

Research Article

Chemical composition, antioxidant, antimicrobial, antidiabetic and butyrylcholinesterase inhibitory activities in vitro of the essential oil and crude extracts of the aerial parts of *Thymus ciliatus*

Nadia Djermane, Mostapha Brahmi, Djallal Eddine Adli, Micaela Gliozzi, Vincenzo Musolino, Rebbas Khellaf, Ramazan Erenler, Rabah Arhab, Stefania Garzoli

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Abstract

This study explores the potential of *Thymus ciliatus* as a natural source of bioactive compounds by investigating its chemical composition and in vitro biological activities, including antioxidant, antimicrobial, antidiabetic, and anti-Alzheimer properties. The analysis of the essential oil was performed using GC-MS revealing α -terpinenyl acetate (18.74%) and camphor (10.62%) as the major components. Antioxidant activity was evaluated using six methods. Antimicrobial activity was assessed using the disc diffusion and well diffusion techniques. Antidiabetic activity was measured through a colorimetric assay, while anti-Alzheimer activity was evaluated against butyrylcholinesterase (BChE). The results demonstrated that extracts from polar and medium-polar solvents exhibited the highest antioxidant activity, followed by low-polar solvent extracts. The essential oil of *T. ciliatus* displayed significant antimicrobial activity particularly against *Staphylococcus aureus*, *Bacillus cereus*, and *Candida albicans*. Crude extracts also showed antimicrobial activity across all tested strains. The aqueous extract exhibited the strongest antidiabetic activity against α -glucosidase ($IC_{50} = 2.56 \pm 0.06 \mu\text{g/mL}$), followed by the essential oil ($IC_{50} = 57.11 \pm 4.39 \mu\text{g/mL}$). Furthermore, the dichloromethane extract demonstrated the highest anti-Alzheimer activity with an IC_{50} of $0.26 \pm 0.20 \mu\text{g/mL}$. Based on these results, *T. ciliatus* represents a promising source of bioactive substances with potential therapeutic applications.



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