The Antimicrobe of *Kaempferia galanga* L. Rhizome against *Microsporum canis* and *Staphylococcus epidermidis* – In-vitro Study

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**Abstract.** This study aims to determine the ability of ethanolic extract of *Kaempferia galanga* L. rhizome in inhibiting the growth of *Microsporum canis* and *Staphylococcus epidermidis*. Rhizome concentrations used were 40, 50, 60, and 70%. Each treatment was replicate 4 times. Results showed that extract of K. galanga rhizome up to 70% have not significantly differences against *M. canis* and *S. epidermidis*. Rhizome extract of 70% inhibit the growth of *M. canis* with the highest inhibition 5.88 mm (in compared to ketoconazole 10.35 mm). Whereas the extract of 70% inhibit *S. epidermidis* with the highest inhibition 3.16 mm (in compared to chloramphenicol 25.49 mm).

**Keywords:** *Kaempferia galanga*, rhizome, *Microsporum canis*, *Staphylococcus epidermidis*

**Abstrak.** Penelitian ini bertujuan untuk mengetahui kemampuan ekstrak etanol rimpang *Kaempferia galanga* L. dalam menghambat pertumbuhan *Microsporum canis* dan *Staphylococcus epidermidis*. Konsentrasi rimpang yang digunakan adalah 40, 50, 60, dan 70%. Setiap perlakuan diulang sebanyak 4 kali. Hasil penelitian menunjukkan bahwa ekstrak rimpang K. galanga hingga 70% tidak berbeda nyata terhadap *M. canis* dan *S. epidermidis*. Ekstrak rimpang 70% menghambat pertumbuhan *M. canis* dengan daya hambat tertinggi 5.88 mm (dibandingkan ketoconazole 10.35 mm). Sedangkan ekstrak 70% menghambat *S. epidermidis* dengan daya hambat tertinggi 3.16 mm (dibandingkan kloramfenicol 25.49 mm).

**Kata kunci:** *Kaempferia galanga*, rimpang, *Microsporum canis*, *Staphylococcus epidermidis*
1 Introduction

*Kaempferia galanga* L. is one of herb plants (Family Zingiberaceae), native to India and common grow in China, Myanmar, Indonesia, Malaysia, and Thailand [1]. The herb commonly used as mixed for food flavoring, spice since its highly aromas, cosmetics or as a traditional medicine [2, 3]. Rao and Kaladhar [4] reported that rhizome of *K. galanga* contain antioxidant and antimicrobial activity. The in vitro antimicrobial activity of the essential oil of *K. galanga* rhizome against Gram-positive and Gram-negative bacteria was reported by Tewtrakul et al. [5]. Whereas Belgis et al. [6] observed that essential oils of *K. galanga* rhizome contain ethyl p-methoxy cinnamate (23.65%) and ethyl cinnamate (5.98%) that potential as an antibacterial against *Staphylococcus pyogenes* and *Staphylococcus aureus* that can cause sore throat. Previous study by Parvez et al. [7] stated that crude extract of the rhizome *K. galanga* with petroleum, ether, acetone, and methanol have antimicrobial activities against Gram-positive bacteria (*Bacillus* sp., *Pseudomonas* sp.) and Gram-negative pathogenic bacteria (*Escherichia coli*, *Salmonella* sp., *Shigella sonnei*) [3]. The in vitro antifungal activity of essential oil of *K. galanga* rhizome against dermatophyte, filamentous fungi and yeast was studied by Jantan et al. [8], they found that the essential oil showed selective antifungal activity against dermatophytes *Aspergillus fumigatus* but ineffective against yeasts. *Microsporum canis* is the most common dermatophyte in domestic and wild animals [9, 10]. The pathogen is easily transmitted to human, causing lesion on skin (tinea corporis) and to the head (tinea capitis). Vuong and Otto [11] reported that *Staphylococcus epidermidis* is one of opportunistic bacteria on human that cause nosocomial infection and difficult to eradicate. Otto [12] also stated that *S. epidermidis* is more virulent than *Staphylococcus aureus*. Therefore, the objective of this current study is to determine the ability ethanolic extract of *Kaempferia galanga* rhizome in inhibiting the growth of *Microsporum canis* and *Staphylococcus epidermidis*.

2 Materials and Methods

**Bacterial and fungal isolation**

Microbes used in this experiment was culture collection of Microbiology Pharmacy Laboratory, Universitas Sumatera Utara.

**Preparation of extract**

A total of 3000 g fresh harvested *K. galanga* was purchased from local farmer at Tinokkah Village Sipispis Regency, Serdang Bedagai, North Sumatera. The process of extraction was conducted according to the procedures of Sasidharan et al. [13] with some modifications. The dried rhizome was ground into powder using blender. The powder in flask 1000 ml then were submerged in 95% (v/v) ethanol. The suspension was stirred at 28°C at 100 rpm for 12 h and filtered. The residue obtained was re-extracted in 40 ml 95% of ethanol, stirred for 12 h and filtered. The filtrate obtained then was concentrated using a rotary evaporator and lyophilized in a freeze dryer.
The filtrate was dissolved in DMSO to make concentration 40, 50, 60 and 70%. Antifungal (ketoconazole) and antibacteria (chloramphenicol) used as positive control (K+) and sterilized distilled water were used as negative control (K-). Each treatment was repeated three times.

**Antimicrrobe activity**

The antimicrrobe activity was conducted based on zone method. The medium used was potato dextrose agar (PDA) and nutrient agar (NA).

**Statistical analysis**

We analyzed the observed data using analysis of variance (ANOVA) for statistically significant differences, followed by Duncan’s multiple range test at the 5% probability level. We used the Statistical Analysis System (SAS) software (version 9.1.3) statistical package (SAS Institute Inc. North Carolina).

2 **Results and Discussion**

Ethanolic extract of *K. galanga* rhizome was potential inhibit the growth of *M. canis* and *S. epidermidis*. The growth inhibition was indicated as the presence of clear zone surrounding paper disc. In general, the extract on each concentration more inhibits *S. epidermidis* than *M. canis* (Figure 1). However, Rao and Kaladhar et al. [4] observed that rhizome extract of *K. galanga* as good activity against *Aspergillus niger* and *Candida albicans* (11 to 22 mm) when compared to gram positive bacteria (9.5 to 13 mm). Selective toxicity of the extract against *M. canis* might occurred as reported by Jantan et al. [8].

![Figure 1](image)

Figure 1. Inhibition zone ethanolic extract of *K. galanga* rhizome on *Microsporum canis* on PDA medium after 4 days at 28°C (left), (b) Inhibition zone on NA medium on *Staphylococcus epidermidis* after 24 h at 28°C (right)

Table 1 showed extract concentration of *K. galanga* from 40 to 70% inhibits the growth of *M. canis* and *S. epidermidis*. However, the inhibition not significantly different to concentration up to 70%. Control treatments, positive control (K+) i.e., ketoconazole (for *M. canis*) and chloramphenicol (for *S. epidermidis*) showed antimicrobial activity, both antimicrobes inhibit *M. canis* and *S. epidermidis* and showed significantly different to all extract treatments.
Table 1 Inhibition zone (mm) of \textit{K. galanga} rhizome on \textit{Microsporum canis} and \textit{Staphylococcus epidermidis}

<table>
<thead>
<tr>
<th>Extract concentration (%)</th>
<th>\textit{Microsporum canis}</th>
<th>\textit{Staphylococcus epidermidis}</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-</td>
<td>0.00 a</td>
<td>0.00 a</td>
</tr>
<tr>
<td>K+</td>
<td>25.49 b</td>
<td>10.35 c</td>
</tr>
<tr>
<td>40</td>
<td>2.01 a</td>
<td>3.94 b</td>
</tr>
<tr>
<td>50</td>
<td>2.90 a</td>
<td>3.96 b</td>
</tr>
<tr>
<td>60</td>
<td>3.04 a</td>
<td>5.45 b</td>
</tr>
<tr>
<td>70</td>
<td>3.16 a</td>
<td>5.88 b</td>
</tr>
</tbody>
</table>

Note: Numbers followed by same letters at the same column not significantly different (P<0.05)
K- = no extract; K+ = ketoconazole for \textit{M. canis} and chloramphenicol for \textit{S. epidermidis}

3 Conclusions

The ethanolic extract of \textit{Kaempferia galanga} rhizome has shown antimicrobial activity against \textit{Microsporum canis} and \textit{Staphylococcus epidermidis} and hence the use of the rhizome extract is potential as an alternative antimicrobe.

Reference


