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Investigation of Antioxidant Properties of Badantolstolistic Extractivity

[1]S.V. Tsyrendorzhieva and [2]S.D. Zhamsaranova
[1]Faculty of Technology of Products of Public Catering,
[2]Department of Biotechnology,
East-Siberian Technological University of Technology and Management, Ulan-UdE, Russia

Abstract: In the study it is shown that in the territory of Buryatia the badantolstolistic is widespread, the analysis of its chemical composition indicates the presence of a complex of compounds related to natural antioxidants: tocopherols, carotenoids, phospholipids, flavonoids, anthocyanins. When carrying out researches of antioxidant properties of leaf extracts of thick-leaved balm, the method of aqueous extraction of Biologically Active Substances (BAS) from vegetable raw materials was chosen. In the composition of the dry substances of the extract the largest amount contains tannic substances and phenolic compounds. Phenolic compounds and proteins account for about 40%, reducing sugars account for 20% of the dry residue organic acids for 3%. The extract contains carotenoids ascorbic acid as well as a large amount of minerals including trace elements. In this study, we studied the antioxidant activity of water extracts from the leaves of thick-leafed horseradish collected at different periods of vegetation. The extracts studied had a high ability to absorb free radicals but the extract from the green leaves of badan had a greater antiradical activity at a concentration of 125 mg/cm^3 and had a minimum E_{C50} of all the extracts. In addition, the extracts showed the ability to chelate iron ions in particular, the extract from the green leaves of the badan showed the greatest restoring force (0.97 mmol Fe^{2+}/1 mg). According to the presented data, plant extracts from the leaves of badan have a pronounced antiradical and chelating activity. Extracts from green leaves of badan are the most promising for further research which in turn opens up new ways of using it as components of food products: beverages, confectionery and bakery products, meat and fish products and functional purpose.

Key words: Badantolstolistic, herbal extract, anti-radical ability, chelating ability, extracts, functional

INTRODUCTION

Nowadays it is established that the main path of pathological processes occurring in the human body and as a consequence, leading to premature aging and the development of many diseases is the copulation in the body of an excess of free oxygen radicals. An increase in their concentration in the body is also due to a decrease in the potential of the human antioxidant system, aggravated by alcoholism, smoking, exposure to radiation and UV irradiation, stress and poor-quality, environmentally polluted food. As a result of the harmful effects of radioactive substances that damage the walls of blood vessels, membranes and oxidative stress is formed (Shakhmardanova *et al*., 2016). However, the manifestation of oxidative stress can reduce the regular use, not only of dietary supplements, herbal medicines but also foods that have high antioxidant activity. This circumstance is explained by the ability of changes in the components of the latter to processes of free radical oxidation in tissues (Novikov and Levchenkova, 2013).

Antioxidants are substances that can significantly slow down or pre-reduce the acceleration of oxidation of the substrate, widely used for technological purposes in cosmetology, food industry, veterinary medicine. This compound which can be added to food products, especially lipid-containing foods can increase the shelf life by slowing down the process of lipid peroxidation which is one of the main causes of deterioration of food quality during processing and storage (Makarova and Zyuzina, 2011).

It is known that the most important source of natural antioxidants are medicinal and food plants such as phenolic acids and flavonoids which have high biological activity including antioxidant, antiviral, anti-inflammatory and anti-aging effect. Natural antioxidants, especially phenols, flavonoids, tannins and anthocyanins from plants are safe, have a complex effect and have a mild therapeutic effect (Boboerov and Ikrami, 2017). Presumed therapeutic effects that can be achieved with the presence of antioxidants, so, recently much attention is paid to the study of plant extracts with a potential antioxidant effect.

Corresponding Author: S.V. Tsyrendorzhieva, Faculty of Technology of Products of Public Catering,
East-Siberian Technological University of Technology and Management, Ulan-UdE, Russia

MATERIALS AND METHODS

The ability to capture free radicals DPPH (1, 1-diphenyl-2-picrylhydrazyl) is one of the methods of studying antioxidant activity which is based on the ability of the DPPH-radical to interact with the active components of the extract due to the hydrogen donor ability including phenolic connections. DPPH is a stable free radical that takes an electron or a hydrogen radical to become a stable molecule (Makarova and Zyuzina, 2011).

Reduction of the concentration of the radical DPPH is determined by a decrease in ab sorption at its maximum absorption at 517 nm which is caused by interaction with the antioxidant. It is visualized in the form of a change of color from violet to yellow. One of the main indicators characterizing antiradical activity by the DPPH method is E_{C50} the concentration of the antioxidant extract at which 50% inhibition of DPPH radicals is observed. This figure for water extracts from the leaves of badan is shown in Fig. 1.

As can be seen from the data presented in Fig. 1, all the extracts studied had a high ability to absorb free radicals but the extract from the green leaves of badanhad a greater antiradical activity at a concentration of 125 mg/cm^3 and had a minimum E_{C50} of all extracts.

In addition, one of the oxidative stress initiating factors is the presence of free iron ions in the cytoplasm. Bonding metal ions, chelating agents do not have a direct antioxidant effect, however, they prevent generation of peroxide radicals and as a consequence, peroxide oxidation of lipids caused by transition metal ions. The study of chelating ability is important both for fundamental science and for biotechnology and medicine as it expands our knowledge of the molecular mechanisms of preparations and helps us to identify new sources of natural compounds in vitro including wild boars of Buryatia which have high chelating. The chelating ability of the test extracts of the leaves of badan in vitro using a spectrophotometric method (Fig. 2).

As the data shown in Fig. 2, the extracts studied showed the ability to chelate iron ions. The extract from the green leaves of badan showed the greatest restoring force (0.97 mmol Fe^{2+}/1 mg). The chelating properties of extracts can be due not only to metabolites of phenolic nature but also to other compounds such as polysaccharides and proteins.

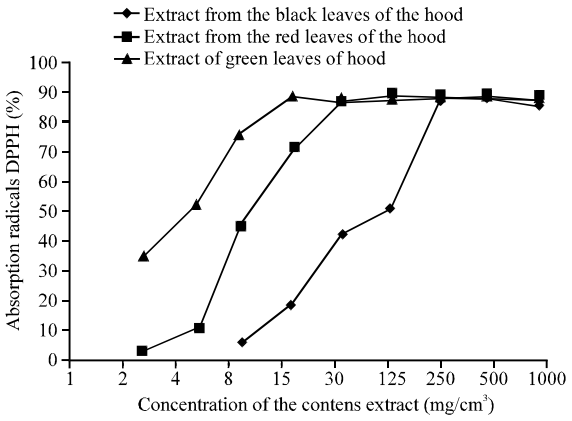

Fig. 1: Indicators of the radical-binding activity of extracts from the leaves of the beetle

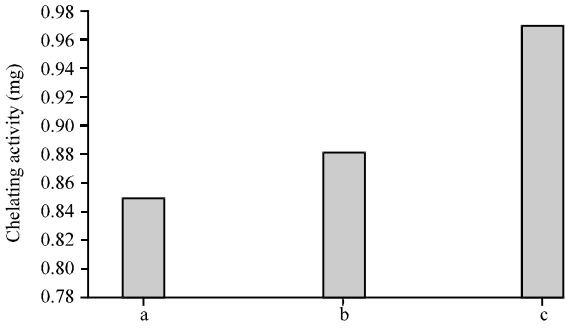

Fig. 2: Chelating activity of extracts from the leaves of the butter: a) Extract of green leaves of hood; b) Extract from the red leaves of the hood and c) Extract from the black leaves of the hood

RESULTS AND DISCUSSION

In the territory of Buryatia, a thick-leafed sheep is widespread. Literature analysis of the chemical composition of this plant for the presence of a complex related to natural antioxidants: tocopherols, carotenoids, phospholipids, flavonoids, anthocyanins (Tsyrendorzhieva, 2014).

It is known that the thick-leaved bean in the vegetative stage has three kinds of leaves:green leaves are formed in the summer, red are formed in the autumn period, black-overwintered which is half the mass of the dicorose and is considered to be a waste material (Tsyrendorzhieva and Shiretorova, 2015).

In carrying out the studies, the method of aqueous extraction of Biologically Active Substances (BAS) from vegetable raw materials was chosen which is the most beneficial and easily applicable than conventional maceration at which the yield of extractive substances is

low. To obtain aqueous extracts with an increased content of dry substances, additional mechanical mixing is proposed f ollowed by ultrasonic treatment which allows to increase the yield of extractive substances in comparison with maceration by 1.5 times and to cut the extraction time by 3 times (Tsyrendorzhieva *et al*., 1999).

It is established that practically all the compounds found in the leaves pass into the aqueous extract, so, the tannin substances and phenolic compounds contain the largest amount of the extract's solids. Phenolic compounds and proteins account for about 40%, reducing sugars account for 20% of the dry residue organic acids for 3%. The extract contains carotenoids ascorbic acid as well as a large number of minerals including trace elements (Tsyrendorzhieva and Shiretorova, 2015).

The use of the extract of the leaves of badan is of great interest for the food, pharmaceutical and cosmetology industries. Extracts of leaves of thick-leafed horseradish due to the presence of a complex of valuable biologically active substances, thanks to which a pronounced adaptogenic effect is manifested are of great interest. The purpose of this research was to study the antioxidant activity of water extracts from the leaves of badana, collected at different periods of vegetation.

CONCLUSION

Thus, in accordance with the presented data, it can be concluded that the extracts from the leaves of badan are distinctly antiradical and chelating. Extracts from the green leaves of the oil are the most promising for further research which in its turn opens up new technologies: beverages, confectionery and bakery products, meat and fish products and functional purpose.

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