

## Chromium in Some Herbal Drugs

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The use and demand of herbal drug is increasing day by day in both developing and developed countries due to the growing recognition that these are natural products having no or little side effects and can easily be available at affordable prices. Sometimes these are the only source of health care available to poor people particularly in South East Asia where more than 80% population depend on herbal drugs for their health care needs. Thus the quality and safety of herbal products is very important in order to have desired therapeutic efficacy. But in today's polluted environment with increasing automobile consumption and industrialization, WHO is emphasizing emphatically that without heavy metal assessment the herbal drug should not be used. The concentration of heavy metals including Cr is increasing in the environment and many hazardous effects are caused in the inhabitants of that environment (Prasad and Hagemeyer, 1999; Nriagu and Pacyna, 1998). For example, in human beings, due to Cr numbers of disorders occur like damage to liver, kidney, respiratory and nerve tissues. Besides enhancing risk of human lung cancer due to automobile exhaust and even irritation of skin have also been reported by excess of Cr (Anonymous, 1998; Anonymous 1988). Therefore it is mandatory to assess the Cr concentration in herbal drugs before use. Although some work has been carried out by Rai *et al.*, 2001 a, b; Fuh *et al.*, 2003; Al Ajasa *et al.*, 2004 and Ernst 2002 but it is not enough and lot of work is required in this field.

With this vision the present work was done to estimate Cr concentration in some important herbal drugs collected from different parts of India with the objective to compare the Cr concentration in different species and its variation in the same species collected from different places. The species selected for study are *Alpinia galanga* Willd. ('Kulanjan'), *Artemisia parviflora* Roxb. ('Masipachchai'), *Butea monosperma* Kuntze ('Palash'), *Coleus forskohlii* Briq. ('Gandira'), *Curcuma amada* Roxb. ('Amra Haridra'), *Euphorbia prostrata* W. Ait. ('Dudhika'), *Leucas aspera* Spreng. ('Thumbai'), *Malaxis acuminata* D. Don ('Jeevak') and *Peuraria*

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*tuberosa* DC. ('Vidarikand'), due to their importance in indigenous systems of medicine.

## MATERIALS AND METHODS

The plant parts which have medicinal value were collected from different parts of our country and commercial samples were also procured from different herbal drug markets being sold under the same vernacular names for estimation of heavy metals (Table-1). A total of 34 samples belonging to 9 different plant species were analyzed. Plants were washed in fresh running water to eliminate dust, dirt and possible parasites and then they were washed again with deionized water (Zurera *et al*, 1987). Cr was estimated in all the samples by the method described by Rai *et al* (2001a). The prepared samples were analyzed on Atomic Absorption Spectrophotometer (Perkin Elmer 5000). Hollow cathode lamp was employed for detection of chromium. The standard reference material of Cr (E-merck, Germany) was used to provide calibration and quality assurance for each analytical batch. The efficiency of digestion of plant samples was determined by adding standard reference material of Cr (E-merck, Germany) to the different samples. After addition of standards, samples were digested and Cr was estimated as described above. Mean recoveries of Cr is  $85 \pm 8\%$ . The detection limits of Cr using AAS (Perkin Elmer 5000) were  $0.001 \mu\text{g ml}^{-1}$ . Replicate ( $n=3$ ) analyses were conducted to assess precision of the analytical techniques.

## RESULTS AND DISCUSSION

Chromium was estimated in collected as well as in commercial samples of some important herbal drugs of India. Table 1 lists the place of procurement as well as medicinal properties of herbal drugs analyzed here, (Chopra *et al*, 1956) which are also included in the indigenous pharmacopoeia. Table 2 shows the mean concentration values of Cr. From the present studies, it was revealed that Cr was accumulated in all the nine plant species studied. The mean Cr concentration ranged between 0.42 ppm (SD-0.117) to 27.0 ppm (SD-1.75). The minimum Cr was present in *Malaxis acuminata* (Ranikhet and Tarikhet) and maximum Cr was present in *Euphorbia prostrata* (Tarikhet). WHO has not yet given the permissible limit of Cr in medicinal plants, only limits for Pb and Cd is given which is 10 ppm and 0.3 ppm respectively. It may be due to that Cr has been identified as an essential element for higher animals (Schwartz and Mertz, 1959; Mertz, 1969) particularly for mammals. The impaired carbohydrate metabolism of rat and human beings can be corrected by administration of small amount of Cr. However, Markert (1994) given the normal range of

**Table 1.** Plant species and their medicinal properties.

Plant Species	Part used	Genuine (collected)	Commercial	Medicinal properties (Chopra et al, 1956)
<i>Alpinia galanga</i> Willd 'Kulanjan' (Zingiberaceae)	Rhizome	Lucknow	Bombay Delhi Jammu	Stomachic, carminative, cardio-depressant used in rheumatism and catarrhal affections.
<i>Artemisia parviflora</i> Roxb.* 'Masipachchai' (Asteraceae)	Leavess	Junagadh Tarikhet	-	Diuretic and antiviral
<i>Butea monosperma</i> Kuntze 'Palash' (Fabaceae)	Seeds	Alahabad Ranikhet	Aligarh Bombay Pune	Aperient and rubefacient
<i>Coleus forskohlii</i> Briq.* 'Gandira' (Lamiaceae)	Roots	Agrakhal Tarikhet Vijaywada	-	Cardioactive, hypotensive, used in constipation
<i>Curcuma amada</i> Roxb. 'Amra haridra' (Zingiberaceae)	Rhizome	Lucknow Tirunelveli	Delhi Nagpur	Stomachic, carminative, used in bruises and sprains
<i>Euphorbia prostrata</i> W. Ait. 'Dudhika' (Euphorbiaceae)	Whole plant	Lucknow Tarikhet Tirunelveli	Patiala	Stimulant, astringent, anthelmintic and laxative.
<i>Leucas aspera</i> Spreng.* 'Thumbai' (Lamiaceae)	Whole plant	Banglore Bhubaneswar Calcutta Thiruvananthpuram Tirunelveli	-	Antipyretic, stimulant, expectorant, aperient, diaphoretic and used in chronic rheumatism
<i>Malaxis acuminata</i> D. Don. 'Jeevak' (Orchidaceae)	Tubers	Ranikhet Tarikhet	Aligarh Bombay	Aphrodisiac, febrifuge and have a cooling effect.
<i>Peuraria tuberosa</i> DC. 'Vidarikand' (Fabaceae)	Tubers	Dehra Dun Mandi	Delhi	Aphrodisiac, tonic, galactagogue, diuretic and cures leprosy.

\* Crude drugs were not available in the markets of India surveyed.

**Table 2.** Chromium (Cr) concentration [ppm (dw)] in some important herbal drugs.

Herbal drug	Place	Cr	Herbal drug	Place	Cr
<i>Alpinia galanga</i>	Delhi*	2.08±0.117	<i>Artemisia parviflora</i>	Junagadh	11.16±1.120
	Jammu*	5.41±0.624		Tarikhet	3.50±0.204
	Lucknow	4.62±0.375			
	Mumbai*	4.16±0.790			
<i>Coleus forskohlii</i>	Agrakhal	5.16±0.580	<i>Butea monosperma</i>	Allahabad	3.25±0.270
	Tarikhet	10.66±1.66		Aligarh*	2.50±0.540
	Vijaywada	4.33±0.589		Mumbai*	3.00±0.310
				Pune*	3.33±0.117
<i>Curcuma amada</i>			<i>Euphorbia prostrata</i>	Ranikhet	3.66±0.841
	Delhi*	2.58±0.235		Lucknow	16.75±1.06
	Lucknow	8.08±0.897		Patiala*	7.25±0.707
	Nagpur*	5.00±0.707		Tarikhet	27.0±1.750
<i>Malaxis acuminata</i>	Tirunelveli	7.25±0.353	<i>Leucas aspera</i>	Tirunelveli	11.00±1.200
	Aligarh*	6.00±0.735		Banglore	18.08±2.239
	Mumbai*	4.50±0.408		Bhubaneswar	6.42±0.424
	Ranikhet	0.42±0.117		Calcutta	6.62±0.372
<i>Pueraria tuberosa</i>	Tarikhet	0.42±0.117		Thiruvananthapuram	6.66±1.178
	Dehradun	1.25±0.41		Tirunelveli	7.50±0.889
	Delhi*	2.41±0.50			
	Mandi	1.66±0.240			

Values are arithmetic mean ± SD of 3 determination in each case

\* Market samples

trace elements in uncontaminated plant tissues. According to this Cr concentration should be upto 1.5 ppm. When this limit was compared with Cr concentration in all the 34 samples, it was found that only three samples viz., *Malaxis acuminata* (Ranikhet and Tarikhet) and *Pueraria tuberosa* (Dehradun) had Cr within the limit. All the other 31 samples were beyond this limit. There is high variation occur in Cr concentration in same species of plants collected from different location which is shown in the table 2. In *A. galanga*, *C. forskohlii* and *P. tuberosa* more than two times difference present in Cr concentration in different samples. *C. amada* Lucknow sample has more than four times Cr as compared to Delhi sample. In *M. acuminata* more than ten times Cr was found in Aligarh and Mumbai sample as compared to Ranikhet and Tarikhet samples. In *A. parviflora*, *E. prostrata* and *L. aspera* almost three times difference present in Cr concentration in different samples. Only in *B. monosprma* all the five samples have almost same Cr concentration.

By critical evaluation of results, it is noticed that concentration of metals in plants, depends to the site from where they are collected. But high or low concentration in samples is not always related to the pollution level of procurement site because sometimes parent soil itself has high Cr concentration or sometimes high pollution level in the site is not reflected by the chromium concentration in the sample, as in the case of Delhi sample of *A. galanga* and *C. amada*, which had low Cr concentration even though Delhi is known for its high automobile pollution. It may be possible that these samples are collected from some other unpolluted area and brought to the Delhi market.

Although, according to present knowledge Cr is not as much toxic as other metals like Hg, Pb, Cd to human beings, but in some studies it was found to be carcinogenic. So it is better to check Cr concentration in herbal drugs before use and collect them from safer places.

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