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of the South-Kazakhstan medical academy

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DEVELOPMENT OF TECHNOLOGY OF SEDATIVE ACTION EXTRACT OBTAINING

Annotation

The article presents studies on the development of a technology for the production of a combined extract of sedative action using the percolation method. According to the conducted studies, an optimal extractant was determined for the mixture of medicinal plant material, which is part of the complex extract – 70 % ethyl alcohol. Preparation of fractional extracts of the combined extract and each of the components in a step of DER (drug extract ratio) 1:1 followed by determination of the dry residue and the yield of the extractives allowed determining the effective multiplicity of extraction – 4.

Key words: extraction, percolation, sedative action, extraction multiplicity.

According to official statistics, today the majority of the working-age population is under the influence of stress factors, which include irregular working hours, low solvency, anxiety, etc.

Special attention of doctors is caused by the inability of people suffering from anxiety and stress to relax even outside the working environment, therefore the only possible way to treat this category of the population is the use of sedative medicines.

At the Industrial Pharmacy Department of the National University of Pharmacy, a combined medicine of sedative action was developed, which includes a complex of extracts of plant raw materials: valerian root, motherwort herb, hop seedballs and peony roots. Conducted marketing studies have confirmed the development relevance of new herbal preparations of domestic production with the content of plant raw materials [1,2].

The purpose of our work in the development of the technology for producing a complex liquid extract was the determination of the extractant and the extraction ratio using the percolation method.

Materials and methods.

To determine the optimal extraction conditions, an extract was obtained using the percolation method. Each of the extracts was sampled fractionally with a DER increment of 1:1 (drug extract ratio is the ratio of the starting material to the obtained extract). For each sample the main indicators of the process dynamics have been and calculated.

The extraction process was performed in a laboratory filtration extractor according to the following procedure. In the extractor loaded 50 g of crushed material. The extractant was fed to the «mirror» through a pipe and infused for 24 hours. After infusion, the percolation process took place, the essence of which is the simultaneous collection of liquid extraction and supply of fresh extractant at a rate of 3-4 ml/min. Samples of the extract were collected separately with DER step (drug extract ratio - the ratio of the starting material to the obtained extract) as 1:1. The extraction process was carried out to obtain a total extract of DER 1:10. For each separately collected sample of liquid extract, a dry residue has been determined [3].

The dry residue content (A_n , g) in separate batches of liquid extracts of V_n , obtained by the appropriate extractant with the appropriate ratio of «raw materials:extract» was calculated by the formulas:

$$A_n = \frac{\omega_n \times V_n}{100},$$

where: V_n is the volume of a separately collected portion of the liquid extract obtained by the extractant with a «raw materials:extract» ratio step as 1:1, ml

ω_n - dry residue in a separately collected portion of the liquid extract n, %.

The dry residue content (B_n , g) in the total extracts of V_{n+1} , obtained by the extractant with the appropriate ratio of «raw materials: extract», obtained at the stage, was calculated by the formula:

$$B_n = \sum_{n=1}^n A_n,$$

where: A_n is the dry residue in a separately collected portion of the extract V_n , g
The dry residue content (C_n ,%) in the total extracts of V_{n+1} was calculated by the formula:

$$C_n = \frac{B_n}{V_{n+1}} \times 100,$$

where: V_{n+1} is the volume of the total extract at the stage, ml;

B_n - the content of dry residue in the total extracts V_{n+1} , g.

The determination of the yield of extractives (absolutely dry extract) (D_n ,%) from the extracted raw materials at each of the stages of extraction with the appropriate extractant with the appropriate ratio of «raw materials:extract», was carried out according to the formula:

$$D_n = \frac{B_n}{m_c} \times 100,$$

where: m_c is the mass of the raw material that is loaded into the extractor, g;

B_n - the content of dry residue in the total extracts V_{n+1} , g [4].

Results and discussion.

The first stage of our research was the determination of the extractant, which would maximally facilitate the release of extractive substances and polyphenolic compounds from raw materials [1,2].

To this end, each raw material was crushed and extracted with ethanol of various concentrations and purified water. The data obtained are shown in Figure 1.

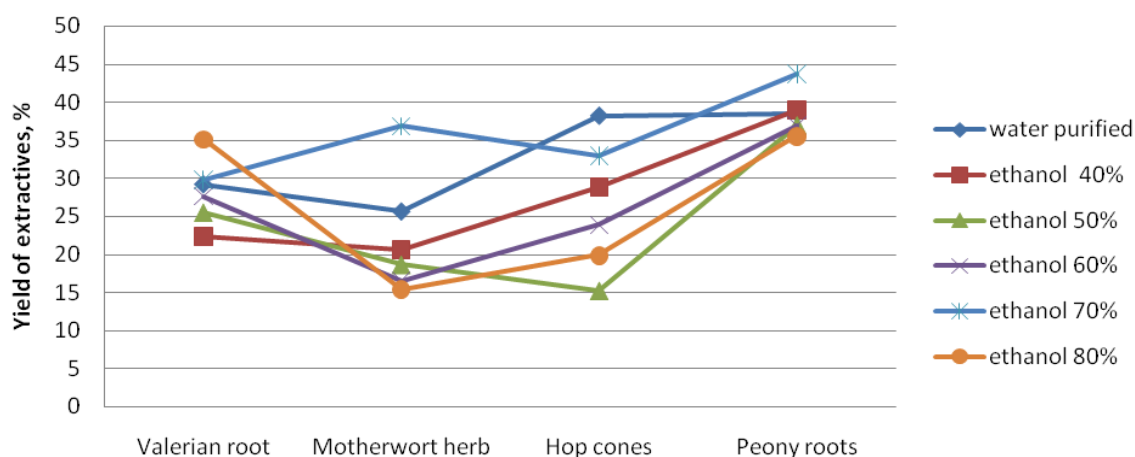


Fig. 1 - Extractive substances' yield depending on the type and concentration of the extractant

According to the data obtained (Fig. 1), it can be seen that the maximum yield of extractive substances is observed when the raw material is extracted with ethyl alcohol at a concentration of 70 %. It is at this alcohol concentration the yield of extractive substances is maximum in motherwort herb and peony roots. In cases of valerian roots and hop cones, slightly higher yields of extractives were observed when using ethyl alcohol in a concentration of 80 % and purified water, respectively, but they are within the statistical error with the yield of extractive substances when using ethyl alcohol 70 %.

Thus, in further studies on the choice of the optimal extraction technology, we used 70 % ethyl alcohol.

The next stage of our work was to determine the multiplicity of raw materials extraction, which is part of a complex liquid extract, based on the analysis of the dry residue in the obtained extracts.

Each medicinal plant material was subjected to percolation by the above method with the collection of liquid extracts in the ratio of raw materials: extractant as 1:1.

The amount of dry residue was investigated in each of the extracts using Sartorius MA-150 moisture analyzer (Germany) and, based on the data obtained, the yield of extractive substances was calculated for the entire extraction process for each raw material.

In order to determine the optimal conditions for the extraction of raw materials, for each of the experiments, the dependence of the main criteria for the efficiency of the extraction process on the change in the ratio «raw materials:extract» was calculated.

The nature of changes in the determined criteria for evaluating the process in the dynamics of changes in the ratio of «raw materials:extract» depending on the type of extractant used is given on the example of valerian roots in table 1

Table 1 - **Determination of the yield of extractives in valerian roots**

Sample number	DER	The volume of a separate portion of the extract V_n , ml	The volume of the total extract of V_{n+1} at the stage, ml	Moisture Analyzer readings	The dry residue content, ω_n , %	The content of dry residue, A_n , g	The content of dry residue, B_n , g	The dry residue, C_n , %	The yield of extractives, D_n , %
1	1:1	50	50,00	2,23	4,46	2,23	2,23	4,46	4,46
2	1: 2	50	100.00	2.77	5.54	2.77	5.00	5.00	10.00
3	1: 3	50	150.00	3.01	6.02	3.01	8.01	5.34	16.02
4	1: 4	50	200.00	2.61	5.22	2.61	10.62	5.31	21.24
5	1: 5	50	250.00	1.81	3.62	1.81	12.43	4.97	24.86
6	1: 6	50	300.00	0.82	1.64	0.82	13.25	4.42	26.50
7	1: 7	50	350.00	0.64	1.28	0.64	13.89	3.97	27.78
8	1: 8	50	400.00	0.47	0.94	0.47	14.36	3.59	28.72
9	1: 9	50	450.00	0.29	0.58	0.29	14.65	3.26	29.30
10	1:10	50	500.00	0.23	0.46	0.23	14.88	2.98	29.76

According to the data obtained, the yield of extractive substances in valerian roots is somewhat higher compared with data from the analysis of extracts of the remaining plant components that make up the complex extract. This may be due to a large amount of the sum of phenolic compounds (hydroxycinnamic acids and polyphenols) in the composition of medicinal plant materials, which was confirmed by further studies to determine the qualitative and quantitative composition of extracts [4].

Analysis of the extraction data showed that a significant decrease in the yield of extractives in the extracts occurs after sample №. 4. Thus, it can be argued about the effective multiplicity of extraction – 4.

After receiving data on the yield of extractive substances in the total extract, we have composed a table for all raw materials, which was used for research to determine the optimal extraction rate, the quantitative value of extractive substances C_n and the dry residue content B_n (Table 2).

Table 2 - **Analysis of the multiplicity of extraction of the studied raw materials**

No.	Raw material	Effective extraction ratio	The dry residue content, ω_n , %	The content of dry residue, B_n , g	The yield of extractives, D_n , %
1	Valerian root	4	5.22	10.62	21.24
2	Motherwort Grass	4	1.97	4.00	7.99
3	Hop cones	4	3.22	9.52	19.04
4	Peony root	5	1.10	7.80	15.60
5	Total extract of sedative action	4	4.54	13.35	26.70

Conclusions.

According to the obtained data on the amount of extractive substances in extracts during percolation, it can be argued that the optimal extraction multiplicity for obtaining the complex liquid extract of sedative action is 4. It is at the four-fold percolation the maximum yield of extractives and polyphenolic compounds from medicinal plant materials occurs. These data were also confirmed by the analysis of extracts for the presence of polyphenolic compounds in them using spectrophotometry.

The next stage of research will be the determination of the pharmacological activity of the resulting total extract and the development of drugs based on it.

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ТҮЙІН

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СЕДАТИВТІ ӘСЕРЛІ ЭКСТРАКТ АЛУ ТЕХНОЛОГИЯСЫН ЖАСАУ

Мақалада перколяция әдісін қолданып седативті әсерлі аралас экстракт алудың технологиясын жасау бойынша зерттеулер ұсынылған. Жүргізілген зерттеулерге сәйкес, күрделі экстракт құрамындағы дәрілік өсімдік шикізаты үшін - 70% этил спирті оңтайлы экстрагент екені анықталды. Аралас экстрактың фракциялық сығындыларын және кіретін компоненттердің әрқайсысының DER сатысымен (drug extract ratio – бастапқы материалдың алынған экстрактқа қатынасы) 1:1 қатынасы, кейіннен құрғақ қалдықты және экстрактивті заттардың шығынын анықтаумен тиімді экстракция коэффициентін (4-ке тең) анықтауға мүмкіндік берді.

Кілт сөздер: экстракция, перколяция, седативті әсер, экстракция жиілігі.

РЕЗЮМЕ

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РАЗРАБОТКА ТЕХНОЛОГИИ ПОЛУЧЕНИЯ ЭКСТРАКТА СЕДАТИВНОГО ДЕЙСТВИЯ

В статье представлены исследования по разработке технологии получения комбинированного экстракта седативного действия с использованием метода перколяции. Согласно проведенным исследованиям был определен оптимальный экстрагент для смеси лекарственного растительного сырья, входящего в состав сложного экстракта – 70 % спирт этиловый. Получение фракционных вытяжек комбинированного экстракта и каждого из входящих компонентов с шагом DER (drug extract ratio – соотношение исходного материала к полученному экстракту) 1:1 с последующим определением сухого остатка и выхода экстрактивных веществ позволило определить эффективную кратность экстракции - 4.

Ключевые слова: экстракция, перколяция, седативное действие, кратность экстракции.

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