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NOTE

Comparative Evaluation of Heavy Metals in Triphala Churna Marketed in India

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In order to ascertain accumulation of heavy metals including, arsenic, cadmium and lead in marketed triphala churna in Yavatmal city, investigations were performed by using atomic absorption spectrometry. The results showed heavy metals accumulation in herbal medicines procured from local market. The main purpose of the investigation was to document evidence for the users, collectors and practitioners of marketed triphala churna. In present research work heavy metal like arsenic, cadmium and lead were analyzed in herbal medicines by atomic absorption spectroscopy. It is found that arsenic content in herbal formulations H2 (0.02 ppm), H3 (0.03 ppm), H4 (0.02 ppm), H5 (0.07 ppm), H7 (0.02 ppm), H8 (0.03 ppm), H9 (0.02) and H10 (0.93 ppm) which is below the permissible limit in all formulations. The cadmium content in H2 (14.15 ppm), H3 (0.41 ppm), H4 (0.87 ppm), H5 (0.93 ppm), H7 (14.16 ppm), H8 (0.41 ppm), H9 (0.88 ppm) and H10 0.93 ppm. The lead content is below detectable level in all formulations. Such formulations are injurious to health of patient if consumed regularly.

Key Words: Triphala churna, Atomic absorption spectrophotometry, Arsenic, Cadmium, Lead.

Herbal medicines are plant derived materials and preparations with therapeutic or other human health benefits, which contain either raw or processed ingredients from one or more plants, inorganic materials or animal origin. Herbal medicine preparations are developed and created drugs by the modern pharmaceutical industry. Nowadays, they are manufactured and sold most widely on the pharmaceutical market for curing diseases and promoting public health in India¹.

Herbal medications are claimed and widely believed to be beneficial. However, there have been reports of acute and chronic intoxications resulting from their use. The popularity and availability of the traditional remedies have generated concerns regarding the safety, efficacy and responsibility of practitioners using traditional remedies. A common misperception is that medicaments of natural substances cannot be present in toxic concentrations in a variety of herbal preparations and dietary supplements.

Incorporation of certain heavy metals into Asian traditional medicines is based on the common time-honored belief that metals such as lead, copper, gold, iron, mercury, silver, tin and zinc are needed for appropriate bodily functioning and that any imbalance can result in disease. A number of beneficial Vectors are considered to be associated with their use. Formulators understand that some of these metals are noxious and therefore, elaborate ways of "detoxification" have been

evolved so that they can be "safely" incorporated into their formulas. According to these formulary philosophies, this might be achieved by the combination of other ingredients in the herbal remedy or by subjecting the metal to a series of multifaceted treatments. For example, in Aryurveda, processed lead or "nagabhasma" is produced by subjecting it to a pharmaceutical procedure that involves repeatedly heating the metal until it glows and alternately dipping it in several herbal mixtures before it is combined with arsenic sulfide. Unfortunately, these heavy metals are often present in traditional formulations in excessive amounts due to inherent problems in preparation, deliberate inclusion or through contamination during the manufacturing process such as the use of metal pots or grinding weights another source of adulteration may be *via* herbs grown in metal-rich soils².

WHO, (1998) mentioned that the maximum permissible limits in raw materials only for arsenic, cadmium and lead, which amount to 1.0, 0.3 and 10 mg/kg, respectively. The concentration of heavy metals makes the raw plants admissible to the production of medicines due to the fact that amount taken increases with the concentration, increased by constant mass of a taken dose³.

20 % of 70 Ayurvedic herbal medicinal products contained potentially harmful levels of toxic heavy metals (American Medical Association 2004) Ayurvedic medicines theory

attributes an important therapeutic role to metals such as mercury; arsenic and lead 35-40 % of the medicines in the Ayurvedic formulary intentionally contain at least one metal⁴.

Triphala is commonly used in an Ayurvedic and traditional Thai medicines. It consists of the dried fruits of three plants, *Phyllanthus emblica* Linn. (or *Embolica officinalis* Gaertn., Indian gooseberry, Amalaki, Ma-kham-pom), *Terminalia chebula* Retz. (*Chebulic myrobalan*, Haritaki, Sa-mor-Thai) and *Terminalia bellerica* (Gaertn.) Roxb. (*Belleric myrobalan*, Vibhitaka, Sa-mor-Phe-phek). Triphala has been described as an important health tonic for detoxification, rejuvenation and balance, especially in the summer season. It is a therapeutic agent for treatment of a variety of conditions such as headache, dyspepsia, constipation, liver conditions, fatigue, infections and assimilation and is also reported to possess many biological activities including antidiabetic, antimutagenic antimicrobial radioprotective, hypocholesterolaemic, antiviral immunomodulatory and anticancer⁵.

All 10 samples were analyzed for toxic metal contamination.

Calibration of equipment: For the studied elements, the sensitivity and detection limits, for As 0.02 and 0.08 ppm, Cd 0.2 and 1.0 ppm, Pb 2 and 10.0 ppm, respectively of the used flame atomic absorption spectrophotometer (AAS) apparatus.

Extraction of heavy metals from herbal formulations: A sample of 10 g of each herbal formulation was taken in a silica crucible and heated to remove the moisture. It was then put in a muffle furnace at 450 °C, for 2 h, to remove the organic material. The ash was digested in 5 mL dilute HCl + 1 mL HNO₃, cool, 20 mL distilled water added. Filtered and the filter paper were washed distilled water, in 100 mL volumetric flask. It was made to 100 mL with distilled water and suitable dilutions were prepared. The concentration of each heavy metal was determined by AAS method⁶.

The general belief that herbal preparations are natural and, therefore, inherently safe harmless and without any adverse effects is sometimes unfounded. Toxic effects of herbal preparations have been attributed to several factors including contamination by poisoning through traditional Chinese, Indian, Malaysian and Thai herbal medicines have been reported⁷⁻⁹.

WHO, (1998) mentioned that the maximum permissible limits in raw materials only for arsenic, cadmium and lead, which amount to 1.0, 0.3 and 10 ppm, respectively. The present

work indicates that there is presence of heavy metal contents in herbal formulations selected for study (Table-1). It is found that arsenic content in herbal formulations H2 (0.02 ppm), H3 (0.03 ppm), H4 (0.02 ppm), H5 (0.07 ppm), H7 (0.02 ppm), H8 (0.03 ppm), H9 (0.02) and H10 (0.93 ppm) which is below the permissible limit in all formulations. The cadmium content in H2 (14.15 ppm), H3 (0.41 ppm), H4 (0.87 ppm), H5 (0.93 ppm), H7 (14.16 ppm), H8 (0.41 ppm), H9 (0.88 ppm) and H10 0.93 ppm. The lead content is below detectable level in all formulations.

TABLE-1
HEAVY METALS CONTENT IN TRIPHALA
CHURNA A HERBAL MEDICINE

Formulation code	Arsenic content (ppm)	Cadmium content (ppm)	Lead content (ppm)
H1	0.00*	BDL	BDL
H2	0.02*	14.15**	BDL
H3	0.03*	0.41**	BDL
H4	0.02*	0.87**	BDL
H5	0.07*	0.93**	BDL
H6	0.00*	BDL	BDL
H7	0.02*	14.16**	BDL
H8	0.03*	0.41**	BDL
H9	0.02*	0.88**	BDL
H10	0.93*	0.93**	BDL

*Within permissible limit. **Above permissible limit. BDL: Below detectable limit.

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