

CHEMICAL AND MINERALOGICAL CHARACTERISTICS OF PROCESSED ORPIMENT USED FOR THE AYURVEDIC MEDICINE

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Ayurveda, which is known as "the knowledge for long life" is a system of traditional medicine. In later periods, Ayurveda began to combine mercury as well as some other "toxic" minerals, metals and nonmetals as important components of pharmaceutical preparations and this practice of adding minerals to herbal medicine is known as *Rasa Shastra*. Arsenic is widely used in *Rasa Shastra* and the application of arsenic is controversial due to its high toxicity. Present study aims to understand the chemical changes of orpiment during the *Rasa Manikya* (ruby colour pharmaceutical preparation made out of purified orpiment) preparation and to explain the effectiveness of different purification methods for the removal of arsenic and other toxic elements from the raw material.

Rasa Manikya was prepared according to traditional *Abhraka patra* (mica sheets) method. The characterization of raw material (unpurified orpiment), intermediate products (purified orpiment), final product (*Rasa Manikya*) and purification media was carried out using Inductively Coupled Plasma-Mass Spectrometer (ICP-MS), Fourier Transform Infra Red (FTIR) instrument, Atomic Absorption Spectrometer (AAS), Scanning Electron Microscope (SEM), Energy dispersive X-ray spectroscopy (EDX), X-Ray Fluorescence (XRF) instrument and the voltometer. In addition, contribution of different purification methods for the removal of arsenic from the raw material was studied.

Chemical analysis reveals the presence of arsenic, sulfur and oxygen as the main elements. Amounts of the measured elements vary slightly during the each step in *Rasa Manikya* preparation. It was revealed that basic medium can remove more arsenic than that of acidic medium. In natural acidic media, arsenic removal can be triggered by the chelation activity. Tomato juice removes much arsenic than tamarind and vinegar as citric acid complexes have increased stability relative to acetic acid and tartaric acid complexes. Even though arsenic is removed from the traditionally used purification media, the final product still contains a high concentration of arsenic with other toxic elements such as lead, mercury, antimony and selenium. The solubility of the final product is very low and therefore releasing of arsenic is very slow. Thus, the toxicity caused by the drug may not be significant.
