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ANTIFUNGAL ACTIVITY OF MALAYSIAN HONEY AGAINST *MICROSPORUM GYPSEUM* AND *EPIDERMOPHYTON FLOCCOSUM*

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ABSTRACT

The emergence of antifungal resistance fungus has lowered the success rates of antifungal therapy thus becoming a major concern worldwide. This has resulted in the re-evaluation of the therapeutic use of ancient remedies including honey. The antibacterial activity of honey has been associated with its osmolarity, acidity, hydrogen peroxide, and non-hydrogen peroxide components. The aim of our study was to investigate the efficacy of Malaysian honeys namely Tualang, Acacia, Nenas and Kelulut as antifungal agent against *Microsporum gypseum* and *Epidermophyton floccosum*. The antifungal activity was examined by determining the MIC using the broth dilution assay on microtiter plates. The MFC was determined by re-inoculation into agar plates from a well with each concentration of honey where bacterial growth was inhibited (from the broth of MIC assay). The honey samples were tested at 70%, 60%, 50%, 25%, 12.5%, 6.25%, 3.1%, 1.6%, 0.8%, 0.4%, 0.2%, and 0.1% (v/v) dilution. The efficacy of Malaysian honey as antifungal agent was compared with Manuka honey which has been known to exhibit antifungal properties. Artificial honey was used as a control group. The result showed that three types of honey which are Tualang, Nenas and Acacia including Artificial honey had substantial antifungal activity against *M. gypseum* and *E. floccosum*. MIC values of Manuka honey are equivalent to other tested honeys and Artificial honey, which are 50% (v/v) for *M. gypseum* and 49% (v/v) for *E. floccosum*. However, only Manuka honey demonstrated fungicidal activity towards *M. gypseum* and *E. floccosum.* Among local honeys, Tualang honey had the lowest MIC value (50% v/v), and thus the best activity, against *M. gypseum.* Meanwhile, Acacia and Nenas honeys had higher MIC values against *M. gypseum* which is 55% (v/v) and 62% (v/v) respectively. When tested against *E. floccosum,* Tualang, Acacia and Nenas honeys suppress the growth of these fungi at concentration of 54% (v/v), 60% (v/v) and 63% (v/v) respectively. Unfortunately, Kelulut honey did not produce any substantial antifungal activity against *M. gypseum* and *E. floccosum*. Malaysian honeys exhibited variable activities against the two types of fungi. The differences in floral source of honey may contribute to the variation in the potency of the antibacterial activity. Further research should be done to assess the antifungal activity of Malaysian honeys to reveal its true potential.

CHAPTER 1

INTRODUCTION

1.1 Background

Infectious diseases remain one of the most significant threats to human health with eukaryotic pathogens (fungi, parasites) being one of the major sources. Dermatophytosis which is caused by fungal dermatophytes is among the infectious diseases that affects approximately 20-25% of the world's population (Murray *et al.*, 1997). Dermatophytes which include Trichophyton, Microsporum and Epidermophyton have keratinolytic activity that enables them to invade the keratinized host structures in human and animal hosts and cause infections in the epidermal stratum corneum, nails, skin or hair (Kim *et al.*, 2011; Burmester *et al.*, 2011).

Recently, scientists have observed that *Microsporum* spp. and *Epidermophyton* spp. cause significant changes in epidemiology, etiology and the clinical pattern of mycotic infection (Skerlev & Miklić, 2010). *Microsporum canis* (*M. canis*) and *Microsporum gypseum* (*M. gypseum*) are zoophilic and geophilic fungi respectively (Ilkit *et al.*, 2007). *M. canis* takes animal as its reservoir to maintain its virulence factor after it has been transmitted to four different persons (Gupta & Summerbell, 2000). Skin, hair and nail mycoses of human and animals usually become the target living site for *M. gypseum* (Romano *et al.*, 1997). *Epidermophyton floccosum* (*E. floccosum*) is an anthropophilic dermatophyte and it