Phytochemical Profile, Antioxidant, and Antimicrobial Potential of Chamaenerion latifolium

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Purpose: This study investigates the phytochemical composition, antioxidant potential, and antimicrobial activity of Chamaenerion latifolium, a medicinal plant known for its traditional applications. The research aimed to identify the plant's bioactive compounds and assess its safety and therapeutic relevance. Procedure: Aboveground parts of the plant were collected in the Almaty region of Kazakhstan. The samples were dried, extracted using various solvents (ethanol, methanol, butanol, ethyl acetate), and analysed using HPLC-UV-ESI/MS for polyphenolic content. The elemental and mineral composition was determined via inductively coupled plasma mass spectrometry (ICP-MS). Antioxidant activity was assessed using FRAP and potassium permanganate titration methods. Antimicrobial activity was evaluated through zone of inhibition testing against several microbial strains. Results: The plant extracts revealed the presence of key polyphenolic compounds such as gallic acid, chlorogenic acid, and quercetin-3-glucoside. The ethanol and methanol extracts showed strong antioxidant activities, with the methanol extract achieving comparable or superior results to gallic acid at higher concentrations. The butanol extract exhibited the highest antimicrobial activity, especially against Candida albicans and Clostridium pneumoniae. Elemental analysis detected 41 elements, all within WHO safety limits. Conclusions: Chamaenerion latifolium demonstrates significant antioxidant and antimicrobial properties, along with a safe elemental profile, indicating its potential for pharmaceutical and nutraceutical applications.

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