

# A preliminary study on metal content in medicinal plant extracts found in Nagaram region, Andhra Pradesh, India

Kasaraneni Madhava Srinivas<sup>1</sup>, Adusumalli Koteswara Rao<sup>2</sup>

<sup>1,2</sup>*Department of Chemistry, Shree Velagapudi Ramakrishna Memorial College (Autonomous), Nagaram 522 268 Guntur District, Andhra Pradesh, INDIA*

**Abstract-** Metals compositions in selected 10 medicinal plant species from Nagaram region, Andhra Pradesh, India were studied in order to understand their mechanism of treatment. Identified medicinal plants were *Mimosa pudica*, *Ocimum sanctum*, *Allium cepa*, *Allium sativum*, *Zingiber officinale*, *Azadirachta indica*, *Calotropis procera*, *Capsicum frutescens*, *Embllica officinalis*, and *Curcuma longa*. The key purpose of this study was to document evidence of essential and non-essential heavy metals in these plant species, which are extensively used in the preparation of herbal products and standardized extracts. From the results of the study zinc and manganese were present in high concentrations among the plant species examined. These plant species, especially those used in the treatment of diseases such as hypertension, diabetes and asthma may require long term usage. Samples were analysed for elemental composition by using Atomic Absorption Spectrophotometer for metals. Among the section of plants, the highest metal content was seen in the latex of *Calotropis procera*. Highest Na concentration was found in the latex of *Calotropis procera*, 280 mg/kg and roots of *Mimosa pudica*, 8860 mg/kg, respectively. Mn content was very high in the rhizome of *Zingiber officinale* (554.20 mg/kg), Fruit of *Embllica Officinalis* (182.74 mg/kg) and rhizome of *Curcuma longa* (331.82 mg/kg). Zn content is usually high in all samples ranged from 22.68 to 86.42 mg/kg, highest seen in leaves of *Ocimum sanctum*.

**Keywords:** Metals, formulations, medicinal plants, extracts

## I. INTRODUCTION

Recently markets are flooded with the introduction of many medicinal plants products, most of them are without any knowledge and scientific validation of their efficacy, toxicity mechanism, and composition. Awareness of medicinal plants' usage is a result of the many years of struggles against diseases and man learned to pursue drugs in barks, seeds, rhizomes, latex, fruits, and other parts of the plants. Reports on mineral composition of medicinal plants/products are wanting, also not possible to relate the results scientifically with others. Healing with medicinal plants is a long-standing treatment method as old as mankind itself. These medicinal plants products are in most cases commonly known home remedies used to treat specific conditions or could be complex formulation preparation often used for life-threatening diseases by the rural people. The data generated may be useful in correlating medicinal properties and mechanisms of individual plant extracts with the objective of exploiting their potential benefit on health. In this study, 10 different commonly available medicinal plant species were collected from their natural habitat and studied for their metallic composition (Co, Zn, Cu, Ca, Mo, Mg & Fe) in sections like root, leaves, rhizome, latex etc.

Selective identified medicinal plants were listed below.

1. *Mimosa pudica*
2. *Ocimum sanctum*
3. *Allium cepa*
4. *Allium sativum*
5. *Zingiber officinale*
6. *Azadirachta indica*
7. *Calotropis procera*
8. *Capsicum frutescens*
9. *Embllica officinalis*
10. *Curcuma longa*

## II. EXPERIMENTAL

### 2.1 Geographical area

The study area is the part of the Guntur district, Nagaram mandal consist of nearly 73 Villages and 25 Panchayats.

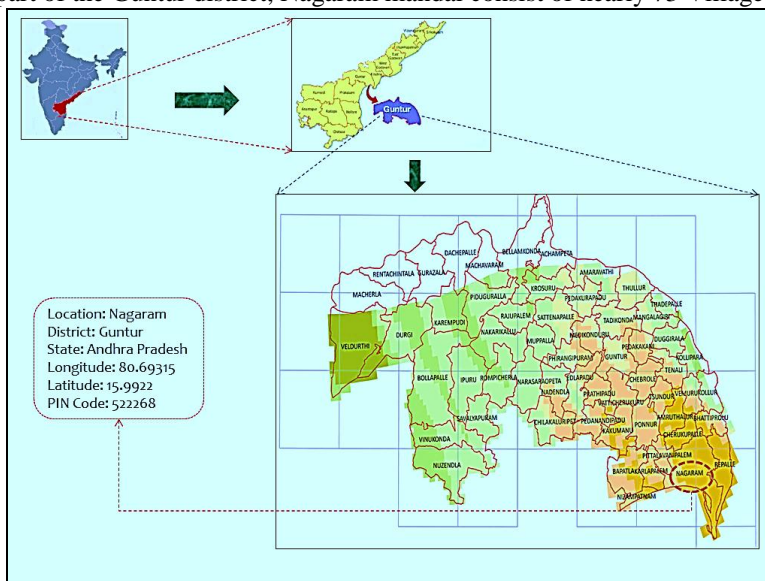


Figure 1 Sample area location

Geographical coordinates are 15°99'22"N/80°69'31"E (Long/Latitude) (see Figure 1). It is located 53 KM towards South from District headquarters Guntur. Approximately 96 kms away towards the north-west from newly formed state capital Amaravathi, Andhra Pradesh.

Nagaram is a village in Guntur district of the Indian state of Andhra Pradesh. It is located in Nagaram mandal. Thotapalle is the smallest Village and Allaparru is the biggest Village. It is in the 10 mt elevations (altitude). The total geographical area of the village is close to 724 hectares. Nagaram has a total population of over 5,924 peoples. Weather and Climate of Nagaram Mandal are hot in summer with summer highest day temperature is in between 40 °C to 48 °C. Nagaram records an average temperature of 34 °C.

### 2.2 Materials and Methods

#### 2.2.1 Instruments

Samples were analysed for elemental composition by using Atomic Absorption Spectrophotometer (AAS), Shimadzu AA-6300 was used for the analysis of essential and non-essential metals (Co, Zn, Cu, Ca, Mo, Mg & Fe). With AAS lamp absorbance wavelengths for metals analysed given in Table 1. Identified medicinal plants were *Mimosa pudica*, *Ocimum sanctum*, *Allium cepa*, *Allium sativum*, *Zingiber officinale*, *Azadirachta indica*, *Calotropis procera*, *Capsicum frutescens*, *Emblica officinalis*, and *Curcuma longa*. Selected commonly available medicinal plants of the region and their uses given in Table 2.

Table 1 Chosen AAS lamp absorbance wavelengths for metals

S. No.	Metal	Wavelength (nm)	Slit width (nm)
	Fe	248.3	0.2
	Mg	285.5	0.2
	Mo	320.9	0.2
	Ca	422.7	0.7
	Cu	324.8	0.7
	Zn	213.9	0.7
	Co	346.6	0.2

#### 2.2.2 Chemicals and standards

All the chemicals were of analytical reagent grade (purity > 99%), purchased from Sigma–Aldrich Co., Inc., USA / Ranbaxy, India / Merck, India, unless otherwise mentioned. All the chemicals were used as received All aqueous solutions were freshly prepared using deionized water (Resistivity,  $\rho \geq 18 \text{ M}\Omega \text{ cm}$ ) from Elga Purelab Option-Q system (ELGA LabWater, UK).

### 2.2.3 Sample collection and preparation procedure

A total of 10 different commonly available medicinal plant species were collected from their natural habitat. The section of plant material was washed, cleaned, air-dried to total dryness for four days and later pulverized to powder form. The dried material was weighed digested with 5-10 ml of 1:3 mixtures of HNO<sub>3</sub> and HClO<sub>4</sub> and subjected for Flame photometric analysis and Atomic absorption spectrophotometric analysis. Appropriate working standard solutions were prepared for each element. The calibration curves were obtained for concentration versus absorbance. The trace elements were determined using standard methods from literature with some small modifications.

Table 2 Selected commonly available medicinal plants of the region and their uses

S. No.	Botanical name	Family	Sample Code	Section of Plant	Medicinal Uses
	Mimosa pudica	Mimosaceae	EMP-1	Whole plant	Snake bites, speed healing in wounds and to treat eczema
	Ocimum sanctum	Lamiaceae	EMP-2	Leaves	Coughs, colds, bronchitis; gastric disorder, earache, ringworm, leprosy and itches
	Allium cepa	Liliaceae	EMP-3	Bulb	Cough, asthma, rheumatism, colic and insect bites.
	Allium sativum	Liliaceae	EMP-4	Bulb	Fevers, bronchitis, rheumatism, inflammation, indigestion, gas formation and pain in the abdomen
	Zingiber officinale	Zingiberaceae	EMP-5	Rhizome	Stomach upset, motion sickness, nausea, and vomiting
	Azadirachta indica	Meliaceae	EMP-6	Leaves, Bark	Bark Fever, thirst, cough and bad taste in the mouth
	Calotropis procera	Asclepiadaceae	EMP-7	Root, Bark	Dyspepsia, flatulence, constipation, loss of appetite, indigestion
	Capsicum frutescens	Solanaceae	EMP-8	Leaves, Fruit	Headache, night blindness, pain, adenitis, sores, dysuria and bronchitis
	Emblica officinalis	Euphorbiaceae	EMP-9	Fruits	Against liver toxins, high blood cholesterol, and age-related kidney disorders
	Curcuma longa	Zingiberaceae	EMP-10	Rhizome	Scabies, itches, boils, eczema, leucoderma, eye diseases, bruises and sprains; internally for cough, cold, fever.

### III. RESULTS AND DISCUSSION

Samples were analysed for elemental composition by using Atomic Absorption Spectrophotometer for metals (Co, Zn, Cu, Ca, Mo, Mg & Fe). Metal composition in mg/kg in some of the selected commonly available medicinal plant extracts was given in Table 3 and comparative illustration was given in Figure 2.

Among the section of plants, the highest metal content was seen in the latex of *Calotropis procera*. Zn content is usually high in all samples ranged from 22.68 to 86.42 mg/kg, highest seen in leaves of *Ocimum sanctum*. Fe content was high in the latex of *Calotropis procera*. 38.22 mg/kg. Unlike other results, Mn content was very high in the rhizome of *Zingiber officinale* (554.20 mg/kg), Fruit of *Emblica officinalis* (182.74 mg/kg) and rhizome of *Curcuma longa* (331.82 mg/kg). Ca, Mg, Mo and Co content was high in the latex of *Calotropis procera*. 210, 45.88, 6.28 & 78.28 mg/kg respectively. Cu content was found in leaves of *Ocimum sanctum*, 16.52 mg/kg.

Table 3: Metal composition in mg/kg in some of the commonly available medicinal plant extracts

S. No.	Botanical name	Sample Code	Part	Fe	Mg	Mo	Ca	Cu	Zn	Co
	Mimosa pudica	EMP-1	Roots	4.26	2.86	1.28	3.58	6.82	68.28	2.36
	Ocimum sanctum	EMP-2	Leaves	2.83	1.42	0.10	1.28	16.52	86.42	0.06
	Allium cepa	EMP-3	Bulb	0.62	0.24	0.08	0.08	5.20	28.14	0.12
	Allium	EMP-4	Bulb	1.12	0.32	0.06	0.12	6.24	22.68	0.08

<i>Zingiber officinale</i>	EMP-5	Rhizome	5.86	0.32	0.42	0.06	4.82	43.18	1.08
<i>Azadirachta indica</i>	EMP-6	Leaves	2.54	1.64	1.02	1.86	6.12	52.40	0.08
<i>Calotropis procera</i>	EMP-7	Latex	38.22	45.88	6.28	210.00	3.86	28.36	78.28
<i>Capsicum frutescens</i>	EMP-8	Leaves	8.28	8.02	1.82	10.12	1.02	26.54	2.36
<i>Emblica officinalis</i>	EMP-9	Fruits	0.33	0.24	0.12	0.08	6.12	36.22	0.08
<i>Curcuma longa</i>	EMP-10	Rhizome	2.14	0.36	0.18	0.28	5.84	62.42	0.09

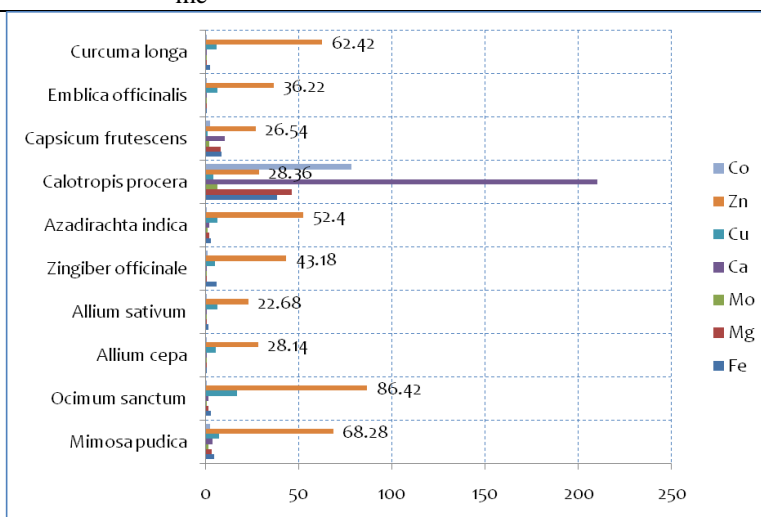


Figure 2 Comparative information on metallic content (in mg/kg) shown here Co, Zn, Cu, Ca, Mo, Mg & Fe

#### IV. CONCLUSION

In conclusion, the results reported here confirm that the plant extract samples contained metal contents. This work is an important result as human health is indirectly affected by the application of this as medicine. Among the section of plants, the highest metal content was seen in the latex of *Calotropis procera*. Zn content is usually high in all samples ranged from 22.68 to 86.42 mg/kg, highest seen in leaves of *Ocimum sanctum*. Unlike other results, Mn content was very high in the rhizome of *Zingiber officinale* (554.20 mg/kg), Fruit of *Emblica officinalis* (182.74 mg/kg) and rhizome of *Curcuma longa* (331.82 mg/kg).

#### V. ACKNOWLEDGEMENT

Authors acknowledge the financial support of the UGC, New Delhi, India for funding the Minor Research Project, No. F MRP-6646/16 (SERO/UGC).

#### VI. REFERENCES

- [1] T. Madhavi Glory, Ethnomedicinal plants used in the healthcare systems of Nagaram Mandal people, Guntur district Andhra Pradesh, India-A case study, *Journal of Advanced Studies in Agricultural, Biological and Environmental Sciences (JABE)*, Vol.3, Issue.3, 2016 (July-Sept) ISSN:2455-0221(P), 2394-2606(O)
- [2] X. Wang, T. Saro, B. Xing, and S. Tao, *Science of The Total Environment*, vol. 330, no. 1-3, p. 28, 2005.
- [3] Akhileshwar Kumar Srivastava, *Synthesis of Medicinal Agents from Plants Chapter 1 - Significance of medicinal plants in human life*, 2018, 1-24; <https://doi.org/10.1016/B978-0-08-102071-5.00001-5>
- [4] Chopra RN, Nayar SL, Chopra IC 1956: *Glossary of Indian Medicinal Plants* CSIR, New Delhi, India pp. 1-259.
- [5] Cox AP, Balick JM: *Ethnobotanical Research and traditional Health Care in Developing Countries*, plants, people and culture. 1996, W.H. Freeman and Co
- [6] Baasinska B, Kulasek G 2004: Garlic and its impact on animal and human health. *Medycyna Weterynaryjna* 60 1151-1155.
- [7] Bais B, Purohit GR, Dhuria RK, Pannu U 2002: Nutritive value of neem leaves in Marwari goats. *Indian Journal of Animal Nutrition* 19 266-268.