

Physico-Chemical and Antibacterial Properties of Herbal-Infused Honey

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Introduction

Honey is known for its antibacterial, antifungal, and antioxidant properties, primarily due to its high sugar content, low water activity, and presence of hydrogen peroxide and other bioactive compounds. Additionally, when infused with medicinal herbs, the bioactive properties of the honey can be significantly enhanced. Herbs contribute additional phytochemicals, including flavonoids, polyphenols, and essential oils, which further boost the mixture's ability to combat harmful microorganisms. Thus honey-herb infusions may be effective against a range of pathogens, including antibiotic-resistant bacteria.

Problem description

The growing interest in natural antimicrobials necessitates the exploration of novel honey products formulation with enhanced multifunctional properties. However, limited research exists on the combined effects of herbal infusion on honey's antibacterial activity and quality parameters. This study investigates the effects of *Thymus vulgaris* L. infusion on the physico-chemical properties and antibacterial efficacy of multifloral honey.

Methodology

Two groups of samples were prepared and analysed: (1) raw multifloral honey and (2) raw multifloral honey infused with *Thymus vulgaris* L. Summer honey was collected in Lithuania in 2024. Herb enriched honey was prepared by addition of 5% (by mass) of dried herb (all parts of the plant without roots). Physico-chemical parameters, including pH, moisture content and electrical conductivity were analyzed. Antibacterial activity was assessed against 10 pathogenic and opportunistic bacterial strains using the agar well diffusion method.

Results and Conclusions

Herbal infusion altered honey's physico-chemical properties, increasing electrical conductivity and pH, but the moisture content was found to be the same in both samples. The raw honey sample demonstrated increased antibacterial activity against *Staphylococcus aureus*, *Salmonella enterica*, *Pseudomonas aeruginosa*, and *Enterobacter cloacae*, whereas the infused honey sample was effective only against *Salmonella enterica*.

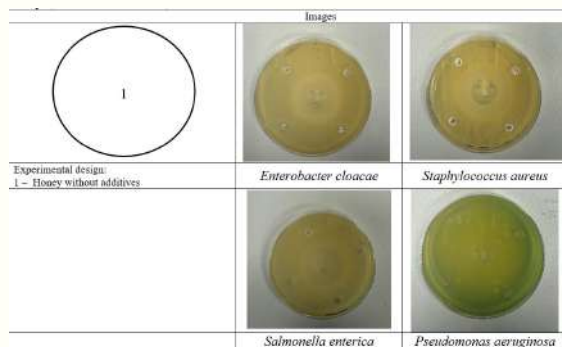


Fig. 1. Honey (without additives)



Fig. 2. 1, 2, 3, 4 – empty; 5 – honey with 5% *Thymus vulgaris* L.

Practical Implications

Herbal-infused honey offers an exciting innovation for beekeepers, combining medicinal plant infusions to enhance its antibacterial properties and mineral content. This high-value product meets consumer demand for natural remedies, boosting both economic returns and the sustainability of apiculture, as well as promoting non-traditional agriculture - cultivation of medicinal herbs.

The authors acknowledge the apiary "Biciuliukai" (Lithuania) and COST action CA22105.

PP-340 [Apitherapy]
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BACKGROUND/PURPOSE:

Honey is known for its antibacterial, antifungal, and antioxidant properties, primarily due to its high sugar content, low water activity, and presence of hydrogen peroxide and other bioactive compounds (Wang H. et al., 2023; Bartkiene E. et al., 2020). Additionally, when infused with medicinal herbs, the bioactive properties of the honey can be significantly enhanced. Herbs contribute additional phytochemicals, including flavonoids, polyphenols, and essential oils, which further boost the mixture's ability to combat harmful microorganisms (Vaou N. et al., 2021). Thust honey-herb infusions may be effective against a range of pathogens, including antibiotic-resistant bacteria (Kumar S. et al., 2024).

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RESUTS and CONCLUSION: Herbal infusion altered honey's physico-chemical properties, increasing electrical conductivity and pH, but the moisture content was found to be the same in both samples. The raw honey sample demonstrated increased antibacterial activity against *Staphylococcus aureus*, *Salmonella enterica*, *Pseudomonas aeruginosa*, and *Enterobacter cloacae*, whereas the infused honey sample was effective only against *Salmonella enterica*.

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