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***Research article***

# ANALYSIS OF SOME ESSENTIAL ELEMENTS IN MEDICINAL PLANTS USED IN AYURVEDA

Om Prakash Rout[1*], Rabinarayan Acharya[2], Rakshapal Gupta[1], Sagar Kumar Mishra[3], Rashmibala Sahoo[4]

[1] Dept. of Dravyaguna, Govt. Ayurveda College, G.E. Road, Raipur, Chhattisgarh
[2] Dept. of Dravyaguna, I.P.G.T. & R.A. Gujarat Ayurved University, Jamnagar, Gujarat, India
[3] Division of Pharmacognosy & Phytochemistry, University Dept. of Pharmaceutical Sciences, Utkal University, VaniVihar, Bhubaneswar. Orissa.
[4] Scientific officer (Botany), State Drug Testing Laboratory (ISM), Govt. Ayurveda Hospital Campus, BJB Nagar, Bhubaneswar, Odisha

**ABSTRACT:** This study presents a preliminary data of occurrence of elemental concentration in medicinal plants i.e *Apium graveolens* (seed), *Sida cordifolia* (root), *Solanum surattense* (whole plant), *Tribulus terrestris*(fruit) and *Withania somnifera* (root) used in Ayurveda, using Atomic absorption spectrometer (AAS) following standard procedures. The elemental concentration i.e. Mn, Na, K, Cl, Ca, Cr, Co, Cu, Fe, Pb, Zn, Ni, Cd and Hg were found in various proportions. The data obtained from the study can be used to evaluate the potentiality of these plants in their used for Ayurvedic drugs.

**Keywords**: Medicinal Plants, ayurved, essential elements, atomic absorption spectrometer.

## INTRODUCTION

Medicinal plants play an important and vital role in traditional medicine and are widely consumed as home remedies. The past decade has seen a significant increase in the use of herbal medicine due to their minimal side effects, availability and acceptability to the majority of the populace of third world countries. Consumption contributes to the intake of minerals (essential and non essential) by infants and elderly people. Numerous medicinal plants and their formulations are used for treating diseases in ethno-medical practices as well as in traditional systems of medicine in India. Environment, pollution, atmosphere, soil, harvesting and handling are some of the factors, which play an important role in contamination of medicinal plants by metals and microbial growth. Trace elements have both a curative and a preventive role in combating diseases. It is therefore of major interest to establish the levels of some metallic elements in common herbal plants because, at elevated levels, these metals can also be dangerous and toxic (Schumacher, Bosque, Domingo, & Corbella, 1991; Somers, 1974). The World Health Organization (WHO, 1992), in a number of resolutions, has also emphasized the need to ensure the quality control of plant products by using modern techniques and applying suitable standards. Thus the analytical control of metals in plants especially medicinal plants is part of quality control, which should establish their purity, safety and efficacy.

Treatment of ailments by natural herbs is well documented in *'Atharvaveda' (circa* 1000 B.c.) out of which evolved *'Ayurveda',* the Indian science of medicine. Several western scholars have pursued the analysis of various Indian plants and herbs for their medicinal properties (Ambasta, 1986). Most studies on such medicinal plants pertain to their organic contents, viz. essential oils, glycosides, vitamins, alkaloids and other active components and their pharmacological/therapeutic effects. However, little has been reported about their minor and trace element composition or mineral contents. Besides several organic compounds, it is now well established that many trace elements play a vital role in general well-being as well as in the cure of diseases (Underwood, 1977; Prasad, 1993).

Several researchers have measured the elemental concentration in medicinal plants using nuclear analytical techniques. Sing and Garg (1997) studied the availability of essential trace elements in specific parts of several plants commonly used in Indian Ayurvedic system of medicine using instrumental neutron activation analysis (INAA).

Rajkumar and Damame (1998) estimated the concentration of Mn, Na, K and Cl in seventeen Ayurvedic medicinal plants used to treat urinary tract disorders by employing the same method. Serfor-Armah et al. 2001 used INAA for multielement analysis on five medicinal plants used in Ghana using the same method. Obiajunwa et al. 2002 determined the concentration of fourteen elements in some twenty Nigerian medicinal plants using energy depressive X-ray florescence analysis. Mohanta et al.2003 measured and correlated the elemental profiles of some widely used medicinal plants in North Eastern India, with their traditional therapeutic use in Ayurveda.

They used proton induced X-ray emission as an analytical tool. Instrumental neutron activation has been used to measure elemental concentration of four Ayurvedic drugs by Rajkumar and Vinchurkar (1992) and Saper et al.2004 were concerned about the lead, mercury and arsenic intoxication associated with the use of Ayurvedic herbal Metallic and mineral raw materials in complex form are used in some very effective Ayurvedic medicine. They determined the heavy metal content in such products produced in South Asia and available in Boston South Asian grocery stores using X-ray fluorescence spectrometry. Chen *et al.* (1993) have, for instance, analyzed 75 samples of various diuretic, phlegm eliminating and stomach invigorating natural drugs. Similarly Kanias *et al.* (1993) have determined TE and active constituents of Greek medicinal plant *E. rostratus schlecht.* Saiki *et al.* (1990) have determined 15 elements in extracts of Brazilian medicinal plants and discussed their therapeutic action. Recently, Fakankun *et al.* (1993) have reported up to 24 elements in Nigerian plants and their ash. In addition, several other studies have been reported from Taiwan (Wang *et al.*, 1996), Malaysia (Majid *et al.*, 1995) and other countries. Samudralwar and Garg (1996) have reported the analysis of six medicinal herbs for their elements contents.

The aim of the present study was to determine the preliminary elemental concentration in some selected Ayurvedic drugs. These Ayurvedic drugs are widely used in India to treat various ailments (Table 1). The concentration of various elements in these drugs is of interest from the point of view of their therapeutic value and also the toxic nature of some elements.

## MATERIALS AND METHODS

### Collection and authenticated of drugs

*Apium graveolens* (seed), *Sida cordifolia* (root), *Solanum surattense* (whole plant), *Tribulus terrestris*(fruit) and *Withania somnifera* (root) were collected from authenticated Ayurvedic medicinal shops and identified by comparing the standard samples as per API.

### Sample preparations

All drugs were first cleaned, dried and then powdered using a grinder. Each material was kept in clean, dry, labeled, and stoppard glass vials. Samples in powder form were used for AAS analysis.

### Elemental analysis by AAS technique

All samples for AAS were weighed. Weighted amount of dried and powder samples were dissolved in a mixture of Conc. Acid (HCl and $HNO_3$). This solution was heated gently and then filtered and the undissolved portion of the sample was again heated in the acid mixture. The procedure was repeated several times until a clear solution remained, rejections the residue and was used for the analysis after the appropriate dilution. The solutions thus obtained were analysed for the elements of interest on a Perkin Elmer 3100 atomic absorption spectrometer with suitable hollow cathode lamps. The concentrations of the different elements in these samples were determined the corresponding standard calibration curve obtained by using standard AR grade solutions if the elements of interest as standard.

## RESULTS AND DISCUSSION

Botanical names of plant analysed along with their parts used for medicinal purpose are listed in table 1(Kapoor, 2001). The results of the elemental analysis of the above mentioned plants by AAS techniques are recorded in Tables 2, these values are averages of three independent measurements. The elements Mn, Na, K, Cl, Ca, Cr, Co, Cu, Fe, Pb, Zn, Ni, Cd and Hg were analysed by the technique of AAS by measuring the absorbance of the species at its resonance wavelength with a Perkin Elmer 3100 instruments. The percentage of their elements obtained by the comparator method is shown in Table 2.An examination of the data from table 2, shows that different medicinal plants contain the elements Mn, Na, K, Cl, Ca, Cr, Co, Cu, Fe, Pb, Zn, Ni, Cd and Hg in various proportions.

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The differences in the concentrations of these elements within the different plants is attributed to factors such as the preferential absorbility of a particular plants for the corresponding elements, the age of the plants, the mineral composition of the soil in which the plant grows, use o fertilizers, irrigation water as well as its ambient climatological conditions.

Medicinal plants are used in many diverse ways. However, the ultimate objective of their use is that they should interact directly or indirectly with our body chemistry. They may be used in various forms like food, medicines, cosmetics or aromatics, but in all cases, their active constituents must be absorbed into the body for deriving the required benefits. One important factor for the formation of active constituents in medicinal plants are the trace elements because they are known to play an important role in plant metabolism and active constituents of medicinal plants are metabolic products of plant cells.

Although there are reports in the literature on the trace element content in plants, we are still far from the point of knowing exactly the mechanisms of action and formation of active constituents for each medicinal plant. A direct linkage between elemental content and its curative capability is yet to be established, however, the data on trace, minor and major elements in plants is of great importance to understand the pharmacological actions of these medicinal plants.

**Table No. 1: Botanical names, parts used and uses**

| Sl No. | Plant name | Uses |
|---|---|---|
| 1. | Ajmoda (Seed)<br>*Apium graveolens* | Dropsy, colic, rheumatoid arthritis, bronchitis, asthma, liver & spllen diseases. |
| 2. | Bala (Root)<br>*Sida cordifolia* | Urinary diseases, disorders of blood & bile, bleeding piles, hematuria, gonorrhea, cystitis, leucorrhea, chronic dysentery, facial paralysis |
| 3. | Kantakari (Whole plant)<br>*Solanum surattense* | Fever, cough, asthma, gonorrhea, rheumatism |
| 4. | Gokshura (Fruit)<br>*Tribulus terrestris* | Spermatorrhea, phosphaturia, dysuria, gonorrhea, chronic cystitis, calculous affections, urinary disorders |
| 5. | Aswagandha (Root)<br>*Withania somnifera* | Emaciation of children, senile debility, rheumatism, general debility, nervous exhaustion, loss of memory, loss of muscular energy, spermatorrhea. |

**TableNo. 2: Elemental analysis of various medicinal plants by AAS *technique***

| S No. | Plant name | Mn | Na | K | Cl | Ca | Cr | Co | Cu | Fe | Pb | Zn | Ni | Cd | Hg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ajmoda | 1.536 | 6.437 | 12.04 | 1.24 | 0.09 | - | 3.799 | 7,099 | 4.165 | - | 8.299 | 1.309 | - | - |
| 2. | Bala | 1.863 | 3.649 | 10.21 | - | 13.09 | 1.309 | 4.681 | 8.899 | 1.135 | 0.136 | 5.163 | 1.209 | 1.790 | - |
| 3. | Kantakari | 1.170 | 4.844 | 9.69 | 3.01 | 10.98 | 0.198 | 1.586 | 9.909 | 1.262 | 1.189 | 6.818 | 0.159 | 1.387 | - |
| 4. | Gokshura | 1.291 | 2.374 | 16.24 | 6.86 | 28.25 | 0.582 | 3.878 | 8.434 | 0.891 | 0.776 | 2.579 | 0.446 | 0.873 | 1.939 |
| 5. | Aswagandha | 3.562 | 5.28 | 3.241 | 1.1012 | 0.499 | 6.782 | 63.7 | 63.7 | 5.628 | 0.605 | 1.823 | 1.0002 | 1.341 | - |

## CONCLUSIONS

Atomic absorption spectrometer (AAS) has proved to be a versatile tool to analyse biological materials like medicinal plants. The data obtained from the study can be used to evaluate the potentiality of these plants in their used for ayurvedic drugs with various combinations of plants.

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