ELEMENTAL ANALYSIS OF *Aerva lanata* (L.) BY EDX METHOD

Ragavendran P[1], Arul Raj C[1], Sophia D[1], Starlin T[2] and Gopalakrishnan V.K.[1, 2*]
[1]Department of Biochemistry, Karpagam University, Coimbatore, Tamilnadu, India 641021
[2]Department of Bioinformatics, Karpagam University, Coimbatore, Tamilnadu, India 641021

*Dr V.K. Gopalakrishnan, Professor and Head**, Department of Biochemistry and Bioinformatics**, Karpagam University**, Coimbatore – 641 021 Tamil Nadu, India Email: vkgopalakrishnan@gmail.com

ABSTRACT
Trace elements concentrations in *Aerva lanata* was studied using SEM-EDX technique. The aim of this study is to determine qualitatively and quantitatively trace elements in *Aerva lanata* and their medicinal roles in the human body. The whole plant was analysed for their trace element contents. The plant samples were found to contain essential trace elements such as Calcium, Magnesium, Silicon, Chloride, Potassium and Carbon which are well known for their important roles in herbal drugs. Most of the medicinal plants were found to be rich in one or more of the essential elements under study. The elemental concentrations of different element in *Aerva lanata* and their biological effects are discussed.
Key words: *Aerva lanata*, SEDM-EDX, Trace elements, Medicinal plants, Herbal drugs.

INTRODUCTION
SEM – EDX among the various analytical techniques used for the elemental analysis, is highly quantified for the identification and quantification of different elements in medicinal plants for various biological and environmental importance. Elemental research has definitely been part of this explosion of scientific knowledge. Impressive developments in this field of mineral elements have taken place in the chemical, biochemical and immunological areas of research. Deficiency of tract elements in human subjects can occur under the most practical dietary conditions and in many diseased statuses. In recent years, Scientist and nationalists have started believing in the therapeutic role of metals in human health[1]. Trace elements play both curative and preventive role in combating diseases. There is a vart scope to exploit the preventive medicinal aspects of various trace elements.

Medicinal plants play the most important role in traditional medicine. Mineral elements through usually form a small portion of total combination of most plant materials and of total body weight, it was nevertheless of treat physiological importance particularly in body metabolism[2].

Aerva lanata (L) contains the source of chemicals of immense medicinal and pharmaceutical importance such as O-acyl glycosides, β-sitosterol, daucosterol, syringic acid, vanillic acid, feruloyl tyramine, feruloyl homovanillylamine, narcissin and aervitrine which are effective as nephroprotective and jaundice.

In our previous investigations, based on FTIR spectrum analysis *Aerva lanata* contains high amount of carboxylic acid, amines, amides and sulphur derivatives[3]. *Aerva lanata* contains high content of both enzymatic and non-enzymatic antioxidants[4]. *Aerva lanata* has cardio protective activity against doxorubicin induced cardiotoxicity[5]. In this study, to evaluate the trace element content in *Aerva lanata* through EDX.

MATERIALS AND METHODS
Plant collection
Fresh plants parts were collected from Coimbatore, Tamil Nadu and India. The plant was authenticated by Dr. G.V.S Moorthy, Botanical survey of India, TNAU Campus and Coimbatore. The voucher No. BSI/SC/5/23/10-11/Tech/22.

Fresh plant material was washed under running tap water, air dried, and then homogenized to fine powder and stored in airtight bottles.

Preparation of Extracts
In each case, *Aerva lanata* was first shade dried and then powdered. The powder of *Aerva lanata* was first defatted with n-hexane and then the residue was extracted with ethanol. The crude extracts obtained were filtered and evaporated in *vacuum* to dryness.

Elemental Analysis
The crude extract derived from plant sample of *Aerva lanata* were subjected to the elemental analysis using Scanning Electron Microscope (SEM) with an energy dispersive x-ray spectrometer (EDX).

RESULTS AND DISCUSSION
The results of the elemental composition of *Aerva lanata* using SEM and EDX technique showed in table 1. The SEM EDX spectra of the crude extract of the *Aerva lanata* showed in figure 1.

Calcium, Magnesium, Silicon, Chloride, Potassium and Carbon are present in *Aerva lanata*. $CaCO_3$, SiO_2, MgO, KCl, K-MAD, Ca-wollastonite are used as the standards. In all these elements, Carbon and oxygen presented as high concentration while K and Ca presented as moderate amount. But Mg, Si, Cl presented only a trace quantities.

The trace elements play a vital role in the medical value of plants as curative and preventive agents in combating disease, nutritive and catalytic disorders[6]. The concentration of mineral and trace elements in plants is so meager that their importance was ignored for a long time. There is a vast scope to explore the preventive medicinal aspects of various trace elements[7]. Health treatment is based on medicinal plants recommended as nutritional supplements for the treatment of every day problems. There is resurgence of interest in herbal medicine for the treatment of main ailments. The main advantage of herbal medicine that naturally occurring products without any side effects. Trace elements play a major role in health and diseases. In the building up and restoration phenomenon, it was observed that during the last 20 years remarkable progress has occurred in this area of health and science[8].

The elemental concentrations were determined to verify the biological role of trace elements in antiparasitic medicinal plants. The variation in elemental concentration is mainly attributed to the differences in botanical structure, as well as in the mineral composition of the soil in which the plants are cultivated. Other factors responsible for variation in elemental content are preferential absorbability of the plant, use of fertilizers, irrigation water and climatologically conditions[9].

The elements Fe, K, Mg, Na, Ca, Co, Mn, Zn and Cu have been classified as essential elements, Ni, Cr are possibly essential while Cd, Pb and Li are non essential elements for the human body. Among the various elements detected in different medicinal plants used in the treatment of different diseases.

Calcium and potassium are found in major concentrations in these plants. It is known that potassium is necessary for muscle contraction (especially cardiac fiber), for the synthesis of some proteins and as an enzymic cofactor. Since the minerals are essential part of nucleoproteins metalloproteins, chromoproteins, lipoproteins, etc., the determination of minerals is important in the case of a disease[10]. We hope that our results will provide a starting point for discovering new compounds with better activity than agents currently available. Calcium is needed in the development of bone and teeth and it regulate heart rhythm, helps in normal blood clothing, maintain proper nerve and muscle functions and lower blood pressure[11]. Kanneez *et al.,*[12] stated that magnesium (Mg) in plant lowers the cholesterol level. Magnesium (Mg) plays an important role in regulating muscular activity of heart rhythm and also Magnesium is important cofactor of convert blood glucose into energy[13]. Already *Aerva lanata* reported that, it has an antihyperlipedimic and anti diabetic activity[14].

The element potassium is an extremely important element in human body. Potassium is essential for the transport of nutrients inside the cell. Without potassium, nutrients could not able enter into the cell that leads cell death. Silicon is also another important element to prevent the hardening of veins and arteries. Chloride works with sodium and potassium carry an electrical charge when dissolved body fluids and to regulate the pH in the body. Chloride is also important for digest the food properly and absorb many elements that what we need to survive.

Toxic elements such as Cd, Hg and Sb were not detected in the samples. From the pharmacological and toxicological points of view the concentrations of these elements present in the samples analyzed are very low to cause any kind of effect.

Based on the conclusion, the data obtained in the present work will be helpful in the synthesis of new ayurvedic drugs which can be used for the control of various diseases. The results of the present research work will be helpful to ayurvedic clinicians and scientists who would like to pursue further research in the areas of Ayurvedic and alternative medicines. Trace elements present in *Aerva lanata* has a lot of biological activities to prevent organs from diseases. In future, *Aerva lanata* could be used as good pharmaceutical and therapeutic agents.

REFERENCES
1. Udayakumar R, Begum VH. Elemental analysis of Medicinal Plants used in controlling infectious diseases. Hamdard Medicus 2004; 67: 35-36.
2. Hameed I, Dastagir G, Hussain F. Nutritional and elemental analyses of some Selected medicinal plants of the family Polygonaceae. Pak J Bot 2008; 40: 2493-2502.
3. Ragavendran P, Sophia D, Arulraj C, Starlin T, Gopalakrishnan VK. Evaluation of Enzymatic and Non-Enzymatic antioxidant properties of *Aerva lanata* (L) – An *in vitro* Study, Int J Pharm Pharm Sci 2012; 4: 522 – 526.
4. Ragavendran P, Sophia D, Arul Raj C, Gopalakrishnan VK. Functional group analysis of various extracts of *Aerva lanata* (L) by FTIR spectrum. Pharmacologyonline Newsletter 2011; 1:358-364.
5. Ragavendran P, Sophia D, Arul Raj C, Gopalakrishnan VK. Cardioprotective effect of Aqueous, Ethanol and Aqueous ethanol extract of *Aerva lanata* (Linn) against doxorubicin induced cardiomyopathy in rats. Asian Pacific Journal of Tropical Biomedicine 2012; Suppl 1: S212-S218.
6. Joyo, M., S.S. Ali, T. Kazi and G.H. Kazi. Detection of trace elements in *Heliotropism europium* L. by atomic absorption analysis. Hamdard Medicus, 1997; 40: 34-39.
7. Samra Bibi, Ghulam Dastagir, Farrukh Hussain and Parveen Sanaullah. Elemental composition of *Viola odorata* Linn. Pak. J. Pl. Sci., 2006;12 : 141-143,
8. Ra S, Ogo S, Slavkovi L, Popovi A. Inorganic analysis of herbal drugs. Part I. Metal determination in herbal drugs originating from medicinal plants of the family *Lamiacae*. J Serb Chem Soc 2005; 70: 1347–1355.
9. Rajurkar NS, Pardeshi BM. Analysis of some herbal plants from India used in the control of diabetes mellitus by NAA and AAS techniques. Appl Radiat Isot 1997; 48: 1059.
10. N. Ekinci, R. Ekinci, R. Polat, G. Budak. Analysis of trace elements in medicinal plants with energy dispersive X-ray fluorescence Journal of Radioanalytical and Nuclear Chemistry, 2004; 260:127- 131.
11. Bibi S, Dastagir G, Hussain F, Sanaullah P. Elemental composition of *Viola odorata* Linn. Pak J Pl Sci 2006; 12: 141-143.
12. Kaneez FA, Qadirrudin M, Kalhoro MA, Khaula S, Badar Y. Determination of major trace elements in *Artemisia elegantissima* and *Rhazya stricta* and their uses. Pak J Sci Ind Res 2001; 45: 291-293.
13. Bahadur A, Chaudhry Z, Jan G, Danish M, Rehman A, Ahmad R, khan A, Khalid S, ullah I, Shah Z, Ali F, Mushtaq T, Jan FG. Nutritional and elemental analyses of some selected fodder species used in traditional medicine. African Journal of Pharmacy and Pharmacology 2011; 5: 1157-1161.
14. Appia Krishnan G, Rai VK, Nandy BC, Meena KC, Dey S, Tyagi PK and Tyagi LK. Hypoglycemic and Antihyperlipidaemic Effect of Ethanolic Extract of Aerial Parts of *Aerva lanata* (L.) in Normal and Alloxan induced Diabetic Rats. International Journal of Pharmaceutical Sciences and Drug Research 2009; 1: 191-194.

Table 1: Elemental composition of *Aerva lanata*

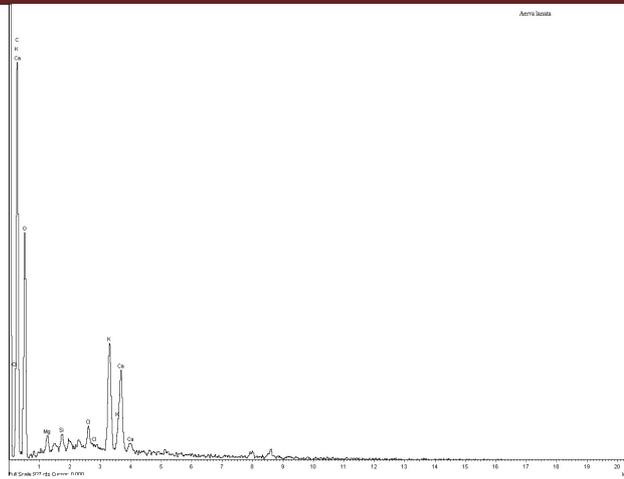| S.No	Elements	App con	Intensity con	Weight %	Weight sigma	Atomic %
1	Carbon	38.48	1.0639	48.17	1.88	57.92
2	Oxygen	15.17	0.4737	42.64	1.71	38.49
3	Silicon	0.31	0.7267	0.57	0.13	0.34
4	Magnesium	0.32	0.9051	0.47	0.11	0.24
5	Chloride	0.42	0.8369	0.67	0.14	0.27
6	Potassium	3.44	1.0591	4.32	0.27	1.60
7	Calcium	2.28	0.9626	3.16	0.25	1.14

Figure 1 shows EDX Spectra of *Aerva lanata*

Source of support: Nil, Conflict of interest: None Declared