

## Comprehensive physicochemical characterization and bioactivity assessment of Rajata Bhasma as a multi-target therapeutic agent

Jeewanthi U. H. P.<sup>1</sup>, Seneviratne K. N.<sup>1</sup>, Wickramarachchi S.<sup>1</sup>, Jayathilaka N.<sup>1</sup>, Chawda M. B.<sup>2</sup>, Gudi R. V.<sup>3</sup>, Bhapkar K. M.<sup>3</sup>, and Paranagama P. A.<sup>1\*</sup>

<sup>1</sup> Department of Chemistry, Faculty of Science, University of Kelaniya, Sri Lanka.

<sup>2</sup> Medical Services Solumiks Herbaceuticals Limited, India.

<sup>3</sup> Shree Dhootapapeshwar Limited, India.

\* priyani@kln.ac.lk

Rajata Bhasma (RB) is a traditional Ayurvedic herbo-metallic preparation used to treat neurological disorders, aging, cardiac and circulatory disorders, fever and infections. Due to the paucity of standardized data in the literature, physicochemical characterization was undertaken to ensure the quality and consistency of Rajata Bhasma. RB contains 0.12±0.01% moisture, 83.2±0.2% total ash, 75.1±0.3% acid-insoluble ash, and 25.4±0.1% water-soluble ash. X-ray diffraction confirmed the predominant crystal structure as Ag<sub>2</sub>S, with an average particle size of 21.4±0.4 μm. Scanning electron microscopy showed irregular granular surface morphology, suggesting a mixture of compounds beyond Ag<sub>2</sub>S. Energy-dispersive X-ray spectroscopy detected additional elements including O(21.26%), C(5.76%), Na(3.98%), Si(0.33%), and Fe(1.83%). Thermogravimetric analysis indicated the presence of composite materials with varying thermal degradation temperatures, while FT-IR confirmed Ag-S bonds, C-O bonds, and hydroxyl groups, likely attributable to the plant compounds used during preparation. RB exhibited 40% DPPH radical scavenging activity at 200 μg/mL compared to standard BHT. It demonstrated an antidiabetic potential with alpha-glucosidase inhibition (IC<sub>50</sub>=2.10±0.03 μg/mL), surpassing the standard acarbose (IC<sub>50</sub>=200.9±0.4 μg/mL), and significant (P<0.05) alpha-amylase inhibition (IC<sub>50</sub>=42.8±0.2 μg/mL). RB showed notable lipase inhibition

(IC<sub>50</sub>=110.2±0.7 μg/mL) compared to standard orlistat and anti-inflammatory potential (IC<sub>50</sub>=220.9±1.8 μg/ml) compared to aspirin. Antibacterial assessment revealed an activity against *B. subtilis* with inhibition zones of 19.01±1.41 mm at 2.5 mg and 25.06±1.41 mm at 5 mg, compared to amoxicillin (14.01±1.41 mm at 0.1 mg). Against *E. coli*, RB showed moderate activity with inhibition zones of 16.30±1.53 mm at 2.5 mg and 23.30±0.58 mm at 5 mg, compared to amoxicillin (31.30±0.58 mm) at 0.05 mg. For *S. aureus*, RB exhibited inhibition zones of 15.70±0.58 mm at 2.5 mg and 22.00±1.00 mm at 5 mg, while amoxicillin showed 35.70±0.58 mm at 0.05 mg. RB possesses diverse bioactivities and a complex physicochemical profile which supports its potential applications in the treatment of metabolic syndrome, diabetes, inflammation, and bacterial infections. Further studies to assess the above activities in vivo will reveal the true potential of RB on these disorders mentioned.

### Keywords:

Rajata Bhasma; anti-diabetic activity; anti-bacterial activity; physicochemical characterization; enzymatic inhibition

### Acknowledgement:

This research is funded by Shree Dhootapapeshwar Limited, Mumbai.