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## ANTIMICROBIAL ACTIVITY OF PROPOLIS

**Maja Vukašinić Sekulić<sup>1</sup>, Marica Rakin<sup>1</sup>, Maja Bulatović<sup>1</sup>, Tanja Krunić<sup>2</sup>**

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Therapy with bee products (honey, propolis, royal jelly, pollen) has been known since ancient times and, in developing countries, they are still one of the cheapest ways for prevention and treatment of many diseases. In recent years, natural remedies with antimicrobial properties have also attracted much attention in developed countries, due to the presence of an increasing number of pathogenic microorganisms resistant to one or more known antibiotics, which complicates treatment of infectious diseases and increases healthcare costs. Propolis is a sticky, gummy, resinous substance collected by honeybees from buds, flowers, leaves and bark of trees and plants, mixed with the glands secretion, abundant with enzymes, which further modify its composition, enriching it with biologically active compounds. Besides its antimicrobial properties, propolis has also other beneficial biological activities (antioxidant, antiinflammatory, antitumor, hepatoprotective, local anesthetic, immunostimulatory, antimutagenic), which makes it a useful ingredient for application in biocosmetics, health foods and in numerous other purposes. It can be used in a natural, crude form, or as aqueous extracts, alcohol tinctures (propolis drops), ointments or creams. The objective of this study was to investigate antimicrobial activity of 10% (w/v) ethanolic extract of propolis (EEP), and its dilution in the range from 0.01 to 5% (w/v), against different pathogenic bacterial and yeast strains, which are a cause of infections in humans and animals or are frequently reported to provoke food poisoning.

Antimicrobial activity of EEP and its dilution was evaluated by agar well diffusion method and the diameters of clear inhibition zones around the wells were measured. In order to exclude antimicrobial activity of ethanol, in which propolis was extracted and later diluted, sample of ethanol was used as a control in this assay. For minimal inhibitory concentration (MIC) the lowest dilution of the sample that caused a clear 1mm inhibition zone was taken.

EEP showed significant antimicrobial activities against tested Gram-positive bacteria (*Staphylococcus aureus*, *Staphylococcus epidermidis*, coagulase negative staphylococcus, *Listeria innocua*, *Listeria monocytogenes*, *Bacillus subtilis*, *Bacillus cereus*, *Bacillus pumilus*) and yeast (*Candida albicans*), while all Gram-negative bacteria were resistant (*Escherichia coli*, *Salmonella enteritidis*, *Shigella sonnei*). The sensitivity of Gram positive bacteria to EEP varied among the strains tested and *Staphylococcus epidermidis*, *Bacillus subtilis* and *Bacillus cereus* ATCC 11778 strains were among most sensitive, with a MIC value in a range 0,01-0,1% (w/v).

According to the results obtained in this study, ethanolic extract of propolis, thanks to its natural origin and no toxicity, could be used in pharmaceutical formulations and as a natural antioxidant and microbicidal additive in food systems.