Bulletin of Pharmaceutical Research 2014;4(3):140-2
An Official Publication of Association of Pharmacy Professionals
ISSN: 2249-6041 (Print); ISSN: 2249-9245 (Online)

SHORT COMMUNICATION

NOVEL STANDARDIZATION METHOD AND CHARACTERIZATION OF *AYAKANDHA CHENDURAM* : EFFICIENT HERBAL MEDICINE FOR ANEMIA

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Received: Sep 08, 2014 / Revised: Dec 30, 2014 / Accepted: Dec 31, 2014

Modern techniques such as XRD, SEM with EDAX, FTIR were used to generate physico-chemical fingerprint for Ayakandha Chenduram (AKC), one of the herbo-mineral siddha medicine prepared as per the siddha classical text by the process of calcination. AKC is used in the treatment of various disorders especially Anaemia. The present study showed that the metals in this preparation were in sulphide form which favours the therapeutic efficacy of the drug. Some particles in nano range were also identified.

Key words: Ayakandha chendhuram, Herbo mineral drug, X-ray diffraction, Siddha medicine.

INTRODUCTION

Siddha system of medicine is always idiosyncratic due to the interpretation of metals and minerals in their preparations (Narayansami, 1975; Sharma, 1992; Shukla *et al* 2011). *Siddhars* are made from some revolutions in field of chemistry. Through process of *Suddhi* (purification) and *Maaranam* (trans- formation), the metals are becoming a biocompatible one. In the herbo-mineral preparations, the metals are becoming very potential (Galib *et al* 2011; Savarimuthu Michael *et al* 2011).

But nowadays, there is questions arised on the safety and efficacy behind these herbo-mineral preparations. The modern techniques are fingerprint for AKC physicochemical properties by analyzing its chemical as well as physical nature, existing in the final formulation. In present investigation, validation of the safety and efficacy of a Siddha herbo-mineral preparation *Ayakandhaa chenduram* was done, which is indicated for anemia, by analyzing the physico-chemical properties. Though, this medicine has been traditionally used as a best drug for anaemia, till there is no scientific validation for this formulation. In present study, the evidences were established to ensure the safety profile and efficacy of AKC.

MATERIALS AND METHODS

The ingredients of AKC are iron - 100 g, magnetic oxide of iron - 100 g, cinnabar - 25 g, juice of *Karisalai* (*Eclipta prostata)* as mentioned in *Yaakoobu Vaidhya Chinthamani*-70. In herbo-mineral preparations, metals are not in usual elemental form.

Purification

The iron ore is made into powder and lemon juice was added to it for consecutive 3 days. The

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Kandham (magnetic oxide of iron) was mixed with cow's urine for 3 days. Equal quantity of lemon juice, milk and juice of *Kuppai meni (Acalypha indica)* were taken and then the mixture was sprinkled steadily on the *Lingam* (Cinnabar) as per siddha literature.

Preparation

The purified and detoxified Iron and Magnetic oxide of iron were mixed and grinded well with herbal juice in *Kalvam* (stone mortar) and made into pellets. These pellets were kept in one earthen saucer, allowed to dry and covered by another earthen saucer and the junction between the two saucer was sealed by mud smeared cloth and allowed to dry. Then, this preparation was subjected to incineration process (*Putam*). After self cooling, the pellets were collected and made into powder. The above said process was repeated for another 4 times. This prepared powder was taken in *kalvam* along with herbal juice, and purified (detoxified) cinnabar in the ratio of 4:1 for grinding. Then, it was made into a form of pellet and again the incineration process was repeated similarly as mentioned above. After this, pellet was taken out and allowed for cooling. Then, the pellet was ground well as long as it attained fine powdered form in a glass container (AKC). The AKC powder was appeared red in colour.

Physicochemical characterization

AKC was subjected for the determination of physicochemical parameters such as total ash, acid-insoluble ash, and water soluble ash. To assess the physical properties such as lightness, fineness, consistency etc, the following parameters are to be considered as the physical tests such as ability of chenduram to float on water, particle must be inserted in furrows of finger of human hand to ensure particle size, freeness of particles from adhesives to each other, reduced particle size. To assess the chemical properties, the parameters such as colour, taste, lustre were considered (Garg *et al* 2011; Thanigavelan *et al* 2013; Shetty *et al* 2013).

Fourier Transform-Infra Red Spectroscopy (FTIR)

IR data acquired with perkin elmer FT-IR spectrometer. For sampling techniques, KBr method (Price, 1972) was followed. The sample was grounded using an agate motor and pestle to give a very fine powder. The finely powder sample was mixed with about 100 mg dried potassium bromide salt. The mixture was then pressed under hydraulic press using a die to yield a transparent disc (measure about 13 mm diameter and 0.3 mm in thickness) through which the beam of spectrometer passed. The analysis was carried out using BRUKER RFS 27: Stand alone FT-Raman Spectrometer.

XRD and Scanning Electron Microscopy (SEM)

To evaluate grain size, particle size, distributions, material homogenicity and inner metallic distributions, SEM was carried out by using FEI quanta 200-high resolution instrument. The XRD studies were carried out by Bruker discover D8 X ray diffractometer (Wei *et al* 2008).

RESULTS AND DISCUSSION

Physicochemical characterization

The AKC looked like red in colour under normal vision. The LOD value was 1.008 *w/w*, the total ash value was 95.627 *w/w*, water soluble ash-17.958 *w/w*, acid in soluble ash 0.25 *w/w*.

Fourier transform-infrared spectroscopic analysis

The FT-IR peaks indicated that Si-O bond and Fe-O bond formation exists in the compound and most of the peaks were well matched with reported FT-IR spectral of alpha-Iron oxide. Typical peak at 1100 cm^{-1} was due to formation of alpha phase of iron oxide compound with siliceous-iron based compound (**Figure 1**).

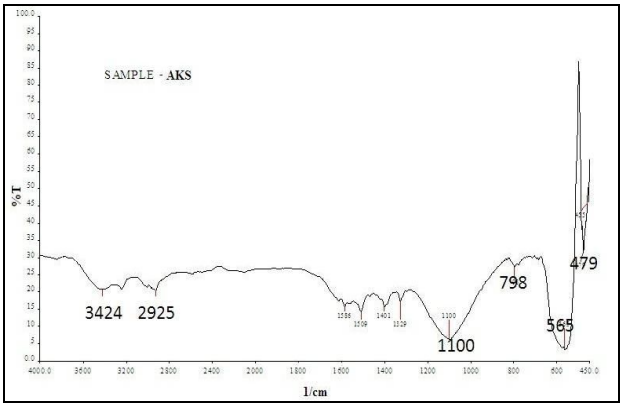

Fig. 1. FTIR spectroscopic studies of AKC

Surface morphology studies

The SEM images clearly indicated the presence of aggregated particle formation with alpha-iron oxide as a major phase. EDX data showed the exact amount of respective element present in the sample in terms of wt % by wt % (**Figure 2**).

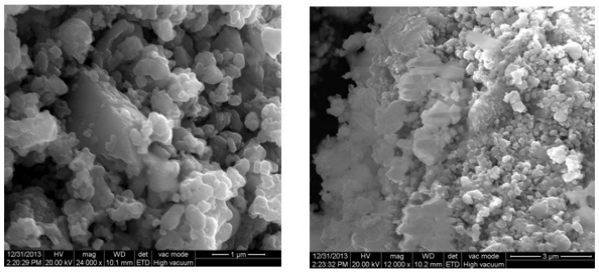

Fig. 2. SEM images of AKC

XRD analysis

The X-ray diffraction pattern of the prepared siddha medicine Ayakandha Chendhooram (AKC) existed with major alpha-iron oxide pattern and its major peaks exactly matched with the JCPDS data card number (JCPDS-33-0664) and the corresponding values of 2-theta were 24, 26, 32.8, 35.6 40.6, 44.7, 49.3, 54.0, 62.5, 63.7 with corresponding intensities of 400, 440, 1784, 1259, 383, 735, 649, 768, 476, 409. The materials showed good crystalline in nature with particle size of below 500 nm, which was also predicted and confirmed by SEM analysis. Elemental composition of AKC was determined by EDX analysis. The Iron content was major component of the herbal formulation compared all other minor elements such as carbon and siliceous materials, which existed in minor quantity and therefore, it will not create any major change in overall activity (**Figure 3**).

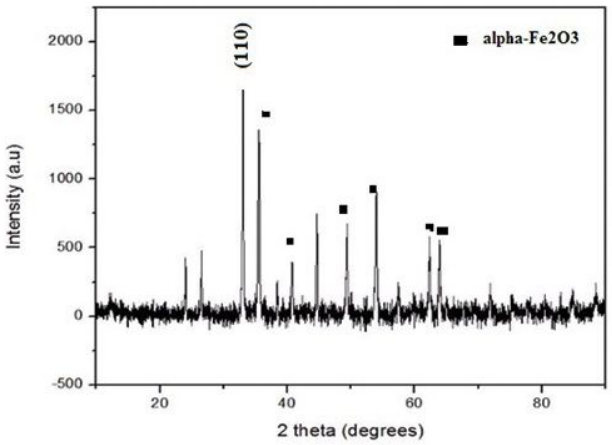

Fig. 3. XRD studies of AKC

CONCLUSION

The present study revealed that the heavy metals were present in AKC within permissible limits as per norms of World Health Organization. This ensured the safety of this formulation. XRD studies confirmed the alpha iron oxide phase existed for AKC formulation. SEM analysis concluded the aggregated particle morphology for obtained AKC formulation. The above investigation on Ayakandha Chendhooram using modern techniques was validating the bioavailability of this herbo-mineral formulation. Hence, it ensured the efficacy of AKC and established the fingerprint for standardization of the effective herbal formulation.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the Principal, Government Siddha Medical College, Chennai, Tamil Nadu for his support.

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