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Comparative IR-spectrophotometry of laxatives herbal preparations based on bark of *Frangula alnus* Mill. And on fruits of *Rhamnus cathartica* L

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Abstract

In the present study were developed the methodic of qualitative analysis of phytopharmaceuticals preparations: "Frangula syrup", "Frangula decoction", "Frangula tablets", "Rhamnus syrup" and "Rhamnus decoction" by means of Infrared spectrophotometry. As a result, more in-depth study of "Frangula syrup", "Frangula decoction", "Frangula tablets" "Rhamnus syrup" and "Rhamnus decoction" conducted by IR spectroscopy to compare and qualitative analysis of phytopharmaceuticals preparations.

Keywords: *Frangula alnus* Mill, *Rhamnus cathartica* L, anthracenderivatives, frangulin A, Infrared spectrophotometry.

1. Introduction

At the present time a lot of laxative chemical drugs exist, but people try to receive herbal preparations, which provide mild laxative effect and are not addictive. Among the laxative herbal preparations can be distinguished drugs based on bark of *Frangula alnus* Mill. and on fruits of *Rhamnus cathartica* L.

The first mention of the use of bark of *Frangula alnus* Mill. And fruits of *Rhamnus cathartica* L. dates back to the tenth century, since this plant has become the most popular sources of laxatives in officinal medicine [1-6]. Pharmacopoeia type of raw material is bark of *Frangula alnus* Mill. (contains significant amounts of anthracenderivatives - 8-10%), and is fruit of *Rhamnus cathartica* L. (contains significant amounts of anthracenderivatives - 2.5-5.0%) causing the main pharmacological effects of drugs [7-8]. On the territory of the Russian Federation is currently registered medicinal products derived from the bark of buckthorn are "Buckthorn extract coated tablets 0.2 g" [9-11].

During previous studies we isolated the active ingredients, set dominant components [6-O- α -L-rhamnopyranoside of frangula-emodin (frangulin A)] from bark of *Frangula alnus* Mill. And from fruits of *Rhamnus cathartica* L.; also developed a technological procedure for preparing of "Frangula syrup" and "Rhamnus syrup" [12-13]. At the present time there are no methods of qualitative analysis of these drugs on the basis of bark of *Frangula alnus* Mill. And of fruits of *Rhamnus cathartica* L. by IR spectrophotometry.

Purpose of our research - to develop methods of qualitative analysis of drugs on the basis of bark of *Frangula alnus* Mill. And of fruits of *Rhamnus cathartica* L.

2. Materials and methods

Materials: "Buckthorn extract coated tablets 0.2 g" (ZAO "VIFITEKH"); bark of *Frangula alnus* Mill. (OAO "Krasnogorleksredstva"); raw materials of fruits of *Rhamnus cathartica* L., made in August 2014, in the Orenburg region (Busuluk, near the river Sakmara). Electronic spectra were measured on the Infrared spectrophotometers "Nicolet iS5" (Thermo).

Methodology. Production of syrup in the laboratory began to produce a decoction of the bark of *Frangula alnus* Mill. And of fruits of *Rhamnus cathartica* L. using ratios of "raw material - finished product" 1:3. The volume of extractant to produce a given volume of the finished product was determined taking into account the water absorption coefficient, which is 2.2 ml/g for the bark of *Frangula alnus* Mill. And 1 ml/g for fruits of *Rhamnus cathartica* L. Most of decoctions prepared pharmacopoeial method: a known amount of a certain amount of raw material filled with purified water at room temperature, heated in a boiling water bath for 30

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minutes, cooled for 10 min, filtered and adjusted if necessary until the desired amount of the resulting ratio "raw material - the finished product" [7].

Water extract of bark of *Frangula alnus* Mill. And of fruits of *Rhamnus cathartica* L. was used instead of purified water to obtain sugar syrups by means of pharmacopoeia method. To 36 g of this aqueous extracts were mixed with 64 g of refined sugar, and the mixture was heated until complete dissolution of sugars was adjusted to boiling twice, each time with removing the resulting foam. Syrups filtered through cheesecloth into a hot, and adjusted to the initial weight of purified water [7].

3. Results and Discussion

The IR spectra of anthracene derivative frangulin A structure in which there are two carbonyl groups (C = O), found two distinct intense absorption bands in the 1625-1620 cm⁻¹. (Figure 1-4).

Intense absorption band in the IR spectra in the region of 3358 cm⁻¹. due to the stretching vibrations of OH groups of the carbohydrate, which confirms the glycoside nature of the substance. Similar absorption band is observed in the IR spectrum of flavonoid of *Rhamnus cathartica* L. (3-O-rutinoside of rhamnetin), which also confirms the glycoside nature of the substance (Figure 5, 6).

In the region 1400-1200 cm⁻¹ IR spectra absorption bands were also observed, characteristic for phenolic compounds, including anthracenderivatives. In the region of 3100-3000 cm⁻¹ IR spectra are also observed absorption bands due to stretching vibrations of aromatic CH = CH (Figure 1-6).

In the region of 1625-1620 cm⁻¹ IR spectrum of flavonoid of *Rhamnus cathartica* L. (3-O-rutinoside of rhamnetin), unlike anthracenderivatives, there is only one intense absorption band due to the carbonyl group (Figure 5, 6).

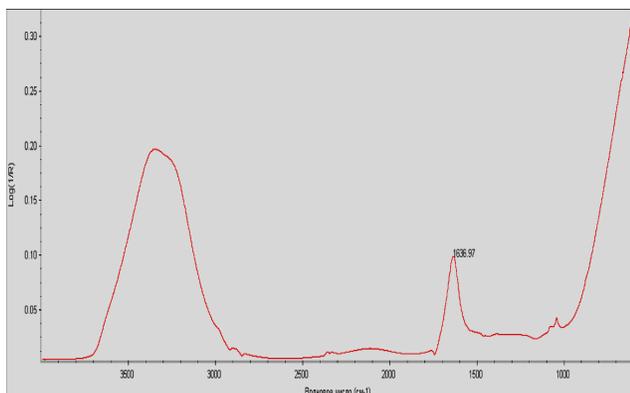


Fig 1: Infrared spectrum of frangula decoction

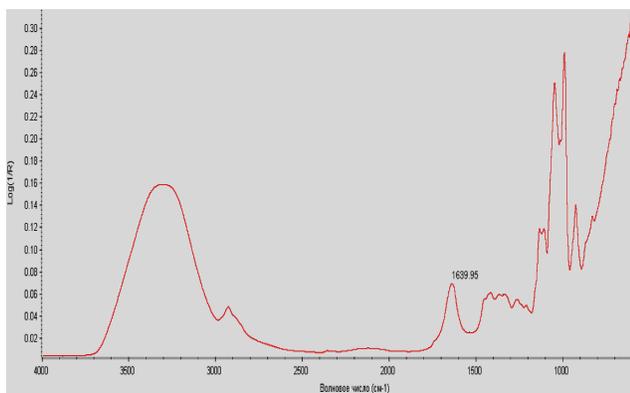


Fig 2: Infrared spectrum of frangula syrup

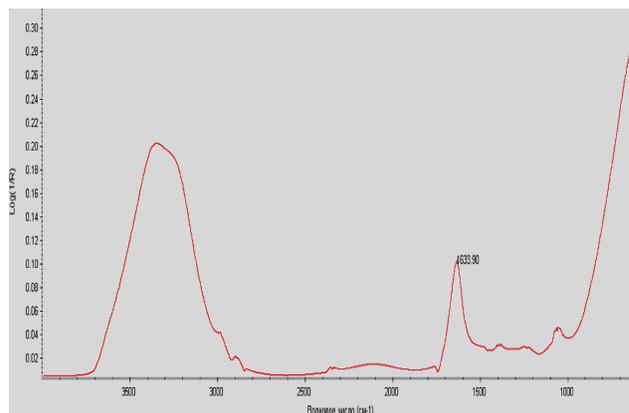


Fig 3: Infrared spectrum of frangula tablets

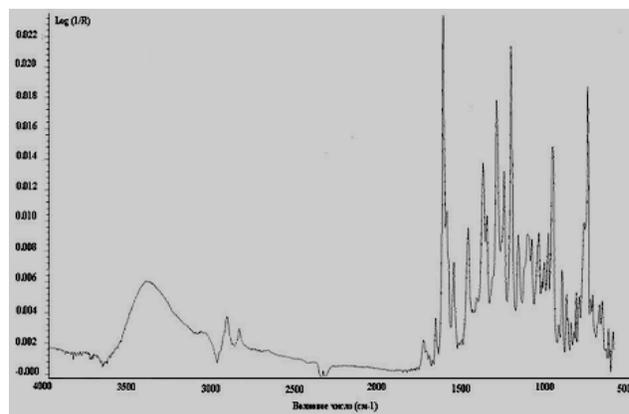


Fig 4: Infrared spectrum of working standard sample of frangulin A

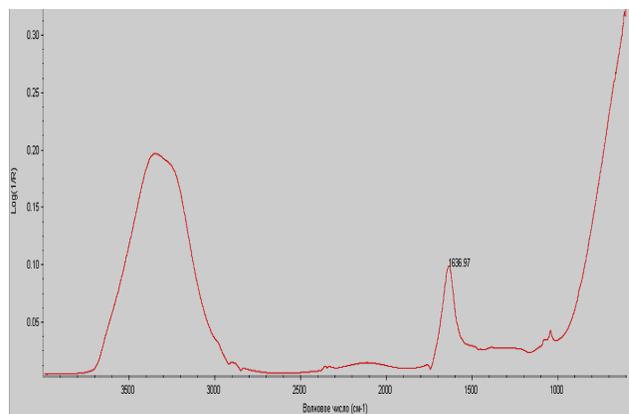


Fig 5: Infrared spectrum of rhamnus decoction

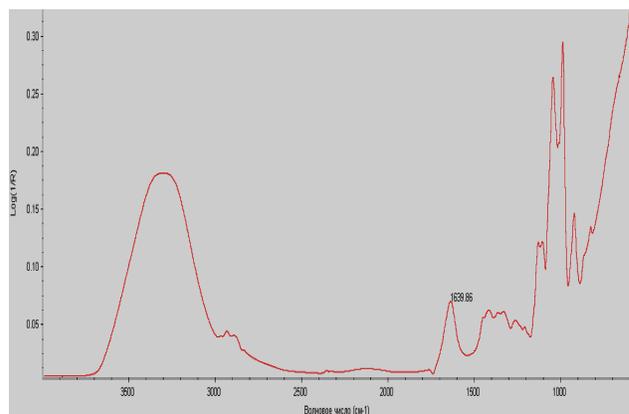


Fig 6: Infrared spectrum of rhamnus syrup

A comparative study of compositional buckthorn bark brittle by IR spectrometry confirmed that in the case of alder buckthorn diagnostic significance have the anthraglycoside - frangulin A, whereas in the case of *Rhamnus cathartica* L. - flavonoid compound - 3-O-rutinoside of rhamnetin, which is the dominant component of the raw material of the plant. In our opinion, the results of IR spectroscopy can be used for the purposes of standardization of drugs test plants (see "Qualitative reaction").

Anthracenderivative dominant in the cortex of alder buckthorn is frangulin A, which can then be used as a standard substance, and on the substance must be based in the qualitative and quantitative analysis.

As for *Rhamnus cathartica* L., the dominant component is 3-O-rutinoside of rhamnetin (flavonoid), it is of interest in terms of the identification of raw materials, in the "Quantitative determination" must be based on anthracenderivatives, given their contribution to the main pharmacological action - laxative effect.

4. Conclusions

1. As a result of infrared spectrophotometry identify dominant substance which is part of bark of *Frangula alnus* Mill. And of fruits of *Rhamnus cathartica* L.
2. It was developed a methodic of qualitative analysis of phytopharmaceutical preparations: "Frangula syrup", "Frangula decoction", "Frangula tablets", "Rhamnus syrup", "Rhamnus decoction"

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