



## Antiradical And Antioxidant Properties Of Some Spices From The National Cuisine Of Azerbaijan

Abdullayev Kh.D<sup>1</sup>., Chiragova S.R.<sup>1\*</sup>, Agalarov R.I.<sup>2</sup>

<sup>1</sup>Department of Biophysics and Molecular Biology,

<sup>2</sup>Biotechnology Laboratory, Biology Faculty, Baku State University, Baku, Azerbaijan

\*Corresponding Author

E-mail:chiragova71@mail.ru

### Abstract

Presented studies were concern on antioxidant (AO) and anti-radical (AR) properties of a number spices widely used in the Azerbaijani cuisine. In our experiments, 70% ethanol –water extracts of clove (*Syzigium aromaticum*), black caraway seeds (*Nigella sativa*), cumin (*Cuminum cymin*) and saffron (*Crocus sativus*), were used. The studies were carried out using two methods based on the ability of quenching the stable free radical DPPH (2,2-diphenyl-1-picrylhydrazyl) and on the chemiluminescence emission quenching ability models. The IC<sub>50</sub> analysis for spice samples against the IC<sub>50</sub> of a standard Trolox quencher (analogue vitamin E) and chemiluminescence emission showed AO and AR activity of the samples in the following line order: saffron> clove> cumin> black caraway.

**Key words:** antioxidant activity, antiradical activity, spices, saffron, cumin, clove, polyphenols

## INTRODUCTION

A polluted environment, a change in the structure of the population's nutrition, the formation of stresses due to various negative influences leads to the need for use the biologically active compounds of various nature, including the antioxidants presented in spicy aromatic plants, in the production of food products that can reduce the consequences external influence on the human body, improve immunity and defense mechanisms and correct metabolic processes. In recent years, studies have been conducted to determine the antioxidant and anti-radical activity of spices and culinary plants [1]. As medicines, spices were used even in ancient Egypt and Syria, as well as natural food preservatives in ancient Rome and Greece. In presented work we show the results of Antioxidant (AO) and Antiradical (AR) activity of extracts from spices widely used in national cookery of Azerbaijan.

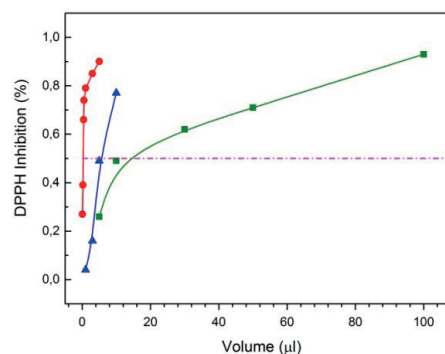
## MATERIALS AND METHODS

The objects of research were spice's extracts, widely used in the national cuisine of Azerbaijan. For this purpose, ethanol extracts of cloves (*Syzigium aromaticum*), caraway seeds (*Nigella sativa*), cumin (*Cuminum cymin*) and saffron (*Crocus sativus*) were used. Extracts from spices were prepared by grinding them in a ceramic mortar to a powder. 40% ethyl alcohol was immediately added to the resulting powder in the ratio (1:10). Extraction was carried out at 20 ° C, periodically stirring during the day. Before the experiment, extracts were stored in the refrigerator. The liquid phase was separated from the precipitate by filtration. Studies of the AR activity of spice extracts were carried out using the chemiluminescent peroxidase model system, based on the oxidation of pyrogallol by hydrogen peroxide in a reaction catalyzed by horseradish peroxidase [2]. Antioxidant activity of spice extracts was made on the basis of measurement of the quenching degree of the free radical DPPH (2,2-diphenyl-1-picrylhydrazyl) by the absorption changes at 518 nm [3] at spectrophotometer. One of the main indicators characterizing AO activity is the IC<sub>50</sub>-concentration of the antioxidant, at which 50% inhibition of the DPPH radical is observed. As a standard quencher of

radical states, Trolox (a synthetic analogue of vitamin E), widely used in the food and pharmacological industry, was used.

## RESULTS

Figure 1 shows the data indicating the concentration of spice extracts capable of quenching a 50% stable DPPH radical.



**Figure 1.** The efficiency of free radicals quenching with an alcohol extract of a number of spices. Dotted line - 50% inhibition of free radicals DPPH by Trolox. Symbols on figure are: ● - Clove, ▲ - black caraway, ■ – cumin.

Experiments with clove spice extracts (*Syzigium aromaticum*), caraway seeds (*Cigar cymin*), and cilia (*Cuminum cymin*) have shown that the clove extract is the most effective as the radicals quencher where IC<sub>50</sub> reach at the volume 0.2 µl. The least pronounced antioxidant effect is for the extract of cumin, with IC<sub>50</sub> reached at 20 µl. For the black caraway extract, IC<sub>50</sub> is 5 µl of the starting material concentration, all other things being equal. The antiradical activity of the spices was measured by the chemiluminescence method using different concentrations of cloves, caraway and cumin extracts (2.5%, 5% and 10%), and 2.5% concentration of extracts from stigmas and petals of saffron (see Table 1). As can be seen from the table at the beginning of the reaction,

a 2.5% clove extract inhibits luminescence by  $4 \pm 0.8$  A.U.. compare to control; 5% on  $2,6 \pm 0,9$  A.U.; and 10% on  $1,4 \pm 1,2$  A.U.. from  $7 \pm 0,3$  compare to control. The 2.5% extract from cumin seeds inhibits by  $3.2 \pm 0.9$  A.U.; 5% by  $2.2 \pm 1.1$  A.U.; 10% by  $1,8 \pm 0,8$  A.U.. compare to control  $5,3 \pm 0,3$  A.U. 2.5% cumin extract inhibits by  $3 \pm 0,7$  A.U.; 5% on  $2.7 \pm 0.8$  A.U.; 10% solution on  $2,1 \pm 1,1$  A.U.. concerning the control of  $4,25 \pm 0,7$  A.U.. In 2.5% of the extract from the stigmas of saffron, inhibition by  $0.35 \pm 1.7$  A.U.. from  $5 \pm 0,4$  A.U.. compare to control, and in 2.5% of the extract from the petals of saffron  $4.7 \pm 1.3$  A.U.. from  $5 \pm 0,4$  A.U. compare to control.

**Table 1.** The parameters of the initial rate of the chemiluminescent reaction ( $E + S + H_2O_2 + AO$ ) under the influence of different concentrations of spice extracts compare to the control.

Samples	Control	Extract concentration		
		2,5%	5%	10%
		Chemyluminescence (A.U.)		
Clove		4	2,6	1,4
Black caraway	5,3	3,2	2,2	1,8
Cumin	4,250,7	30,7	20,8	2.11,1
Saffron stigma	50,4	0,351,7	-	-
Saffron petals	4,250,8	4,71,3	-	-

It can be concluded that the higher activity of AO and AR is possessed by the clove extract in comparison to the cumin and black caraway extracts, the values of which decrease in a number: clove > cumin > black caraway. A number of authors testify to the content of organic compounds in the clove, giving it antioxidant and antiradical properties [4]. The phenolic compounds are: quercetin, rutin, kaferol, luteolin, eugenol, catechin. Such a high antioxidant and antiradical activity of clove extract is probably due to such a rich composition.

A comparative analysis of the activity of 2.5% aqueous alcoholic spice extracts showed that the greatest effect is possessed by saffron extract, namely, its stigmas. According to the literature, the composition of natural essential oil of *Crocus sativus* includes a unique volatile component - safronal (up to 70% by weight), a very strong natural antioxidant, which is a product of hydrolysis of glycoside of picrocrocin. On the basis of the data obtained, it can be assumed that such activity is due precisely to the presence in the saffron stigmas, which is part of essential oils.

## CONCLUSION

Thus, we can conclude that both methods well characterized the spices as natural sources of strong antioxidants and quenchers of free radicals. The most promising spices are discovered, extracts of which can be used as natural sources of AO and AR, necessary for maintaining health. Also, applied methods can be used for estimation of authenticity of natural spices to avoid a falsification on the market.

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