Comparative Evaluation of Antioxidant Capacity and HPLC-Based Bioactive Profiling of Commercial Cocoa Husk Tea in Thailand

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Abstract

Cocoa husk, a major by-product of cocoa processing, is increasingly recognized as a functional ingredient due to its high antioxidant potential and rich phenolic profile. However, limited information is available regarding the variation in antioxidant capacities and bioactive composition of commercially available cocoa husk tea products. This study aimed to evaluate the antioxidant activities and bioactive compound profiles of commercial cocoa husk teas sourced in Thailand. Antioxidant capacity was assessed using DPPH and ABTS radical scavenging assays and the ferric reducing antioxidant power (FRAP) assay. Considerable variation in antioxidant capacity was observed among the samples, with DPPH and ABTS IC50 values ranging from 12.73 to 32.88 and 7.94 to 9.78 mg/mL, respectively, while FRAP values ranged from 13.74 to 25.40 mg Fe2+ equivalent/g. Total phenolic content (TPC), total flavonoid content (TFC), and total tannin content (TTC), determined by spectrophotometric methods, ranged from 10.93 to 29.85 mg/g, 0.17 to 1.17 mg/g, and 19.70 to 35.11 mg/g, respectively. Notably, samples with higher tannin contents generally exhibited stronger antioxidant activities. Individual bioactive compounds were further characterized using high-performance liquid chromatography (HPLC) with a diode array detector. Theobromine was the predominant methylxanthine in all samples, with concentrations ranging from 10.48 to 16.03 mg/g, while catechin, epicatechin, and procyanidins B1 and B2 were detected at varying levels. Overall, these findings demonstrate that differences in antioxidant activity among commercial cocoa husk teas are primarily driven by variations in polyphenolic composition rather than methylxanthine content, highlighting the critical importance of compositional standardization to guarantee consistent functional quality.

Keywords: *cocoa husk tea, antioxidant activity, phenolic compounds, bioactive compounds, high-performance liquid chromatography (HPLC)*