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# ICP-OES Analysis of Siddha Formulation Kabangusa Chooranam

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***Abstract*: *Background:* The Kabangusa Chooranam *(KBC)* is a polyherbal formulation used for treating all types of respiratory diseases. *Objective:* The objective of the present study is to detect heavy metals (arsenic, lead, cadmium, mercury) and other elements within the permissible limits as per WHO guidelines present in the Siddha polyherbal formulation "*Kabangusa Chooranam*". *Materials and Methods:* The ingredients were collected and purified and the drug was prepared as per Siddha literature "*ChikichaRathna Deepam VaiththiyaSinthamani part-2*" by *Kannusamypillai*. Here, the drug was subjected to standardization by simultaneous ICP-OES analysis equipment (PERKIN ELMER OPTIMA 5300 DV). *Result:* This paper revealed the therapeutic safer level of heavy metals and other elements present in *Kabangusa chooranam*, as per WHO guidelines with the help of simultaneous ICP- OES analysis equipment (PERKIN ELMER OPTIMA 5300 DV). *Conclusion:* From the ICP-OES analysis reveals that Kabangusa chooranam are free from toxicity there by proving the safety of its utilization in siddha system. This study forms the base for the pharmaceutical analysis of *Kabangusa Chooranam (KBC)* which will be followed by safe and efficacy studies later.**

***Keywords*: Kabangusa chooranam, Siddha medicine, ICP-OES, Respiratory diseases.**

## 1. Introduction

Siddha medicine is the traditional system of medicine that originated in South India and is considered to be one of India's oldest systems of medicine. The Siddha system is based on a combination of ancient medicinal practices and spiritual disciplines as well as alchemy and mysticism. Siddha system is the holistic and unique medical system based on principles for providing preventive, promotive, curative, rehabilitative and rejuvenative health needs.

It has been almost more than 2year since from 2019 the world is struggling with COVID-19 pandemic. India too has suffered with more than 11,733,369 cases till March 24, 2021. Overall mortality with this outbreak in India is 1.54%. On the other hand, morbidity and mortality because of common chronic respiratory diseases in India vary with the diagnosis. Chronic obstructive pulmonary disease (COPD) is responsible for 4.55% of total disability-adjusted life years (DALYs) while asthma accounts for 1.25% of it. Interstitial lung diseases (ILDs) and sarcoidosis contribute to 0.28% of total DALYs. At the same time, COPD accounts for 9.57% of total deaths in India. Asthma and ILDs contribute to 2.12% and 0.61% of total deaths, respectively.

The polyherbal formulation Kabangusa chooranam (KBC) is a classic Siddha drug internal medicine used to treat Kapha rogam (respiratory diseases). Kabangusa chooranam is used to treat acute respiratoty diseases to chronic respiratory diseases such as Common cold, Cough, Asthma, COPD, Tuberculosis etc. which are recorded with higher prevalence and incidence with rates, most commonly in developing countries like India.

For the development of a new drug the standardization of the traditional Siddha formulations is much more important. In Siddha system most of the medicines are effective but they lack of standardization. Many herbal based formulations also have presence of toxic elements, so there is a need to subject it with standardization for safety profile of drug and therapeutic utility. Here the drug was subjected to standardization by simultaneous ICP-OES analysis equipment (PERKIN ELMER OPTIMA 5300 DV) to detect heavy metals (arsenic, lead, cadmium, mercury) and other elements within the permissible limits as per WHO guidelines present in the Siddha polyherbal drug

Table 1
Ingredients of *Kabangusa chooranam*

| S.No. | Drug | Botanical Name | Parts Used | Quantity |
|---|---|---|---|---|
| 1 | Purified chukka | *Zingiber officinale* | Rhizome | 35 gram |
| 2 | Purified Milagu | *Piper nigrum* | Fruit | 35 gram |
| 3 | Purified Thippili | *Piper longum* | Fruit | 35 gram |
| 4 | Purified Chittaratai | *Alpinia officinarum* | Rhizome | 35 gram |
| 5 | Purified Akkarakaram | *Anacyclus pyrethrum* | Root | 35 gram |
| 6 | Purified Omam | *Trachyspermum ammi* | Seed | 35 gram |
| 7 | Purified Desavaram (thippili ver) | *Piper longum* | Root | 35 gram |
| 8 | Purified Kadukkai | *Terminalia chebula* | Dried fruit | 35 gram |
| 9 | Naatu sarkarai | *Sacchrum officinarum* | Jaggery | 280 gram |

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"*Kabangusa Chooranam*".

## 2. Materials and Methods

- The Siddha drug Kabangusa chooranam selected from a classical Siddha literature cited in Chikitsarathnadeepam part II.
- ICP-OES analysis was done in Sophisticated Analytical Instrument Facility IITM, Chennai-36.

*Collection, Identification and Authentication of the drug:*

The required polyherbal drugs were purchased from a well reputed Siddha drug store. The drugs are identified and authenticated by THE HOD, Department of Gunapadam, Government Siddha Medical College and Hospital, Palayamkottai, Tirunelveli.

*Methods of purification and preparations:*

The drugs were purified as per the evidence mentioned in the chikitsarathnadeepampart II. All the ingredients have been completely purified as per the Siddha literature in the presence knowledge of Guide / Faculty members.

*Preparation of medicine:*

The purified drugs are made into fine powder form which is named as Chooranam in Siddha term.

*ICP-OES study of kabangusa chooranam:*

*Principle of ICP Optical Emission Spectrometry (ICP-OES):*

ICP, abbreviation for Inductively Coupled Plasma, is one method of optical emission spectrometry. When plasma energy is given to an analysis sample from outside, the component elements (atoms) are excited. When the excited atoms return to low energy position, emission rays (spectrum rays) are released and the emission rays that correspond to the photon wavelength are measured. The element type is determined based on the position of the photon rays, and the content of each element is determined based on the ray's intensity.

To generate plasma, first, argon gas is supplied to torch coil, and high frequency electric current is applied to the work coil at the tip of the torch tube. Using the electromagnetic field created in the torch tube by the high frequency current, argon gas is ionized and plasma is generated. This plasma has high electron density and temperature (10000K) and this energy is used in the excitation-emission of the sample. Solution samples are introduced into the plasma in an atomized state through the narrow tube in the center of the torch tube.

*Equipment:*

Equipment for ICP optical emission spectrometry consists of a light source unit, a spectrophotometer, a detector and a data processing unit. There are several types of equipment based on differences in the Spectrophotometer and the detector. The most common type is shown in figure 1.

*1) Sequential type*

A spectrophotometer with a Czerny-Turner monochrometor, and a detector with a photomultiplier is most common for this type. With this equipment, programmed wavelength of the spectrophotometer is consecutively varied to measure multiple elements. This causes rather long measuring time, however, with its high-resolution spectrophotometers, it is favorable for measurement of high-matrix samples.

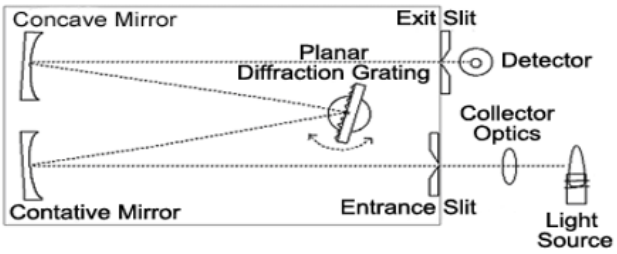


Fig. 1. Sequential type ICP-OES

*2) Simultaneous type*

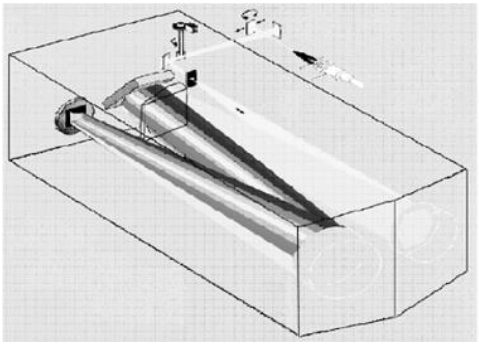

Fig. 2. Simultaneous ICP-OES

This type typically uses an echelle cross disperser in spectrophotometers and semi-conductor detector such as CCD for the detector. Echelle cross disperser disperses light of measurable wavelength range two-dimensionally by combining prism and echelle diffraction grating. Combination of echelle cross disperser and a CCD detector enables multi-element measurement at any wavelength. The most notable feature of this equipment is the high-speed measurement, providing information on all 72 measurable elements in measurements of 1 to 2 minutes normally.

*Siddha drug analysis:*

KBC drug has attracted attention because it is thought to contain a person's health history on some level and is thought to act as an excretory organ for heavy metal in the body. However, there are problems because there are few usable samples and knowledge about multiple elements is required. With simultaneous analysis equipment, we can collect useful information with a small amount of sample.

*Equipment:* Simultaneous ICP-OES, PERKIN ELMER OPTIMA 5300 DV.

*Sample preparation:* 0.5g of KBC drug is measured, and then dissolved in a decomposition vessel with nitric acid into 10ml solution. Partial spectral profile and analysis results shown in table 2.

## 3. Result

Kabangusa Chooranam----------(wt:0.2100710g)

Table 2
Elements of the *Kabangusa Chooranam* (KBC)
*BDL – Below Detectable Limit

| S.No. | Elements | Wavelength | Concentration |
|---|---|---|---|
| 1 | As | 188.979 | BDL |
| 2 | C | 193.030 | 85.210 mg/L |
| 3 | Ca | 315.807 | BDL |
| 4 | Cd | 228.802 | BDL |
| 5 | Cu | 327.393 | BDL |
| 6 | Fe | 238.204 | 01.251 mg/L |
| 7 | Hg | 253.652 | BDL |
| 8 | K | 766.491 | 123.110 mg/L |
| 9 | Na | 589.592 | 61.320 mg/L |
| 10 | P | 213.617 | 246.341 mg/L |
| 11 | S | 180.731 | 01.124 mg/L |
| 12 | Zn | 206.200 | 01.220 mg/L |
| 13 | Mg | 206.200 | 01.131 mg/L |
| 14 | Pb | 206.200 | BDL |

## 4. Discussion

Heavy metal Viz. arsenic (As), cadmium (Cd), mercury (Hg), lead (Pb), and other elements such as iron (Fe), potassium (K), magnesium (Mg), sodium (Na), phosphorus (P), sulfur (S), zinc (Zn) of *Kabangusa Chooranm* on table 2 was found to be within the permissible limits as per WHO guidelines.

## 5. Conclusion

From the ICP-OES analysis reveals that Kabangusa chooranam are free from toxicity there by proving the safety of its utilization in siddha system. This study forms the base for the pharmaceutical analysis of *Kabangusa Chooranam (KBC*) which will be followed by safe and efficacy studies later. So, this study will be a step forward to scientific validation of Kabangusa Chooranam.

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