

HEAVY METAL AND TRACE ELEMENT CONTENT IN STEREOSPERMUM COLAIS BARK

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ABSTRACT

Heavy metal (Hg, Ar, Cr, Cd, Pb) and trace element (K, Se, Zn) composition of stem bark of *Stereospermum colais* was evaluated with flame atomic absorption spectrometry (FAAS). Estimation of heavy metals was performed using hydride generation technique (cold vapour atomic absorption spectrometry) and in which carrier gas was nitrogen. The results obtained revealed the presence of trace elements and heavy metal was within the limit showing the safe use of the bark of *Stereospermum colais* as herbal drug for various treatments like cancer, arthritis etc.

KEYWORDS: *Stereospermum colais*, cancer, arthritis.

INTRODUCTION

Herbal medicine is a global phenomenon, a herbal industry, as raw material, Phytochemical are widely used as the precursor for many herbal based pharmaceutical products. But they have problem in purity with contamination by toxic heavy metals which is one of the most common complaints. Presence of these heavy metals leads to many pharmacological disorders like cancer (uddin 2011), kidney failure, cardiac vascular disorders etc. for all these problem it is essential to control the contaminants in medicinal raw material. Mineral elements such as iron, copper, manganese etc plants are very munch essential for the normal growth as well as responsible for various pharmacological properties such as cancer inflammatory activity. *Stereospermum colais* is a large straight stemmed deciduous tree 18-30 m in height and 2.8 m in girth found throughout in moist regions of India up to an altitude of about 1200 m, chiefly in deciduous forests (Parrota JA 2001). In English it is known as

Yellow snake tree, in Hindi it is padre and in Tamil it is Pathiri. All the parts of the tree are useful in treating many disorders. The leaves are used to treat otalgia, odantalgia, rheumatalgia, malarial fever and wounds. Decoction of the leaves is used as antipyretic and to treat chronic dyspepsia. The root is one of the important ingredients in Dasamula an Ayurvedic formulation. The roots are having bitter, astringent and acrid property. The roots are used as anodyne, appetiser, constipating, diuretic, lithotropic, expectorant, cardio tonic, aphrodisiac, anti-inflammatory, anti bacterial, febrifuge tonic, anti emetic, anti pyretic. The decoction of root is used in the treatment of asthma and cough.(Warriar pk et,al, 2002). On literature survey analysis of heavy metals and inorganic element content in *Stereospermum colais* leaves were done (Kumudhaveni Babu, 2013) but in bark being a major part of the tree elemental analysis was not performed. Based on the literature and future pharmacological properties the quantification of various elements was estimated from the bark of *Stereospermum colais*.

MATERIALS AND METHOD

Sample

Fresh stem bark of *Stereospermum colais* was collected in September 2010 in Madurai forest, Tamil Nadu state, India. Botanical identification and authentication was done by Botanist Dr. P. Jayaraman, PARC, Chennai and the bark materials were shade dried and coarsely powdered.

Instrument

Atomic absorption spectrophotometer (EC Electronics Corporation of India Limited AAS Element AS AAS4141) deuterium lamp was equipped for determination of trace elements and heavy metals. The hollow-cathode lamps were the radiation source for Cu, Mg, Zn, Cd, Hg (ECIL) and As, Pb (Photron). For the formation of hydride in Ar and Hg analysis Hydride generator was adopted. Air/acetylene and N₂O/acetylene and Nitrogen was used as flames and carrier gas respectively.

Chemicals

Nitric acid, hydrochloric acid, sulphuric acid, hydrogen peroxide, sodium borohydride and stannous chloride were of analytical grade (E. Merck). The ultrapure Milli-Q water was used here. The calibration curve was obtained by preparing standard solutions by diluting stock solutions (CPA Ltd) of 1000 ppm of each element immediately before use.

Sample preparation

Dilute nitric acid (10ml) and dried sample (2g) was heated on a hot plate at 95°C for 15 min with stirring. After cooling concentrated nitric acid (5ml) was again added, followed by heating (95°C) for additional 30 min. The mixture was cooled and concentrated nitric acid (5ml) was added again. This mixture was reduced to 5ml. After cooling deionized water (2ml) and 30% hydrogen peroxide (3ml) was added and heated with the beaker covered to start the peroxide reaction. When the peroxide reaction was completed a mixture of deionized water (10ml) and concentrated hydrochloric acid (5ml) was added and heated for 15 min. The mixture was cooled, filtered using a Whattmann No. 42 filter paper and made up to 50 ml with deionized water.

Sample analysis

Digested sample was analyzed for Pb, Cd, Zn, Mg and Cu with flame atomic absorption spectrometry (FAAS). and for Hydride generation technique was used for Ar and Hg. Hg was analyzed by cold vapour atomic absorption spectrometry. (Kumar Sukender 2012). Calibration curve for five concentration was obtained from 1000 ppm standard solution. All the measurements were run in triplicate for the sample and standard solutions.

RESULTS AND DISCUSSION

Table 1: Heavy Metal And Trace Element Analysis

S. No	Elements	Quantity
Heavy metals		
1	Mercury	0.112 ppm
2	Arsenic	Nil
3	Chromium	0.2434
4	Nickel	Nil
5	Lead	1.22 ppm
6	Cadmium	Nil
Trace elements		
7	Copper	Nil
8	Zinc	0.332 ppb
9	Potassium	5.6 mg/gm
10	Iron	0.345mg/ gm
11	Selenium	In traces

Heavy metals viz lead (1.22 ppm), mercury (0.112 ppm), Chromium (0.2434) of the bark was found to be within the limit as per WHO guidelines. (WHO, 1995) (Table 1) The bark was free from Arsenic, cadmium and Nickel proving the safety to be used in herbal formulations.

Mineral elements such as Zinc (0.332 ppb), potassium (5.6 mg/gm), iron (0.345 mg/gm) which are in considerable amount which may be useful in managing many biological disorders.

CONCLUSION

The results of the present study supports the safety of this plant to use as raw material in herbal formulation since the heavy metal concentration is within the limits and presence of trace elements which plays a key role in secondary metabolite production in the plants. Evaluation of heavy metal and trace elements of the stem bark of *Stereospermum colais* are promising source of potent herbal drug.

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