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Study Of the Influence of Technological Parameters Of Extracts On The Yield Of Flavonoids From The Collection In Oil Extract Obtaining

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Abstract: This paper presents the results of experimental development of a technology for obtaining an oil extract from a collection of medicinal plants, including the root of the naked sorrel, the herb of the burdock plant, the rhizome of the calamus, the rhizome of the rosehip plant, and the herb of the zeroba plant. Sunflower oil was used as an extractant.

Before matzing, the plant material was treated with ethyl alcohol, and the extraction process itself was intensified using fermentation (cellulose) and ultrasound. Step-by-step, one-factor optimization of key technological parameters was performed: degree of raw material, hydromodule process, temperature, extraction time, and ultrasound performance. The process's effectiveness was assessed by the total flavonoid content, determined spectrophotometrically in comparison with rutin . The resulting extract is promising for both dermatological and nutritive purposes.

Keywords: Oil extract, medicinal plants, maceration, fermentative processing, ultrasound, technology, extraction, sunflower oil, dermatology, nutritsevticka.

Introduction: In recent years, there has been a significant increase in interest in the development of oil extract technology obtained from medicinal plants. Oil extracts have a number of advantages, including high stability of fat-soluble components, mild action, and the possibility of targeted dermatological and nutritive application [1,2]. Moreover, the effectiveness of such extracts is largely determined by both the composition of the original plant material and the technology of their production.

The problem of the determination of the rational nature of the conditions of extraction remains in the actual task in the field of phytopreparation technology. The use of modern methods of intensification, such as enzymatic destruction of cell membranes and ultrasonic maceration, allows to significantly increase the output of biologically active substances, to increase pharmacotechnological characteristics of the extract

Of particular interest are plant composite extracts that combine anti-inflammatory, antioxidant, reparative and antimicrobial properties. In this study, a mixture of five medicinal plants was chosen as the object of study: the root of Glycyrrhiza glabra (Glycyrrhiza glabra), grass chereda (Bidens tripartite), Kornevishcha aira swamp (Acorus calamus), fruit-bearing cypress (Rosa canina) and St. John's wort (Hypericum perforatum). Eti rasteniya is widely used in official and folk medicine for skin diseases and tissue regeneration disorders [3,4].

The aim of this work is to study the influence of various

technological parameters of extraction on the yield of total flavonoids from the collection when obtaining oil extract during the development of its rational technology.

Material and method

The plant medium for obtaining the oil extract was a mixture of medicinal plants in the following quantitative ratio (per 30 g of dry weight): root of naked sorrel (Glycyrrhiza glabra) - 1.0 g, grass chereda (Bidens tripartite) – 6.0 g, hornwort calamus (Acorus calamus) – 9.0 g, fruit of the rosehip (Rosa canina) – 10.0 g, St. John's wort (Hypericum perforatum) - 12.0 g. The raw material was pre-dried at a temperature no higher than 40 ° C, then crushed and a fraction with a particle size of 1–2 mm was collected, ensuring a better yield of biologically active substances according to the results of preliminary experiments. Matzeration extraction method. Pre-treatment of raw materials with 96% ethanol for 30 minutes at a hydromodule of 1:1 with the purpose of increasing the permeability of the cell membrane, inactivating microflora and initial extraction of polar components. After processing, alcohol is used at a temperature no higher than 45 ° C, and the air is taken up for complete evaporation. Sunflower oil was used as an extractant. The first stage of matsering is carried out at hydromodule 1:10, temperature 45 0 C, with the introduction of enzyme preparation cellulose (0.5% of massy srya) in 3 batches. Fermentative processing is carried out at the end 30 minutes of ultrasound (power 100 W, frequency 40 kHz) to increase the output of biologically active tissues [5,6].

After the end of the extraction process, the filtered mixture was cooled, after which the precipitate was collected and analyzed for its parameters: organoleptic characteristics, physical and chemical parameters (acidic and peroxide values), yield of extractive substances, and the quantitative content of total flavonoids.

Quantitative determination of total flavonoids in percent Rutin was analyzed using UV spectrophotometry at a wavelength of 410 nm. Sample preparation included oil precipitation with alcohol, centrifugation, and extraction of flavonoid compounds from a water- ethanol solution . A calibration curve was constructed using rutin solutions with concentrations from 5 to 50 µg/ml, followed by calculation of the flavonoid content in the extract samples [7]. All measurements and experiments are carried out in triplicate, with calculation of average values and standard deviations.

Results and discussion

In order to determine the optimal parameters for obtaining an oil extract with the maximum content of extractive substances, especially flavonoids, a study was conducted on the influence of individual factors: temperature, extraction time, ultrasonic power, and process hydromodulus.

It is known that the extraction of the temperature regime significantly affects the output of the desired compound, accelerates the diffusion, and the final result is a mass-free phase. In the table, the results of the experiments and the study of the temperature of the process and the hydromodule and the yield of flavonoids are presented.

Table 1

Influence of temperature and hydromodulya on the output of sum flavonoids (n =3).

No.	Temperature, ^{0}C	Hydromodule			Total flavonoids yield, mg/g		
1	30	1:5	1:10	1:15	4.02	4.13	4.15
2	40	1:5	1:10	1:15	4.12	4.81	4.88
3	50	1:5	1:10	1:15	5.16	5.32	5.35
4	60	1:5	1:10	1:15	5.29	5.61	5.89
5	70	1:5	1:10	1:15	5.58	5.91	5.95
6	80	1:5	1:10	1:15	5.71	5.89	5.93

From the presented experimental data it follows that the best results in the course of the sum of flavonoids are achieved in the temperature range of 50-70 0 C. It should be noted that with a further increase in the temperature of the process, a slight increase in the total sum of extractive substances is observed with the preservation or even a slight decrease in the amount of flavonoids, which is possibly associated with the partial destruction of thermolabile compounds. It is naturally assumed that the value of the water modulus for mass exchange processes in the solid-liquid system leads to a proportional increase in the amount of extractable substances. In fact, when increasing the water modulus from 1:15 to 1:15, the total amount of flavonoids in the extract is about 30%, and when increasing the value of the water modulus from 1:20 to 1:25, the total amount of flavonoids in the extract is 1.5–2.0 %, which is 1:15; and the extracts were low-concentration . Therefore,

we consider it reasonable to perform extraction at a water modulus of 1:10.

Table 2 shows the results of the experiments, the study of the extraction time, and the ultrasonic strength of the desired product.

Table 2

Effect of extraction time and ultrasound power on the yield of total flavonoids

No.	Time, minute	Amount of flavanoids	Power. UZ, W	Sum of flavonoids, mg/g
1	10	3.76±0.03	60	4.27±0.04
2	20	3.91±0.04	120	5.91±0.03
3	30	4.26±0.03	180	5.47±0.03
4	40	4.87±0.03	240	6.21±0.03
5	50	6.11±0.04	300	6.13±0.04
6	60	6.18±0.04		

Experiments to study the effect of extraction time were conducted at a water ratio of 1:10 and a temperature of 70 ° C with crushed syrup. The ultrasound power was 120 W for 10 minutes. In all experiments, when studying the effect of ultrasound power, the extraction time was 30 minutes. The experiments have shown that the process of extracting cavitation effects leads to a significant intensification of ultrasonography . At the same time, it was found that increasing the ultrasound power above 180 V, especially during its action for 15±20 min, leads to a small decrease in the amount of total flavonoids, which is associated with the degradation of biologically active compounds.

Conclusion

The conducted research allows for a well-founded approach to the development of a technology for obtaining an oil extract from a medicinal herb collection, including marsh cinquefoil, St. John's wort, burdock, salsify, and rose hip. Experiments have shown that the main indicator of process efficiency is the yield of total flavonoids, determined spectrophotometrically and expressed per dry unit. A series of single-factor experiments examined key technological factors such as temperature, extraction time, process water modulus, ultrasound power, and duration. The best results were obtained during extraction of crushed vegetable pulp at a temperature of 60 ° C for 30 minutes. The duration of ultrasound action with a power of 120 W is 10 minutes at a water modulus of 1:10. The yield of total flavonoids and extractable substances constitutes over 85% of its content in cheese. The obtained data allow us to confirm that the developed technology is efficient, reproducible and can be recommended for implementation in production.

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