



## The Antimicrobe of *Kaempferia galanga* L. Rhizome against *Microsporium 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 *Microsporium 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, *Microsporium canis*, *Staphylococcus epidermidis*

**Abstrak.** Penelitian ini bertujuan untuk mengetahui kemampuan ekstrak etanol rimpang *Kaempferia galanga* L. dalam menghambat pertumbuhan *Microsporium 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 kloramfenikol 25,49 mm).

**Kata kunci:** *Kaempferia galanga*, rimpang, *Microsporium canis*, *Staphylococcus epidermidis*

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## 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.

### Antimicrobe activity

The antimicrobe 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

Ethanollic 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].

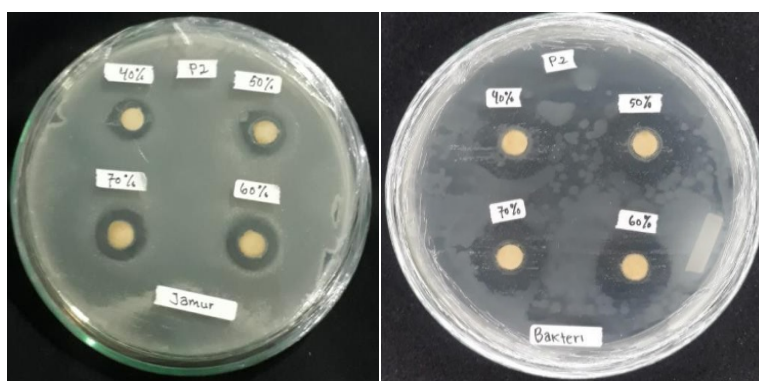


Figure 1. Inhibition zone ethanolic extract of *K. galanga* rhizome on *Microsporum canis* on PDA medium after 4 days at 28°C (left), (b) Inhibition zone on NA medium on *Staphylococcus epidermidis* after 24 h at 28°C (right)

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) ethanolic extract of *K. galanga* rhizome on *Microsporium canis* and *Staphylococcus epidermidis*

Extract concentration (%)	Inhibition zone (mm)	
	<i>Microsporium canis</i>	<i>Staphylococcus epidermidis</i>
K-	0.00 a	0.00 a
K+	25.49 b	10.35 c
40	2.01 a	3.94 b
50	2.90 a	3.96 b
60	3.04 a	5.45 b
70	3.16 a	5.88 b

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

### 3 Conclusions

The ethanolic extract of *Kaempferia galanga* rhizome has shown antimicrobial activity against *Microsporium canis* and *Staphylococcus epidermidis* and hence the use of the rhizome extract is potential as an alternative antimicrobe.

### Reference

- [1] Wang S.Y, Zhao H, Xu H.T, Han X.D, Wu Y.S, Xu F.F, Yang X.B, Goranss U, Liu B, “*Kaempferia galanga* L.: Progresses in phytochemistry, pharmacology, toxicology and ethnomedicinal uses”. *Frontiers in Pharmacology*. vol. 12, Article 675360. 19 October 2021.
- [2] Limiyati D.A, Juniar B.L.L , “Jamu gendong, a kind of traditional medicine in Indonesia: the microbial contamination of its raw materials and end products”, *Journal of Ethnopharmacology*, vol.63, no.3, pp. 201-208. 1998.
- [3] Kumar A, “Phytochemistry, pharmacological activities and uses of traditional medicinal plants *Kaempferia galanga* L. An overview”, *Journal Ethnopharmacology*, vol. 253, 112667. 2020.
- [4] Rao N, Kaladhar DSVGK., “Antioxidant and antimicrobial activities of rhizome extracts of *Kaempferia galanga*”, *World Journal of Pharmacy and Pharmaceutical Sciences*, vol 3, no.5, pp. 1180-1189. 2014.
- [5] Tewtrakul S.S, Yuenyongsawad S, Kummee L, Atsawajaruwan, “Chemical components and biological activities of volatile oil of *Kaempferia galanga* Linn. Songklanakarin”, *Journal Science Technology*, vol. 27, no.2, pp. 503-507. 2005.
- [6] Belgis M, Nafi A, Giyarto, Wulandari A.D, “Antibacterial activity of *Kaempferia galanga* L. hard candy against *Streptococcus pyogenes* and *Staphylococcus aureus* bacteria growth”, *International Journal of Food, Agriculture, and Natural Resources*, vol. 2, no.1, pp. 1-8. 2021.
- [7] Parves M.A.K, Md. Mahboob H.K, Md. Zahurul I, Shek M.H, “Antimicrobial activities of the petroleum ether, methanol, and acetone extract of *Kaempferia galanga* L. rhizome”, *Journal of Life and Earth Science*, vol.1, pp. 25-29. 2005.

- [8] Jantan M.S.I.B, Yassin M, Chin C.B, Chen L.L, Sim N.L, “Antifungal activity of the essential oils of nine Zingiberaceae species”, *Pharmaceutical Biology*, vol.41, no.5, pp. 392-397. 2003.
- [9] Chermette R, Ferreiro L, GuillotJ, Dermatophytoses in animals. *Mycopathologia* 166: 385-405. 2008.
- [10] Pasquetti M, A.R Molinar M, S Scacchetti A. Dogliero, A. Peano, “Infection by *Microsporum canis* in paediatric patients: a veterinary perspective”, *Veterinary Sciences* vol.4, no.46, pp. 1-6. 2017.
- [11] Vuong C, Otto M, *Staphylococcus epidermidis* infections. *Microbes and Infection* ,vol.4, pp. 481-489. 2002.
- [12] Otto M, *Staphylococcus epidermidis* - the “accidental” pathogen. *Nat. Rev. Microbiology* 7(8): 555-567. 2009.
- [13] Sasidharan S, Chen Y, Saravanan D, Sundram K.M, Yoga Latha L., “Extraction, isolation, and characterization of bioactive compound from plant’s extract”, *African Journal of Traditional, Complementary and Alternative Medicines*, vol.8, no.1, pp. 1-10. 2011.