

Abstracts

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Changes of Physicochemical Properties and Antibiofilm Activity of Hungarian Unifloral Honey as a Function of Storage Time

*Lilla Nagy-Radványi¹, Viktória L. Balázs¹, Béla Kocsis², Virág D. Ángyán¹, Marianna Kocsis³,
Ágnes Farkas¹*

¹Department of Pharmacognosy, Faculty of Pharmacy,

²Department of Medical Microbiology and Immunology, Medical School,

³Department of Agricultural Biology, Institute of Biology, University of Pécs, Pécs, Hungary

As antibiotic resistance poses an ever increasing challenge, there is great need to develop new antibacterial agents. Honey has been used as a natural product with antibacterial and antibiofilm activity, being effective against several types of bacteria. The origin and quality of honey, as well as its storage time and conditions, influence its antimicrobial properties to a great extent. The hydrogen peroxide content of honey is essential for its antibacterial activity (except for manuka honey). The H₂O₂ responsible for the bactericidal effect breaks down into water and oxygen over time, so its level decreases thanks to the plant-derived catalase enzyme. Similarly, other sensory and physicochemical traits of honey, including its color, pH, electrical conductivity and polyphenol content, change as a function of storage time. In order for honey to be an adjunctive therapy to an antibiotic regimen, it is essential to examine how the age of honey affects its antibacterial properties. In the case of Hungarian varietal honeys, a similar comparative study involving several years has not yet been carried out.

The antimicrobial activity of black locust, goldenrod, linden and sunflower honeys from three consecutive years was analyzed against respiratory tract bacteria, including both Gram-negative (*Haemophilus influenzae*, *H. parainfluenzae*, *Pseudomonas aeruginosa*) and Gram-positive (*Streptococcus pneumoniae*) pathogens, using in vitro methods. In order to establish the floral origin of honeys we performed a melissopalynological analysis. After determining the physicochemical parameters (color, pH, electrical conductivity) of honey, broth microdilution was applied to ascertain the minimum inhibitory concentration of each honey type against each bacterium, and crystal violet assay was used to test their antibiofilm effect.

Based on the pollen analysis and examination of the physicochemical properties of the honeys included in the research, all honey samples can be considered as true varietal honeys. With the increase of storage time, the color of honeys became darker, and their antibacterial activity decreased significantly. In the case of 2020 honeys, the average inhibition rate (34.7-53.4%) was about half of that of 2022 honeys (67.9-83.2%). The antibiofilm effect of linden and sunflower honey was the most remarkable, the inhibition rate for the 2022 samples reached 80% against *Haemophilus* strains. Considering each sampling year, the honey samples were able to exert the most significant antibiofilm effect against *Haemophilus* strains, while their activity was lower in the case of *P. aeruginosa* and *S. pneumoniae* strains. Our results show that honey should be used as fresh as possible, when it is applied in complementary therapy of respiratory tract infections.

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