MACRO AND MICROELEMENTS OF THE *CYNARA SCOLYMUS* L. PLANT

Kh.Kh.Dolimov

Fergana medical institute of public health

ABSTRACT. The genus ***Cynara* L.** (artichoke) belongs to the Asteraceae family and comprises perennial plants, with 11 species identified. Among these, ***Cynara scolymus* L.** (commonly known as thorny artichoke) is noteworthy. To date, alcohol extracts and capsules derived from the artichoke plant have been widely used in medicine as remedies for liver and biliary tract diseases, reducing blood cholesterol levels, and treating conditions such as chronic hepatitis, chronic intoxication, and renal failure. A pharmaceutical product containing cynarin, a biologically active compound extracted from artichoke, has also been utilized to treat chronic cholecystitis, liver cirrhosis, and chronic nephritis. This article focuses on the study of the chemical composition of ***Cynara scolymus* L.**, specifically its macro- and microelements.

ANNOTATSIYA. ***Cynara* L.** (artishok) turkumi ***Asteraceae*** (qirqbo‘g‘imdo‘shlar) oilasiga mansub bo‘lib, ko‘p yillik o‘simliklardan tashkil topgan va 11 ta turi aniqlangan. Ular orasida ***Cynara scolymus* L.** (odatda tikanli artishok deb ataladi) alohida ahamiyatga ega. Hozirgi kunga kelib, artishok o‘simligidan olingan spirtli ekstraktlar va kapsulalar jigar va o‘t yo‘llari kasalliklarini davolash, qondagi xolesterin darajasini pasaytirish, shuningdek, surunkali gepatit, surunkali intoksikatsiya va buyrak yetishmovchiligi kabi holatlarni davolash uchun tibbiyotda keng qo‘llanilmoqda. Artishokdan ajratilgan biologik faol birikma – tsinarinni o‘z ichiga olgan farmatsevtik mahsulot surunkali xolesistit, jigar sirrozi va surunkali nefritni davolashda ham qo‘llaniladi. Ushbu maqolada ***Cynara scolymus* L.** ning kimyoviy tarkibi, xususan, makro va mikroelementlari o‘rganilgan.

АННОТАЦИЯ. Род ***Cynara* L.** (артишок) относится к семейству ***Asteraceae*** (астровые) и включает многолетние растения, из которых идентифицировано 11 видов. Среди них особого внимания заслуживает ***Cynara scolymus* L.** (обычно называемый колючим артишоком). На сегодняшний день спиртовые экстракты и капсулы, полученные из растения артишок, широко используются в медицине для лечения заболеваний печени и желчевыводящих путей, снижения уровня холестерина в крови, а также для лечения таких состояний, как хронический гепатит, хроническая интоксикация и почечная недостаточность. Фармацевтический препарат, содержащий биологически

ISSN 3030-3907

активное соединение цинарин, извлечённое из артишока, также применяется для лечения хронического холецистита, цирроза печени и хронического нефрита. В данной статье изучается химический состав ***Cynara scolymus* L.**, в частности, его макро- и микроэлементы.

INTRODUCTION

The artichoke is native to Mediterranean countries [1]. Wild varieties are found in the Canary Islands and the northern regions of Africa, while cultivated varieties are commonly grown in European and southern countries. In the CIS (Commonwealth of Independent States), artichoke cultivation is very limited [2]. Currently, ***Cynara scolymus* L.** is widely grown as a perennial plant in regions with a moderate subtropical climate, such as Transcaucasia and areas around the Black Sea. The artichoke blooms between July and October. Ethiopia is considered the native land of artichokes, from where it spread to Egypt and subsequently throughout Europe, particularly in Mediterranean countries [3]. Currently, artichokes are widely cultivated in countries such as Italy, France, Germany, Algeria, Iran, India, Sri Lanka, Japan, the United States, and Brazil. In Russia, the artichoke was introduced 300 years ago. Today, it is primarily grown as a perennial plant in the southern regions, while in the central regions, it is cultivated as an annual plant in greenhouses, with seedlings prepared in advance[4]. Extensive research has shown that ***Cynara scolymus* L.** contains various compounds in its different parts, including flavonoids, phenolic compounds, saponins, sesquiterpene glycosides, and fatty acids. These phytochemicals play a significant role in the plant's medicinal properties[5]. The primary secondary metabolites identified in the plant include: Cynarin (1,3-di-O-caffeoylquinic acid), luteolin, cynaroside (luteolin-7-O-glucoside), scolimoside (luteolin-7-rutinoside), caffeic acid derivatives, coumarins, hydroxycinnamic acid, ferulic acid, and chlorogenic acid derivatives. Including chlorogenic acid and its derivatives[6].

METHOD

To determine the macro- and microelements in ***Cynara scolymus* L.**, a sample weighing precisely **0.1000 g** was prepared and placed into Teflon autoclaves. The sample was treated with **3 ml of purified concentrated nitric acid (HNO_3)** and **2 ml of purified hydrogen peroxide (H_2O_2)**. The autoclave was sealed and placed into a microwave digestion system, such as the **Berghof Speed Wave Xpert**, or a similar microwave device. The device's interface was programmed according to specific settings for digestion. During the digestion process, the system automatically controlled and monitored the number of autoclaves, as well as the

ISSN 3030-3907

internal temperature and pressure. The real-time parameters were displayed on a liquid-crystal display. The digestion was conducted under the following conditions: **Temperature range**: minimum 50°C to maximum 230°C. **Pressure**: Up to 40 bar. **Duration**: 35-45 minutes. After digestion, the autoclaves were cooled to room temperature, and the liquid contents were quantitatively transferred to volumetric flasks (50 ml or 100 ml capacity). The autoclaves were rinsed 2-3 times, and the rinsing liquid was added to the flasks. The flasks were then filled to the calibration mark with double-distilled water. The solutions were mixed thoroughly and transferred into autosampler tubes, which were placed in designated positions in the autosampler. In the software, the position of each tube, the initial sample mass, and the dilution factor were entered to ensure automated calculation of concentrations. The mineralized solutions were analyzed using an **ICP-OES (Inductively Coupled Plasma Optical Emission Spectrometer)**, such as the **PerkinElmer Avio-200**, or an equivalent device. The instrument quantified the levels of macro- and microelements, heavy metals, and rare metals in the samples. The analysis was performed relative to a standard solution with known element concentrations. At the end of the process, the instrument automatically calculated the results, including the sample's element concentrations, measurement accuracy, and relative standard deviation (RSD). These results provided a quantitative assessment of the elements present in the sample.

RESULTS

The amounts of macro and microelements identified in the root, leaf, and stem of *Cynara scolymus* L. plant. It is known that macro and microelements, like vitamins, act as coenzymes in the biochemical processes occurring in the organism. Even a small deficiency of macro and microelements can lead to significant pathological processes, such as iodine deficiency, which results in decreased thyroid gland activity. Therefore, the qualitative and quantitative study of macro and microelements, as well as heavy metals, in the tested plant is of great importance, as it can serve as a basis for developing medicinal products and biologically active additives. In the stem, leaf and root part of *Cynara scolymus* L. plant samples, 7 macroelements and 28 microelements were identified, with the amounts of Sr, Ti, B, and Fe being relatively higher (Table 1).

Table 1

The amounts of macro elements in the stem, leaf and root of* Cynara scolymus L. *plant (mg/kg)

№	Macro elements	steam	leaf	root

ISSN 3030-3907

1	Na	209.981	248.552	1583.098
2	Mg	1657.376	3252.808	1898.458
3	Al	9.778	22.521	661.126
4	Si	706.637	2017.423	2613.168
5	P	2394.210	11847.291	3355.262
6	K	7856.018	18575.198	10806.038
7	Ca	1454.261	3032.463	1507.026

Table 2

Amounts of microelements in the leaves,root and steam of* Cynara scolymus L. *plant (mg/kg)

№	Micro elements	steam	root	leaf
1	Ge	0.000	0.001	0.000
2	As	0.026	0.122	0.333
3	Se	2.444	0.014	0.081
4	Sn	0.006	0.120	0.065

ISSN 3030-3907

5	Sr	0.036	2.240	1.944
6	Zr	0.001	0.016	0.028
7	Nb	0.098	0.002	0.000
8	Mo	0.000	0.115	0.066
9	Ag	0.000	0.014	0.001
10	Rb	0.248	0.194	0.198
11	In	0.001	0.000	0.000
12	Cs	0.000	0.002	0.000
13	Ba	0.000	0.423	0.474
14	Ta	0.000	0.001	0.001
15	W	21.346	0.001	0.004
16	Re	0.005	0.000	0.003
17	B	2.444	7.463	36.458
18	Tl	0.505	0.001	0.001
19	Be	0.009	0.007	0.008

ISSN 3030-3907

20	Li	0.086	0.619	2.158
21	Ti	0.061	1.847	41.639
22	V	0.731	0.329	0.024
23	Ga	0.066	0.001	0.119
24	Mn	0.031	0.335	2.583
25	Co	0.004	0.045	0.037
26	Ni	4.998	0.206	0.178
27	Cu	0.067	0.508	0.149
28	Zn	0.273	1.860	1.171
29	Ga	0.000	219.203	0.119
30	Fe	80.256	0.496	178.369

In the plant leaves,steam and root a total of 29 different microelements were identified. Among the identified microelements, the amounts of Sr, Ti, B, Zn, and Fe were found to be higher compared to others (Table 2).

Table-3

The amount of heavy metals in the stem, leaves, and roots of *Cynara scolymus* L. (mg/kg)

No	Heavy metals	stem	leaf	root

ISSN 3030-3907

1	Cd	0.001	0.001	0.003
2	Sb	0.001	0.003	0.002
3	Hg	0.005	0.002	0.004
4	Pb	0.017	0.018	0.012
5	Bi	0.001	0.001	0.001
6	U	0.001	0.001	0.003

It was determined that the plant's stem, leaves, and roots contain 6 types of heavy metals, with differences in their quantities, and the amount of heavy metals is low (Table 3).

DISCUSSION

Artichoke (Cynara scolymus) is a nutrient-rich plant with a diverse composition of macro and microelements essential for health. Its **macroelements** (potassium, phosphorus, calcium, magnesium) play a key role in strengthening the skeletal and muscular systems, supporting cardiovascular health, and aiding in energy production. The **microelements** (iron, zinc, copper, manganese, selenium) are crucial for boosting immunity, improving blood composition, providing antioxidant protection, and regulating enzymatic processes.

REFERENCE

1. Speroni E, Cervellati R, Govoni P, Guizzardi S, Renzulli C, Guerra MC. Efficacy of different Cynara scolymus preparations on liver complaints. Journal of ethnopharmacology. 2003 Jun 1;86(2-3):203-11.

2. Wang M, Simon JE, Aviles IF, He K, Zheng QY, Tadmor Y. Analysis of antioxidative phenolic compounds in artichoke (Cynara scolymus L.). Journal of agricultural and Food Chemistry. 2003 Jan 29;51(3):601-8.

ISSN 3030-3907

3. Nateghi R, Samadi F, Ganji F, Zerehdaran S. Hepatoprotective effects of Cynara scolymus L. extract on CCl_4 induced liver injury in broiler chickens. International Journal of AgriScience. 2013;3(9):678-88.

4. Llorach R, Espin JC, Tomas-Barberan FA, Ferreres F. Artichoke (Cynara scolymus L.) byproducts as a potential source of health-promoting antioxidant phenolics. Journal of agricultural and food chemistry. 2002 Jun 5;50(12):3458-64.

5. Lattanzio V, Kroon PA, Linsalata V, Cardinali A. Globe artichoke: A functional food and source of nutraceutical ingredients. Journal of functional foods. 2009 Apr 1;1(2):131-44.

6. Pandino G, Lombardo S, Mauromicale G, Williamson G. Profile of polyphenols and phenolic acids in bracts and receptacles of globe artichoke (Cynara cardunculus var. scolymus) germplasm. Journal of food composition and analysis. 2011 Mar 1;24(2):148-53.

ISSN 3030-3907