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Antimicrobial properties of South African honeys against pathogens associated with wounds

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ABSTRACT

The use of honey for therapeutic applications against a wide range of ailments has been demonstrated since the primordial age. Although modern-day medicine has advanced to substantial heights, there are still major concerns with drugs such as antimicrobials due to the ever growing problem of drug resistance. Presently, antimicrobial resistance is rife in South Africa (SA), where apart from common pathogens developing resistance, instances of extreme drug-resistant tuberculosis are dominating headlines. Complementary and alternative medication (CAM) such as honey has become a popular alternative, as patients often perceive that these 'natural' preparations are superior to conventional medicine with a lower incidence of adverse reactions subsequently resulting in the increased utilisation of CAM preparations.

The aim of this study was to validate the antimicrobial efficacy of SA honey against pathogens associated with wound infections. Prior to this evaluation, an extensive review into wound pathology, conventional antimicrobial wound dressings and honey's antimicrobial potential was conducted to provide an appropriate background to this study. Evaluation of the potential antimicrobial properties of the various SA honeys from varying geographical locations within the country against a variety of common wound pathogens was determined *in vitro*. Antimicrobial activity was gauged by determining minumum inhibitory concentrations (MICs) by the agar dilution method. Commercially available Manuka honey was utilised as a control and antimicrobial activity of these samples ranged from 15.28-41.67%. The mean MICs of the SA honey samples tested ranged from 10.42-50.00% with honey sample 16-(FYNBOS/WC) displaying the most desirable antimicrobial activity with a mean MIC of 10.42±8.27%.

Combination studies using selected honey samples having highest antimicrobial efficacy, with conventional antimicrobials such as ciprofloxacin, gentamicin and antifungal agents such as amphotericin B and nystatin, were performed. This was conducted to investigate whether the phenomena of synergism, additive or antagonistic effects were observed. Honey displayed noteworthy potential to be combined with antibiotics namely; ciprofloxacin and gentamicin and antifungals namely; nystatin to produce synergism. Synergism of 16-(FYNBOS/WC), 18-(MIXEDGUM/FS), 19-(CITYMIX/FS), 26-(FYNBOS/WC) and 41-(INDIGENOUS/WC) with gentamicin against *Stapyhlococcus aureus* (*S. aureus*) was most noticeable, displaying a sum of fractional inhibitory concentration (ΣFIC) of 0.27.

The physicochemical properties of selected SA honeys were further investigated with emphasis being placed on water content, sugar content and pH and how these particular properties affected its antimicrobial efficacy. Furthermore, levels of impurification of honey were also investigated. The pH of honey samples tested in this study ranged from 3.89 to 5.09, displaying acidic characteristics. The sugar content range was 77.00-82.50%, and the moisture content range was 15.80-21.60%. The percentage impurification ranged from 0.19-33.60% with 3 samples; [1–(CITYMIXA/EC), 47-(SALIGNAGUM/KZN) and 53-(LITCHI/MP)] demonstrating impurification that should further be investigated. No definite correlation was established between these physicochemical properties and the antimicrobial activity of honey.

The positive ramifications of this study formed a basis for expanding honey-based antimicrobial treatment against certain infectious diseases such as those affecting the skin. The study proved that harnessing the antimicrobial potential of SA honey could lead to positive outcomes especially in the SA setting from which these samples were derived.