant properties of plant-based extracts in various composite mixtures were studied over a time interval.

In conclusion, it can be said that the plant extract obtained in a 1:1 ratio demonstrated the highest antioxidant activity compared to other samples.

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