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DETERMINATION THE OPTIMAL CONDITION OF SELECTION POLYSACCHARIDES FROM PLANTS HELIANTHUS TUBEROSUS

Abstract. Helianthus tuberosus is a perennial plant of the family Compositae. According to valuable dietary properties, people's attention is attracted. Helianthus tuberosus is growing in all climatic regions. Helianthus tuberosus as a potatoes is growing at all the unfavorable regions of the country. Topinambur preparations are antiarthritis, anti-tuberculosis drugs, fibrinolytic agents that have antiarrhythmic activity. Topinambur juice has an antitumor effect of the stomach that helps restore gastric activity. In this article methods of complex isolation of polysaccharides from aboveground (flowers, leaves, stems) and underground (tubers) parts of plants of Helianthus tuberosus are considered. As a result of the research, optimal conditions for isolation of inulin, pectin substances, hemicellulose A and B were found.

Key words: Helianthus tuberosus, inulin, pectin substances, hemicellulose A and B, fraction, extraction.

Introduction. All over the world, as well as in Kazakhstan families of Compositae plants are widely used in technical and medical purposes. Families compositae plants are used in different industries.

The homeland of Helianthus tuberosus is North America. However, during this short period of time, it is the spread on the territory of the Republic of Kazakhstan for half a century; this plant is a great hope for the future of the population of the country[1].

Topinambur preparations are antiarthritis, anti-tuberculosis drugs, fibrinolytic agents that have antiarrhythmic activity. Topinambur juice has an antitumor effect of the stomach that helps restore gastric activity [2].

Helianthus tuberosus depends on sugars and physiologically active substances. When studying the chemical composition of Helianthus tuberosus varieties, it was found that the phase of plant growth, soil climate, agrotechnics, the total sugar content in Torinambur differs depends on the varieties in the regions. Helianthus tuberosus is a valuable and valuable food for humanity. At the same time, as a result of the biological and clinical study of Helianthus tuberosus, it was found that, as a drug-prophylactic product, it increases its activity against sugar and cholesterol [3].

The countries of the world are engaged in the production of sugars from Helianthus tuberosus, consisting of the basic fructose. In the chemical composition of Helianthus tuberosus, sugar is up to 6–12 g / ha. The yield of sugar from Helianthus tuberosus is much greater than from sugar beet and sugar cane. According to foreign researchers, Jerusalem artichoke is grew for the production of fructose and alcohol. Biofuels, drinks and juices are also prepared. It is also widely used in animal feeding [4].

Polysaccharides isolated from plants have immunological properties, activate humoral immunity and increase the level of immunoglobulin in the blood [5].

Therefore, the isolation of polysaccharides from comatose plants is one of the topical problems.

Purpose of the study: to develop the optimal conditions of the isolation polysaccharides from plants, Helianthus tuberosus.

EXPERIMENTAL PART

Object of investigation: plant Helianthus tuberosus (flower, leaves, leaves, fruits), collected from September to October 2015–2016 in Turksib district of Almaty and Karasai district of Almaty region.

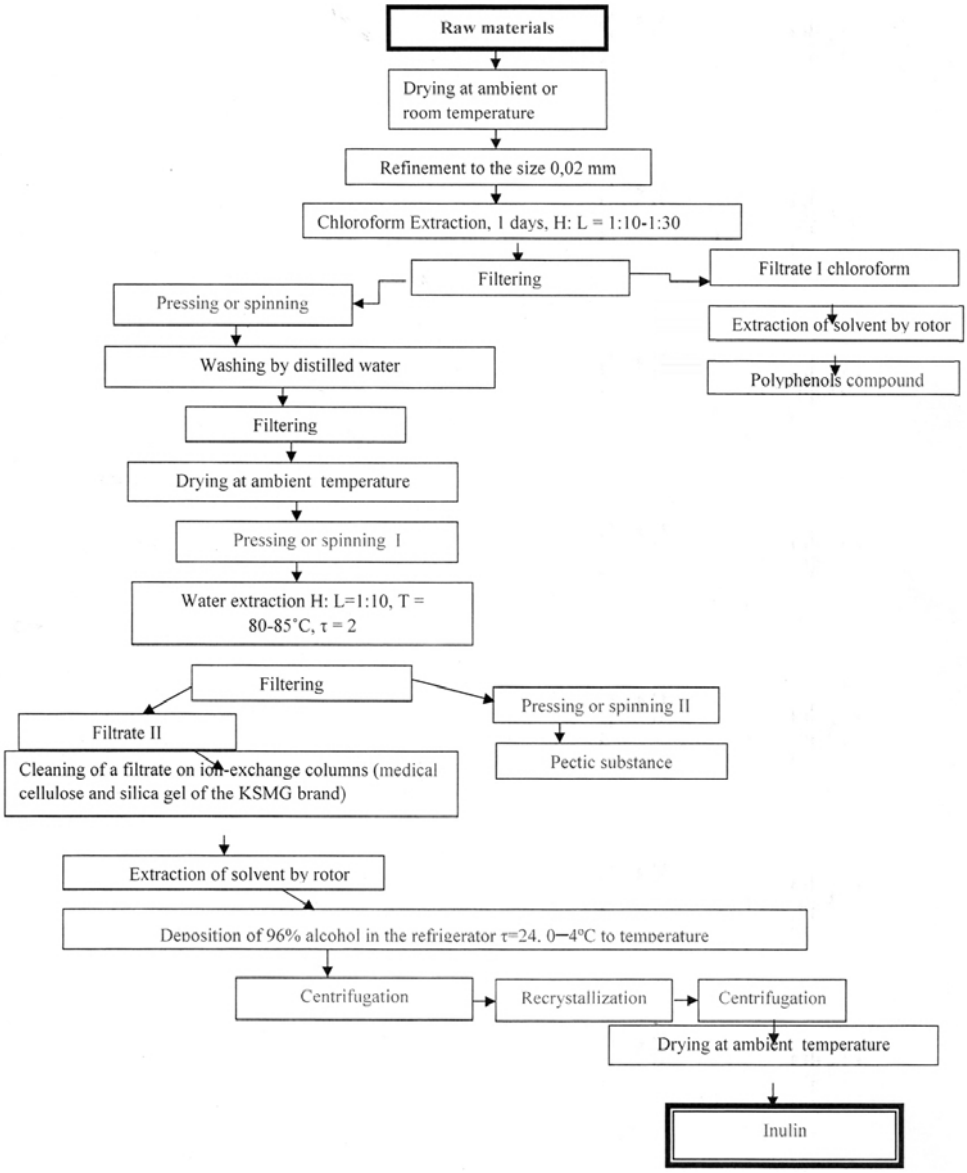
At isolation of biological active substances from the plant Helianthus tuberosus (flower, leaf, leaf, fruit) used Kochetkov's method "fractional highlighting of polysaccharides". According to this method, polysaccharides, pectin substances, hemocelluloses A and B were obtained from the aboveground and underground parts of the plant Helianthus tuberosus [6].

The mixture was filtered, the solution was evaporated to a volume of 1/5, and precipitated the resulting solution was 96% ethyl alcohol. The solution was left in a refrigerator at the temperature of 0–4 °C during 1 day. Then solution was centrifuged and obtained precipitate was dried and a dry mass was weighed.

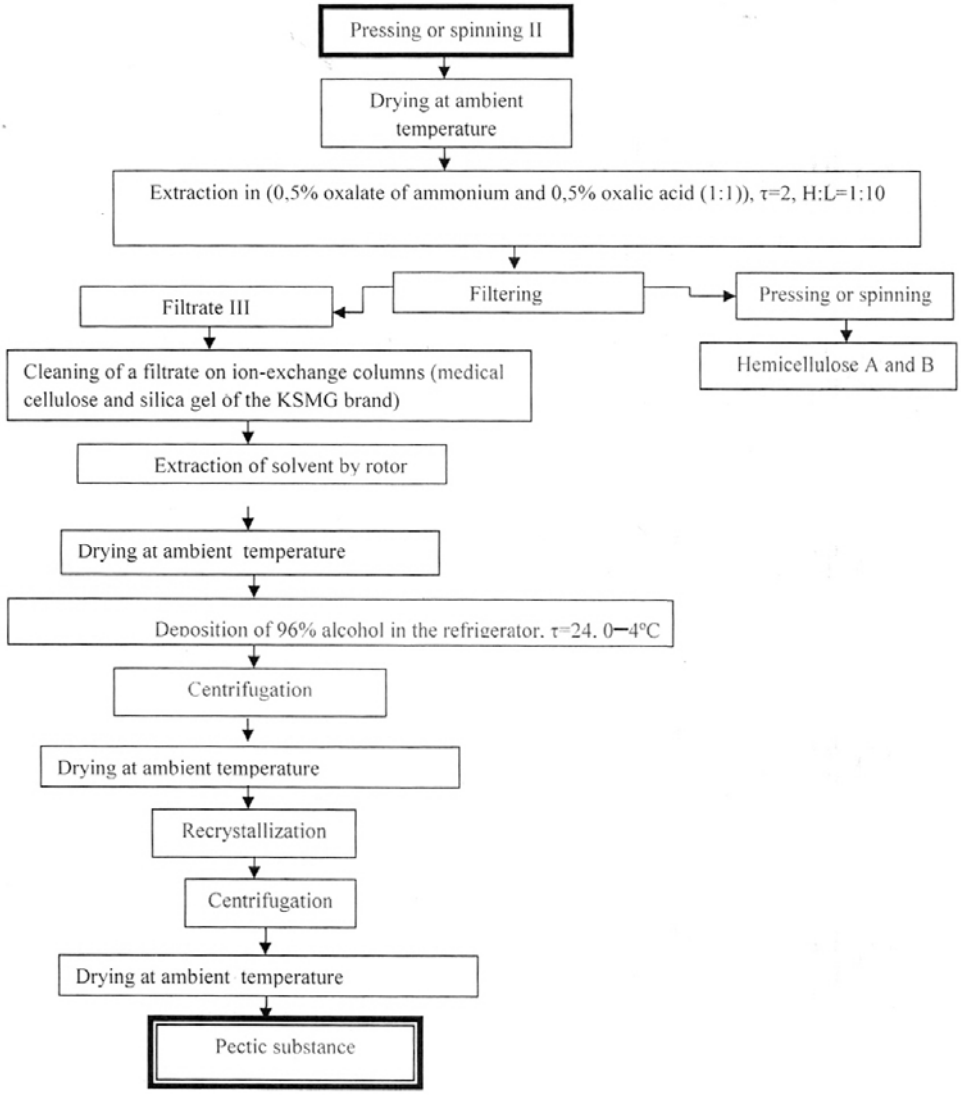
For allocation of pectin substances, molasses II was used. Extraction was carried out from molasses II by solution I (0.5% oxalic acid: 0.5% ammonium oxalate (1: 1)) at solid: liquid ratio equal to 1: 20 at 80–85ºC for 2.The mixture was filtered, the solution was evaporated to a volume of 1/5 and was precipitated by 96% ethyl alcohol. The solution was then centrifuged, the precipitate was dried, a dry mass was weighed.

To isolate hemicellulose A and B, molasses III was used.

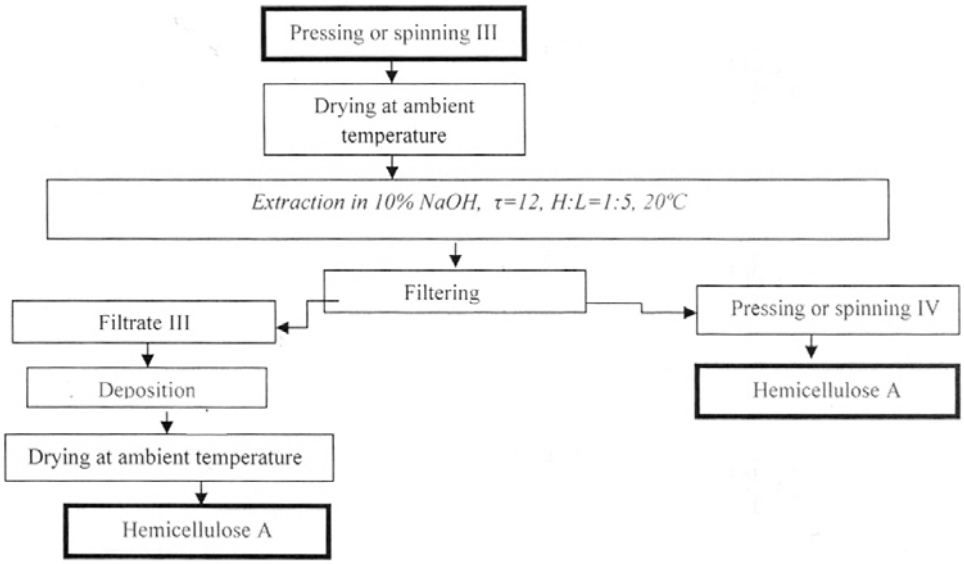
Hemicelluloses (HZ) A and B were extracted while keeping the cake III in 10% NaOH solution for 12 h at r.t. Acetic acid was used to precipitate HZ A. The precipitation was washed with 96% ethanol. The deposition of HZ B occurred when 96 % ethanol was added to the NaOH filtrate; the obtained precipitate was filtrate and washed with 96% ethanol. Then the solution was centrifuged, the precipitate was dried and the weight of the separated substance was weighed (scheme 1) [7].



Scheme 1 – Drawing version of polysaccharide (inulins) separation technology from Hellianthus tuberosus L.



Scheme 2 – Drawing version of polysaccharide (pectin compound) separation technology from Hellianthus tuberosus L.



Scheme 3 –Drawing version of polysaccharide (hemicellulose A and B) separation technology from Hellianthus tuberosus L.

The yield of polysaccharides isolated from the aboveground and underground part of Helianthus tuberosus, %

№	Raw material	Inulin	Pectin compounds	Heimicellulose A	Heimicellulose B
1	flower	3,8	3,6	10	45
1	leaf	6,8	11	35,4	6
2	frog	4,3	8,6	–	3,33
3	fruit	18	4,5	12	1,6

RESULTS AND DISCUSSION

Polysaccharides from the aboveground and underground parts of the plant Helianthus tuberosus were isolated by fractional methods. For purification from impurities, chloroform was used as an extractant. The outputs of the polysaccharide substances were as follows: more quantity inulin in stems is about 3.8%, pectin substance in leaves is 3.6%, hemicellulose A in leaves 35.4%, hemicellulose B in flowers 45%. A quantity of inulin in leaves is about 6.8%, a pectin substance in tubers is 11%, hemicellulose A in flowers is 6% (in stems not detected), hemicellulose B in tubers is 1.6%.

It was found that inulin presents in the aboveground and underground parts of the plant. A greater quantity pectin substance was found in leaves, in stems and in flowers, for example, Hemicellulose A in leaves, hemicellulose B in flowers.

Consequently, in the future, Helianthus tuberosus can be used in medicine, food industry, agriculture and requires further research are required.

Conclusion. The chemical analysis of various extraction of L. Helianthus tuberosus showed dependence on of chemical profile the applied method of extraction. According to the analysis it was found that the inulin is presented in all land and underground parts of Helianthus tuberosus. Pectin substance in larger quantity present in stalks, in bases, in tubers and in flowers. Therefore, in the future, Helianthus tuberosus can be used in medicine, in the food industry, agriculture and demands a further research. We suggest testing the activity of extracts isolated from different parts of the plant Heliantus tuberosus on eye diseases.

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Резюме

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HELIANTHUS TUBEROSUS ӨСІМДІГІНЕН
ПОЛИСАХАРИДТЕРДІ БӨЛУДІҢ ОҢТАЙЛЫ ЖАҒДАЙЫН АНЫҚТАУ

Мақалада Helianthus tuberosus өсімдігінің жерүсті бөлігінен (гүлі, жапырағы, сабағы) және жерасты бөлігенен (жемісі) полисахаридтердің бөліп алынуы жанжақты қаратырылған. Зерттеу нәтижесінде инулин, пектинді заттар, гемицеллюлоза А мен Б бөліп алдуың оңтайлы әдістері анықталған.

Түйін сөздер: Helianthus tuberosus, инулин, пектинді заттар, А және Б гемицеллюлоза, фракция, экстракция.

Резюме

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ОПРЕДЕЛЕНИЕ ОПТИМАЛЬНЫХ УСЛОВИЙ
ДЛЯ ВЫДЕЛЕНИЯ ПОЛИСАХАРИДОВ
ИЗ РАСТЕНИЙ HELIANTHUS TUBEROSUS

В статье рассмотрены методы комплексного выделения полисахаридов из надземной (цветы, листья, стебли) и подземной (клубни) частей растений Helianthus tuberosus. В результате определены оптимальные условия выделения инсулина, пектиновых веществ, гемицеллюлозы А и Б.

Ключевые слова: Helianthus tuberosus, инулин, пектиновые вещества, гемицеллюлоза А мен Б, фракция, экстракция.