STUDY OF THE INFLUENCE OF PHARMACEUTICAL FACTORS ON THE OPTIMIZATION OF THE RELEASE OF BIOLOGICALLY ACTIVE SUBSTANCES UPON RECEIPT THE WATER EXTRACTS FROM GYNECOLOGICAL PLANT MEDICAL COLLECTION

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Introduction.

Infusions are water extracts that do not require either sophisticated equipment or expensive or scarce extractants. From a biopharmaceutical point of view, aqueous extracts provide good availability of drug substances. Compared with individual medicinal substances, they have a milder and simultaneous complex effect on the body. These circumstances are one of the reasons that these dosage forms, which appeared even before Galen, still retained their significance. In the formulation of pharmacies, infusions and decoctions can be prepared independently, and can also be part of potions. Therefore, the study of water extraction technology is important for the practical activities of the pharmacist.

One of the important stages in the complex of studies when creating new drugs is the rationale for rational technology. Since the medicinal product in the form of a collection is a solid dosage form that is used in medical practice in the form of infusions or decoctions, the justification of the optimal manufacturing conditions, both of the collection itself and of water extracts from it, should be based on a complex of pharmacotechnological studies.

The process of obtaining an aqueous extract from a plant drug collection is focused on the maximum level of biologically active substances. Since the extraction of biologically active substances from medical plant material cells occurs due to extraction, it was advisable to study the effect of various pharmaceutical factors on the level of extractive substances.

The main factors affecting the completeness and speed of water extraction of medicinal plant materials are:

1. The time (duration) of extraction. The amount of diffused substance is directly proportional to the time of extraction.
2. Temperature. An increase in temperature accelerates the extraction process, since the diffusion and dialysis process intensifies, the material swells faster, the microflora perishes and enzymes are inactivated.
3. Porosity and pore distance of medical plant materials. The higher the value of these indicators, the more internal plant juice is formed during swelling.

There is a dependence of these indicators on the degree of dispersion of medical plant materials particles that characterize the extraction surface. [1].

Other factors influence the completeness of biologically active substances in the preparation of aqueous extracts, among which the extraction mode plays an important role. Therefore, when developing a rational technology for obtaining water extracts, it is necessary to justify the duration of infusion at elevated temperature and the subsequent infusion at room temperature until cooling [2,3].

Purpose of the study. The study of factors affecting the optimization of the release of biologically active substances in the medical drug of aqueous extracts from medicinal plant collection.

Materials and Methods. As objects of the study a medical plant collection was used, which included clover inflorescence, yarrow grass, linden flowers, thyme grass, which were selected for the pharmaceutical development of the collection for non-hormonal therapy of menopausal syndrome [4]. Purified water was used as extractant. The completeness of extraction was determined by the quantitative content of extractives and flavonoids content, expressed as rutin [5].

In order to study the effect of various pharmaceutical factors on the release of extractives from medicinal plant materials, three collection fractions were studied that were identical in composition but different in degree of grinding components, which were obtained by sifting through sieves No. 1, 2, 3. Medicinal raw materials were ground by grass cutter. The particle size of the first fraction was 1–3 mm, the second fraction was 3–4 mm, and the third was 4–6 mm. Based on the obtained results, a fraction of 1–3 mm was selected for further studies to substantiate the extraction parameters [4].

According to pharmacopoeial methods, raw materials were placed in a heated tunic, filled with purified room temperature water at a ratio of 1:10 (the collection does not contain medical plant material requiring a different ratio with extractant), taking into account the calculated coefficient of water absorption ($C_{wcollection} = 2.35$), insisted on a boiling water bath left for further cooling at room temperature. Then the resulting infusion was filtered, bringing the total volume of the aqueous extract from the medical plant material with purified water to the required volume [2].

For each of these collection fractions, 24 variants of the extraction mode were studied. For each sample, infusion in a water bath was carried out for 5, 10, 15, 20, 25, 30 (in increments of 5 minutes). Choosing the time intervals for infusion at room temperature, we were guided by well-known rules for cooling the infusion of medical plant material for 15, 30, 45 and 60 minutes (in increments of 15 minutes).

Results and Discussion. To optimize the extraction conditions, the level of extractives from medicinal plant materials with a grinding degree of 1–3 mm was studied under the above extraction conditions. As a result of the

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study, the influence of the degree of grinding of raw materials on the level of extractive substances obtained from aqueous extracts of plant collection (table, figures 1-2), was studied.

Table 1. The obtained results of the dependence of the level of extractive substances on the extraction modes

Infusion time in a water bath, min	Description	Cooling time to room temperature, min	The content of extractives,% (n = 5)	Flavonoid content, expressed as rutin, mg / %
5	Light yellow liquid with a slight specific grassy odor	15	1,895±0,001	0,290±0,001
	Light yellow liquid with a slight specific grassy odor	30	1,913± 0,001	0,293±0,002
	Light yellow liquid with a slight specific grassy odor	45	1,915± 0,002	0,294±0,001
	Light yellow liquid with a slight specific grassy odor	60	1,916±0,001	0,293±0,003
10	Yellow liquid with a specific floral–grassy odor	15	2,002±0,003	0,378±0,002
	Yellow liquid with a specific floral–grassy odor	30	2,093±0,002	0,391±0,001
	Yellow liquid with a specific floral–grassy odor	45	2,096±0,002	0,400±0,001
	Yellow liquid with a specific floral–grassy odor	60	2,090±0,001	0,405±0,003
15	Brownish–green liquid with a sharp specific floral–grassy odor	15	2,158±0,001	0,438±0,002
	Brownish–green liquid with a sharp specific floral–grassy odor	**30**	**2,167±0,002**	**0,448±0,001**
	Brownish–green liquid with a sharp specific floral–grassy odor	**45**	**2,169±0,001**	**0,447±0,003**
	Brownish–green liquid with a sharp specific floral–grassy odor. Precipitation is observed.	60	2,160±0,003	0,441±0,001
20	Brownish–green liquid with a sharp specific floral–grassy odor	15	2,165±0,001	0,439±0,002
	Brownish–green liquid with a sharp specific floral–grassy odor	30	2,168±0,001	0,442±0,001
	Brownish–green liquid with a sharp specific floral–grassy odor	45	2,166±0,002	0,446±0,003
	Brownish–green liquid with a sharp specific floral–grassy odor. Precipitation is observed.	60	2,162±0,003	0,446±0,001
25	Light brown liquid with a specific floral–grassy odor	15	2,164±0,003	0,415±0,001
	Light brown liquid with a specific floral–grassy odor	30	2,168±0,001	0,417±0,002
	Light brown liquid with a specific floral–grassy odor	45	2,161±0,001	0,413±0,001
	Light brown liquid with a specific floral–grassy odor. Precipitation is observed.	60	2,150±0,002	0,411±0,003
30	Light brown liquid with a specific floral–grassy odor	15	2,159±0,001	0,405±0,001
	Light brown liquid with a specific floral–grassy odor	30	2,161±0,001	0,408±0,003
	Light brown liquid with a specific floral–grassy odor	45	2,131±0,001	0,408±0,002
	Light brown liquid with a specific floral–grassy odor. Precipitation is observed.	60	2,126±0,002	0,406±0,001

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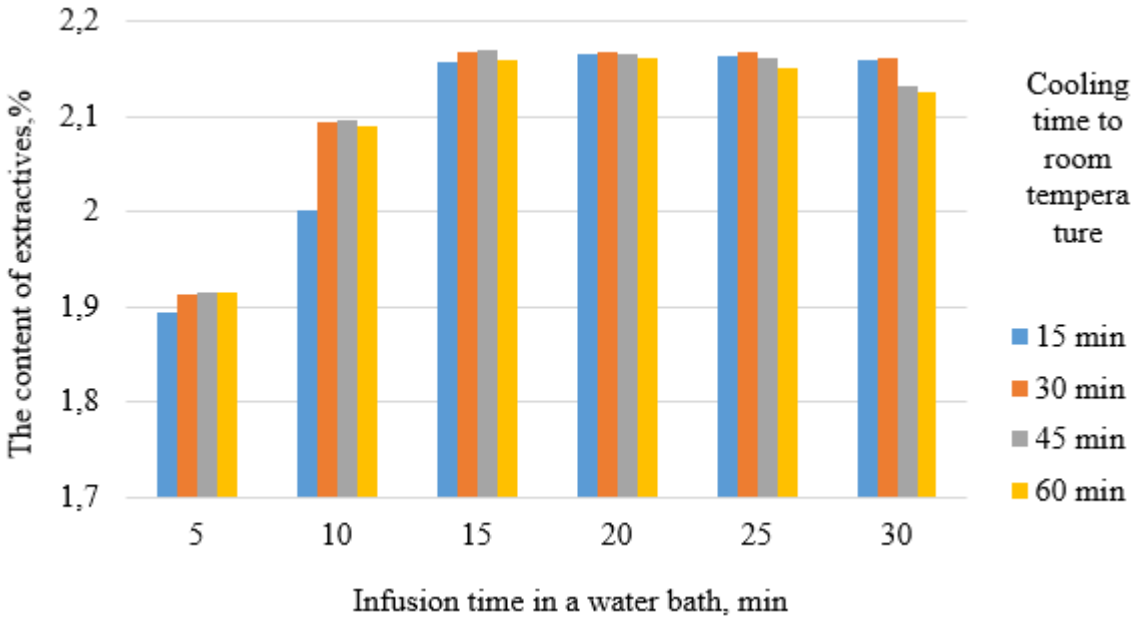

Fig. 1 The dependence of the level of extractives on the extraction mode from collection

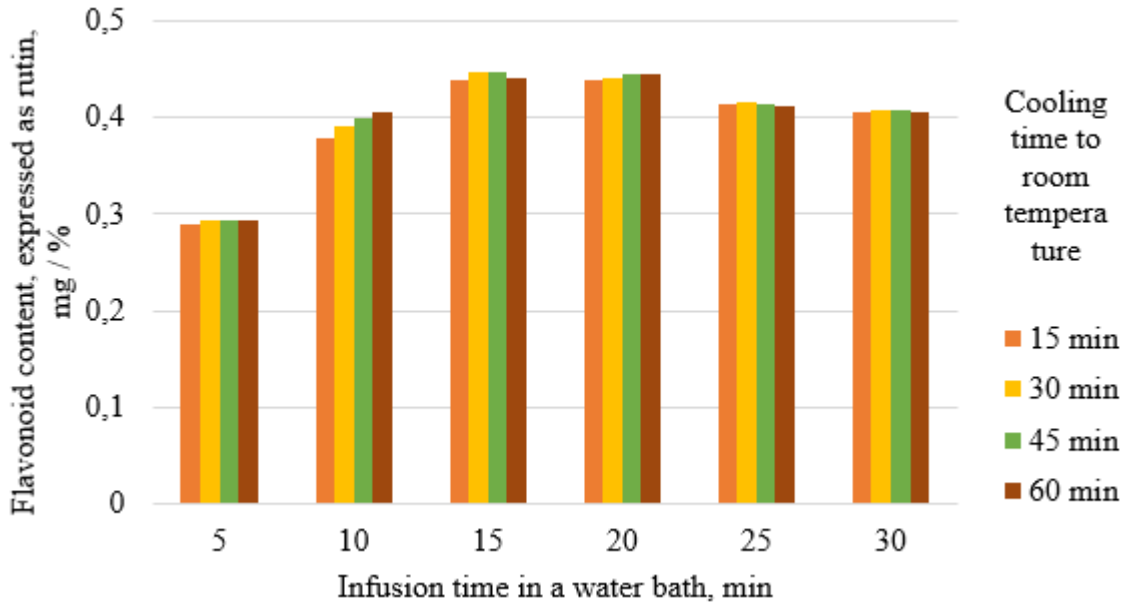

Fig. 2 Dependence of the level of flavonoids content, expressed as rutin on the extraction mode from collection

It was experimentally established that an increase in the time of infusion in a water bath from 5 to 15 minutes leads to an increase in the content of extracts as well as biologically active substances in the infusion. Further heating in a water bath does not increase the yield of extractives and flavonoids, and a color change may indicate the destruction of a number of biologically active substances under the influence of temperature. It is advisable to increase the infusion time before cooling for 30–45 minutes, since further cooling does not increase the content of active substances and leads to precipitation.

Conclusions

1. We studied the factors affecting the optimization of the release of biologically active substances in the preparation of aqueous extracts from medicinal plant collection.
2. We investigated various extraction regimes of the drug collection and found that the optimal mode of extraction of biologically active substances from the plant collection is to

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insist on a water bath for 15 minutes, followed by cooling at room temperature for 30–45 minutes.

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Keywords: water extraction, extractives, medical plant material, gynecological drug.

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