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THE RESEARCH OF OPTIMAL CONDITIONS FOR SAFRANAL EXTRACTION FROM SAFFRON FLOWER

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Abstract:

Saffron flower on different stages of its physiological development contains important biologically active compounds (including: protocrocine, picrocrocine, crocine, safranal), which can affect on human organism and it is important to use saffron in food technologies.
Use of saffron in folk medicine has a huge background. It was used to cure around 70 illness and what is the most important, it was used to prevent and treat heart diseases. This effect is typical for safranal, which is synthesized and accumulated during the flower drying process.
In this article the following issues are discussed: the process of safranal extraction, optimal conditions of this process and the results of extract analysis.

Keywords: Saffron, Biologically active compounds, safranal, extraction, extract.

INTRODUCTION

Food technology and especially the production of healthy food is very important issue. In different stages of reproduction of food we meet such important issues as the management of chemical and biochemical changes in plant row materials in that way to receive final product which will be beneficial for human health and rich with biologically active compounds.

One of the important directions of food technologies is the production of alcoholic and non-alcoholic drinks. Since the ancient time people have used plant and drink produced by it, as a medicine and nowadays the technological development gives us the possibility to produce drinks which will be nice and beneficial simultaneously.

At the stage of production of semi-finished products of phyto origin, great importance is attached to the study of the chemical composition of the plant and its processing at the optimal time, when the target substance is present in maximum quantities, and during the procession the maximum amount of this substance is needed in the finished product. The product should have a positive impact on human health.

In food technologies, saffron is used as a spice. Its special aroma is caused by large amount of safranal in it. Safranal is an organic substance, which is received by the conversion of Zeaxanthin. Safranal reveals an antioxidant activity and oppositional activity towards the free radicals.

THE METHODS AND OBJECTS OF OUR RESEARCH

We used the saffron air-dried flowers as the object of our research.

A spectrophotometric method of analysis was used as a research method. We took 10-10 ml of water-alcohol infusion for analysis and placed it in 1cm thick cuvettes. In the samples safranal was determined according to the official method of defining by spectrophotometer.

The number of the absorbed safranal is calculated and the quantity is expressed as percent $E_{1em}^{1\%}$, where 1 % is wavelength (nm) amount of 1 Moll of crocin absorption, which is perceived as a 1 cm quartz beam breakthrough towards cuvette.

THE PROCESS OF RESEARCH AND THE RESULTS

In order to determine the conditions required for the maximum extraction of saffronal from the raw material in such a way that the obtained extract (semi-finished product) can be used in the process of making the drink, it was necessary to determine the optimal variant of the extraction process by setting delay period regimes.

The synthesis of saffronal is known to take place during the drying of plant raw materials as a result of the breakdown of protocrocin contained in it. So for extraction we took pre-dried (air-dried), saffron flowers examined for protocrocin and saffron content. The content of protocrocin in the initial raw material was 73.2 mg / 100 g, while that of saffronal was 27.6 mg / 100 g.

To facilitate the extraction process, we cut the flowers into 0.5-1.0 mm pieces, and in all cases the extraction process took place in a glass jar. Stirring during the extraction process took an average of 2 hours in 24 hours.

To determine what proportion is required for the maximum amount of suffronal to be extracted, we used a ratio of 1: 5.

At the initial stage we used ethyl alcohol 96, 60, 40, and 30% vol. The delay period in all cases was 1, 3, 5 and 7 days, with a temperature of 20 ° C.

As a result, we obtained the following samples (proportion - alcohol content of the extract - delay period):

Sample I. 1:5 – 96 – 1
Sample II. 1:5 – 96 – 3
Sample III. 1:5 – 96 – 5
Sample IV. 1:5 – 96 – 7
Sample V. 1:5 – 60 – 1
Sample VI. 1:5 – 60 – 3
Sample VII. 1:5 – 60 – 5
Sample VIII. 1:5 – 60 – 7
Sample IX. 1:5 – 40 – 1
Sample X. 1:5 – 40 – 3
Sample XI. 1:5 – 40 - 5
Sample ο XII. 1:5 – 40 – 7
Sample XIII. 1:5 – 30 – 1
Sample XIV. 1:5 – 30 – 3
Sample XV. 1:5 – 30 - 5
Sample XVI. 1:5 – 30 – 7

The results of the analysis are given in Table 1.

Table 1. Quantitative content of saffronal
In extracts made with different modes

Name of sample	Safranal, mg/l	Name of sample	Safranal, mg/l
Sample I	172.5	Sample IX	84.4
Sample II	196.8	Sample X	102.3
Sample III	237.7	Sample XI	121.2
Sample IV	243.4	Sample XII	129.5
Sample V	154.3	Sample XIII	32.6
Sample VI	171.9	Sample XIV	53.4
Sample VII	208.1	Sample XV	79.8
Sample VIII	217.3	Sample XVI	81.2

As can be seen from the table, the best result was given by the extract, which was made with 96% alcohol and delayed for 7 days, although its organoleptic characteristics do not allow it to be used in production. Sample XI had the best organoleptic characteristics.In the next step we prepared the extracts using the method of making sample XI and changed only the extraction temperature. As a result, we obtained three samples:

Sample XI-I (delayed at 5 ° C)
Sample XI-II (delayed at 10 ° C)
Sample XI-III (delayed at 15 ° C)

We performed analyzes on the obtained samples. The results of the analysis are given in Table 2

Table 2. Quantitative content of saffronal in extracts made at different temperatures

Sample name	Safronal, mg / l
Sample XI-I	21,4
Sample XI-II	51,3
Sample XI-III	72,1

As can be seen from the table, the amount of safronal transferred from the raw material to the extractant is much lower in all three samples than in the previous cases, therefore, in the next stage of the experiment we increased the temperature and reduced the delay time. As a result, we obtained 4 samples:

Sample XI-IV (delayed at 30 ° C - 1 hour)
Sample XI-V (delayed at 30 ° C for 2 hours)
Sample XI-VI (delayed at 30 ° C - 3 hours)
Sample XI-VII (delayed at 30 ° C for 4 hours)

The obtained samples were analyzed. The results of the analysis are given in Table 3.

Table 3. Quantitative content of saffronal in extracts delayed at 30 ° C and at different periods

Sample name	Safronal mg/L
Sample XI-IV	12.3
Sample XI-V	37.8
Sample XI-VI	78.9
Sample XI-VII	101.3

As can be seen from the table, the amount of saffronal in sample XI-VII is only 19.9 mg / l less than in sample XI and is better organoleptic. As for the manufacturing period it is much less, which further simplifies the technological process.

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