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Exploring Ultrasound-Assisted Methanolic Extraction of *Piper sarmentosum* for Improved Phytochemical and Bioactivity Enhancement

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Piper sarmentosum is a medicinal plant native to southeast Asia associated with various phytochemicals including high phenolic and several flavonoids. However, the extraction methodology might significantly impact on these phytochemical components for their bioactivity. This study aims to evaluate the phytochemical analysis, antimicrobial, anticancer, and antioxidant activities of ultrasound-assisted methanolic extracts of *Piper sarmentosum* (UAMPS). The methanolic extraction were prepared using ultrasound- assisted extraction method and phytochemicals were investigated. The antioxidant potential was assessed using the DPPH free radical scavenging assay. Furthermore, the antibacterial activity and anticancer properties against neuroblastoma (SH-SY5Y-CRL- 2266) cell lines were investigated. The moisture content was 10% and UAMPS revealed the presence of phenolic compounds, flavonoids, steroids, tannins, saponins and alkaloids. The total flavonoid content was 28.66 ± 2.01 mg QE/g d.w. which proved to be a contributing factor to its augmented biological activity. UAMPS extracts demonstrated significant anticancer activity against neuroblastoma cell lines (SH-SY5Y-CRL-2266) on dose dependent manner with IC50 as 250µg/mL along with notable free radical inhibition. In addition, antibacterial testing revealed inhibitory effects against both Gram-positive bacteria (*Staphylococcus aureus*) and Gram-negative bacteria (*Escherichia coli*), as evidenced by clear zones of inhibition, but resistant to *Pseudomonas aeruginosa*. These findings underline the superior therapeutic bioactivity of UAMPS and suggest that ultrasonic assisted extraction is a more effective for separation of bioactive phytochemicals from *Piper sarmentosum*, presenting promising therapeutic applications in antimicrobial and anticancer formulations.

Keywords: DPPH scavenging activity, Neuroblastoma, *Piper sarmentosum* Leaf, Phytochemicals, Ultrasonic-assisted extraction

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