Analytical Methods, Volume 15, Issue 30, Pages 3735 - 3751, 12 July 2023

Metabolite profiling from different parts of tender fruit endosperm of Borassus flabellifer L. (ice apple)

Abstract

Borassus flabellifer L., commonly known as Asian palmyra, is native to South and Southeast Asia. The endosperms of B. flabellifer (known as nungu in Dravidian culture) are widely consumed during the summer season. It is rich in various nutrients and helps in reducing weight, treating skin and digestive issues, lowering body temperature, and managing migraines and diabetes. This study focuses on identifying the small molecules and proteins from the two varieties of B. flabellifer tender fruit endosperms collected from districts around Chennai, Tamil Nadu, India. The collected free nuclear endosperm was subjected to direct extraction and the mesocarp and cellular endosperms were lyophilized and homogenized. Metabolites were extracted by hexane, methanol, and chloroform and investigated using gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS). The compounds identified were from the classes of carboxylic acids, flavonoids, amino acids, alkaloids, fatty acids, oligopeptides, vitamins, and glycosides. High-performance liquid chromatography (HPLC) technique was employed to estimate the quantity of amino acids, wherein the total amino acid in the green variety was found to be higher than in the black variety. Proteins were identified after simulating with a gastrointestinal enzyme using liquid chromatography tandem mass spectrometry (LC-MS/MS)-based peptide mass fingerprinting. The different mineral oxides present in the tender fruit endosperm were identified using X-ray diffraction studies, which confirmed the presence of mineral oxides, such as Br1.25ClO2.75Pb3.88, calcium zirconium tantalum oxide, and barium fluoroniobate. This study validates the presence of bioactive metabolites in green and black varieties of B. flabellifer tender fruit endosperm with a range of activities, such as anti-inflammatory, antibacterial, anticancer, and anti-diabetic properties.