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# RESEARCH OF PROCESSES OF OBTAINING SAPONINS FROM THE ROOTS OF SAPONARIA OFFICINALIS L

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**ABSTRACT:**

**In this article discusses about the processes of extraction saponins from roots Saponaria officinalis L.an insisting method at temperature 100 $^0$C and a method repercolation. Definitions of frequency rate of pouring water at an extraction a method repercolation for the purpose of the maximum extraction of operating substances (saponins). And comparison of technological properties of the extracts received by these methods.**

**Keywords: extraction, repercolation, Saponaria officinalis L., saponins, emulsifying properties, foam properties.**

## INTRODUCTION:

Saponins (from the Latin word "sapo" - soap) include substances whose aqueous solutions, with standard shaking, form an abundant, persistent foam. They are secondary plant metabolites, are widespread in the plant world and belong to the class of triterpene and steroid glycosides, in the structure of which there is a certain ratio of hydrophobic and hydrophilic groups, which is characteristic of colloidal surfactants. When dissolved in water, saponins are capable of forming micelles, which allows them to be used as natural emulsifiers [3].

In Uzbekistan, the use of plant saponins in the food industry is limited. The use of licorice root saponins (Glycyrrhiza glabra L.), glandular thistle (Acanthophyllum glandulosum B) and thistle root (Acanthophyllum gypsophiloides R) as a foaming agent in the production of effervescent drinks and halva is officially permitted. Due to the fact that these plants are endemic to Central Asia and many of them are listed in the Red Book, the possibility of using soapwort saponins (Saponaria officinalis L.) as a food plant emulsifier has been investigated.

Earlier it was found that extracts from the roots of soapwort (Saponaria officinalis L.) [2], obtained by extracting the roots by infusion (100$^0$C, 150 min.) With a particle size of 5-10 mm, had the best foaming and emulsifying properties. The dry matter content in the extract was 8%, the amount of saponins was 72% of the total dry matter weight. However, the duration of the extraction process, the increased content of ballast substances (polysaccharides, mucus, proteins, etc.) and the formation of sediment during the concentration of the solution by evaporation negatively affect the quality of the extract, reducing its functional properties [1].

This work is devoted to the study to determine the optimal extraction mode for obtaining a plant emulsifier with the best functional and technological properties. To solve these problems, a comparative characteristic of the extracts obtained by the method of repercolation and infusion was carried out.

To obtain extracts from medicinal plants, countercurrent extraction in a battery of three or more percolators is usually used. To reduce the extraction time and improve the quality of the extract, the required concentration difference is maintained in each apparatus during circulating stirring. Continuous extraction of components from raw

materials leads to an increase in the concentration of the extract.

In the study, the roots of Saponaria officinalis L. were subjected to extraction, crushed to a particle size of 5-10 mm, dried in a dryer by means of active ventilation. The initial moisture content in the raw material was 6.0%.

To determine the multiplicity of pouring the extractant (water) during extraction by the method of repercolation in order to maximize the extraction of active substances (saponins), the extraction of presoaked roots was carried out (30 min) at a temperature of 87-$^0$C for 10 min. The hydromodulus of the first extraction (fraction I) was 1: 8, the amount of extractant in the subsequent fractions was calculated taking into account the swelling of the roots. The completeness of the extraction was determined refractometrically by the content of dry substances and visually by the decolorization of the solution. The quality of the obtained extracts with the same amount of dry matter (5%) was determined by the content of saponins and polysaccharides, foaming and emulsifying abilities.

Table 1. The characteristic of three consecutive extraction from roots Saponaria officinalis L.

| Characteristics of the extract | I fraction | II fraction | III fraction |
|---|---|---|---|
| Extract Output | 48,7 | 54,6 | 57,8 |
| Dry substances by refractometer | 5 | 2 | 0,4 |
| Number of polysaccharides | 5,3 | 10,0 | 15,1 |
| Number of saponins | 69,6 | 39,7 | 19,9 |
| Foaming ability | 480 | 150 | 64 |
| Foam stability | 100 | 68 | 14 |
| Emulsifying ability | 14,9 | 4,3 | 2,3 |
| Inversion point | 119 | 34 | 18 |
| Stability of the emulsion | 100 | 54 | 41 |

The table shows that the mass fraction of solids in the extract decreases from 5.0 in the first fraction to 0.4% in the last, the amount of saponins also decreases from 69.6 to 19.9%, and polysaccharides increases from 5.3 to 15.1%.

The aqueous extract of the first stage forms a rich and stable foam (510 and 100%, respectively), while the last fraction has low foaming rates (69%) and foam stability (18%). Emulsifying power, inversion point and emulsion stability tend to decrease from 12.8 to 2.5; from 125 to 21 ml and from 100 to 46%, respectively. The deterioration of the functional and technological properties of the extract of the last fraction can be explained by the lower content of saponins in the extract, which are responsible for foaming and emulsification.

Thus, high extraction of saponins is observed at the second stage; further processing of plant roots is economically inexpedient.

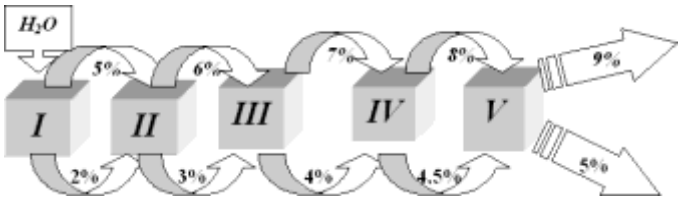
In the study of the process of extraction of the roots of Saponaria officinalis L. by the method of repercolation, the roots were subjected to only two extractions, thus obtaining extracts of the first and second extraction, depending on the percentage of the active substance in them - saponin.

Extraction of the roots of the soapwort was carried out by the method of percolation extraction consisting of five percolators with a common hydromodule, taking into account soaking 1:7.5.

The roots of Saponaria officinalis L. for pre-soaking for 30 minutes, they were simultaneously loaded into all percolators in equal parts and filled with hot water (87-90 $^0$C) at a ratio of raw materials:water 1:3. The remaining amount of extractant was poured into the first percolator and root extraction was carried out at a temperature of 100 $^0$C for 10 minutes, due to mixing, the concentration difference in the raw material and extractant was maintained. The concentration of dry substances in the extract obtained in the first percolator was 5%.

The resulting extract was sent alternately to subsequent percolators and extraction was carried out in a similar mode (Figure, I, II, III, IV, V - the sequence of percolators in the battery).

The scheme of reception of the extract containing saponins by a method repercolation




The concentration of solids in the extracts in each subsequent percolator increased by 1%, the final dry matter content in the extract was 9%, the extract yield was 38.4%, the total extraction time, taking into account the soaking time, was 80 min.

Secondary extraction of raw materials was carried out similarly, but without the soaking stage. At the same time, the final content of dry substances was 5%, the extract yield was 45.8%, the total extraction time was 50 min.

Table 2 presents the characteristics of the extracts of the first and second fractions obtained by the method of repercolation, and the extract obtained by infusing for 150 minutes at a temperature of 100 $C^0$.

Table 2 The comparative characteristic of the extracts received by methods of repercolation and insisting

| Characteristics of the extract, % | Repercolation | | Infusion |
|---|---|---|---|
| | I fraction | II fraction | |
| Dry substances by refractometer | 9,0 | 5,0 | 8,0 |
| Total extract yield | 34,8 | 45,8 | 21,9 |
| Number of polysaccharides | 4,6 | 21,2 | 8,9 |
| Number of saponins | 72,6 | 43,1 | 72,1 |
| pH | 5,0 | 4,8 | 4,7 |
| Foaming ability | 500 | 280 | 304 |
| Foam stability | 100 | 64 | 82 |
| Emulsifying ability | 17,3 | 9,0 | 9,4 |
| Inversion point | 138 | 72 | 75 |
| Stability of the emulsion | 100 | 87 | 100 |

It follows from Table 2 that the amount of saponins and polysaccharides for the first and second fractions of extracts is 72.6 and 4.6%, 43.1 and 21.2%, respectively, in terms of dry matter. The extract obtained during the primary extraction is capable of forming an abundant (500%) and stable foam (100%), while the second fraction of the extract has lower indicators. Stability of the emulsion of extracts of the first and second fractions of the roots Saponaria officinalis L. it was 100 and 87%; the inversion point was 138 and 72 ml, respectively.

Thus, the first fraction of the extract can be used as an emulsifier of the highest grade, and the second can be pre-mixed with the first and also used for the preparation of emulsions.

From the table. 2 it can be seen that the first fraction of the extract obtained by the method of repercolation has the best foaming properties: foam resistance is 1.6 times; foam stability is 1.2 times higher than when extracted by the infusion method. Emulsifying properties are also higher for extracts obtained by the method of percolation than by the method of infusion. Apparently, prolonged exposure to high temperatures leads to partial destruction of saponins. However, the total amount of saponins in the studied extracts is almost the same (72.6 and 72.1%). There are twice as many polysaccharides when infused, which negatively affects the emulsifying and foaming properties of the extract.

In addition, the method of repercolation, compared with infusion, has a shorter extraction time with almost the same hydromodule (1:7.5 and 90 min - the method of repercolation; 1:8 and 150 min - infusion).

The concentration of extracts by the method of percolation was carried out by pouring the swollen raw materials in each subsequent percolator with the previously obtained extract. This method of extraction of Saponaria officinalis L. roots allowed to

increase the concentration of the extract to 22%.

**REFERENCES:**

1) Oakenfull D. Aggregation of saponins and bile acids in aqueous solution // Aust. J. Chem. – 1986. – Vol. 39. – P. 1671-1683.
2) Yudina T.P. Extraction of saponins from the roots of the medicinal Saponaria officinalis L. [Text] / T.P. Yudina, E.I. Cherevach, I.S. Barkulova, T.A. Sidorova, E.V. Maslennikova // Technological and microbiological problems of preservation and storage of fruits and vegetables: sat. tr. International Scientific and Practical Conference, dedicated. To the 100th anniversary of the birth of V.I. Rogachev. - M., 2007.
3) Klochkova I.S. Substantiation of the technology of saponin-containing extracts of Saponaria officinalis D. and their use in the production of churned confectionery: dis. ... Candidate of Technical Sciences: 05.18.07, 05.18.15: protected on 23.12.2009: approved on 14.05.2010 / Irina Sergeevna Klochkova. - - Vladivostok, 2008. - 156 p.Golant P.Ya. Saponins [Text] / P.Ya. Golant. - P.: Narkompishcheprom, 1935. - 135 p.
4) Voyutskiy S.S. On the reasons for the aggregate stability of emulsions. Advances in chemistry. // Moscow, 1961, pp. 1237-1257.
5) Muravyov I.A. Technology of drugs. // Medicine. - Moscow, 1980, p. 704.
6) Ponomarev V.D. Extraction of medicinal raw materials. // Medicine. Moscow, 1976, p. 202.