Determination of Antioxidant Properties of Wormwood and Pine Extracts

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Abstract: This article discusses the use of natural extracts in the storage and preparation of semi-finished meat products. The antiradical activity of aqueous and alcoholic extracts of wormwood and pine was determined by spectrophotometric (DPPH) method.

Keywords: antiradical activity, extract, wormwood, pine, semi-finished meat products, antioxidant.

Introduction

Since raw meat is very inconvenient to store, the problem of increasing the oxidation resistance of fats in meat during storage is of practical interest.Storage of such products leads to hydrolytic (action of lipase enzymes and accumulation of free fatty acids) and oxidation (formation of bitter and salty taste) processes of fats, as well as deterioration of product quality and safety [1]. In the production of semi-finished meat products, fats derived from beef, mutton, pork, poultry and fatty raw materials are added as ingredients according to the recipe.It is these components that are the sources of unpleasant taste, which then acidifies the finished product.

The chemical reactions that affect the quality of frozen semi-finished meat products are lipid oxidation reactions. The formation of oxidation products not only deteriorates the quality of food and reduces its nutritional value, but also leads to the accumulation in it of substances that pose a threat to human health [2].

Exposure to air in the product accelerates oxidation processes and forms free radicals.

The use of antioxidants to prevent oxidative degradation of fatty foods is of particular practical importance. This is because such products undergo high oxidative degradation during production, processing and storage.

The industry uses natural and synthetic antioxidants depending on the product type and production conditions. Natural antioxidants have many advantages over synthetic antioxidants, have high antioxidant activity, are safe for human health and have a positive biological effect.

The antioxidant activity of the compounds depends on the nature of the product and a number of factors. Therefore, scientific research is needed to substantiate the effects of antioxidants

and their complexes on specific foods [3, 4].

As a natural antioxidant, spices, various oils, teas, seeds, grains, cocoa bean husk, fruits and vegetables are used.The antioxidant activity of natural compounds containing various individual antioxidants such as ascorbic acid, tocopherols, carotenoids, flavonoids (quercetin, kempferol, myriticin), catechins (carnosol, rozmanol, rozamiri-diphenol), phenols and phenolic acids has been determined [5]. In particular, the essential oils of licorice, cumin, basil and pepper added to sunflower oil have been proven to be stronger than the synthetic antioxidant - butyloxytoluene, and ayovan (cumin) is almost twice as effective [6, 7].

Based on this, 6 plant extracts were included in this study: wormwood; aqueous extracts of pine buds and conifers; alcoholic extract of pine needles; the antiradical activity (ARF) of chloroform extract of wormwood against stable free radical DPPH (2,2-diphenyl-1-picrylhydrazine) was studied.

Materials and methods.

Materials: 6 different extracts:

1. Chloroform extract of wormwood
2. Alcoholic extract of pine buds
3. Aqueous extract of pine buds;
4. Aqueous extract of wormwood;
5. Alcoholic extract of pine needles;
6. Aqueous extract of pine needles.
7. Ascorbic acid (control).

*DPPH method.*To evaluate ARF, in this study, we used a method of spectrophotometric measurement of antioxidant reduction kinetics of stable radical 2,2-diphenyl-1-picrylhydrazole (DPPH) molecules [8]. The method is based on the interaction of antioxidants with the stable chromogenic radical 2,2-diphenyl-1-picrylhydrazine (DPPH). A standard solution of DPPH (5x10-4 M) in ethanol with acetic acid was diluted 1:10 with ethanol to obtain a working solution.The resulting solution should have an optical density of not more than 0.9 at 517 nm. 50 μl of the studied extracts were added to 5 ml of the working solution of DPPH, mixed, and the kinetics of the decrease in the optical density of the solution at a wavelength of 517 nm were recorded for 30 min.A working solution of DPPH was used as a control sample.

Antiradikalfaollikquyidagiformula bilananiqlandi:

$$\% \text{ inhibition} = \frac{A_{\text{contur}} - A_x}{A_{\text{contur}}} x\ 100\%$$

There are A_x is the optical density of the test solution,

A_{contur} - optical density of the test sample.

Discussion

Antioxidants can have different mechanisms of action, it is recommended to study their activity using different methods. In this study, the antiradical activity of the extracts was evaluated against the free radical DPPH.

When the compounds studied are added to an alcoholic solution of DPPH, the free radical molecules are converted to a non-radical form, while the intense purple solution of DPPH

becomes colorless. Figure 1 shows the kinetics of changes in the optical density of the DPPH solution when we add the samples we studied.

A 50 µl concentrated solution was selected for each extract presented to compare the ARF of the studied samples. Since samples 4 and 5 showed very high ARF, we diluted them 1: 100 with appropriate solvents (water and alcohol).Analyzing the obtained results, we can conclude that when the studied 1, 2, 3, 6 and 7 extracts (according to the list) are added to the alcoholic solution of DPPH, the optical density of DPPH decreases sharply. This is evidenced by their high ARF (Figure 1). For samples 4 and 5, APF was evaluated after dilution 100 times, indicating that the extracts have strong antiradical ability.

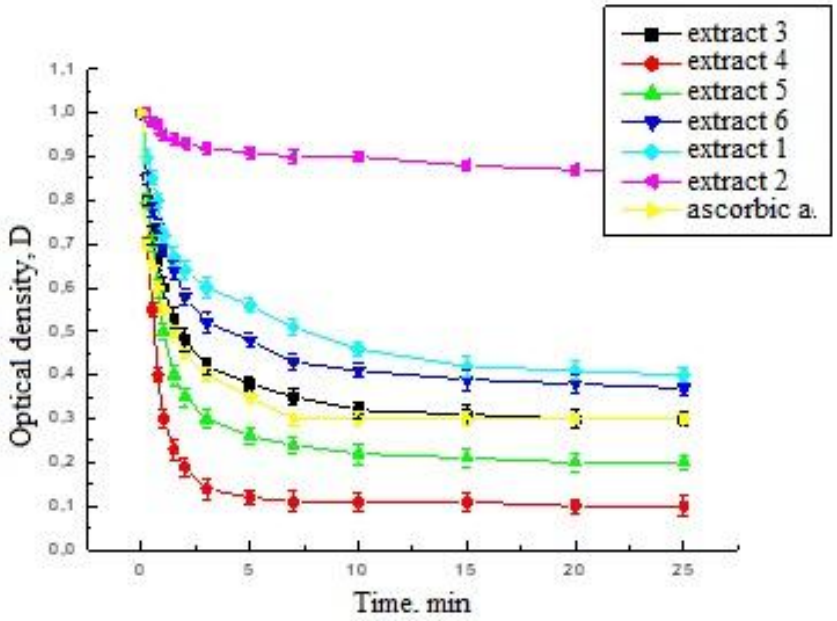

Figure 1. The change in optical density of the DPPH alcohol solution over time relative to the control when the extracts studied were added. The continuous line is based on nonlinear regression. The DPPH concentration is 0.1 m M. Measurements were performed at 20 ° C immediately after the addition of the studied extracts. The concentration of the extracts studied is 50 µl. Samples 4 and 5 were diluted 100 times with appropriate solvents (water, alcohol).

Experimental results show that extracts 4 and 5 have the highest activity for quenching free radicals. № The ARF values of samples 1, 2, 3, and 6, 7 are less significant than those of previous samples.To quantify the anti-radical activity, we used the time parameter required for the drugs under study to reduce the initial concentration of stable radical 2,2-diphenyl-1-picrylhydrasyl (DPPH) as well as t50-radical by 50%. In the reaction of DPPH with extracts at 20 ° C t50: 455 ± 15.0 seconds for №2 sample, 38 ± 6.0 seconds for №4 sample (diluted 100 times), 60 ± 4.3 seconds for №5 sample (Diluted 100 times), for control number 7 (ascorbic acid) - 98 ± 4.0 seconds (Table 1).

Table 1. Time required to reduce DPPH concentration by 50% (t50) when reacting with the extracts studied and inhibitory concentration values (IC50) by 50%

Number of extracts	IC_{50}, mkl	t_{50}, 50 µl of matter per second
№ 1	-	-
№ 2	8,1±1,6	455±15,0
№ 3	12,1±1,3	72±4,0

№ 4	35±0,8 (diluted)	38±6,0
№ 5	45,2±1,1 (diluted)	60±4,3
№ 6	7,5±1,0	235±5,1
№7 (ascorbicacid)	11,9±1,4	98±4,0

Analysis of the experimental results obtained in the study of the extracts showed that the №4 sample had the highest antiradical activity against free radical DPPH compared to other samples.

Conclusion

Thus, the antiradical activity of plant extracts was studied. The highest antiradical activity was found in the aqueous extract of wormwood and the alcoholic extract of pine needles. There is sufficient information in the literature on the antiradical activity of medicinal plant extracts, the maximum effect of which is found in extracts containing more polyphenols and flavonoids. Thus, further work requires a detailed study of the qualitative and quantitative composition of extracts (polyphenols, flavonoids, tannins, alkaloids, etc.) to substantiate the mechanism of ARF. It turned out that these extracts can be used as a natural antioxidant in the production of minced meat products.

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