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Sensitivity of Torch Ginger and Basil Extracts Against Candida sp. from Vaginal Discharge Samples

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ABSTRACT

Pathological vaginal discharge is a common infection among women, often caused by the fungal species Candida albicans. The increasing resistance to synthetic antifungal agents such as ketoconazole has prompted the need for alternative herbal therapies. This study aimed to identify the presence of Candida albicans in vaginal swab samples from female D4 TLM UNAIC students an to assess the antifungal activity of combined extracts of kecombrang flower (Etlingera elatior) and basil leaves (Ocimum basilicum) prepared using the infusion method. An experimental design was used with the well diffusion method to measure inhibition zones at extract concentration of 50%, 70%, and 90%. The results showed that 31% of the 48 samples tested positive for Candida albicans. Macroscopically, the colonies appeared white to cream, convex, and had a characteristic yeast odor, while microscopic examination revealed blastospores. The positive control group using ketoconazole exhibited strong antifungal activity with an inhibition zone diameter of 23 mm. In contrast, the combined infusion extracts at all tested concentration (50%, 70%, and 90%) showed no inhibition zones (0 mm), indicating an absence of antifungal activity. The conclusions of this research are the infusion extraction method was ineffective in isolating active antifungal compounds from the tested plants under the conditions of this study.

Keywords: *Candida albicans; vaginal discharge; kecombrang flower; basil leaves; antifungal activity*

ABSTRAK

Keputihan patologis merupakan salah satu infeksi yang umum dialami wanita, salah satu penyebab utamanya adalah jamur *Candida albicans*. Penggunaan obat antifungi sintesis seperti *ketoconazole* telah menimbulkan resistensi, sehingga diperlukan alternatif pengobatan berbasis bahan alam. Penelitian ini bertujuan untuk mengidentifikasi keberadaan *Candida albicans* pada swab keputihan mahasiswi D4 TLM UNAIC dan mengevaluasi aktivitas antifungi kombinasi ekstrak bunga kecombrang (*Etlingera elatior*) dan daun kemangi (*Ocimum basilicum*) menggunakan metode infusa. Penelitian ini dilakukan secara eksperimental menggunakan metode difusi sumuran dengan konsentrasi ekstrak 50%, 70%, dan 90%, serta membandingkan dengan kontrol positif (*ketoconazole*) dan negatif. Hasil penelitian menunjukkan bahwa dari 48 sampel, sebanyak 31% teridentifikasi positif mengandung *Candida albicans*. Ciri morfologis koloni yang tumbuh berwarna putih hingga cream, berbentuk bulat menonjol, dan teramati blastospora secara mikroskopis. Kontrol positif dengan *ketoconazole* menunjukkan daya hambat kuat dengan diameter zona hambat 23 mm. Namun, kombinasi ekstrak bunga kecombrang dan daun kemangi tidak menunjukkan zona hambat pada semua konsentrasi. Kesimpulan dari penelitian ini adalah metode infusa tidak efektif dalam mengekstraksi senyawa aktif yang bersifat antifungi terhadap *Candida albicans*.

Kata kunci: *Candida albicans*; Keputihan; Bunga Kecombrang; Daun Kemangi; Aktivitas antifungi

INTRODUCTION

Vaginal discharge or fluor albus is a common condition experienced by women across various age groups. This condition may be physiological as part of normal bodily processes or pathological, typically caused by infection with microorganisms such as bacteria, viruses, or fungi. One of the most common fungal pathogens responsible for pathological vaginal discharge is Candida albicans. This opportunistic fungus proliferates rapidly when the balance of normal vaginal flora is disrupted or when the host's immune system is compromised(1,2). Candida infections have a high global prevalence and represent a major cause of vaginitis, often leading to clinical symptoms such as itching, irritation, and increased vaginal secretion(2).

Synthetic antifungal agents such as ketoconazole and nystatin remain the first-line therapy for Candida infections. However, several studies have reported increasing antifungal resistance, as well as adverse effects including local irritation and hepatotoxicity during long-term use(3,4). These challenges highlight the need for alternative antifungal agents that are safer, affordable, and effective, particularly those derived from natural products(4).

Sweet basil (Ocimum basilicum) contains a variety of bioactive compounds, including flavonoids, saponins, tannins, and essential oils—particularly eugenol—that exhibit antibacterial and antifungal activities by disrupting microbial cell membranes and inhibiting growth(5,6). Meanwhile, torch ginger (Etlingera elatior) contains flavonoids, alkaloids, and saponins, which have been shown to possess antimicrobial and strong antioxidant properties(7,8). The combination of these two plants is theoretically capable of producing synergistic effects in inhibiting pathogenic fungal growth(9–11).

Previous studies have demonstrated that basil leaf extract is effective in inhibiting Candida albicans at certain concentrations(12–15). However, to date, no studies have reported the antifungal effectiveness of a combined infusion extract of basil leaves and torch ginger flowers against Candida albicans. Addressing this research gap is essential to explore natural alternative

therapies that are easily accessible and potentially applicable as traditional antifungal formulations.

METHODS

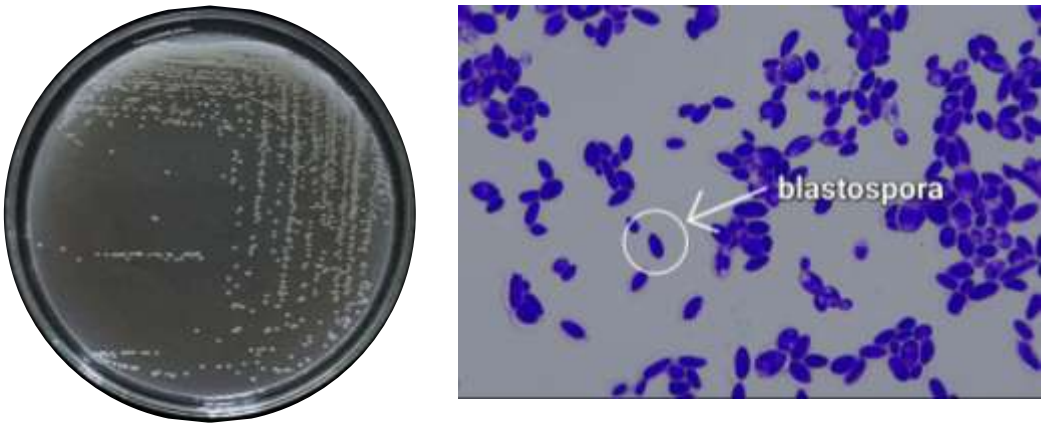
This study was an experimental laboratory research employing the well diffusion method. Vaginal discharge swab samples were collected from 48 female students of the Diploma IV Medical Laboratory Technology Program at UNAIC. The samples were cultured for the isolation and identification of Candida albicans through macroscopic examination, microscopic observation, and standard biochemical tests.Infusion extracts of torch ginger (Etlingera elatior) flowers and basil (Ocimum basilicum) leaves were prepared at concentrations of 50%, 70%, and 90%. All extracts were prepared under sterile conditions prior to testing. Sensitivity testing was performed by inoculating a suspension of Candida albicans onto the surface of Potato Dextrose Agar (PDA) plates. Wells were created using a sterile perforator, and each well was filled with the extract according to its concentration. Two types of controls were used: ketoconazole as the positive control and sterile distilled water as the negative control. The plates were incubated for 3 × 24 hours at 37°C. The inhibition zone diameter was measured using a caliper after incubation. The data obtained were analyzed descriptively to evaluate the inhibitory effectiveness of each extract against Candida albicans. This study received ethical approval with Ethical Clearance Number: 009/EC/UNAIC/IV/2025.

RESULTS

Table 1 presents the results of Candida albicans isolation from vaginal discharge swab samples. Of the 48 samples examined, 15 samples (31%) were identified as positive for Candida albicans. The identification was based on macroscopic and microscopic characteristics. The colonies grown on PDA appeared white to cream, round, raised, and produced a characteristic yeast-like odor. Microscopic observation revealed the presence of blastospores.

Table 1. Isolation Results of Candida albicans

Interpretation	Number (Vaginal Swabs)	Percentage (%)
(+) Positive	15	31
(–) Negative	33	69
Total	**48**	**100**



(a) **(b)**

Figure 1. (a) Candida albicans colonies on PDA; (b) Blastospores observed microscopically.

In the sensitivity test, the positive control (ketoconazole) demonstrated a strong antifungal effect with an inhibition zone diameter of 23 mm. In contrast, the combined infusion extract of torch ginger flowers and basil leaves at concentrations of 50%, 70%, and 90% showed no antifungal activity against Candida albicans, indicated by the absence of inhibition zones (0 mm).

Table 2. Inhibition Zone Measurements of Basil Leaf and Torch Ginger Flower Infusion Extracts

Sample Code	50%	70%	90%
A2	0	0	0
A5	0	0	0
A7	0	0	0
A8	0	0	0
A10	0	0	0
A11	0	0	0
A12	0	0	0
A13	0	0	0
A14	0	0	0
A16	0	0	0
A18	0	0	0
A29	0	0	0
A35	0	0	0
A36	0	0	0
A37	0	0	0

Based on Table 2, none of the tested concentrations (50%, 70%, and 90%) of the combined infusion extract of basil leaves and torch ginger flowers produced an inhibition zone against Candida albicans. All tested isolates showed a diameter of 0 mm, indicating that the extract lacked antifungal activity under the conditions of this study. These findings suggest that the phytochemical content present in the infusion preparation such as flavonoids, saponins, and tannins was either insufficient in concentration or not optimally extracted using the infusion method to exert inhibitory effects on Candida albicans.

DISCUSSION

The findings of this study show that Candida albicans was detected in 31% of the 48 vaginal discharge swab samples collected from Diploma IV Medical Laboratory Technology students at UNAIC. This result is consistent with WHO reports indicating that approximately 75% of women experience candidiasis at least once in their lifetime, with the majority occurring during reproductive age(16). The identification of C. albicans in this study was supported by its macroscopic characteristics on PDA, including white to cream-colored colonies with raised, round morphology and a characteristic yeast-like odor. Microscopic examination further confirmed the presence of blastospores, reinforcing the accuracy of the identification process(17). The antifungal sensitivity test demonstrated that the positive control, ketoconazole, produced a 23 mm inhibition zone, categorized as a very strong antifungal effect according to standard interpretive criteria(18). Ketoconazole functions by inhibiting the enzyme lanosterol 14-α-demethylase in the ergosterol biosynthesis pathway, leading to disruption of fungal cell membrane integrity(19). This result supports the well-established effectiveness of ketoconazole in treating candidiasis. In contrast, the combined infusion extract of torch ginger flowers and basil leaves at concentrations of 50%, 70%, and 90% showed no inhibitory activity against C. albicans, as indicated by the absence of inhibition zones. Several factors may explain this lack of antifungal

activity. First, the infusion extraction method may not have effectively extracted the bioactive components responsible for antifungal effects. The use of high temperatures in infusion may degrade thermolabile compounds, and water as a solvent generally yields lower concentrations of active phytochemicals compared to organic solvents(20). Second, the concentration and stability of the bioactive compounds may have been insufficient to exert inhibitory effects. Additionally, the combination of plant components may have resulted in antagonistic interactions, reducing overall antifungal potency.

From a microbiological perspective, C. albicans possesses several mechanisms that contribute to its resilience against antifungal agents. One of these mechanisms involves calcineurin, a heterodimeric phosphatase enzyme that regulates calcium-dependent cell signaling pathways. In C. albicans, calcineurin contributes to virulence, membrane stress adaptation, and survival during exposure to antifungal drugs such as fluconazole. Activation of calcineurin and its downstream targets, including the Rta2p protein and the Crz1 transcription factor, can significantly reduce antifungal susceptibility in both in vitro and in vivo settings. Additionally, the molecular chaperone Hsp90 stabilizes calcineurin, enhancing tolerance to antifungal stress(21). These intrinsic resistance mechanisms may have contributed to the inability of the infusion extracts to inhibit fungal growth. However, previous studies have shown antifungal activity of both plants when extracted with different methods. Basil leaf and stem extract at a concentration of 15% was able to inhibit C. albicans with a 6 mm inhibition zone(22). Similarly, ethanol extract of torch ginger flowers demonstrated antifungal effects against Malassezia furfur beginning at 15% concentration(23). These findings suggest that extraction method and solvent selection play a critical role in determining the antifungal efficacy of herbal preparations.

Overall, the results of this study indicate that the infusion preparation of basil leaves and torch ginger flowers was not effective against C. albicans, likely due to suboptimal extraction efficiency and the inherent resistance mechanisms of the fungus. Further research using different extraction methods—such as maceration or Soxhlet extraction with ethanol—may provide better insight into the antifungal potential of these plants.

CONCLUSION

Candida albicans was detected in 31% of the examined vaginal swab samples. The infused extract combination of torch ginger (Etlingera elatior) flowers and basil (Ocimum basilicum) leaves showed no antifungal activity at concentrations of 50%, 70%, and 90%. These findings suggest that the infusion method and the use of water as a solvent were not sufficient to extract active antifungal compounds. Further research using alternative extraction methods, such as ethanol-based extraction or fractionation of active components, is recommended to better evaluate the antifungal potential of these plant materials.

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