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Research Article

ICP-AES, ICP-MS DETERMINATION OF ELEMENTAL ANALYSIS OF AERIAL PARTS AND ROOTS OF *IRIS PERSICA* L. COLLECTED IN KURDISTAN REGION/IRAQ

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ABSTRACT

The present study includes the estimation of elements in the arial parts and roots of *Iris persica* L. (Iridaceae), collected in Kurdistan Region-Iraq, which is uses by Local people as a treatment of wound inflammation and tumor by using the ICP-AES/ICP-MS techniques for the first time. ICP-AES technique is one of the most powerful and quick multi elemental analysis with high sensitivity. 65 elements Au, Pd, Pt, Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, K, La, Li, Lu, Mg, Mn, Mo, Na, Nb, Nd, Ni, P, Pb, Pr, Rb, Re, S, Sb, Sc, Se, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn, Zr were screened.The content of Manganese and Zinc was highest and least respectively among elements. In case of minor elements, the content of manganese and chromium was highest and least, respectively.The elements present in the medicinal plant plays an important role in the treatment of diseases.

Keywords: *Iris persica*, Elemental analysis, ICP-AES/ICP-MS.

INTRODUCTION

The medicinal efficacy of the plants are accounted for their organic constituents like flavonoids, alkaloids, essential oils, vitamins, glycosides, etc., present in them and little attention has been given to their inorganic constituents[1]. Excess doses or prolonged intake of medicinal plants can lead to accumulation of trace elements which can cause various health problems[2]. Heavy metal elements are naturally present in the environment. Occurrence of these heavy metal elements has been increasing with the increasing industrialization. Agricultural soils, as an essential part of the environment, are no exception of this phenomenon[3]. Additional sources of heavy metal contamination are rainfall, atmospheric dust, plant protective agents and fertilizers[4,5].

Mineral elements are inorganic substances found in all tissue of the body of fluids[6].

The human beings require both metallic and nonmetallic elements within certain permissible limits for growth and good health[7]. Analyzing the elemental composition in foods and related medicinal products is therefore very important for understanding their nutritive and medicinal value. These mineral elements may be broadly classified as macro (major) or micro (minor) elements based on their daily requirement[8].

To determine the contents of the herbs, medicinal or aromatic plants and tea leaves from many parts of the world, various techniques such as Flame Atomic Absorption Spectrometry (FAAS), Electrothermal Atomic Absorption Spectrometry (ETAAS), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) were used[9,10]. ICP-MS offers the advantages of high sensitivity and simultaneous multi element analysis capability. Furthermore, some commonelements such as K, Na and P are essential for health andthe quantification of these elements is important for nutritional purposes[11].

The genus *Iris* (Iridaceae) comprises over 300 species[12]; most of them have medicinal importance and are used for the treatment of cancer, inflammation, bacterial and viral infections, among other diseases[13]. Moreover, a plethora of bioactive metabolites have been isolated[14].*Irispersica* L.is a plant belonging to the Iridaceae family and is widely distributed in Kurdistan region-Iraq[15]. Prior to the initiation of this work, no study appears to have been carried out on determination of elemental analysis from the aerial parts and roots of *I. persica*.

MATERIALS AND METHODS

Plant material

Iris persica L. was collected in April 2014 from (Korek Mountain) in the Kurdistan region/IRAQ. The plant was identified by two botanists Prof.Dr. A. H. Al-khayyat and Dr. Abdullah Sh. Sardar at the Biology Department, College of Education, Salahaddin University-Erbil/Iraq. A voucher specimen (No. 7229) was deposited at Education Salahaddin University Herbarium (ESUH), Kurdistan. The plant raw materials were air dried under shade place at room temperature. After drying, the plant parts were grounded in to fine powder using a laboratory grinding mill, to provide homogeneous powder for the analysis. Powdered materials were stored in bottles in a dark room temperature until required.

Estimation of elements

Prepared dried plant sample (1.0g) is cold digested for approximately 8 hours in nitric acid**,** samples are then heated gradually up to 115 degree Celsius for approximately 2.5 hours**.** Samples are subsequently cooled and brought up to volume with hydrochloric acid Resulting solutions are mixed thoroughly and analysed by ICP-AES (Agilent 725-ES Radial) and ICP-MS (Agilent 7700x). Analytical results are corrected for inter-element spectral interferences.

Setting parameters; Power [kW] 1.2, Plasma flow [l/min]15, Auxiliary flow [l/min]1.50, Nebulizer flow [l/min] 0.85, Nebulizer Cyclonic type, Replicate read time [s] 10, Number of replicates 3, Instrument stabilization delay [s] 30, Rinse time [s] 60, Sample uptake delay [s] 10, Pump rate [rpm] 15.

RESULT AND DISCUSSION

For ensuring the purity, safety and efficacy of herbal products, determination of the elemental contents in medicinal plants should be a part of the quality control process[16].

In the present study we found the Au, Pd, Pt, Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Gd, Ge, Hf, Hg, Ho, In, K, La, Li, Lu, Mg, Mn, Mo, Na, Nb, Nd, Ni, P, Pb, Pr, Rb, Re, S, Sb, Sc, Se, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn, Zr elements in varying concentrations by applying ICP-AES/ICP-MS technique. Minor, Major and heavy metal elemental content from aerial parts and roots of *I.persica* are presented in Table 1.

The results showed that the two powder (arial part and root) samples both contained many elements (AI, Ca, Co, Cr, Fe, Mg, Mn, Mo, Ni, P, Se, Sr, V and Zn) which are necessary to human health. Besides the wholesome elements, the contents of heavy metals (As, Cd, Cu, Hg and Pb) are also the important standard to identify the quality of the plant.

The proposed ICP-MS/ICP-AES has been proved to be a quick and sensitive method for the detection of various elements in the kurdish medicinal plant *I. persica*. ICP-MS made it possible to determine elements (As, Cd, Cu, Hg, Pb, AI, Co, Cr, Mn, Mo, Ni, Se, V and Zn) with high precision and accuracy. Meanwhile, the use of ICP-AES is an appropriate choice for the determination of elements (Ca, Fe, Mg, P, and Sr) with the concentrations usually at the percentage level because no further dilution of the sample solution is needed.

By comparing the total contents of the 65 elements in two *I. persica* samples from arial part and root, we found that the distribution tendency of elements in the two samples was similar, indicating that the plant might absorb given elements in a proportional way.

CONCLUSION

Determination of elemental analysis of arial parts and roots of *Iris persica* L. which collected from Kurdistan region/Iraq by using the ICP-AES/ ICP-MS technique for the first time. The results obtained in the ICP-AES analysis of arial parts and roots of *Iris persica* showed the presence of essential elements that could enhance the curative process of ill health.

Table 1: Minor, Major and heavy metal elemental content of *Iris persica* aerial parts and roots in ppm, LOD; Limit of detection in ppm

Elements	symbol	LOD	A.P	Root
Aurum	Au	0.0002	0.009	0.009
Palladium	Pd	0.001	0.001	0.001
Platinum	Pt	0.001	0.001	0.001
Silver	Ag	0.001	0.01	0.028
Aluminum	Al	0.01	0.2	0.08
Arsenic	As	0.05	1.17	0.61
Boron	B	10	20	10
Barium	Ba	0.1	7.6	4.1
Beryllium	Be	0.01	0.07	0.04
Bismuth	Bi	0.001	0.049	0.063
Calcium	Ca	0.01	0.62	1.04
Cadmium	Cd	0.002	0.377	0.655
Cerium	Ce	0.003	2.32	0.918
Cobalt	Co	0.002	1.275	0.5
Chromium	Cr	0.5	8.2	4.6
Cesium	Cs	0.005	0.154	0.066
Copper	Cu	0.01	10.5	4.38
Dysprosium	Dy	0.005	0.168	0.062
Erbium	Er	0.003	0.081	0.032
Europium	Eu	0.003	0.047	0.017
Iron	Fe	0.001	0.203	0.08
Gallium	Ga	0.01	0.48	0.2
Gadolinium	Gd	0.005	0.195	0.075
Germanium	Ge	0.005	0.039	0.029
Hafnium	Hf	0.002	0.029	0.024
Mercury	Hg	0.001	0.004	0.011
Holmium	Ho	0.001	0.03	0.012
Indium	In	0.005	0.005	0.005
Potassium	K	0.01	2.01	1.44
Lanthanum	La	0.002	1.04	0.392
Lithium	Li	0.1	1.6	0.7
Lutetium	Lu	0.001	0.01	0.003
Magnesium	Mg	0.001	0.31	0.146
Manganese	Mn	1	64	25
Molybdenum	Mo	0.01	0.31	0.17
Sodium	Na	0.001	0.046	0.05
Niobium	Nb	0.002	0.138	0.123
Neodymium	Nd	0.001	1.14	0.443
Nickel	Ni	0.04	9.41	3.8
Phosphorus	P	0.001	0.285	0.206
Lead	Pb	0.01	1.38	0.85
Praseodymium	Pr	0.003	0.28	0.107
Rubidium	Rb	0.01	6.35	2.73
Rhenium	Re	0.001	0.001	0.001
Sulfur	S	0.01	0.27	0.11
Antimony	Sb	0.02	0.11	0.11
Scandium	Sc	0.01	0.27	0.13
Selenium	Se	0.1	0.1	0.1
Samarium	Sm	0.003	0.262	0.102
Tin	Sn	0.01	0.07	0.02
Strontium	Sr	0.02	5.24	14.85
Tantalum	Ta	0.005	0.005	0.008
Terbium	Tb	0.001	0.029	0.011
Tellurium	Te	0.02	0.02	0.02
Thorium	Th	0.002	0.12	0.062
Titanium	Ti	0.001	0.003	0.001
Thallium	Tl	0.002	0.023	0.017
Thulium	Tm	0.001	0.011	0.005
Uranium	U	0.005	0.067	0.033
Vanadium	V	1	4	2
Tungsten	W	0.01	24.09	7.85
Yttrium	Y	0.003	0.918	0.342
Ytterbium	Yb	0.003	0.067	0.025
Zink	Zn	0.1	38.4	23.1
Zirconium	Zr	0.02	0.92	0.68
Aurum	Au	0.0002	0.009	0.009

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