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## The Study of Micro- and Macroelements Composition of Quince (*Cydonia Oblonga*) Plant Material.

Moeen F Dababneh<sup>1</sup>, Uliana V Grinenko<sup>2\*</sup>, Nayef S Almuaikeel<sup>3</sup> and Iryna O Zhuravel<sup>2</sup>.

<sup>1</sup>Department of Pharmacognosy, Faculty of Pharmacy, Aljouf University, Kingdom of Saudi Arabia.

<sup>2</sup>Department of Chemistry of Natural Compounds, National University of Pharmacy, Kharkov, Ukraine.

<sup>3</sup>Department of Medicinal Chemistry, Pharmacy College, AlJouf University, Kingdom of Saudi Arabia.

### ABSTRACT

Quince is widely used in traditional medicine. But a great amount of quince varieties are used for parks and backyard landscaping. The element composition of the quince plant material was determined by the means of atomic-absorption spectroscopy. 19 elements, 5 of which were present in trace amounts, were determined as a result of the study. On quantitative comparing of element composition the high content of potassium and calcium in all the samples studied should be mentioned. Beyond that, the quince leaf was found to have the highest element content. Silicon, magnesium and phosphorus were identified in sufficient amount in the latter. The quince fruit peel and fruit flesh tend to accumulate elements in significantly smaller quantity.

**Keywords:** micro- and macroelements, quince, atom-emission spectroscopy

*\*Corresponding author*

## INTRODUCTION

A great amount of biologically active compounds gets to the human body along with food daily [1]. Regular functioning of the body is impossible without micro- and macro elements, vitamins, lipids. Thus, the search of novel sources of plant-derived biologically active compounds for the prevention of nutrients' deficiency in the human body is relevant nowadays. The biological role of elements in physiological processes of the body is very complex. Macro elements play a role of flexible material in tissue formation, maintain the osmotic pressure, pH of the media, ionic and acid-base equilibrium. Microelements as a component of enzymes, hormones, vitamins and other biologically active compounds take part in the reproduction and growth processes, as well as metabolism of proteins, lipids and carbohydrates. Macro- and microelements such as calcium, fluorine, phosphorus, aluminum, silicon promote the formation of bone and tooth tissues [2].

Quince (*Cydonia oblonga* Mill.) is the only *Cydonia* genus representative of the Rosaceae family, Maloideae subfamily. The plant is widely used in traditional medicine as an appetite and digestion stimulant, possessing emollient, gastro protective and antimicrobial activity [3]. Besides, some quince varieties are used for parks and backyard landscaping [4].

The **purpose** of our work was to determine the element composition of quince leaves, fruit flesh, seeds and fruit peel.

## EXPERIMENTAL

The quince leaves, fruit flesh, seeds, and fruit peel were chosen as the objects of the study. The leaves and fruits were collected in Kharkiv region, Ukraine, in 2015–2016.

The qualitative composition and quantitative content of elements were determined using the atomic emission spectroscopy method at the laboratory of analytical chemistry of functional materials and environmental objects of the STC "Institute for Single Crystals", National Academy of Sciences of Ukraine (Kharkiv) using the CAS-120 device, manufacturing group "Electron" by atomization in air-acetylene flame. Analytical parameters were the following: pressure – 0,4 kg/cm<sup>2</sup>, flame temperature – 2250°C. The plant material samples were pretreated with diluted sulfuric acid with further carbonization in a muffle furnace under the temperature 500°C and evaporation from graphite electrode craters in AC arc discharge at 16 A current and 60 sec exposure. Registration of the studied and standard samples was carried out by DFS-8 spectrograph, estimation of the line intensity in the spectra – by micro photometer MPh-1. The calibration plots were built using the standard samples of metals' salts solutions (ICOMP-23-27). RSD for 5 measurements did not exceed 30 % on determination of numeric values of the elements concentration [5].

The results of determination of the macro- and microelement composition are given in the Table 1.

**Table 1: The content of macro- and microelements in quince plant material**

The element content, mg/100g	Sample			
	Quince leaves	Quince fruit flesh	Quince seeds	Quince fruit peel
Fe	70.00	0.60	3.40	1.20
Si	690.00	12.60	17.00	12.00
P	145.00	21.00	135.00	30.00
Al	86.00	25.00	0.70	2.00
Mn	6.40	0.05	0.12	0.12
Mg	260.00	73.50	135.00	75.00
Pb	0.08	0.04	<0.03	<0.03
Ni	0.08	<0.03	0.05	<0.03

Ca	770.00	170.00	270.00	175.00
Cu	0.43	0.26	0.85	0.40
Zn	8.60	2.10	6.80	1.20
Na	45.00	21.00	17.00	20.00
K	2150.00	630.00	1020.00	875.00
Sr	5.10	0.30	0.70	0.25

Note. The samples studied contained Co <0.03; Cd <0.01; As <0.01; Hg <0.01; Mo <0.03 each.

## RESULTS AND DISCUSSION

19 elements, 5 of which were found in trace amounts, were determined as a result of the study. When comparing the element composition of all the samples, the presence of high amount of potassium and calcium was determined. But taking into account the content of other micro- and macro elements in the parts of the plant studied, attention should be drawn to the leaves. They contain high amount of silicon, magnesium, phosphorus and iron. The content of sodium, zink and manganese was slightly lower. Lead and nickel were found in trace amount.

The quince seeds contain a fair number of micro- and macro elements as well. They contain phosphorus, magnesium, sodium and silicon, while zink, iron and manganese are found in much less amount. They also contain small quantity of lead and nickel.

The elements are accumulated in significantly lower quantity in the fruit flesh and peels. Only the content of aluminum in the fruit flesh was much higher than in the quince fruit peel. Both types of the plant material contained magnesium, phosphorus, sodium and silicon in slightly lower quantity. Lead, nickel, copper and strontium were detected in the least quantity.

After comparison of the element composition of all the quince plant material samples it can be assumed that the quince leaves are the richest in microelements. The content of mineral elements was somewhat lower in quince fruit flesh and peel.

The content of the sum of heavy metals in all the plant material samples was within the maximum permissible limits for crude drugs and food products [6, 7].

## CONCLUSION

1. The study of mineral composition of quince leaves, fruit flesh, seeds and fruit peel was carried out using the atomic emission spectroscopy which allowed determining the presence of 19 elements, 5 of which were found in trace amount. Potassium, calcium and silicon were accumulated in the highest quantity in all the plant material samples.
2. The heavy metals content in all the plant material samples was within the maximum permissible limits.
3. The experimental data obtained will be used in standardization parameters development for the plant material – quince fruits and leaves.

## REFERENCES

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