

# Elemental profile of Herb and Medicinal plant using Spectro Analytical AAS technique

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**Abstract.** Medicinal plants and herbs are largely used due to its wide application in the traditional medicinal system. These plants are the true backbones of a wide range of local health traditions and are largely used in 3 different forms: Curative, promotive and preventive. In rural areas, people depend on local traditional healing systems for their primary healthcare. Several attempts have been made by the researchers to determine the major, minor and trace elemental compositions with respect to human health. In the present study the elemental analysis was carried out for a medicinal plant and a herb collected from Gulbarga and Shivamogga of Karnataka region using Atomic Absorption Spectrophotometer (AAS) technique. A total of 09 elements viz. as Mg, K, Ca, Fe, Al, Cr, Mn, Cu and Zn were determined. Among all the elements, the concentration of Ca was recorded as highest in both the herb and medicinal plant followed by K, Mg, Fe, etc. and few elements were at trace level concentration. Monitoring such traditional herb and medicinal plant for elemental concentration is of great importance for physicians, health care professionals, and policymakers in protecting the public from the adverse effects.

## INTRODUCTION

Elements play the vital role in the production of various bioactive compounds in herbs and medicinal plants. They govern their toxic and therapeutic effectiveness based on concentration level. Traditional herbs and medicinal plants are found to be rich in one or the other distinct element. Each element could maybe be a connection for the therapeutic action of the medicine [1-4]. In this perspective, estimation of major, minor and trace elemental content of medicinal plants and herbs could offer useful evidences leading to thoughtful on the efficiency of the plant based medicine for curing various ailments. Several spectro analytical techniques such as atomic absorption spectrophotometry (AAS), neutron activation analysis and inductively coupled plasma mass spectrometry are adopted for elemental analysis [5-8].

In view of the significance of major, minor and trace elemental content in several metabolic processes and their therapeutic properties, in the current study, we adopted the sensitive spectro analytical technique such as AAS for the estimation of an important elemental content in the leaves of herb as well as medicinal plant namely *Tinospora Cordifolia* and *Mentha* which are collected from Gulbarga & Shivamogga.

The complete influence of elements present in the herb and medicinal plant on human health issues is discussed. Because of rapid growth in industrial development and their impact on environmental pollution, the investigation was further carried out to determine the concentration level of contaminated elements present in the samples of herb and medicinal plant. However, the connection between the required important elemental content and their therapeutic capacity is not yet recognized the outcomes of the present work will be important in the synthesis of novel ayurvedic medicine preparation and also helps in deciding the amount of several active ingredients of specific formulation. The herb and medicinal plant leaves were collected from Gulbarga & Shivamogga, Karnataka, India. External toxins of the plant and herb samples were wiped out by washing with deionizer double distilled water. The

collected leaves were dried in a shade for more than 45 days. The dried samples were powdered and passed through Nano-meter scale size mesh sieve. Solution samples for AAS analysis for the determination of elements were prepared using a standard method. The elements namely Mg, K, Al, Ca, Fe, Zn, Cr, Cu & Mn were analyzed by estimating the absorbance at its resonance wavelength. The standard parameters for atomic absorption estimation are represented and the concentrations of various elements present in the collected samples were determined.

The present work is designed to study the elemental profile of the herb and medicinal plant by spectro analytical AAS technique and their influences on the biological activities.

### STUDY AREA:

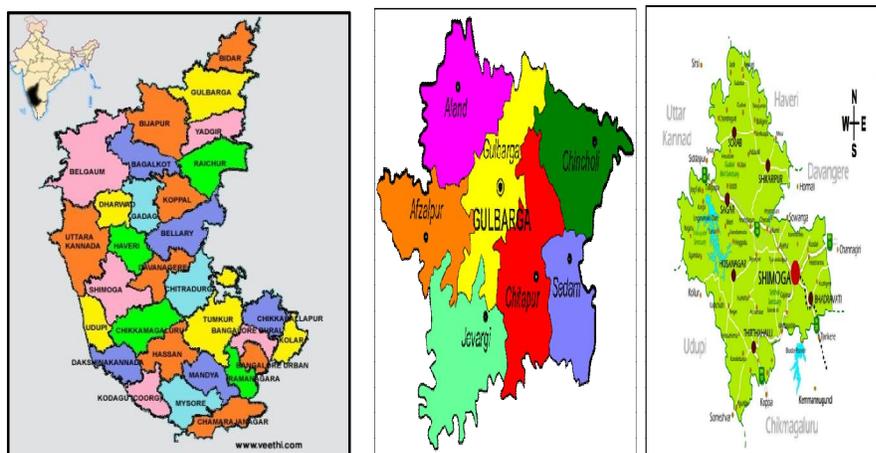


Fig. 1. Study area selected for the present study (Location Map)

### EXPERIMENTAL MATERIALS AND METHOD:

#### Medicinal plants collection:

Herb and medicinal plant were collected from two different places namely Gulbarga and Shivamogga of Karnataka. The leaves of the traditional herb and medicinal plant were washed thoroughly 2-3 times with de-ionized double distilled water to eliminate external toxins due to dust and environmental pollution. The washed leaves were dried in shade for 30-45 days at 25-30 °C and then grinded to a fine powder. The powdered samples were kept in dry uncontaminated polythene bags for additional mineral and trace elemental investigation.



Fig. 2. Images of leaves of (a) *Tinospora Cordifolia* (b) *Mint* Leaves collected from Gulbarga and Shivamogga

## Sample preparation for elemental analysis

A fine powder was used for the determination of some major, minor and trace elements in the herb and medicinal plant. A total of ten gram of grinded powder was taken in a pre-cleaned silica crucible and heated at 300-400° C for 2-3 hours in an oven. The crucible was brought to the room temperature using a desiccator. At the end of the process, the ash was obtained which was further used for the preparation of solution. One gram of ash was accurately weighed and mixed it with 25 ml of concentrated HCl and 25 ml of double distilled deionized water [1gm of Ash + 25 ml of Conc. Hcl + 25 ml of deionized H2O]. The mixed solution was then stirred for few minutes to have a clear solution; it was finally filtered using the watt man filter Paper 41. A 950 ml of deionized double distilled water was added to the filtered solution to make it to one litre [1000 ml] solution [9]. The same procedure was repeated for all the herb and medicinal plant material samples collected from Gulbarga & Shivamogga. The obtained solutions were then used for the quantitative measurement of some minerals and trace elemental analysis using Spectroanalytical Atomic Absorption Spectroscopy [AAS] technique.

## RESULTS AND DISCUSSION

In the present study, the analysis for various major, minor and trace elements present in herb and medicinal plant, which are used for preventing and curing various ailments, indicated that the following elements Fe, Ca, K, Mg, Mn, Zn, Cu, Al and Cr are present. The presence of these elements in the herb and medicinal plant are ascribed to prevent and treat the various ailments and also play a dynamic role in the development of metabolites which are accountable for pharmacological actions. The major and trace elemental analysis of *Tinospora Cordifolia* and *Mentha* through a spectro-analytical Atomic Absorption Spectroscopy technique shows *different* concentration of various elemental content such as Iron, Calcium, Potassium, Magnesium, Copper, Zinc, Manganese, Chromium and Aluminium.

The comparative concentration of the determined elements in *Tinospora Cordifolia* and *Mentha* herb and medicinal plant are tabulated in **Table .1** and graphically represented in **Fig.1 (a) & (b)**. In the current investigation, it is observed that, the concentration of calcium is found to be significantly at higher level and ranged from 28.54 to 34.95mg/L in both *Tinospora Cordifolia* and *Mentha or Mint* leaves. Further, the presence of elemental concentration level of Ca is found to be higher in both herb and medicinal plant collected from Gulbarga region as compared to Shivamogga. The presence of higher calcium concentration level in the Gulbarga region is mainly due to the presence of higher calcium level in soil of Gulbarga (10) and thus the same is reflected in the herb and medicinal plant.

**Table. 1** Elemental Concentration in the *Tinospora Cordifolia* and *Mint* Leaves in mg/L

No.	Coding	Atomic Number	<i>Tinospora Cordifolia</i> Leaves		<i>Mentha or Mint</i> Leaves	
			Gulbarga	Shivamogga	Gulbarga	Shivamogga
1	Mg	12	7.3255	8.0325	6.9589	7.0024
2	Al	13	0.0308	0.0508	0.0344	0.0187
3	K	19	10.259	12.2563	12.8591	11.1254
4	Ca	20	32.8254	28.5426	34.9562	30.0078
5	Cr	20	0.103	0.0089	0.0738	0.0235
6	Mn	25	0.7958	0.8234	0.3745	0.2647
7	Fe	26	4.8654	4.9854	3.2314	3.9856
8	Cu	29	0.0984	0.1325	0.1035	0.0098
9	Zn	30	0.1124	0.1564	0.0087	0.09854

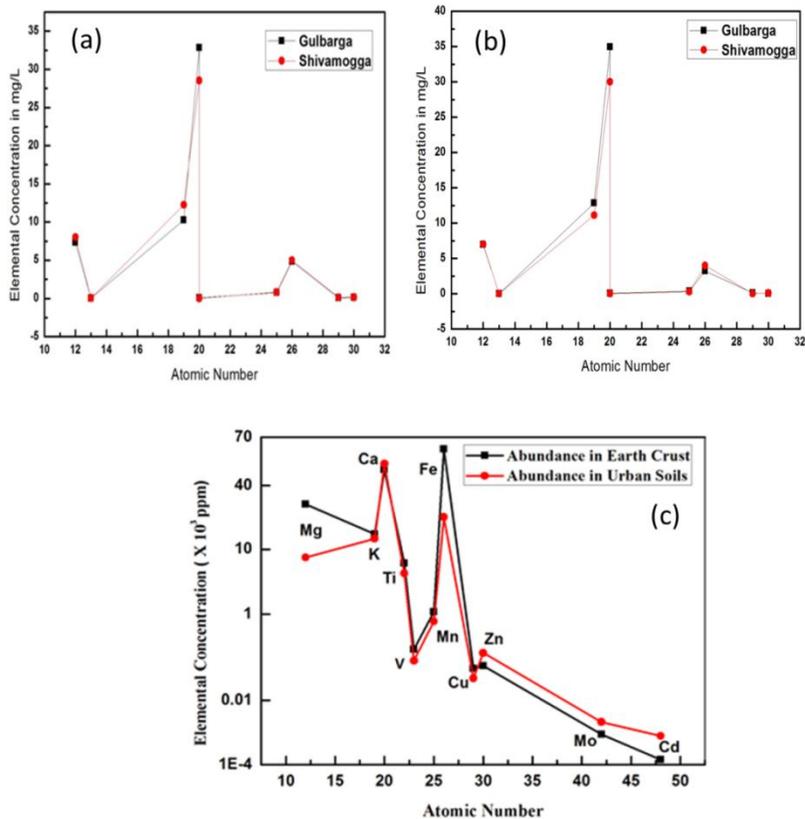


Fig.3 Elemental Concentration in the (a)*TinosporaCordifolia*(b)*Mentha or Mint* Leaves collected form Gulbarga & Shivamogga and (c) Earth crust and urban soil.

The elemental concentration of Mg is found to be at moderate level and ranged is between 6.9589 to 8.0325 mg/L to in both *TinosporaCordifolia* and *Mentha/Mint* leaves. Further, the presence of elemental concentration level of Mg is found to be slightly higher in both herb and medicinal plant collected from Shivamogga as compared to Gulbarga region. The presence of higher level of Mg in Shivamogga is again attributed to the soil concentration level of Shivamogga (11) and same could be seen in the herb and medicinal plant. The elemental concentration level of K is also found to be at moderate level only and ranged from 10.25 to 11.12 mg/L in both *TinosporaCordifolia* and *Mentha or Mint* leaves. However, the concentration levels are found to be almost similar in both Gulbarga and Shivamogga. The elemental concentration of Fe is found to be at higher concentration among the minor elements compared to Cu, Mn, Zn etc. To investigate the side effects of the herb and medicinal plant the toxic elements such as heavy-metals such as Al, Cr, Mn, Cu and Zn were also determined and they are found to be at the trace level as well as within the permissible limit of WHO, thus it can be concluded that the investigated herb and medicinal plant don't have any side effects. Further, the major elements such as Ca, Mg, and K are also within the permissible limit given by WHO.

In the current study, it is also observed that the trend in the variation of elemental concentration level observed in the herb and medicinal plant is same as the earth crust and urban soil as shown in **Fig. 1(C)**.

## CONCLUSION:

The current study provides a new perspective about the existence of few major, minor and trace elements in the herb and medicinal plant used in preventing and curing various ailments. In the conclusion, there is very wide discrepancy in the elemental concentration levels in the studied herb and medicinal plant. The discrepancy in elemental concentration level is mainly recognized due to the variances in botanical structure, as well as in the

elemental composition of the soil in which the herb and plant grows. Additional issues responsible for a discrepancy in elemental content are preferentially due to an absorbability of the plant and climatological conditions. The study shows that all herb and medicinal plant used for preventing and curing of various ailments are rich sources of major, minor and trace elements. These medicinal plants can be utilized to treat diseases that are mainly caused due to deficiency of these major, minor and trace elements. The studied herb and medicinal plant contain considerable quantity of K, Ca and Mg which are required component of human nutrition. The obtained results also revealed that the major, minor and trace elemental concentration levels in the collected herb and medicinal plant leaves studied are within the WHO/FAO permissible levels; thus, the herb and medicinal plant will be useful in the synthesis of novel drugs with combination are useful in the treatment of various ailments.

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