Research article
Curr. Pers. MAPs, (2020); 3(1): 8-17

Current Perspectives on Medicinal and Aromatic Plants

An International Journal
ISSN: 2619-9645 | e-ISSN: 2667-5722

Analysis of Mineral Compound of Plant *Anthemis pseudocotula* Boiss with Different Solvents by Ion Chromatography

Holem H. BALAKY[1*], Eyyüp KARAOĞUL[2], Ertuğrul ALTUNTAŞ[3], Alaa Taha Younis HAMMADI[4], Ali Mala Khedir GALALAEY[5], Mehmet Hakkı ALMA[6]

[*1] General Science Department, Faculty of Education, Soran University, Erbil, Kurdistan-Iraq.
[2] Department of Food Engineering, Harran University, Sanliurfa-Turkey.
[3] Kahramanmaras Sutcu Imam University, Forest Faculty, Forest Industry Engineering, Kahramanmaras-Turkey.
[4] Department of Biology, College of Education, University of Mosul-Iraq
[5] College of Agriculture Engineering Sciences, University of Salahaddin, Erbil-Iraq.
[6] Kahramanmaraş Sütçü İmam University, Department of Bioengineering and Sciences, Kahramanmaras-Turkey
*Corresponding author : holem86@gmail.com

https://doi.org/10.38093/cupmap.680033

Received : 25/01/2020
Accepted : 05/04/2020

Abstract

This aim of this study was to determine the mineral contents in the plant of *anthemis pseudocotula boiss* with several solvents by Ion Chromatography , that the plant *Anthemis pseudocotula Boiss* commonly native and collected from their natural place from Hawdian's village soran/Erbil, North Iraq.The extract of five solvent as (distilled water, ethanol, distilled water: ethanol, hexane: ethanol and hexane) with both technique of microwave and conventional extraction. It was shown that fifteen mineral ion compounds were identified in the suppressed IC technique. Our results were detected eight mineral ions as (F, Cl-, PO_4+, SO_4+, NH_4, K+, Mg and Ca+) from 15 ions in our plant according to solvent extract and method technique. The concentrations of mineral ion compounds were the results showed high amounts of K+ (71.370ppm), Ca+ (71.420ppm), PO_4+ (24.164ppm), SO_4+ (28.127 ppm), Cl- (17.548 ppm) and Mg (10.279ppm) were found by microwave extraction with distilled water and ethanol with other solvents respectively. Furthermore, the results showed that mineral values of the K+ (43.277 ppm), SO_4+ (26.761 ppm), Cl- (18.028 ppm) were high concentration by conventional extraction with distilled water and water-ethanol solvents, respectively. These results were compatible with quantitative measurements. This study showed that the technique of microwave with distilled water and ethanol: distilled water solvents were important for the minerals content of *Anthemis pseudocotula* Boiss, a precious plant.

Key Words: *Anthemis,* Mineral Compound, Plant, Microwave Extraction

1. Introduction

Herbal plants play a significant role in conventional western medicine. People all over the continents have long utilized poultices and imbibed infusions of hundreds, if not thousands, of indigenous plants, courting returned to prehistory (Barbour et al., 2004). The genus *Anthemis* is belonging to the family Asteraceae and consists of about one hundred thirty species in the world

(Karioti et al., 2009) and this is one of the great phytochemical investigated genera of the family Asteraceae (Vučković et al., 2006). The geographic classification of anthemius extends throughout Europe, Southwestern Asia, Northern, and Northeastern Africa, Southern Arabia, and tropical East Africa (Bremer and Humphries 1993; Bremer 1994), the species of this genus have been in many instances used in traditional medicine healing procedures (Javidnia et al., 2004; Saroglou et al., 2006).

The mineral content material of plant samples is generally determined by analyzing the liquid phase after dry ashing or wet ashing ground dried plant materials. The processes and the problems of fume disposal and special laboratory equipment required for the methods have been mentioned (Johnson and Ulrich 1959). This study aimed to determine the mineral contents in the plant of *Anthemis pseudocotula* Boiss with several solvent extracts.

2. Material and Method

2.1. Plant Collection

The aerial part of plants was collected from their natural place. The species *A. pseudocotula* Boiss was collected from North Iraq, Erbil, Soran, Hawdian's village, which taxonomists at this plant was identified by Dr. (Abdullah Sh.Sardar), Erbil, Iraq: College of Education, Salahaddin University. After collected the plant sample was ground by new modern grinder (Model GI, Capacity/hour 15 Kg, Capacity 5 letter, Speed 13000 rpm, and Cycle 500 gr) has been done at the Forest Faculty, Kahramanmaras Sutcu Imam University, Turkey. After that prepared of powder plant, it was kept in a plastic bag in refrigerator at 4°C.

2.2. Preparation and Extraction Plant

The plant powder was extracted by ten gram with 200 ml of different solvents as (distilled water, ethanol: distilled water, ethanol, hexane: ethanol and hexane), with the using two different of method: Conventional extraction and microwave extraction, after that evaporated by using Fume Hood.

2.3. Analysis Plant Extract by Ion Chromatography (IC)

Ion chromatography (IC) is a speedy and sensitive method for isolating and analyzing solutions containing complex mixtures of mineral ions (Basta and Tabatabai, 1991). The study was carried out with Shimadzu Prominence (HIC-20A Dual IC) Super Ion Chromatograph device brand Dual Flow-Line IC/HPLC.

After prepared extract crude plant, Approximately 0.001 g of the crude plant is weighed and then 10 mL distilled water was added and shaken by vortex instrument for during 10 minutes to precipitate crude plant after that take 4 ml of solution added by micro peptide into vial injected into Ion chromatography technique. A representative isolation the utilization of IC-CD of a standard solution containing the inorganic compounds specified in the crude plant. The optimized columns shim packs IC-SA3 and shim pack IC-C4 were performed (250 mm x 4.6 mm x 0.25 µm). The elution of the mobile phase of 2.5 Mm oxalic acid and 3.6 mM Na_2CO_3 at the 450C Column Oven Temperature, the solvent flow rate was maintained at 0.8 mL/min with sample size 50 uL and injection volume was settled as 1600 µL. the solvent flow rate at a flow rate of this technique was used for the separation of mineral compounds as anions and cation (F, ClO2-, BrO3-, Cl-, NO2-, Br -, NO3-, PO4-, SO4-, Li+, Na+, NH4+, K+, Mg+, and Ca+) (Masson et al., 2005).

3. Results and Discussion

IC was used to representative separation of a standard solution to identified fifteen mineral ion compounds (F, ClO_2-, BrO_3-, Cl-, NO_2 -, Br -, NO_3-, PO_4-, SO_4-, Li+, Na+, NH_4+, K+, Mg+, and Ca+), in our plants. that the Ion chromatography (IC) technique identified just eight mineral compounds (F, Cl-, PO_4-,

SO_4-, NH_4+, K+, Mg+ and Ca+) by using different methods, conventional extraction and microwave-assisted extraction with five different solvents in our plant (Table1,2) and (Figure 1,2). The conventional extraction methods were detected the limit values of ion mineral compounds as K+ (60.697 ppm), SO_4+ (26.380 ppm), PO_4+ (14.759 ppm), Cl- (18.558 ppm), Ca+ (16.891 ppm) and Mg+ (8.157 ppm), with solvent extracts of distilled water-ethanol, water and hexane, respectively.

Table 1. Results of mineral components according convectional extraction in plants

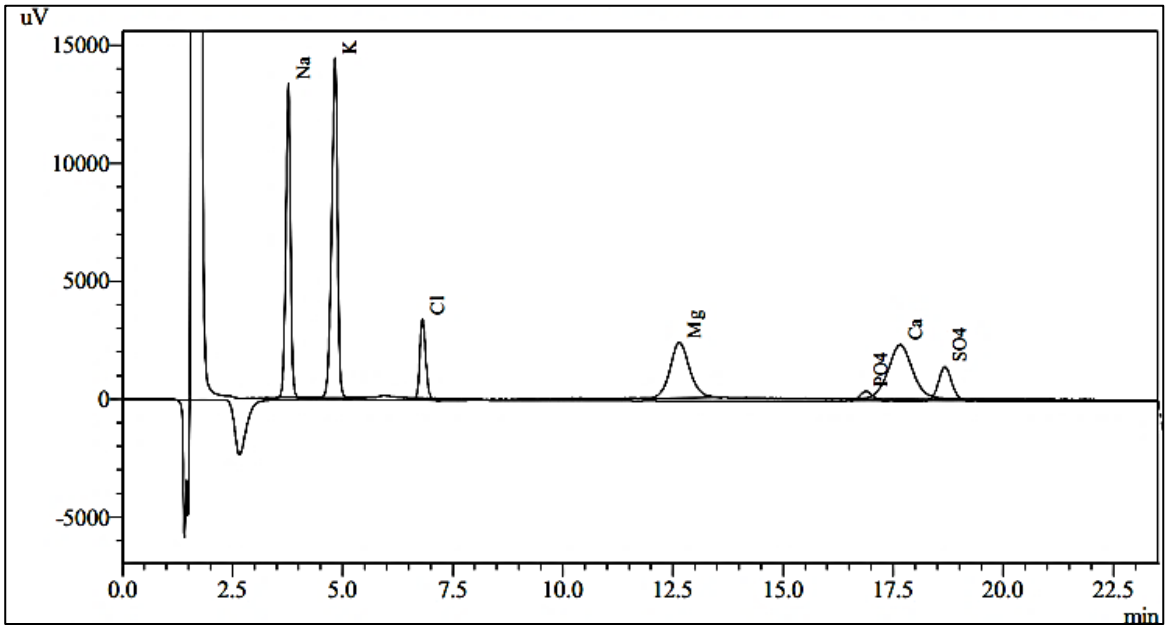
CE/S									
Detector	**Name**	**Ret.Time**	**Area**	**W Conc. (ppm)**	**W: E Conc. (ppm)**	**E Conc. (ppm)**	**H: E Conc. (ppm)**	**H Conc. (ppm)**	**Units**
1.	**F-**	0.000	0	0.000	5.994	5.165	0.000	0.000	mg/L
2.	**ClO_2-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
3.	**BrO_3-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
4.	**Cl-**	6.814	31508	12.469	18.558	18.028	12.859	12.373	mg/L
5.	**NO_2-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
6.	**Br-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
7.	**NO_3-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
8.	**PO_4-**	16.904	1684	14.759	13.897	0.000	0.000	6.654	mg/L
9.	**SO_4-**	18.690	36764	20.109	26.761	21.337	16.380	23.206	mg/L
10.	**Li+**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
11.	**Na+**	3.783	135792	N.D	N.D	N.D	N.D	N.D	mg/L
12.	**NH_4+**	0.000	0	0.000	0.000	0.680	0.000	0.000	mg/L
13.	**K+**	4.784	29062	43.277	60.697	16.807	8.452	10.309	mg/L
14.	**Mg+**	12.651	56929	7.616	8.157	6.284	4.989	6.243	mg/L
15.	**Ca+**	17.668	105006	14.700	13.884	14.859	9.606	16.891	mg/L

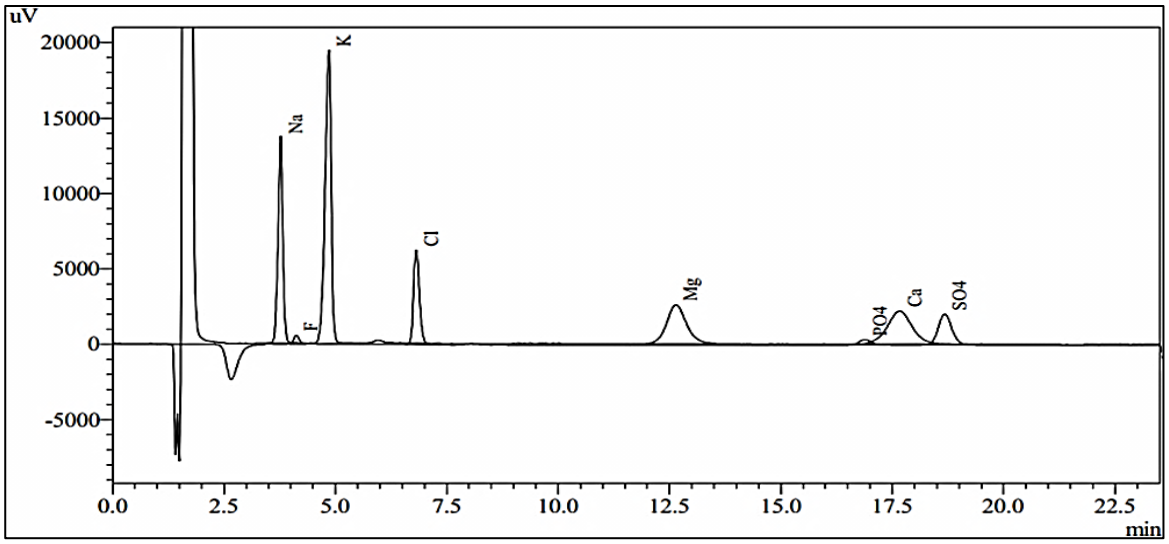
Not detected: N.D,
Method: CE/S Convectional Extraction Solvent
Solvents: DW: Distilled water, DW: E, Distilled water-Ethanol, E: Ethanol, H-E: Hexane-Ethanol, and H: Hexane

On the other hand, the microwave extraction method was detected highly values of K+ (71.370 ppm), Ca+ (71.420 ppm), and PO_4- (24.164 ppm), SO_4- (28.127 ppm), Cl- (17.548 ppm) and Mg+ (10.279 ppm) in solvent extracts of the distilled water-ethanol, water, and hexane, respectively. Furthermore, significant values of the mineral compound in the distilled water solvents were determined by the microwave extraction method. Whereas, compared with the method of conventional extraction that showed a lower concentration. Therefore, the concentration of K+, PO_4+ and Ca+ extracted with water and water: ethanol was similarity to, or larger than, all other extraction solvents extraction.

Our result the Calcium (Ca+) was the highest value in our plant, It is very much required for the normal functioning of the cardiac muscle blood coagulation, milk clothing and the

system of the permeability, also the Ca+ constitutes a large proportion of the bone, human blood and extracellular fluid (Indrayan et al., 2005), and also the Ca+ is an essential component in fibrin formation which types fibrinogen and in consequence fibrin and collagen (Schalm et al., 1975).The Fibrin is a dotting issue responsible for homeostasis. K+ and Na+ ions are acknowledged activators of energy potentials throughout nerve membrane collectively with Ca+, ions may also serve as replenishment in diarrheic conditions, maintenance of ordinary apprehensive function and intestine peristalsis. Mg+ ions are recognized hormone activators in kind 2 diabetes (Schalm et al., 1975). However, the both of Mg+ and Ca+ were indicated a high and limited value in our plant .that is a play a big function in photosynthesis, bio molecules metabolism and binding agents of cell walls. Ca+ is additionally the component of bone and assists in tooth improvement (El Khatib et al., 2003).





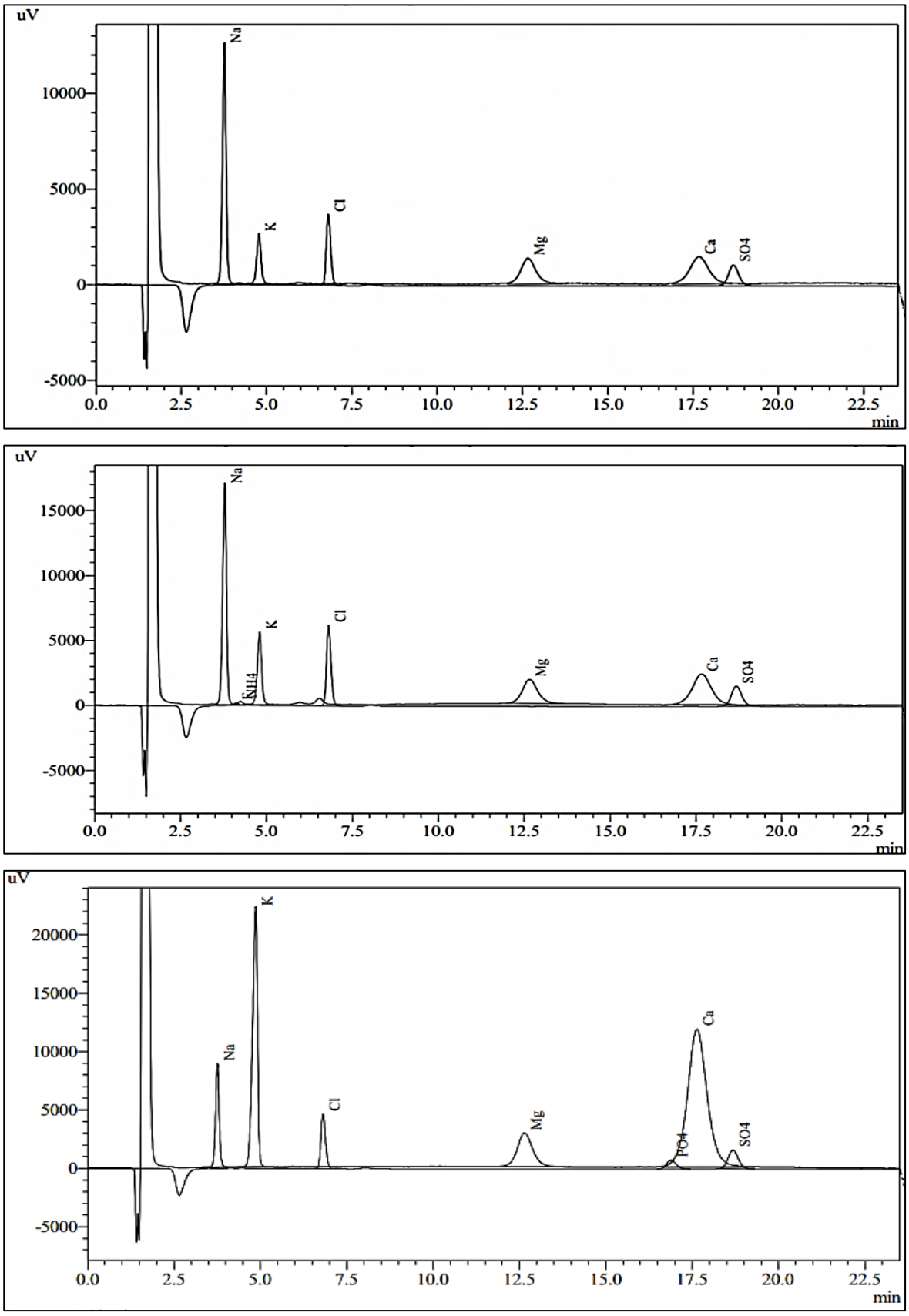
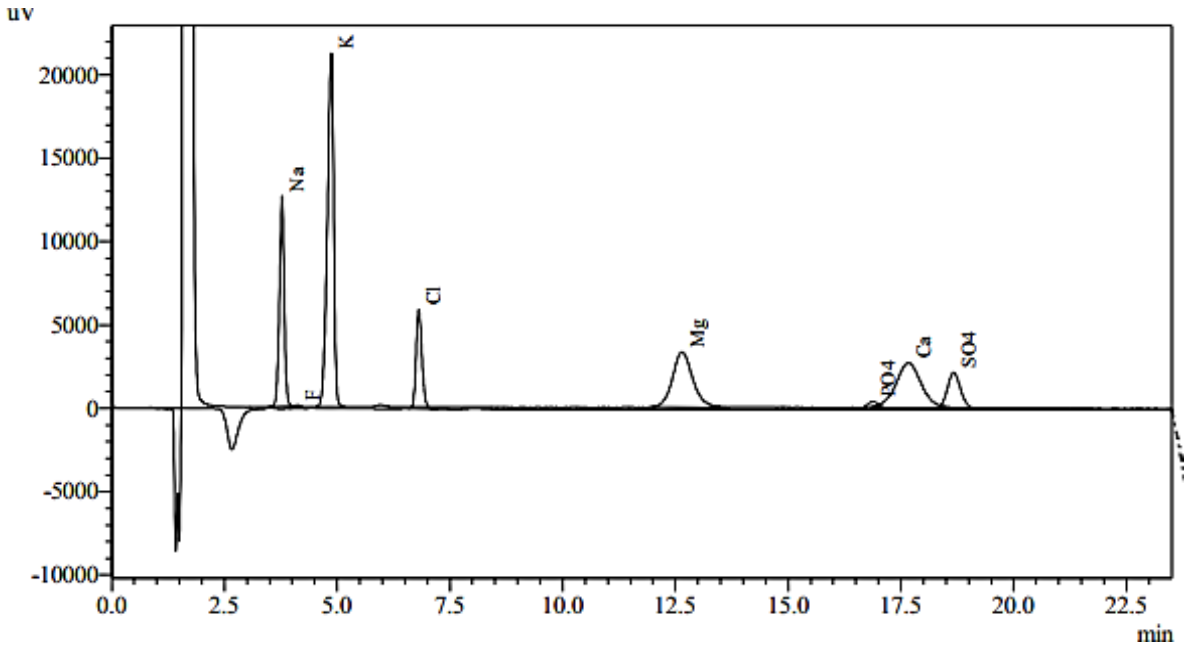


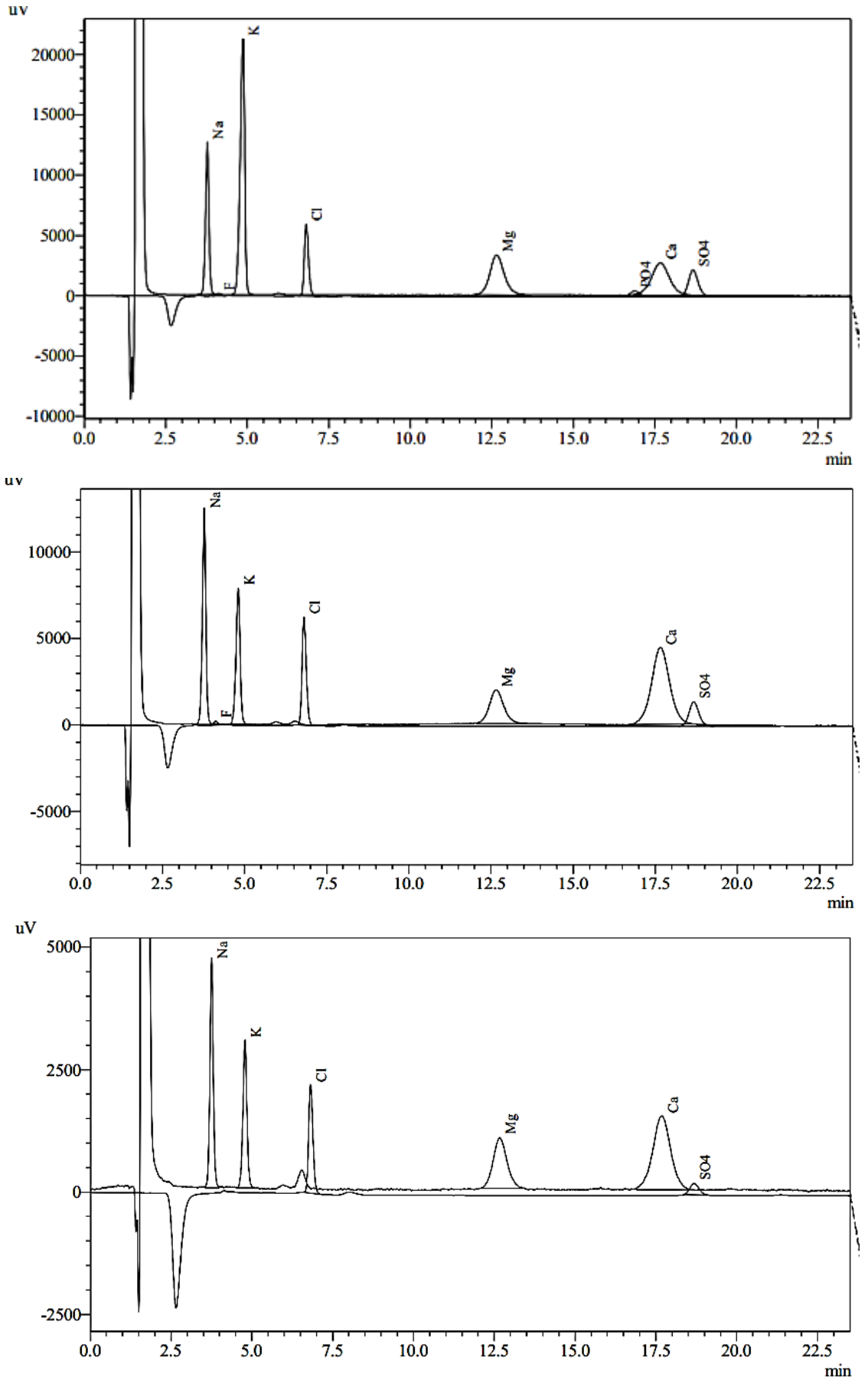
Figure 1. Quantitative result of solvents with conventional extraction by ion chromatography *(Water solvent; Water-ethanol solvent; Ethanol solvent; Hexane-ethanol solvent; Hexane solvent)*

Table 2. Results of mineral components according microwave extraction in plants

ME/S									
Detector	**Name**	**Ret. Time**	**Area**	**W Conc. (ppm)**	**W: E Conc. (ppm)**	**E Conc. (ppm)**	**H:E Conc. (ppm)**	**H Conc. (ppm)**	**Units**
1.	**F-**	0.000	0	0.000	5.203	5.221	0.000	0.000	mg/L
2.	**ClO_2-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
3.	**BrO_3-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
4.	**Cl-**	6.809	43978	15.278	17.548	18.096	9.836	6.904	mg/L
5.	**NO_2-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
6.	**Br-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
7.	**NO_3-**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
8.	**PO_4-**	16.884	15066	24.164	16.365	0.000	0.000	0.000	mg/L
9.	**SO_4-**	18.674	34633	22.139	28.127	19.683	7.172	8.977	mg/L
10.	**Li+**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
11.	**Na+**	3.755	65152	N.D	N.D	N.D	N.D	N.D	mg/L
12.	**NH_4+**	0.000	0	0.000	0.000	0.000	0.000	0.000	mg/L
13.	**K+**	4.861	221769	71.370	67.166	23.078	9.455	3.691	mg/L
14.	**Mg+**	12.640	88458	8.938	10.279	6.481	4.035	4.423	mg/L
15.	**Ca+**	17.639	472445	71.420	16.967	27.025	9.977	9.328	mg/L

Not detected: N.D
Method: MWE/S Microwave Extraction Solvent
Solvents: DW: Distilled water, DW: E, Distilled water-Ethanol, E: Ethanol, H-E: Hexane-Ethanol, and H: Hexane

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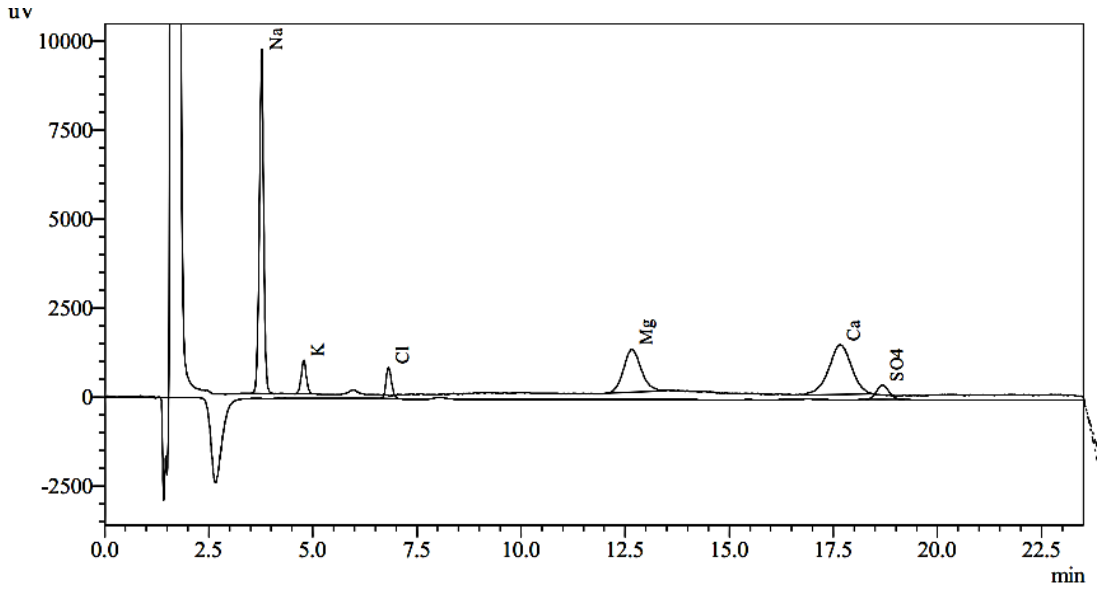

Figure 2. Quantitative result of solvents with microwave extraction by Ion Chromatography *(Water solvent; Water-ethanol solvent; Ethanol solvent; Hexane-ethanol solvent; Hexane solvent)*

The K+ content in our result was highest in the plant, the K+ participate to maintains tissue excitability and in ionic balance of the human body. And it is an essential nutrient and has an important function in the synthesis of proteins and amino acids (Zhou et al. 2005)

In spite of that, the Na+ content was not detected but Na+ plays an important function in the transport of metabolites (Zhou et al. 2005). The ratio K+ and Na+ in any food is an essential factor in the prevention of hypertension and arteriosclerosis with K depressed and No enhance blood stress (Saupi et al. 2009) , and the ion K+ is necessary for its diuretic nature (Zhou et al. 2005). Our results agreement with (Cataldi et al. 2003), but dissimilar with a species of plant.(Butnariu et al., 2012), also, agreement with species of plant by (Russo and Karmarkar, 1998), and disagreement with (Malone et al., 2002), due to the difference method and plant but same species. In the present work, an efficient, sensitive, and rapid ion chromatography technique approach was established and proven as appropriate for separating, quantifying, and identifying mineral contents of (Ca+, Mg+, K+, NH4+, Na+, Li+, SO4-, PO4-, NO3-, Br-NO2-, Cl-,BrO3-, ClO2- and F-). The high sensitivity, extraordinary linearity, precision, and rigor have been achieved. The concentration of all mineral compound had been exhibited the most inconstancy among solvent types, inside extraction technique. That is supplying a very beneficial technique for chemical analysis and biological research purposes. To the excellent of our Knowledge no preceding work has been pronounced of the mineral compound in plant of *A. pseudocotula* Boiss.

4. Conclusion

This study shows an overview analysis of the five extract solvents with the methods of microwave and conventional extraction. That shows all results of the analysis were found but as limited value. Therefore, our results were detected 8 mineral compounds from 15 ions. The microwave extraction method was a significant value of mineral compound with solvents of (distilled water and distilled water: ethanol), our study is very important and will be useful for other researchers, additionally, that suggest who interesting in our plant to use another analytical methods to get more and extensive results. That the *A. pseudocotula* Boiss, a precious plant.

Acknowledgements

We are thankful to General Science Department, Faculty of Education, Soran University, Erbil, Iraq, and Kahramanmaraş Sütçü İmam University, Department of Bioengineering and Sciences.

Coflict of Interest

None.

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