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Standard manufacturing procedure of *Teekshna lauha bhasma*

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ABSTRACT

Background: *Lauha bhasma* is one of the herbo-metallic preparations used in *Ayurveda*, a traditional Indian system of medicine for treating various ailments such as anemia, diarrhea, hyperlipidemia and diabetes.
Objective: To establish standard manufacturing procedure of *Teekshna lauha bhasma* and analyze its physico-chemical properties.
Materials and methods: The preparation of *T. lauha bhasma* (calx of iron [Fe] turning) involves *samanya shodhana*, *vishesha shodhana* followed by *bhanupaka*, *sthalipaka* and *putapaka* with *Triphala kwatha* as a medium under temperature of 650 °C in electric muffle furnace (EMF) and maintained for 1 h. *T. lauha bhasma* were subjected to different physico-chemical characterization using X-ray fluorescence spectrophotometer and scanning electron microscopy.
Results and discussion: The results suggest that these steps are necessary to obtain a good quality of *bhasma* and also make it acceptable for trituration during *Bhasmikarana* process. It is found that *T. lauha bhasma* was prepared properly in 20 *puta* at a temperature of 650 °C. The particle size of 20 *puta T. lauha bhasma* is 100–500 nm in range.
Conclusion: Pharmaceutical procedures given in *Ayurvedic* texts are necessary to prepare *pakwa jambu phala varna T. lauha bhasma* that complies with all the classical *bhasma pariksha* and modern analytical parameters in 20 *puta* at a temperature of 650 °C maintained for 1 h in EMF.

Introduction

Ayurveda, the science of life, is a comprehensive medical system that has been the traditional system of healthcare in India for more than 5000 years. The basic aim of this science is to maintain healthcare by balancing the physical, mental, and spiritual functions of the human body [1,2]. *Rasashastra*, an integral part of *Ayurveda*, deals with the drugs of mineral origin, and details their varieties, characteristics, processing techniques, properties, therapeutic uses, possibilities of developing adverse effects and their management, etc. in a comprehensive way [3]. *Ayurvedic* experts have estimated that 35–40% of the approximately 600 medicines mentioned in the *Ayurvedic* formulary may contain at least one metal [4]. *Ayurvedic* medicines are mostly *Rasoushadhies* (herbo-mineral) and they play an important role in *Ayurvedic* therapeutics because of their qualities such as *Alpamatropayogitvat* (low dose), *Arucher-aprasangata* (good palatability) and *Kshipramarogayadayitvat* (fast acting) [5]. *Rasayana* (immunomodulation and anti-aging quality) and *Yogavahi* (ability to target drugs to the site) are characteristics of a properly made herbo-mineral preparation, which is also nontoxic, readily absorbable, adaptable, and assimilable in the body [6]. *Bhasmas* are herbo-metallic ashes in which the metal is calcined along with various herbal ingredients to form organometallic complexes [7]. These complexes should neither contain free metal nor contain free organic constituents, whose presence in *bhasma* indicates improper calcination [8].

Iron (Fe) is an essential element for almost all living organisms as it participates in a wide variety of metabolic processes, including oxygen transport, deoxyribonucleic acid synthesis, and electron transport [9]. The incinerated Fe preparations of *Ayurveda* are known as *lauha bhasma* (Fe calx) [10]. It is a herbo-metallic calx that has several therapeutic applications. Pandit et al. reported that, *lauha bhasma* for hematinic activity and hemoglobin regeneration efficacy on agar gel diet and phlebotomy induced Fe deficiency anemia in rats and reported significant hematinic and hemoglobin

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regeneration efficiency in comparison to control and standard ferrous sulfate containing drug [11]. Antibacterial activity of *lauha bhasma* was reported by Tambekar and Dahikar [12], In the *Samhita* period Fe (*Ayas-Lauha*) was used in the form of fine powder. Later, *Rasashastra* classical texts explained the *shodhana* (purification) and *marana* (incineration) methods [13]. According to *Rasa Ratna Samuchchhaya*, *kanta lauha* (magnetite Fe ore) is considered as best raw material variety of Fe-for *lauha bhasma* [14]. However in the absence of *kanta lauha*, *Teekshna lauha* (Fe turning) is used for the preparation of *lauha bhasma*. Now-a-days, in many *Ayurvedic* pharmacies and industries *lauha bhasma* is prepared from *T. lauha* and the preparation protocol for *bhasma* varies from manufacturer to manufacturer; there are many *Ayurvedic* texts describing different methods of preparation of *lauha bhasma* [15,16] and it plays a major role in deciding the therapeutic efficacy, as well as the toxic effects of *bhasmas*. The conventional *puta* (using electric muffle furnace [EMF]) method of heating is very easy and convenient to regulate temperature in closed atmosphere as comparative to traditional *puta* (using cow dung). Hence, in this study standard manufacturing procedure of *T. lauha bhasma* (calx of Fe turning) was established by following the guidelines of *Ayurvedic* formulary of India by adopting various procedures such as *samanya shodhana* (normal purification), *vishesha shodhana* (special purification), *trividh lauhapaka,* that is, *bhanupaka* (exposure to sunlight), *sthalipaka* (roasting in an Fe pan), and *putapaka* (calcination) using EMF. This study also attempts to characterize physico-chemical properties of *T. lauha bhasma* through conventional studies for studying the quality of *bhasma Nischandratvam* (lusterless), *Apunarbhava* (metal irreversibility test), *Varitaratvam* (floating test), and detailed information on elemental composition and particle size of *T. lauha bhasma* has been evaluated by Bhargava et al. using modern analytical instruments like scanning electron microscope (SEM) and X-ray fluorescence (XRF) spectrophotometer [17,18].

Materials and methods

Procurement of raw material

The authenticated raw materials; *T. lauha* (Fe turnings) were collected from the Department of Metallurgy, IIT (BHU); *Tila taila* and *Triphala* were collected from the *Ayurvedic* pharmacy, BHU; *Kulattha* collected from local market, Varanasi and *Gomutra* (cow's urine) were collected from Dairy farm, Institute of Agricultural Sciences, BHU, Varanasi.

Materials

EMF – inner hearth (length: 15 cm, breadth: 19 cm, depth: 30 cm, and maximum temperature capacity: 1000 °C), *khalva yantra* (mortar – length: 36 cm, breadth: 21 cm, thickness: 3 cm, depth: 11 cm; pestle – length: 13 cm, and diameters: 7 cm).

Methods

The preparation of *T. lauha bhasma* (calx of Fe turning) was carried out in Laboratory of Department of Rasa Shastra, Institute of Medical Sciences, Banaras Hindu University, Varanasi, India by following the procedure described in the *Ayurvedic* formulary of India [19]. It involves the following major steps; *samanya shodhana* (normal purification), *vishesha shodhana* (special purification), *trividh lauhapaka*, that is, *bhanupaka* (exposure to sunlight), *sthalipaka* (roasting in an Fe pan), and *putapaka* (calcination) (Fig. 1).

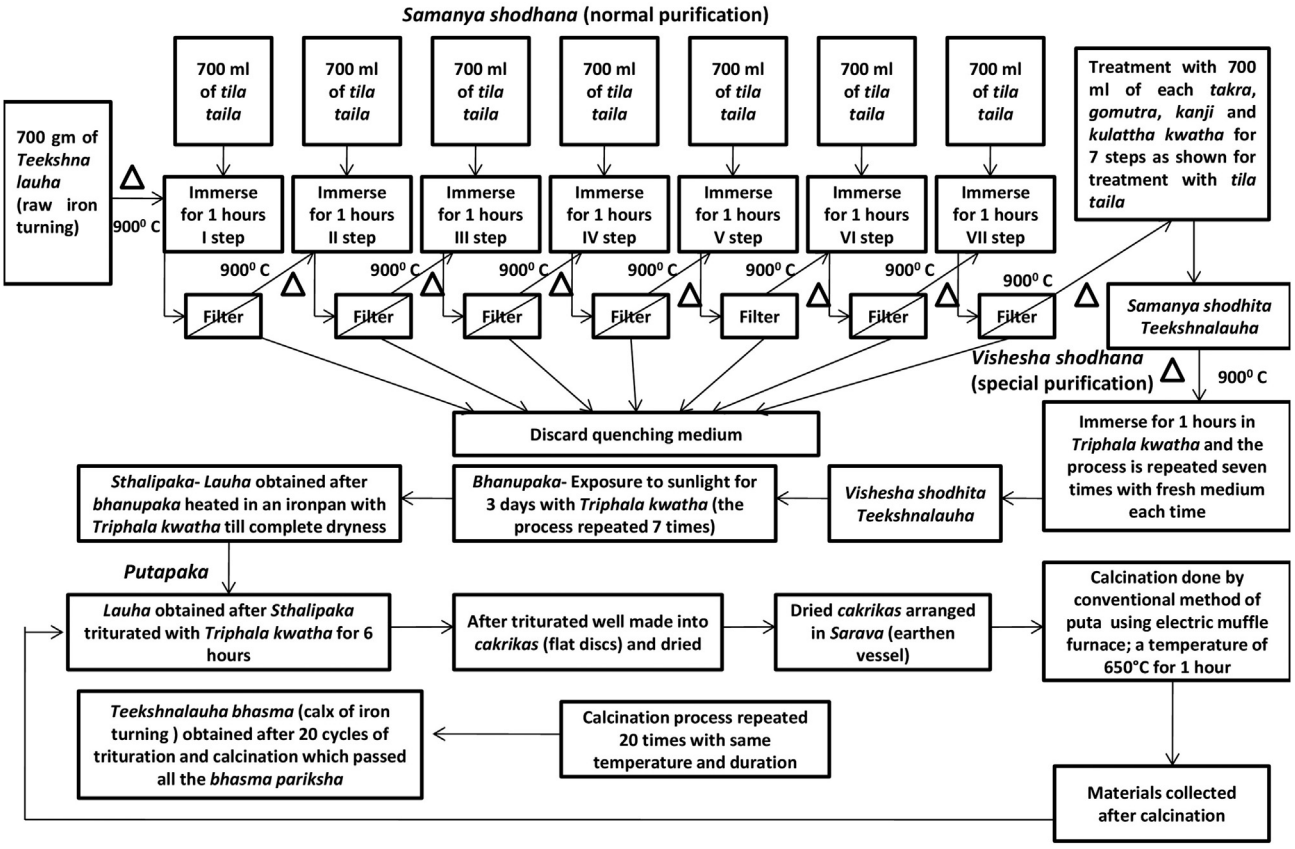

Fig. 1. Flow diagram for the preparation of *Teekshna lauha bhasma*.