Comparative evaluation of the lipase-inhibitory potential of *Bacopa monnieri* (L.) Wettst in five different dosage forms: An *in-vitro* study

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Bacopa monnieri (L.) Wettst., commonly known as Brahmi, is a traditional medicinal plant recognized for its cognitive, antioxidant, and adaptogenic properties. Recent interest has focused on its potential role in managing metabolic disorders, including obesity, through mechanisms such as pancreatic lipase inhibition. However, the bioactivity of herbal preparations can be significantly influenced by processing techniques. This study investigates the impact of different heat-based preparation methods on the lipase inhibitory activity of *Bacopa monnieri*. This *in vitro* study aimed to evaluate and compare the lipase inhibitory activity of five different *Bacopa monnieri* (L.) Wettst. dosage forms—normal decoction, freeze-dried decoction, powdered plant decoction, aqueous dried plant and freeze-dried plant. The porcine pancreatic lipase (PPL) inhibitory assay was employed to screen each extract at concentrations ranging from 25 µL/mL to 200 µL/mL. Extracts demonstrating more than 50% inhibition at 200 µL/mL were further subjected to IC_{50} determination. Each sample (20 µL) was incubated with 10 µL of PPL (4 mg/mL), 10 µL of p-nitrophenyl butyrate (2 µL dissolved in 50 µL DMSO), and 50 µL of Tris-HCl buffer (pH 7.4) at 37°C for 15 minutes. The absorbance of released p-nitrophenol was measured at 405 nm. Orlistat served as the positive control. Due to color interference, concentrations above 300 µL/mL were excluded from analysis. Results showed that several extracts, particularly the freeze-dried forms, exhibited significant lipase inhibitory activity, with IC_{50} values determined for the most potent samples. These findings suggest that processing techniques—especially freeze-drying—substantially influence the functional bioactivity of *Bacopa monnieri*. This study highlights the importance of optimizing preparation methods to enhance the therapeutic potential of herbal products, particularly in addressing lipid metabolism and oxidative stress associated with aging and metabolic disorders.

Keywords: *Aging*, *Bacopa monnieri*, *Herbal formulations*, *Lipase inhibition*, *Porcine pancreatic lipase (PPL)*