THE MARKETING ANALYSIS OF MEDICINES CONTAINING INULIN AND PRESENTED AT THE PHARMACEUTICAL MARKET OF UKRAINE

RESEARCH GROUP:

Sakhatska Inna Mykhailivna
Candidate of Pharmaceutical Sciences, Senior Lecturer of the Department of pharmaceutical botany and pharmacognosy
Bukovinian State Medical University, Chernivtsi, Ukraine

Horoshko Oleksandra Marianivna
Candidate of Pharmaceutical Sciences, Associate Professor of the Department of pharmaceutical botany and pharmacognosy
Bukovinian State Medical University, Chernivtsi, Ukraine

Ezhned Mariia Akhmedivna
Assistant Professor of the Department of pharmaceutical botany and pharmacognosy
Bukovinian State Medical University, Chernivtsi, Ukraine

Matushchak Marta Romanivna
Assistant Professor of the Department of pharmaceutical botany and pharmacognosy
Bukovinian State Medical University, Chernivtsi, Ukraine

Summary. Medicines containing inulin and which are registered on the pharmaceutical market of Ukraine have been studied. A comparative analysis of drugs by characteristics: country of manufacture, dosage form, composition. It is proposed to carry out extensive information work among medical and pharmaceutical specialists regarding the use of inulin-containing phytoremedies.

Keywords: inulin, nutrition, pharmaceutical market, medicines, biologically active supplements, dosage form.

Topicality. Recently, there has been an increasing interest in the use of not only glucose-containing raw materials in human nutrition, but also unconventional plants containing fructose-, mannose-, arabinose-, and xylose-containing polysaccharides. This is due to the fact that a one-plan (glucose) approach to human carbohydrate nutrition is harmful.
Thus, from the results of the study, which was conducted in 195 countries from 1990 to 2017, it was proved that a poor high-carbohydrate diet more than smoking, high blood pressure and any other risk factor causes the greatest number of deaths worldwide. Every fifth death in the world occurs precisely because people do not eat healthy food. It is the nature of human nutrition that fully determines the functioning of all organs and systems, physical and psycho-emotional activity. In addition to mortality, poor nutrition affects the DALY (Disability-Adjusted Life Year). It is the number of years of healthy life lost as a result of illness or death. 255 million years of healthy life are lost due to poor nutrition, which is 16% of DALYs among adults worldwide [1].

It is more effective to use various complex polysaccharides in food, which are not hydrolyzed by enzymes of the gastrointestinal tract, but only by microorganisms of the large intestine and have a low glycemic index. The introduction of complex polysaccharides into the human diet has a positive effect on the functioning of the body as a whole and has recently been actively used for preventive nutrition in many diseases. It is complex polysaccharides that determine the physiological activity of many food additives [2].

The aim of the work is to conduct a marketing analysis of the assortment of medicines, which include inulin and which are registered on the pharmaceutical market of Ukraine, and to determine the prospects for their further use in medicine.

Materials and methods. The objects of the study were drugs containing inulin registered on the pharmaceutical market of Ukraine. The study was conducted on the basis of pharmacy chains in Chernivtsi, namely «Harmonia», «D.S.», «Liulia Pilulka», «Bazhaloimo zdorovia», «Podorozhnyk», «Italiana Farmacia Stasi». In addition, were also analyzed the online pharmacies «Dobroho dnia», «apteka 911», electronic resources: tabletki.ua, liki24, https://zt-zelena-apteka.com.ua/, https://fitoapteka-ua.com/, https://eco-goods.com.ua/, https://www.amrita.ua/, https://vitamins.in.ua/, https://ua.iherb.com/ etc. and data from the electronic directory «Compendium – drugs».

The research used methods of marketing analysis of the range of medicines and statistical processing of the obtained data.

Results and their discussion.

Inulin is one of the polysaccharides and components of a healthy diet that helps ensure the full functioning of our body, improves the health of the gastrointestinal tract, and has a low glycemic index. It was first discovered in 1804 in the roots of Inula helenium L., from which it got its name.

Inulin is a common reserve polysaccharide in nature, which is found only in plants of some families – Asteraceae, Liliaceae, Campanulaceae, Violaceae, and in some algae, bacteria Streptococcus mutans and others. It is contained in the cell sap of plants [3]. Its quantity depends on the season and climatic conditions. The maximum content of inulin was noted in autumn and winter.

It is found in large quantities in the underground organs of a number of plants: Arctium lappa L. (45%), Helianthus tuberosus L. (18%), Taraxacum officinale Weber (40%), Inula helenium L. (44%), plants of the genus Cichorium L. (up to 75%), Centaurea cyanus L. (40 %), Dahlia Cav (19-22%), Cynara scolymus L. (80%), Scorzoneria hispanicci L. (19%), as well as families Alliaceae – Allium sativum L. (16%),
Amaryllidáceae – Narcissus L., Hyacinthaceae – Hyacinthus, Asparagaceae – Polianthes tuberosa L., Agave tequilana L. (18%), Campanulaceae, Liliaceae, Lobeliaceae. Helianthus tuberosus L. and Cichorium intybus L. are mostly used for the industrial production of inulin in Ukraine and the CIS countries, and agave fruits are used in the USA [4].

Inulin, which is also called «vegetable insulin», is easily absorbed and is used in therapeutic and preventive nutrition to normalize carbohydrate metabolism and as an enterosorbent. It is also a raw material for the industrial production of fructose [3]. During the hydrolysis of inulin, fructose is formed – a carbohydrate from the group of monosaccharides (hexaatomic ketoalcohol), which can be recommended for feeding patients with diabetes, since its absorption is not accompanied by a significant increase in blood sugar [5]. Inulin prevents complications in diabetes, is also used in obesity, kidney disease, arthritis and other diseases. It has a positive effect on metabolism, strengthens the immune system, reduces the risk of cardiovascular and oncological diseases, promotes the assimilation of vitamins and minerals in the body, and also prevents the reproduction of salmonella and colibacteria.

Research in recent years has proven that inulin and its derivatives are able to remove heavy metal salts, poisons, radioactive substances (strontium and cobalt) from the body 2.5-3 times faster than pectin and other biologically active substances [5]. According to literature data, injectable inulin is used to diagnose kidney function, namely to measure the rate of glomerular filtration.

We conducted a marketing analysis of the range of medicines that contain inulin and are registered on the territory of Ukraine. According to the work carried out, 46 trade names in various dosage forms.

In the assortment of the studied pharmacies in Chernivtsi, mainly only biologically active supplements containing inulin (97.83%) were observed.

It should be noted that on the pharmaceutical market there are both single-component dietary supplements with inulin (13.04 %) and its combinations with other active components (86.96 %) (Fig. 1).
The main share in the production of inulin-containing drugs belongs to the domestic producer, which is 76.09%, while the share of imported producers is only 23.91%.

Studies of the pharmaceutical market in terms of the contribution of different dosage forms of release have shown that inulin-containing drugs are presented in different dosage forms (Fig. 2), among which solid predominate – tablets, capsules, powders and sachets (Fig. 3).

![Pie chart showing the ratio of inulin-containing drugs in solid and liquid dosage forms.](image)

**Fig. 2. The ratio of inulin-containing drugs in solid and liquid dosage forms**

![Bar chart showing the ratio of inulin-containing drugs in solid dosage forms.](image)

**Fig. 3. Ratio of inulin-containing drugs in solid dosage forms**

Medicines that contain inulin are most often used for comprehensive prevention and pharmacotherapy of non-insulin-dependent diabetes mellitus (type II), dysbacteriosis, atherosclerosis, as drugs to increase immunity.

In medical practice, medicines containing inulin are most often combined with pro- and prebiotics, medicinal plant raw materials, vitamins, amino acids, mineral supplements, sources of calcium and butyric acid.
**Conclusion.** Today, inulin is used in medical practice in complex therapy for the treatment of diabetes. The use of the product in the form of plant raw materials has a positive effect on the physiological and immune status of the body as a whole.

Inulin-containing drugs are represented by a considerable assortment of dosage forms, which will make it possible to approach the choice of medicines more individually, taking into account the state of the body and the concomitant history.

It is promising to carry out information work among medical and pharmaceutical specialists with this assortment for further implementation of sanitary and educational activities in medical institutions and pharmacies regarding the use of inulin-containing phytoremedies.

**References:**

[1] Yak kharchuvannia vplyvaie na smertnist i shcho mozhe zminyty kozhen dla svoho zdorovia. (2019). Retrieved from https://moz.gov.ua/article/health/jak-harchuvannja-vplivae-na-zdorovja-i-scho-mozhe-zm oriti-kozhen-dlya-svого- zdorovja.

[2] Bezusov, A.T., Pylypenko, I.V. & Srednytska, Z.Iu. (2009). Vyvchennia fermentatyvnykh system topinamburu dla otrymnia inulinu ta inulinopodibnykh rechovyn in vitro. *Naukovi pratsi*, (36, 2), 34-37.

[3] Kyslychenko, V.S., Zhuravel, I.O., Marchyshyn, S.M., Minarchenko, V.M., Khvorost, O.P. (2015). *Farmakohnoziia*. Kharkiv: Zoloti storinky, 736.

[4] Kichymasova, Ya. S.(2013). Perspektyvy poshuku inulinmisnykh roslin. *Funksionalni kharchovi produkty – dietychni dobovky – yak dii evyi zasib riznoplanovi profilaktyky zakhvoriuvan: proceeding I Mizhnarodnoi naukovo-praktychnoi konferentsii*. (121-122). 11-12 April, 2013, Kharkiv.

[5] Tsymbalista, Yu.A. (2015) *Porivnialne farmakohnostychne doslidzhennia predstavnykiv rodu Helianthus L.: soniashnyka odnorichnoho ta soniashnyka bulbystoho* (dys. ... kand. farm. nauk). Natsionalnyi medychnyi universytet imeni O.O. Bohomoltsia. Kyiv, Ukraine.