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Bee Venom as a Source of Novel Antimicrobial Agents: A Regional Study from Armenia

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ABSTRACT

Antimicrobial resistance poses a significant threat to global public health and development, making the discovery of new antibiotics critically important. Bee venom, long utilized in traditional medicine, shows promise as a potential source of novel antimicrobial agents. This study aimed to investigate the antagonistic activity of honeybee venom (*Apis mellifera*) samples collected from various regions of the Republic of Armenia and to perform a comparative analysis. Antibacterial activity was assessed using the agar diffusion method, while antifungal activity was evaluated through the agar total diffusion method. Cytotoxicity was determined using a colorimetric assay on the HeLa cervical cancer cell line. The minimum inhibitory concentration of the studied honeybee venoms against both Gram-positive and Gram-negative bacteria ranges from 0.003 to 0.03 μg/mL. A venom concentration of 3 mg/mL effectively suppresses the growth of *Penicillium aurantioviolaceum* and *Ascosphaera apis*. The venom from the Drakhtik N1 honeybee population demonstrates statistically significant cytotoxic activity at a concentration of 0.6 mg/mL. Notably, honeybee venom from different regions exhibits varying degrees of effectiveness in inhibiting cell growth, suggesting differences in both active compounds and mechanisms of action. The findings of this study highlight the potent antimicrobial and cytotoxic properties of honeybee venom, with significant variation observed among samples from different regions of Armenia. These results underscore the potential of honeybee venom as a source of novel bioactive compounds and warrant further investigation into its components and mechanisms of action for therapeutic development.

Keywords: *Apis mellifera*, honeybee venom, antibacterial activity, antifungal activity, anticancer activity

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