ТЕХНОЛОГО-АНАЛИТИЧЕСКОЕ ИССЛЕДОВАНИЕ ВОДНЫХ ИЗВЛЕЧЕНИЙ ИЗ КОРНЕВИЩ БАДАНА

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Цель. Изучение технологии изготовления водных извлечений из корневищ бадана с установлением их показателей качества.

Материалы и методы. Объектом исследования являлись водные извлечения, изготовленные из порошкованных корневищ бадана в фильтр-пакетах (1,5 г) и из измельченных корневищ бадана, фасованных в пачки (50 г). Из указанного сырья готовились водные извлечения методом горячего настаивания с водой по инструкции на упаковке с сырьем. Идентификацию в извлечениях арбутина проводили цветной реакцией с кристалликом железа закисного сульфата, тонкослойной хроматографией извлечений на пластинах Sorbfill в системе растворителей этилацетат – муравьиная кислота – вода. Проявители: 1% спиртовой раствор 2,6-дихлорхинонхлоримида, 2% раствор натрия карбоната. Дубильные вещества идентифицировались с 1% раствором железоаммониевых квасцов. Количественное определение арбутина в извлечениях проводилось хроматоспектрофотометрическим методом при длине волны 282 нм с расчетом его в пробе через удельный показатель поглощения равный 72,23. Количественное определение дубильных веществ в извлечении проводили по фармакопейному методу 1 определения дубильных веществ в сырье и лекарственных препаратах. Сухой остаток, pH извлечений определяли фармакопейными методами. Результаты обработаны статистически.

Результаты. Изученные водные извлечения бадана, изготовленные по двум составам и технологиям представляли собой жидкости желто-коричневого цвета со слабым запахом, вяжущим вкусом. Сухой остаток составлял 0,022-0,025%, содержание арбутина составляло 0,34-0,36%, дубильных веществ 2,07-2,57%. Значение pH извлечения из порошкованного сырья в фильтр-пакете составляло 5,45, из измельченного сырья 6,58.

Заключение. В работе впервые проведено комплексное технолого-аналитическое исследование водных извлечений из корневищ бадана изготовленных согласно технологии и составам, приведенных в инструкции на упаковке с сырьем. Современными фармакопейными методами качественного и количественного анализа проведена идентификация и количественный анализ действующих веществ фенолгликозида арбутина и дубильных веществ. Установлены показатели качества по описанию, величинам сухого остатка, pH, содержанию арбутина, дубильных веществ.

Ключевые слова: *водные извлечения, бадан, показатели качества.*

TECHNOLOGICAL AND ANALYTICAL STUDY OF WATER EXTRACTS FROM THE RHIZOMES OF THE HOOD

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Aim. Study of the technology of making water extracts from the rhizomes of badan with the establishment of their quality indicators.
Materials and Methods. The object of the study was water extracts made from powdered balanic rhizomes in filter bags (1.5 g) and from crushed rhizomes of baked beans packed in packs (50 g). From this raw material, aqueous extracts were prepared by the method of hot infusion with water according to instructions on the packaging with raw materials. Identification in extracts of arbutin was carried out by color reaction with iron oxide ferrous sulfate, thin-layer chromatography of extracts on Sorbfill plates in the solvent system ethyl acetate-formic acid-water. Developers: 1% alcohol solution of 2,6-dichloroquinone chloroimide, 2% sodium carbonate solution. Tannins were identified with a 1% solution of iron ammonium alum. The quantitative determination of arbutin in the extracts was carried out by the chromatographic spectrophotometric method at a wavelength of 282 nm with the calculation of it in the sample through a specific absorption index of 72.23. The quantitative determination of tannins in the extraction was carried out according to the pharmacopoeial method 1 for the determination of tannins in raw materials and medicinal preparations. The dry residue, the pH of the extracts, was determined by pharmacopeia techniques and methods. The results are statistically processed.
Results. The studied water extracts of badan made on two compositions and technologies were liquid of a yellow-brown color with a weak smell, astringent taste. The dry residue was 0.022-0.025%, the content of arbutin was 0.34-0.36%, tannins 2.07-2.57%. The pH of the extraction from the powdered raw material in the filter bag was 5.45, from the crushed material 6.58.
Conclusion. In the work for the first time, a complex technological and analytical study of aqueous extracts from the rhizomes of badan made according to the technology and the compositions given in the instructions on the packaging with raw materials was conducted. Modern pharmacopoeial methods of qualitative and quantitative analysis identified the active substances phenol glycoside arbutin and tannins. Quality indicators have been established by description, dry residue, pH, arbutin content, tannins.
Keywords: *water extracts, badan, quality indicators.*

Badan lemongrass (Bergénia crassifólia) is a perennial herbaceous plant of the family of saxifrages (Saxifragaceae), its roots contain a complex of biologically active substances (BAS): tannins (up to 25-27%), phenolic glycosides (arbutin), catechin, gallic acid. There are also isocoumarin, bergenin, starch. Applied in medical practice in the form of aqueous extracts as an external astringent [1].

On the pharmaceutical market, the forms of the release of the rhizomes of the panicle are represented by filter packets with a powdered rhizome of badana (1.5 g.) And crushed rhizomes of the panic packed in packs (5 g.). From this raw material, the consumer at home, following instructions on the packaging, prepares water extractions.

Development and standardization of medicinal herbal preparations should ensure their quality, efficacy and safety [2].

In the literature available to us, as well as in regulatory documents, we did not find information on the extractability of phenolic glycosides, tannins, as the main BAS groups of rhizomes of buckthorn in water extracts, manufactured at home by the consumer following instructions on the packaging with raw materials. It should be noted that the assessment of the quality of such aquatic extracts, including the content of active substances, is relevant [3].

The *aim* of our work was to study the technology of making water extracts from the rhizomes of badan with the establishment of their quality indicators.

Materials and Methods

The object of the study was powdered raw material of rhizomes of badana in filter packets (1.5 g) produced by OJSC

«Krasnogorskleksredstva» and crushed rhizomes of bahtana, packaged in bundles (50 g) by the manufacturer of ZAO Ivanchai. From this raw material, aqueous extracts were prepared by the method of hot infusion with water according to instructions on the packaging with raw materials. Compositions and technology of their manufacture offered to consumers is presented in Table 1.

When carrying out a qualitative and quantitative determination of arbutin, a standard sample of arbutin, manufactured by OOO «Phytopanacea», was used.

Table 1

Compositions and technology of aqueous extracts from the rhizomes of the butterfish

Composition № 1	Composition № 2
About 3 g (1 teaspoon) of crushed rhizomes are placed in enameled dishes, pour 200 ml (1 cup) of boiling water, cover with a lid and heat in a boiling water bath for 30 minutes. Filter without cooling. The remaining raw material is squeezed. The volume of the resulting broth is brought to 200 ml with boiled water.	2 filter bags (3 g) are placed in enameled dishes, pour 200 ml (1 glass) of boiling water, cover and insist 30 minutes, periodically pressing on the bags with a spoon, squeeze. The volume of the resulting broth is brought to 200 ml with boiled water.

Extractability of phenol glycoside-arbutin and tannins was evaluated by qualitative and quantitative analysis.

The presence of arbutin in water extracts from the rhizomes was determined by a qualitative reaction with iron crystals of ferrous sulphate. Tannins were identified with a 1% solution of iron ammonium alum.

The UV spectrum of water extraction from badan was recorded on a Thermo Scientific spectrophotometer.

Additional identification of arbutin in the extraction from the rhizomes of badana was carried out by thin-layer chromatography using an ascending method according to a known technique [4]. Sorbfil plates, solvent system ethyl acetate-formic acid anhydrous-water (88: 6: 6) were used as a carrier. 5 μl of a solution of a standard sample of arbutin and 5 μl of water extract of the baby oil were applied to the plate.

The plate with the samples was air dried, then chromatography was carried out, after which the traces of solvents were removed. Then, the chromatogram was treated first with 1% alcohol solution of 2.6-dichloroquinonchloroimide, drying the chromatogram, after which the chromatogram was treated with 2% aqueous sodium carbonate solution, dried, viewed in daylight.

The dry residue was determined by the pharmacopeia method [5], the pH of the aqueous extracts was measured with a pH meter of pH 211 Microprocessor pH Meter in accordance with the pharmacopeia method [6].

Quantitative determination of arbutin and tannins in the extracts was carried out.

The content of arbutin in the extracts was determined by the chromatographic spectrophotometric method, adapted to water extractions. An analysis of the UV spectrum of water extraction from badan (Figure 1) showed the presence of an absorption maximum in it with an analytic wavelength at 281 nm, characteristic of arbutin [7]. The content of arbutin and calculated by the formula [7,8]:

$$X = \frac{D \cdot 25 \cdot k}{72.23 \cdot 0.3},$$

where D is the optical density of the eluate at length waves of 282 nm;

k – is the partial elution coefficient of 1.14025;

0.3 – volume of the sample taken for analysis,

72.23 – specific absorption index of arbutin.

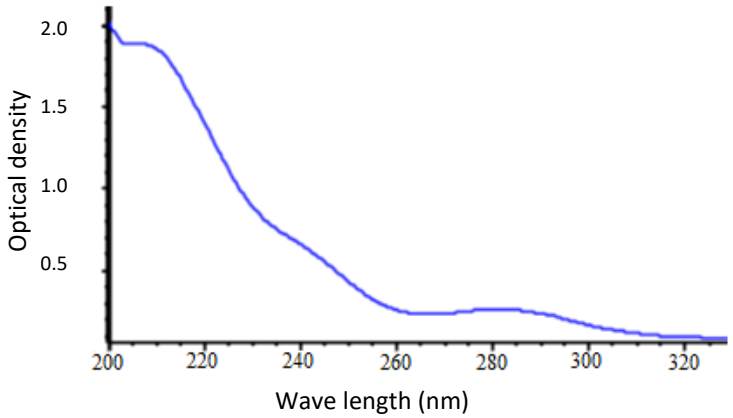

Fig. 1. UV-spectrum extraction from the rhizomes of the badan

The content of tannins in aqueous extracts (in terms of tannin) was determined by method 1 [9]. The method is based on the ability of tannins to be rapidly oxidized by a standard solution of potassium permanganate in a highly dilute acidic solution in the presence of an indicator and an indiosulfonic acid catalyst.

The content of the sum of tannins in terms of tannin in percent (X) was calculated by the formula:

$$X = \frac{(V - V_1) \cdot 0.004157 \cdot 250 \cdot 100}{a \cdot 25},$$

where V – is the volume of potassium permanganate of the 0.02 M solution used for titration of aqueous extract, ml;

V_1 – is the volume of potassium permanganate of the 0.02 M solution used for titration in the control experiment, ml;

0.004157 – the amount of tannins corresponding to 1 ml of potassium permanganate solution of 0.02 M (in terms of tannin), g;

a – sample of raw materials, g for 200 ml of extraction;

250 – total volume of water extraction, ml;

25 – is the volume of aqueous extract taken for titration, ml.

The results of the study were processed statistically [10].

Results and Discussion

According to the description, aquatic extracts from the rhizomes of badana were a liquid of yellow-brown color with a weak odor strongly astringent taste. When a ferric oxide of ferrous sulfate was added to 1 ml of extracts, a dark purple precipitate (arbutin) was detected. When 3 drops of 1% ferric ammonium alum solution were added to 3 ml of extracts, black-blue staining (tannins) appeared. These tests confirm the transition to extracting the active substances arbutin and tannins.

On the chromatogram with the sample of the extraction of the rhizomes of badan (Figure 2), four zones are detected: the blue adsorption zone with Rf 0.52 corresponding to the adsorption zone of the standard arbutin, and the adsorption zone above the purple arbutin zone with Rf 0.67, brown with Rf 0.88.

Qualitative and quantitative indices of extracts from the rhizomes of badana are presented in Table 2.

From the table it follows that the content of dry residue and arbutin in the studied water extracts had similar values. The content of tannins made from ground raw materials was higher than that obtained from the powdered rhizomes in the filter bags. This is probably due to the higher crushedness of the rhizomes of the hood, packed in a filter bag. In extracts made from powdered rhizomes of badana in filter packets the pH was lower by 1.13, which is probably due to the influence of the filter bag paper.

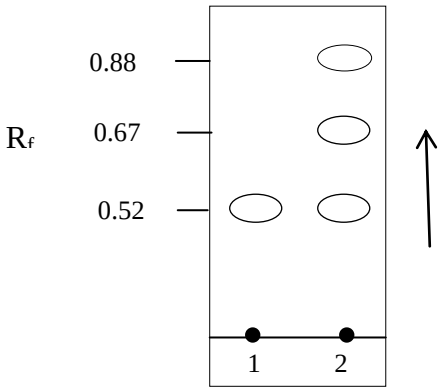

Fig. 2. Diagram of the chromatogram of aquatic extract of badan
1 – arbutin, 2 – aqueous extract of the rhizomes of the banyan

Table 2

Qualitative and quantitative indices of water extracts of badan

Description	Dry residue,%	Arbutin content,%	Tannins content,%	pH
Composition number 1: Liquid of a yellow-brown color with a weak smell, taste-strongly astringent.	0.024±0.003	0.357±0.07	2.07±0.30	6.58±0.01
Composition number 2: Liquid of a yellowish-brown color with a weak smell, taste is strongly astringent.	0.022±0.001	0.34±0.01	2.57±0.10	5.45±0.01

Conclusion

Впервые For the first time, a complex technological and analytical study of aqueous extracts from the rhizomes of badan made according to the technology and the compositions given in the instructions on the packaging with raw materials was carried out. Modern pharmacopoeial methods of qualitative and quantitative analysis identified the active substances phenol glycoside arbutin and tannins. Quality indicators have been established by description, dry residue, pH, arbutin content, tannins.

Additional information

No conflict of interests.

Participation of the authors:

Author of the idea, the coordinating role in technological research and discussion of the results, the study of water extracts of badan by thin layer chromatography – Selezenev N.G.

Carrying out a study of water extracts prepared from powdered rhizomes of badan in filter packets – Kuznetsova E.A.

Carrying out a study of water extracts, prepared from packaged bales of b / s in packs – Timofeeva V.A.

Coordination of the analytical part of the experiment, setting up a methodology for quantifying tannic substances in extracts of badan, statistical processing – Frolova M.A.

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