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DEVELOPMENT OF A METHOD FOR DRYING ABOVE-GROUND PART OF PLANTS URTICADIOICA L, CRATAEGUSPONTICA L

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ABSTRACT

The work is the development of optimal conditions for drying and obtaining a dry extract of a biological active additive, which are contained in the composition of plants Urtica dioica L, *Crataeguspontica L. The parameters and modes of drying of the aqueous extract of the aerial parts of plants Urtica dioica L, Crataeguspontica L on the drying plant "Anhydro ", Which are as follows: the temperature of the coolant at the inlet is 160-180 0C, and at the outlet 75-90 0C, the solution supply rate is 6.66 l / h * m, the solution supply pressure is 0.2 MPa.*

KEYWORDS: *Aerial Part, Dry Extract, Substance, Extraction, Technology, Process, Experience.*

INTRODUCTION

*Urticadioica*is used in official and folk medicine as a hemostatic and vitamin remedy, and is used in homeopathy. Most often, nettle leaves are used in the form of an infusion; a liquid extract is also allowed for use. The leaves of *Urticadioica*, in addition to the rich complex of biologically active substances (flavonoids, vitamins, tannins, organic acids, etc.), contain a significant amount of calcium, which passes into liquid dosage forms, therefore, the infusion and liquid extract obtained from nettle raw materials can be considered as a possible source of calcium [1].

In folk and practical medicine, nettle preparations are widely used in the treatment of hypo- and avitaminosis. Preparations of stinging nettle leaves are successfully used in medical practice for various internal bleeding, uterine hemorrhoidal, gastric, and also externally for the treatment of chronic ulcers [2, 3].

The mineral components of the plant emphasize its therapeutic value and make it possible to use this species in the future for the complex creation of medicines. Medicinal plant raw materials intended for the production of phyto-preparations using various extraction methods and industrial or home conditions and preparations without preliminary extraction have been little studied in terms of their elemental composition [4].

Plants of the genus (*Crataegus Koch*.) are shrubs or small trees that have been used in medicine since ancient times. Today, hawthorn raw materials are used to obtain drugs for the treatment and prevention of heart failure [5]. Currently, herbal medicinal preparations are gaining increasing popularity and are used both in the treatment and prevention of various diseases [6, 7].

This is possibly due to the fact that herbal medicinal preparations have low toxicity with a sufficiently high efficiency, a wide range of therapeutic action, a complex effect on the human body with their rational use, as well as their relative cheapness in comparison with synthetic drugs [8].

In the course of studying the chemical composition of blood-red hawthorn leaves, a flavonoid substance - 7-O-β-D-glucopyranoside 5,7,3_1,5_1-tetrahydroxyflavanone - was isolated for the first time, which is a new natural compound. For the first time isolated and identified for hawthorn leaves: quercitrin, tripoline, 4-O-β-D-glucopyranosideof n-coumaric acid, 3-O-β-D-glucopyranoside ergosterol. In addition, during column chromatography, substances known for this plant were also isolated - vitexin, 2-O-rhamnoside of vitexin, hyperoside, caffeic acid and oleanolic acid. [9].

The authors studied (Raimova K.V , Abdulladjanova N.G, Kurbanova A., Makhmanov D.M, KadirovaSh.O, etc.) the chemical composition of *the Urtica dioica L*. plant growing in the mountainous regions of the republic and determined the following water-soluble vitamins: thiamine, riboflavin, pyridoxine , nicotinic acid and ascorbic acid, and the data obtained are compared with the literature data. And also a comparative analysis of the flavonoid composition of the aerial part of the *Urtica dioica* plant showed a difference from the literature data, which, in all likelihood, can explain the differences in soil and climatic conditions. Also, the study of the content of macro- and microelement composition of the aerial part of the plant *Urtica dioica*, collected in late spring and early summer, showed that it contains more than 25 elements of which 34% are essential, 21% are salts of heavy metals and 45% are other elements. The total protein content in the aerial part of the *Urtica dioica L* plant was 1.184%; in the aqueous extract of the *Urtica dioica L*. plant, 17 free amino acids were found with a total content of 0.086% [10].

The chemical composition of the plant *CrataegusponticaKoch* as the second object was investigated by the authors (Raimova, K. V., Matchanov, A. D., &Abdullajonova, N. G.). The following water-soluble vitamins were identified in the composition of the *Crataeguspontic* hawthorn plant: thiamine, riboflavin, nicotinic and ascorbic acids. The data obtained are compared with the literature data. The contents of the macro- and microelement composition of the aerial part of the plant *Crataeguspontica* . were also studied and it was shown that it contains more than 25 elements: of which the content of essential elements reaches up to 24%, of the total content of elements. The qualitative and quantitative composition of the polyphenols of the plant *Crataeguspontica* was studied, the chemical structures of individual polyphenols, such as catechin and epicatechin, were determined by the methods of BC and TLC, as well as by chromatography-mass spectrometry, the content of which depends on the time and period of collection. The total protein content in the aerial part of the plant, and in the *Crataeguspontica*plant is 0.425%. In the water extract of the *Crataegus*plant, 19 free amino acids with a total content of 0.25% were found [11].

Therefore, the development of a biologically active additive based on these plants, the study of drying technologies for plant extracts *Urtica dioica* L, *Crataeguspontica* is an urgent task.

The purpose of this work is to develop optimal conditions for drying and obtaining a dry extract of a biological active additive, which are contained in the composition of plants *Urtica dioica L*, *Crataeguspontica.*

Experimental part. Various drying methods were used to dry the aqueous extract from the aerial part of stinging nettle and common hawthorn. According to the research results, the spray dryer was identified as the most effective of them. At the same time, the factors influencing the drying process of the extract, such as temperature, solution feed rate and solution concentration, have been studied[12].

In order to obtain an aqueous extract, the aerial part of *Urtica dioica L* and hawthorn fruits were extracted three times with boiling water, the combined extract was concentrated and treated with extraction gasoline in order to remove lyophilic substances. The purified extract was concentrated and dried in various ways.

To obtain a dry extract from these plants, a ShSV-45K vacuum drying oven (Russia), an IKS-2M infrared dryer (Russia) and an Anhydro nozzle-type spray dryer (Denmark) were used.For each drying apparatus, the parameters of the extract drying are selected.

1. Vacuum drying cabinet: drying chamber temperature - 80-90 0C; vacuum - 0.6-0.8 kgf / cm2.

2. Infrared dryer: drying temperature - 75 0C;

3. Nozzle type spray dryer: coolant temperature at the inlet 160 0C, at the outlet 75 0C; solution feed rate – 6.66 l / h * m3; solution supply pressure - 0.2 MPa.

The extracts dried in a vacuum oven and an infrared dryer had the appearance of a resinous mass that was difficult to separate from the surface of the dryer. Whereas the spray dried extract had a powdery appearance. The mass fraction of dry matter in the obtained extract from the vacuum drying cabinet is 10%, from the infrared dryer – 12%, from the spray dryer - 15%. Based on the results obtained, it was determined that when drying nettle-hawthorn extract, the use of a spray dryer is optimal.

Next, we studied the parameters affecting the drying process on a spray dryer.

At the first stage, the temperature regime for drying the condensed extract was determined. For this, the condensed extract was dried at different temperature conditions, which are shown in Table 1. An increase in the temperature at the entrance to the drying chamber increases the productivity of the drying apparatus. On the other hand, a large increase in temperature can negatively affect the quality of the dried product. Therefore, the condensed extract was dried at a coolant temperature at the inlet in the range of 140-190 ° C. At temperatures below 140 ° C, the extract adhered to the walls of the dryer; at temperatures above 190 ° C, the product began to burn and large losses were observed.

TABLE 1 INFLUENCE OF THE TEMPERATURE REGIME OF DRYING ON THE QUALITY OF THE EXTRACT

Heatcarriertemperature, ^{0}C		Finalproductmoisture, %	The quality of the final product
at the entrance to the drying chamber	at the outlet of the drying chamber		
140	65±0,5	10,3±0,09	notacc.
150	70±0,5	5,8±0,04	notacc.
160	75±0,5	4,0±0,07	acc.
170	85±0,6	4,6±0,03	acc.
180	90±0,6	4,2±0,04	notacc.
190	95±0,6	3,0±0,03	notacc.

As can be seen from the data in Table 1, with an increase in the temperature of the coolant at the entrance to the drying chamber, along with an increase in drying performance, the final moisture content of the dried product decreases. Also, an increase in the temperature of the coolant at the inlet above 180 ° C leads to a decrease in the organoleptic characteristics of the finished product: there is an appearance of odor, deterioration of taste, color and, in general, the product loses its consumer qualities.

Based on the results of the process research, it was determined that the optimal temperature of the coolant is 160-170 ° C at the inlet and 75-85 ° C at the outlet.To determine the optimal feed rate of the initial solution, experiments were carried out at different feed rates of the solution using a Zalimp peristaltic pump (Poland). The results obtained are shown in Table 2, from which it can be seen that an increase in the feed rate of the aqueous extract leads to an increase in the productivity of the dryer.

TABLE 2 INFLUENCE OF THE SOLUTION FEED RATE ON THE DRYING PROCESS

Extract feed rate into the drying chamber, l / h	Heatcarriertemperature, ^{0}C		The moisture content of the final product,%
	at the entrance to the drying chamber	at the outlet of the drying chamber	
1	170	120±1,10	3,0±0,21
3		110±1,17	3,1±0,15
5		90±0,54	4,2±0,22
7		80±0,42	7,6±0,29

But when the water extract is supplied at a rate of more than 6 l / h, the extract dries poorly, and part of it adheres to the walls of the drying chamber, and the moisture content of the final product exceeds the permissible norm. Taking into account the above, to obtain a dry extract of thermopsis, the solution feed rate was chosen - 6 l / h, i.e. in terms of productivity per unit volume over time - 6.66 l / h * m3.

The degree of atomization of the solution by the nozzle in the drying chamber depends on the air pressure supplied to the spray nozzle. The optimum pressure ensures good drying of the solution in the chamber. For the experiments, the following pressure values were selected: 0.05; 0.1; 0.15; 0.2; 0.25 MPa.

The optimum pressure for feeding the solution into the nozzle was 0.2 MPa. At pressure values of 0.05; 0.1; The 0.15 mPa solution was poorly sprayed inside the dryer and the resulting product was wet. At 0.25 mPa, the solution adhered to the top wall of the dryer.

CONCLUSIONS: thus, we have determined the parameters and modes of drying of the aqueous extract of the aerial parts of plants Urtica dioica L, Crataeguspontica L on the Anhydro drying unit, which are as follows: coolant temperature at the inlet 160-180 ° C, outlet 75-90 ° C

solution feed rate - 6.66 l / h * m3

solution supply pressure - 0.2 MPa.

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