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Bioactivities of *Thymbra spicata*: Exploring its Cytotoxic, Antibacterial and Antiviral Activities

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Abstract

Thymbra spicata, locally known as zahter, is a medicinal plant-rich in bioactive compounds, including phenolic compounds, flavonoids, and essential oils. *T. spicata* is used to regulate blood sugar levels and digestive system, strengthen immunity, improve memory, be calm, and care for the skin. It is known to have remarkable antibacterial, antifungal, antioxidant, and insecticidal activities. The aim of this study was to investigate the cytotoxic, antibacterial, and antiviral activities of *T. spicata* ethanol extract. Firstly, ultrasound-assisted extraction was performed using 70% ethanol. Then, total phenolic and total flavonoid contents were determined. The cytotoxic activity was assessed against lung adenocarcinoma (A-549), breast adenocarcinoma (MDA-MB-231), breast adenocarcinoma (MCF-7), prostate cancer (PC-3), and neuroblastoma (SH-SY5Y) cell lines using the MTT assay to determine cell viability and IC₅₀ values. Antibacterial activity was tested against *Escherichia coli* and *Staphylococcus aureus* using the disk diffusion and minimum inhibitory concentration methods. The antiviral potential was evaluated *in ovo* against infectious bronchitis virus. Herein, total phenolic content was measured as 31.84±0.09 mg GAE/g, total flavonoid content as 5.42±0.13 mg CE/g. MTT assay revealed dose-dependent cytotoxicity to all cell lines. IC₅₀ values were found as 335.78±39.10 µg/ml for A549, 592.18±20.83 µg/ml for MDA-MB-231, 473.00±27.52 µg/ml for MCF-7, 308.99±31.51 µg/ml for PC-3, and 370.668±11.85 µg/ml for SH-SY5Y cell lines. The zone diameter was measured as 8.19 mm for *S. aureus*, and 7.12 mm for *E. coli*, demonstrating antibacterial potential of *T. spicata*. In addition, MIC values were 6.25 mg/ml and 12.5 mg/ml for *S. aureus* and *E. coli*, respectively. The antiviral activity of the extract was determined between 125-500 µg/ml concentrations, indicating promising inhibitory effects. These findings highlight the potential of *T. spicata* as a natural source of bioactive compounds for biomedical and pharmaceutical applications. Further studies are needed to identify its active components and elucidate its mechanism of action.

Key Words: *Thymbra spicata*, zahter, cytotoxic, antibacterial, antiviral

