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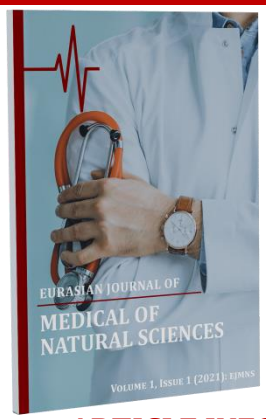

DEVELOPMENT OF SYRUP TECHNOLOGY BASED ON ALTHEA EXTRACT

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ABSTRACT

Tradition of use in the treatment of various diseases medicinal plants, as well as products of natural origin, dates back thousands of years. Currently, despite the achievements of chemistry and biotechnology, the relevance and popularity of the use of herbal medicines remains quite high. The peculiarity of the therapeutic effect of drugs from herbal medicinal raw materials is that the therapeutic effect does not occur immediately and is not always pronounced, as when using drugs obtained by chemical synthesis. However, preparations containing biologically active substances (BAS) of plant origin, unlike synthetic ones, do not cause allergies, have low toxicity, have a beneficial effect on the body, and do not have side effects with long-term use [1, 2, 3].

Infectious diseases of the respiratory system are a heterogeneous group of diseases of the upper and lower respiratory tract, which include acute respiratory viral infections, acute rhinitis, laryngotracheitis, pharyngitis, and acute bronchitis. These diseases currently pose a serious health problem in many countries [4, 5, 6].

Purpose of the research. The purpose of this research is to develop the optimal composition and technology of expectorant syrup.

Research objectives.

1. Substantiate the composition and develop a technology for the production of an expectorant syrup based on dry extracts of marshmallow and licorice.
2. Investigate the technological and physico-chemical properties of this syrup.
3. Determine syrup quality indicators.

Cough is a symptom that accompanies most respiratory diseases. From a physiological point of view, it is a complex reflex protective reaction aimed at removing excess mucus and foreign bodies from the respiratory tract. The nature of the cough is dry (non-productive) and wet (productive). According to duration, it is divided into acute (up to 3 weeks), protracted (from 3 weeks to 3 months) and chronic (more than 3 months). Considering that cough is precisely a protective reaction in various diseases, the main goal of therapy is not to eliminate

it, but to alleviate its course. Elimination (suppression) is carried out in the case of a dry, painful cough.

In the treatment of wet cough, expectorants and mucolytics are used [7, 8]. According to various sources, more than 50% of children under the age of one year, as well as more than 30% of preschool and school-aged children suffer from various diseases accompanied by cough. Difficulty in selecting the optimal drug lies in the wide range of antitussives on the market and the characteristics of their impact on physiological processes in the body.

The composition of the preparations can be of plant origin or obtained synthetically. Herbal preparations are represented by a large number of names, which is associated with a large range of medicinal plants used as expectorants. Analysis of medicinal products that include herbal pharmaceutical substances (Fig. 1) showed that the most used medicinal plants for the production of antitussive and expectorant drugs include licorice, marshmallow, creeping thyme, anise, peppermint, eucalyptus leaves, coltsfoot, thermopsis, ivy and primrose [9].

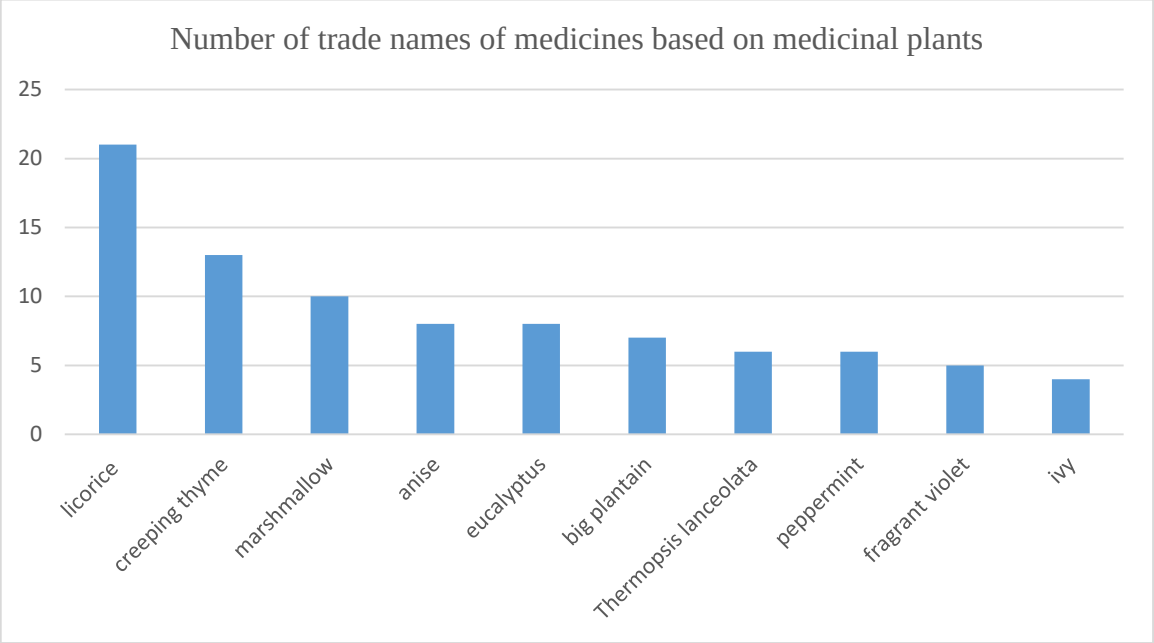

Fig.1 - Number of trade names of medicines based on medicinal plants

The expectorant effect of herbal remedies is due to the content of certain groups of biologically active substances: triterpene saponins, essential oil, polysaccharides (mucus).

Practical part. Plants that contain predominantly saponins include licorice, spring primrose, common ivy, field cyanosis, and Siberian primrose. Triterpene saponins of these plants, due to their effect on the lining of the stomach, reflexively increase the secretion of mucus by the bronchial glands, enhance bronchial peristalsis, increase the activity of the cilia of the ciliated epithelium of the bronchial mucosa, promoting the evacuation of sputum.

In addition, saponins have anti-inflammatory and emollient effects. They are indicated in the presence of mucopurulent sputum in the resolution phase, insufficient function of the cough center and residual inflammatory phenomena.

Plants with a predominant mucilage content include coltsfoot, great plantain, tricolor violet, and marshmallow. The expectorant effect of these plants is based on a reflex

mechanism of action - after ingestion, polysaccharides irritate the stomach receptors, which reflexively increases the function of secretory cells of the respiratory tract through the medulla oblongata. This leads to more mucus being released, it becomes less viscous and easier to cough up. Reducing the viscosity of sputum restores the motor activity of ciliated epithelial cells and, accordingly, the evacuation of sputum from the respiratory tract. Polysaccharide-containing plants also have an coating, emollient, reparative and anti-inflammatory effect.

Currently, there are various approaches to the formulation of complex drugs. One of them involves achieving summation or mutual enhancement of the positive properties of the plants used, which expands their therapeutic effect. When compiling a recipe for expectorant action, we used a similar method. At the same time, the main components in the selection of components were information about the etiology and pathogenesis of respiratory tract diseases, the composition of biologically active substances of plants and their use in medicine.

The composition of the syrup for the treatment of diseases of the upper respiratory tract included dry extracts of marshmallow root and licorice root.

Dry marshmallow root extract contains polysaccharides, mainly mucus. Aqueous extracts of marshmallow root have an expectorant and some analgesic effect, have coating, protective, emollient, anti-inflammatory properties, which makes the use of dry marshmallow root extract in the syrup formulation quite substantiated.

The expectorant properties of licorice root extract are associated with content of glycyrrhizic acid and flavone compounds, among of which liquiritoside is considered the most active. Presence of licorice in the formulation allows you to enhance the positive effect due to the additional anti-inflammatory, immunostimulating and detoxifying effects of its drugs.

The choice of dry extracts as intermediate products is due to their advantages: high content of active ingredients, stability of extracts, dosage accuracy, ease of use during production, storage and transportation.

The choice of the optimal combination of excipients, taking into account the characteristics of the phytocomposition, is one of the important stages in the development of syrups, based on their specificity as a dosage form with improved organoleptic characteristics.

One of the important stages in developing a syrup composition is the selection of the optimal sweetener (base). Sucrose was chosen as a sweetener for the syrup because its solutions have a pronounced sweetness, which makes it possible to correct the peculiar taste of plant extracts, and also have a high viscosity. In addition, sucrose is one of the available and cost-effective sweeteners.

In addition to sucrose, 0.05 g of citric acid was included in the syrup as a stabilizer and flavor enhancer. Based on literary information, to improve the microbiological purity of the syrup, the preservative sodium benzoate was chosen in the amount of 0.5 g.

Thus, the following composition of expectorant syrup was proposed (Table 1):

Table 1

Composition of syrup per 100 ml

Component	Quantity
Althea dry extract	1.0 g

Dry licorice extract	1.5 g
Citric acid	0.05 g
Sodium benzoate	0.5 g
Sugar syrup	Up to 100 ml

Development of technology for producing expectorant syrup

The specificity of the technology of the developed expectorant syrup is the introduction of dry extracts of thermopsis, licorice and marshmallow during the production process. In this regard, a very important factor is the selection of technological parameters for the process of dissolving ingredients.

Next, studies were carried out to clarify the solubility conditions. Variable parameters were the ratio of solvent and extract, dissolution time at a temperature of 40°C.

The following technological parameters were set:

- ratio “extract: water” - 1:1; 1:2; 1:3; 1:4; 1:5;
- dissolution time - 5 minutes, 10 minutes, 20 minutes, 30 minutes. The optimal conditions for dissolving all extracts turned out to be a 1:5 ratio, a dissolution time of 20 minutes, and a dissolution temperature of 40°C. When preparing a mixture of extracts according to the selected recipe and using experimentally selected dissolution conditions, the syrup production technology includes the following steps: weighing the ingredients, dissolving extracts and citric acid in purified water, preparing sugar syrup, introducing solutions of ingredients into sugar syrup, filtration.

Dissolution of marshmallow, licorice and thermopsis extracts, as well as citric acid, is carried out in a 5-fold volume of purified water at a temperature of 40°C, with constant stirring for 20 minutes.

To obtain sugar syrup, purified water is supplied to the syrup boiler. The water is heated to 50–60°C, after which, without stopping heating, the calculated amount of sugar is introduced with continuous stirring. Rotation speed of the anchor mixer is about 30-40 revolutions. After the sugar has completely dissolved, the solution is brought to a boil.

The cooking time should not exceed 30 minutes, since prolonged heating of the syrup can cause caramelization of the sugar, which will lead to yellowing or darkening of the syrup. The readiness of the syrup is determined by the concentration of sugar in it using a refractometer. The resulting syrup is filtered.

To the prepared and cooled to 40°C sugar syrup a preservative (sodium benzoate), previously dissolved in purified water in a ratio of 1:1 is added, while rotating the mixer at a speed of 50 rpm. Mixing is carried out for 20 minutes.

The introduction of the extract solution into the syrup is carried out at a temperature of 40°C with the stirrer rotating at a speed of 50 rpm. Mixing is carried out for 40 minutes.

The finished syrup is packaged in 100 ml bottles of orange glass, sealed with lids.

CONCLUSION

The composition has been substantiated and technologies for the production of expectorant syrup based on dry extracts of marshmallow and licorice have been developed.

The physicochemical and technological properties of dry extracts and excipients used in the development of syrup have been studied. Their quality was assessed.

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