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# Comparative Analysis of the Antifungal Efficacy of Tomato Leaves (*Lycopersicum esculatum* Mill) at Concentrations of 25% and 70% on the Growth of *Candida albicans*

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**A B S T R A C T**

**Introduction.** *Candida albicans* commonly causes oral thrush, an opportunistic illness that affects the mouth. Both topical and systemic antifungal medications effectively treat oral thrush. The study compared tomato leaf (*Lycopersicum esculatum* Mill) antifungal effects on *Candida albicans* growth at two different concentrations: 25% and 70%. **Methods.** This research utilizes laboratory trials employing post-test-only control groups. The Microbiology Laboratory Universitas Sumatera Utara supplied the investigation with a pure culture isolate of *Candida albicans*. To figure out the sample size, we used the Federer formula six times, once for each group of tomato leaves at 25% and 70% concentrations and once for the nystatin (positive control) and DMSO (negative control) groups. Use of a digital caliper for measuring the resistance diameter. We used the Mann-Whitney U test and the Kruskal-Wallis test to look at the data. **Result.** Tomato leaves at 25% and 70% concentrations successfully limit Candida albicans development, according to the Kruskal-Wallis and Mann-Whitney tests. The efficiency of tomato leaves at 25% and 70% concentrations in inhibiting the development of Candida albicans was shown by mean inhibitory diameters of 7.73 ± 0.366 mm and 10.21 ± 0.948 mm, respectively. Nystatin, the positive control, had an average inhibitory diameter of 25.77 ± 0.505 mm, whereas DMSO solvent, the negative control, showed no inhibition at all. Between the groups, there was a significantly different inhibitory diameter of Candida albicans growth, as shown by the Kruskal-Wallis test ($p=0.000$; $p \leq 0.05$). At doses ranging from 25% to 75%, the Mann-Whitney test showed that there was a significant difference ($p \leq 0.05$) in the effectiveness of tomato leaf extracts in inhibiting the development of Candida albicans compared to the negative control group. **Conclusion.** Tomato leaves inhibit the development of *Candida albicans*. The antifungal efficacy of tomato leaves is higher at a concentration of 70% compared to 25%.

## 1. Introduction

Candida albicans, more often referred to as "oral thrush," is an opportunistic infection that causes inflammation of the mouth and gums. *Candida albicans* and other species from the *Candida* genus cause the infection. A tender, pale plaque that resembles a clump of milk distinguishes the infection. Individuals can easily remove this plaque, which

leaves behind a reddish stain or erythema. This infection can affect individuals of all ages, including infants, as well as healthy youngsters, adults, denture wearers, and individuals with chronic illnesses like leukemia and HIV. Dentists often recommend Nystatin, a pharmaceutical, for treating oral thrush. This medication was one of the initial topical antifungal medicines. The *Streptomyces noursei* strain makes membrane-active polyene macrolide topical antifungals. These come in different forms, like oral suspension, topical cream, and oral pastilles. Nystatin administration is associated with several adverse effects. The potential side effects of oral administration of nystatin include nausea, vomiting, and diarrhea. On the other hand, topical use of nystatin may occasionally cause irritation. Extended utilization of these antifungal medicines may further result in hepatic impairment and the development of resistance.[1-4]

With the passage of time, the adoption and use of traditional medicine in Indonesia have experienced significant improvement. The public continues to extensively utilize traditional medicines as an alternative form of therapy due to their derivation from plants and pure natural substances, resulting in significantly reduced side effects, hazards, and risks compared to chemical medications while also lacking any resistance. Tomato leaves (*Lycopersicum esculatum* Mill) can serve as an option for therapy. People often overlook tomato leaves as a plentiful supply due to the presence of potentially poisonous glycoalkaloids when consumed in high amounts. Glycoalkaloids possess both antifungal and antifungal properties. Studies indicate that tomato leaves contain secondary metabolite components, such as flavonoids, saponins, and essential oils, in quantities of 0.1%, 0.3%, 0.5%, and 0.7%. Flavonoid and saponin compounds are particularly significant as antifungal agents.

## 2. Methods

This study is in vitro experimental research. We used pure cultures of Candida albicans to carry out the investigation. This research included six groups, with each group doing six repetitions. There was a positive control group that used nystatin and a negative control group that used dimethyl sulfoxide (DMSO). The experimental groups also included tomato leaves extract at 25% and 70% concentrations. Ethical approval from Universitas Prima Indonesia's medical and health research ethics committee was granted for the project.

We rinse 500 grams of fresh tomato leaves with running water, dry them, and subsequently chop them into smaller pieces. To achieve a smooth consistency, further puree the tomato leaves. Then, filtration is used to separate the outcome of immersing for a duration of five days, yielding a filtrate and residue. As soon as the liquid has gone through the filter, collect it and put it in a tight container. Subsequently, immerse the residual substance once more for 48 hours, with intermittent agitation, in a solution containing 1.25 liters of ethanol with a concentration of 96%.

After that, the Candida albicans was diluted and mixed with a vortex for 10 minutes. Check the turbidity level next using the 1.5 x 108 cfu/mL McFarland turbidity cutoff. When tested against the McFarland turbidity criterion of 0.5, the fungal suspension was found to be opaque. For colonies that were less turbid, nutritional broth (NB) was added to the suspension; for colonies that seemed more turbid, the opposite was true. Sterilization was achieved by autoclaving the combination of 38 grams of NA medium and 1 liter of distilled water at 121°C for 15 minutes. Move to a petri dish that is 5 millimeters thick. The agar medium may be utilized immediately after cooling down. According to the McFarland standard, with a concentration of 100 µ, the fungal colonies were evenly dispersed into the Sabouroud Dextrose Agar (SDA) agar medium using a sterile

cotton swab. Subsequently, submerge the blind disk in tomato leaf extract at 25% and 70% concentrations. Submerging the opaque disk into the positive and negative control solutions is the next step. The next step is to prep the agar medium and paper discs for the incubator. Preheat it to 37°C and leave them there for 8 hours. The next step is to meticulously measure the width of the drag zone using a digital caliper. To find the inhibitory power, which is the area around the paper disk where microbes can't grow, measure its diameter. In order to analyze the data, we used SPSS version 25. Different groups were compared based on the diameter of their inhibitory zones using univariate and bivariate analyses, with a significance threshold of $p<0.05$.

## 3. Results and Discussion

Table 1 presents the complete findings of the study that investigated variations in the antifungal efficacy of tomato leaves (*Lycopersicum esculatum* Mill) on the development of *Candida albicans*.

Table 1. Inhibitory effect of tomato leaf extract on the growth of *Candida albicans*.

| Groups | Inhibitory zones | p-value |
|---|---|---|
| | Mean (mm) ±SD | |
| Tomato leaves extract 25% | 7.73±0.366 | 0,000* |
| Tomato leaves extract 70% | 10.21±0.948 | |
| Nystatin | 25.77±0.505 | |
| DMSO | 0 | |

Notes: *Oneway* ANOVA; *Significant.

According to Table 1, the one-way ANOVA test showed that there is a significant difference ($p = 0.000$; $p \leq 0.05$) in the average inhibitory diameter of Candida albicans growth at 25% and 70% concentrations of tomato leaf extract (Lycopersicum esculatum Mill). According to these findings, tomato leaf extract (Lycopersicum esculatum Mill) inhibits Candida albicans growth by 25% to 70%.

Nystatin surpasses extracts in efficacy due to its classification as a first-line antifungal agent. Additionally, nystatin possesses the ability to induce oxidative damage to fungal cells. Topical administration of nystatin through creams, ointments, suppositories, and other skin and mucous membrane formulations minimizes its toxicological impact. The unpleasant taste of nystatin restricts its use when taken orally. Nystatin is the most common antifungal drug used to treat superficial infections caused by *C. albicans*, like esophageal candidiasis, thrush, diaper rashes, and vaginal yeast infections. Furthermore, this antifungal medication has a wide range of activity, rendering it a very efficacious option for addressing many fungal infections.[9-14]

According to the study findings, nystatin is superior to tomato leaf extract when used at doses of 25% and 70%. However, due to the potential hazard of systemic toxicity, nystatin is limited to use on the skin, vagina, and mouth. The active component, saponin, is present in tomato leaves. Saponin acts as an antifungal by decreasing surface tension, which leads to enhanced permeability and leaking of fungal cells. As a result, the fungal cells expel internal chemicals. Flavonoid chemicals, alkaloids, and essential oils are also present in tomato leaves.[15-20]

## 4. Conclusion

Tomato leaves inhibit the development of *Candida albicans*. The antifungal efficacy of tomato leaves is higher at a concentration of 70% compared to 25%.

**5.References**


1. Koundal S, Cojandaraj L. *Candida* species-morphology, medical aspects and pathogenic spectrum. Eur J Mol Clin Med. 2020;7(7):4015-21.
2. Kurniawan AA, Wardana T, Darmawan AR. Case report: candidiasis acute erythematous of diabetes mellitus patients. Stomatognatic. 2018;15(1):21-5.
3. Madonna M, Setyaningrum E, Pratami GD, Kanedi M. Efektivitas ekstrak daun tomat (*Solanum lycopersicum* L.) sebagai ovisida nyamuk *Aedes aegypti*. J Ilmu Kedokteran Kesehatan. 2020;7(1):368-74.
4. Menon A, Ganapathy D. Denture stomatitis: a comprehensive diagnostic approach. Biosc Biotech Res Comm Special. 2020;13((7):22-6.
5. Nursahfitri, Amalia R, Fadillah Q. Uji efektivitas antifungi ekstrak daun jarak pagar (*Jatropha curcas* Linn) terhadap bakteri *Staphyloccocus aureus*. JIMKesmas. 2020;5(4):6-12.
6. Oktaria I. Prevention and management of denture stomatitis. Interdental J Kedokteran Gigi. 2022;18(2):67-73.
7. Palupi LM. Keefektifan propolis pada penderita kandidiasis oral: literature review. Jurnal Informasi Kesehatan Indonesia. 2018;4(2):172-77.
8. Puspitasari A, Kawilarang AP, Ervianti E, Rohiman A. Profile of new patients of candidiasis. Period Dermatol Venereol. 2019;31(1):24-34.
9. Rai A, Misra SR, Panda S. Nystatin effectiveness in oral candidiasis treatment: a systematic review & meta-analysis of clinical trials. Life. 2022;12(1677):1-16.
10. Ratna NH, Base, Husnul DRK. Uji daya hambat ekstrak etanol daun rambutan (*Nephelium lappaceum* L.) terhadap *Streptococcus mutans*. J Kesehatan Yamasi Makasar. 2018;2(2).