Comparative study of the antioxidant activity of Schisandra leaves Chinese introduced in the conditions of the Republic of Bashkortostan

E.H. Galiakhmetova, N.V. Kudashkina
(GBOU HPE "Bashkir State Medical University" of the Ministry of Health RF, Ufa)

Comparative study of antioxidant activity of Chinese lemongrass leaves introduced in Bashkortostan

E.Kh. Galiakhmetova, NV Kudashkina
Bashkir state medical university (Ufa, Russia)

RESUME

Comparative study of the spectrophotometric and chemiluminescence analysis methods in vitro for assessment of antioxidant activity of extracts from the leaves of Chinese lemongrass, introduced in conditions of the Republic of Bashkortostan was conducted. Fe + 2 induced model systems with chemiluminescence activation by luminol in phosphate buffer (pH 7.45) were used. Spectrophotometric determination of antioxidant activity of the objects of study was evaluated by its ability to inhibit adrenaline autooxidation and inhibit the formation of reactive oxygen forms.

Keywords: Chinese lemongrass, antioxidant activity, chemiluminescence analysis, raw medicinal herbs.

SUMMARY

Carried out comparative study of spectrophotometric and chemiluminescent methods of in vitro analysis to assess the antioxidant activity of extracts from the leaves of Schisandra chinensis, introduced under the conditions of the Republic of Bashkortostan. Fe^{+2}-induced model systems with the chemiluminescence activator luminol in phosphate buffer (pH 7.45). The spectrophotometric determination of the antioxidant activity of the studied objects was judged by their ability to inhibit autooxidation of adrenaline and suppress the formation of reactive oxygen species.

Key words: schisandra chinensis, antioxidant activity, chemiluminescent analysis, medicinal plant raw materials.

Introduction

Recently, much attention has been paid to antioxidant activity in the study of biologically active compounds of medicinal plants. This is due to the fact that the participation of free radicals in the pathogenesis of many diseases has been proven: shock of various origins, atherosclerosis, circulatory disorders, diabetes mellitus, inflammatory diseases, eye lesions, oncological pathology, etc., as well as in premature aging [4]. Free radicals, released from the control of antioxidant protection, attack phospholipids of cell membranes, which contain unsaturated fatty acids. V

as a result of the reaction, peroxides are formed and the permeability of membranes increases, their structure is disturbed, and as a result, the course of diseases is aggravated [6].

The classic antioxidants are vitamins E and C, which are able to block the process of fatty acid peroxidation and protect fatty acids in and around cells from attacking free radicals; β-carotene, which binds atomic oxygen and peroxyl radicals. Phenolic compounds are also a promising group of natural antioxidants, which can convert highly active free radicals into low-active forms and bind heavy metal ions, which are catalysts for oxidative processes. Mineral substances, in particular selenium, calcium, zinc, magnesium, also have a deactivating effect on free radicals [1, 7].

It is known that Schisandra chinensis fruits have a wide spectrum of pharmacological activity, including the ability to stimulate antioxidant activity and slow down the aging process.

Schisandra chinensis is a perennial vine that grows wild in the Primorsky and Khabarovsk Territories, the Amur and Sakhalin Regions [3]. At present, it has been successfully introduced into culture and can be cultivated in almost all regions of the country, including the Republic of Bashkortostan.

We carried out a comparative study of the antioxidant activity of the fruits and leaves of Schisandra chinensis introduced on the territory of the Republic of Bashkortostan. The collection of fruits was carried out during fruiting, leaves - during the growing season. The objects of the study were an infusion of schisandra leaves (1:10), a tincture of schisandra leaves in 70% ethyl alcohol (1:10), and a tincture of schisandra leaves in 95% ethyl alcohol (1: 5).

Methods

The antioxidant activity of the study objects was determined using two methods.

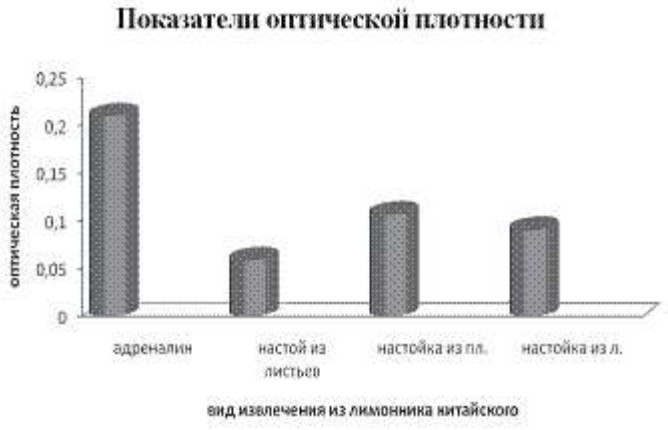
First method. Determination of antioxidant activity was carried out by measuring the activity of the resulting product as a result of autooxidation of low concentrations of epinephrine (0.1 ml 0.1% solution) to adreno-chromium (in vitro) in an alkaline medium (pH 10.65; 0.2 M bicarbonate buffer) at room temperature and in the absence of additional sources of oxidation at 347 nm [5]. The procedure for the reaction of autooxidation of adrenaline was carried out as follows: to 2 ml of bicarbonate buffer [2] was added 0.1 ml of 0.1% solution of epinephrine hydrochloride (OD1). The optical density was measured after 20 min on a UV-1800 shimadzu spectrophotometer in a 10 mm thick cuvette. Next, 0.01 ml of the test object was added to 2 ml of bicarbonate buffer in the form of an infusion (tincture), 0.1 ml 0,

The antioxidant activity index (AOA) is calculated by the formula:

$$AOA = \{(OD_{one}-OD_2) / OD_{one}\} * one\ hundred,$$

where OD_{one} - change in the optical density of the sample in the absence of extraction; OD_2 - change in the optical density of the sample in the presence of extraction.

The average value was found in six dimensions (Fig. 1), taking into account the fact that extracts from medicinal plants have their own color, which absorbs a certain wavelength in the visible region.



Rice. 1. Optical density of the investigated extracts...

AOA value of more than 10% indicates the presence of antioxidant activity.

Second method. The antioxidant activity was measured in model systems (in vitro) by changing the intensity of chemiluminescence on a chemiluminometer KhL-003: in the reactions of formation of reactive oxygen species (ROS) and in the reactions of free radical lipid peroxidation (LPO), which are most common in the body. In the first model, the effect of biological objects on reactive oxygen species was investigated, which were initiated by the introduction of 1 ml of 50 mM ferrous sulfate solution. For the reaction, 20 ml of phosphate buffer (20 mM KH2PO4 - 2.72 g, 105 mM KCl - 7.82 g in 1 L of distilled water) was used with the addition of 1.5 g of sodium citrate and the chemiluminescence activator luminol (stock solution - 10-4M solution in dimethyl sulfoxide; luminol working solution - 0.5 ml of stock solution diluted in physiological solution). The pH value of the resulting solution was adjusted to 7.45 units by titration with a saturated KOH solution and the addition of 0.2 ml of a mother liquor of luminol (10-5). In the second model, to assess the effect of the objects of study on lipid peroxidation, they were added to lipids obtained from chicken yolk containing lipoprotein complexes similar to blood lipids. The yolk was mixed with phosphate buffer (20 mM KH_2RO_4 - 2.72 g, 105 mM KCl - 7.82 g in 1 liter of distilled water) in a ratio of 1: 5, homogenized and diluted with an average of 25 ml of the resulting homogenate per 1 liter of buffer. Then, 20 ml were taken, chemiluminescence was initiated by adding 50 ml of a solution of ferrous sulfate (1.39 g per 100 ml of distilled water acidified with 0.1 ml of 0.1 N HCl) with constant stirring, which led to the oxidation of unsaturated fatty acids included in the composition lipids. The processes of lipid peroxidation were judged by the intensity of chemiluminescence, which was recorded for 5 min.

results

According to the first method, the results of the study are presented in table.

1. The results of the study showed that all objects have high antioxidant activity. The highest indices were found in the infusion of Schisandra chinensis leaves (1:10) 71.90 ± 3.4. Apparently, this is due to the presence of water-soluble compounds (ascorbic acid, etc.) in the aqueous extract. The intensity of antioxidant activity in the studied objects can be represented as follows: infusion of leaves <tincture of leaves <tincture of fruits.

The results of the experiment on model systems were determined by the degree of change in chemiluminescence in the presence of the test objects (0.1 ml) in arbitrary units and recalculated in% of control (Tables 2, 3).

Table 1

Anthioxidant activity of the studied extracts, %

Retrieving	Infusion of leaves	Tincture from fruits	Tincture from leaves
AOA,%	71.90 ± 3.4	49.05 ± 2.1	63.3 ± 2.9

table 2

Chemiluminescence indices in reactions of formation of active forms oxygen

Objects research	Light sum, cu	AOA,%
Control	25.6	
Infusion of leaves	8.2	68.0 ± 1.8
Leaf tincture	4.0	84.4 ± 2.3
Fruit tincture	16.8	34.4 ± 0.9

Table 3

Chemiluminescence indices in free-radical reactions lipid peroxidation

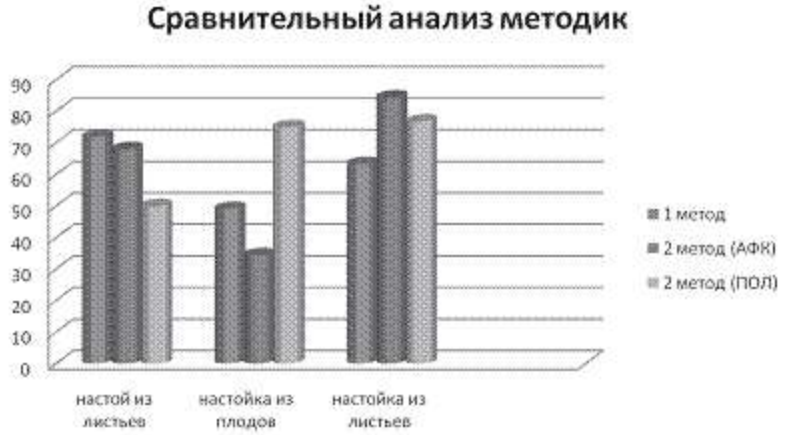
Objects research	Light sum, cu	AOA,%
Control	5.6	
Infusion of leaves	2.8	50.0 ± 1.4
Leaf tincture	1.3	76.8 ± 1.9
Fruit tincture	1.4	75.0 ± 2.1

The research results showed that all types of extracts exhibit antioxidant activity. When antioxidants (studied extracts) were introduced into the model systems, we observed a decrease in the amount of free radicals and lipid peroxidation products, which was reflected in the form of a decrease in the intensity of chemiluminescence.

The intensity of antioxidant activity in model systems in the studied objects can be represented as follows: a set of leaves <

leaf infusion <fruit infusion (ROS) and leaf infusion <fruit infusion <leaf infusion (LPO).

A comparative analysis of the two methods used to determine the antioxidant activity (in vitro) is shown in Fig. 2.



Rice. 2. Comparative analysis of spectrophotometric and chemiluminescent methods.

conclusions

Thus, from the results presented in the figures and tables, it can be seen that the methods used give comparable results, according to which all extracts have, to one degree or another, antioxidant activity. Comparing the methods in model systems, it can be seen that the tincture from leaves has the greatest effect on lipid peroxidation, and tincture from fruits has the greatest effect on reactive oxygen species. That is, extracts, aqueous and alcoholic, from different parts of medicinal plant materials (leaves, fruits) affect different links in the formation of free radicals.

Literature

1. Berezovsky V.M. Chemistry of vitamins. - M .: Food industry, 1973 .-- 632 s.

2. State Pharmacopoeia of the USSR. 11th ed. - M .: Medicine, 1987. - Issue 1 - 334 p.

3. Nikitina A.A., Pankova I.A. Anatomical atlas of useful and some poisonous plants - Leningrad, 1982 .-- 768 p.

4. Bound S.V. Clinical Pharmacology of Antioxidants / PHARMindeksPraktik, issue 5, 2001. - 85–111 p.

5. Sirota T.V. Method for determining antioxidant activity superoxide dismudase and chemical compounds. Application No. 99103192 (003673), Priority dated 02.24.1999.

6. Gerontology_explorer.narod.ru (from 26.01.15).

7.www.antioxidant-of-food.bessmertie.ru (from 26.01.15)

Author's address

Ph.D., Galiakhmetova E.Kh., Associate Professor of the Department of Pharmacognosy with a course of botany and the basics of phytotherapy.

galiahmetova.elvi@yandex.ru

Galiakhmetova, E.Kh. Comparative study of the antioxidant activity of Schisandra chinensis leaves introduced in the Republic of Bashkortostan / E.Kh. Galiakhmetova, N.V. Kudashkina // Traditional medicine. - 2015. - No. 2 (41). - S.31-34.