

Antimicrobial Activity of the Herbal Product BACTEROMAT HERB Against *Paenibacillus larvae* and *Melissococcus plutonius* - Causative Agents of Foulbrood Diseases in Bees

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ABSTRACT

European foulbrood (EFB) should not be confused with American foulbrood (AFB), as the two diseases differ in their causative agents, clinical manifestations, epidemiology, and control strategies. American foulbrood is caused by *Paenibacillus larvae*, while European foulbrood is caused by *Melissococcus plutonius*. Both diseases represent the most important bacterial brood diseases of honey bees (*Apis mellifera*) and are responsible for significant economic losses in apiculture worldwide due to colony weakening, reduced productivity, and potential colony collapse.

Effective prevention and control of foulbrood diseases rely largely on good beekeeping practices, including regular hive inspections, early diagnosis, sanitation of equipment, replacement of infected combs, and maintenance of strong and well-nourished colonies. Additional preventive measures include strict biosecurity, limitation of colony movement, and the use of natural products that support colony health and exhibit antimicrobial properties.

The use of antibiotics for the treatment of bacterial diseases in bees is highly restricted and, in practice, prohibited under European Union legislation, primarily due to the risk of antibiotic residues in honey and other bee products, as well as concerns related to the development of antimicrobial resistance. Consequently, the identification of effective, safe, and legally compliant alternatives to antibiotics is of considerable importance for sustainable apiculture.

In this study, through a combination of *in vitro* and *in vivo* experiments, we demonstrated that both AFB and EFB can be effectively controlled using the same commercial herbal product, BACTEROMAT HERB. The product exhibited pronounced antibacterial activity against *P. larvae* and *M. plutonius*. In addition to experimental evidence, long-term practical observations reported by beekeepers who have applied the product over several seasons may provide valuable real-world insights into its effectiveness and applicability under field conditions. These findings support the potential of herbal products as part of integrated strategies for the prevention and control of bacterial diseases in beekeeping.

Keywords: *Paenibacillus larvae*, *Melissococcus plutonius*, Antibacterial activity, Foulbrood diseases, Herbal product

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