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## Antifungal Activity of Cassia alata L. Ethyl Acetate and N-Hexane Leaves Extract against *Candida albicans*

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### ABSTRACT

This study aims to determine the effect of Cassia alata L. ethyl acetate and n-hexane leaves extract in inhibiting the growth of *Candida albicans*. The study used an experimental laboratory. In this study, C. alata ethyl acetate and n-hexane leaves extract used with concentrations of 2% w/v, 4% w/v and 8% w/v. The results showed that ethyl acetate and n-Hexane extracts inhibit C. albicans growth at 2% w/v, 4% w/v and 8% w/v concentrations with diameters of 9 mm, 11 mm, 13 mm for ethyl acetate and 9.3 mm, 12 mm, 14 mm for n-hexane solvent.

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### INTRODUCTION

*Candida* is the most common yeast group found in the oral cavity, digestive tract, reproductive tract and skin, especially *Candida albicans* species (1) (2). The test on the growth of *C. albicans* was influenced by the type and levels of chemical compounds contained in each extract. Antimicrobial activity in plants is related to the presence of several groups of chemical compounds such as alkaloids, phenols, flavonoids, carbohydrates, saponins, steroids and tannins (3).

Opportunistic fungal infections are infections caused by non-pathogenic fungi that turn into pathogens when the body's immunity is weakened. Opportunistic infections are more common than systemic pathogenic fungal infections (4). One of the *Candida* species that causes disease is *C. albicans*. *C. albicans* will be pathogenic, resulting in an infection called candidiasis. *C. albicans* is an opportunistic fungus, which is a fungus that is not pathogenic at first, but if there is a predisposing factor, the fungus becomes a pathogen, one of the diseases caused by *C. albicans*, namely Candidiasis. Candidiasis is a fungal disease that is acute or subacute caused by *C. albicans*, and can affect the mouth, vagina, skin, nails, bronchi, and lungs

*C. albicans* infection can be treated with antifungals drugs. The classes of drugs currently available for the treatment of mycoses include polyenes, -sitostine, azoles, and griseofulvin. The fact shows that there are relatively fewer types of antifungals compared to other antimicrobials, besides that chemical drugs often cause quite severe side effects and are expensive, thus it is necessary to extract alternative medicines from traditional medicinal plants which empirically have often been used by the community (5).

Indonesia is a country that is rich in medicinal plants. In addition to medical treatment, people also still do a lot of traditional treatment. People in general use plant parts which include roots, bark, leaves, flowers or seeds as medicinal ingredients. One alternative way to find antifungal agents is to use traditional medicine. Currently, the world community, including Indonesia, has begun to prioritize the use of herbal medicine (6) (7).

Plants are often used as herbal medicines because they can reduce the side effects left behind and are easy to obtain. One of the plants that can be used as ingredients for herbal medicines is *C. alata*. *C. alata* has been used by the community as an anti-parasitic, lactant, anti-helminth, scabies, influenza, and malaria. *C. alata* leaves extract is used as an antibacterial agent because it contains phytochemical compounds such as tannins, flavonoids, terpenoids, glycosides, and steroids. Apart from being an antibacterial ingredient, ethanol and

aquades extract, *C. alata* is also used as an antipyretic agent. The content of flavonoids in herbal plants has anti-inflammatory, anti-allergic, antimicrobial, antioxidant effects, and is effective as an anti- function for several groups of fungi. *C. alata* traditionally used to treat pinworms, fungal skin infections such as tinea versicolor, ringworm, eczema, thrush and itching. Scientifically, this is due to the presence of chemical substances contained in these plants that are antimicrobial (8).

## METHODOLOGY

*C. alata* used as sample which was taken in Parumpanai village, Malili sub-district, East Luwu district. Extraction was carried out by maceration using ethyl acetate, as much as 100 grams was put into a maceration vessel and pressed with a stirring rod until the surface was flat, then the ethyl acetate solvent was moistened until completely submerged. Leave for 5 days and stir occasionally. Then filtered the maceration results, after that it was continued by being put back in the maceration vessel for 10 days by replacing the Ethyl Acetate solvent used 2 times for 5 days. The extract obtained was filtered and evaporated. The test of *C. alata* leaves extract was carried out by the disk diffusion method. Prepare sterile PDA medium, then pour it aseptically into 15 mL sterile petri dishes and allow to solidify. After that, the test bacterial suspension was inoculated on the PDA media using a sterile cotton swab. Then, the paper disk was immersed in the test material for the ethyl acetate and n-Hexane of *C. alata* leaves extract at concentrations of 2% w/v, 4% w/v, 8% w/v, placed aseptically on the surface of the medium with a paper disk distance. Each other 2-3 cm from the edge of the petri dish. Likewise for negative control (Na.CMC) and Nystatin suspension as positive control.

## RESULTS

**Table 1.** Inhibitory Zone Diameter of *C. alata* L. Leaves Against *C. albicans*

No.	Ethyl Acetate			n-Hexane			Positive control (mm)	Negative control (mm)
	2%	4%	8%	2%	4%	8%		
1.	8	11	12	10	13	14	15	–
2.	10	10	14	9	12	15	14	–
3.	9	12	13	9	11	13	15	–
<b>Avg</b>	<b>9</b>	<b>11</b>	<b>13</b>	<b>9.3</b>	<b>12</b>	<b>14</b>	<b>14.6</b>	–

Table 1. showed the greater the concentration used, the greater the activity produced and the largest diameter is the positive control group, which is 14.6 mm, the *C. alata* ethyl acetate leaves extract group 8% w/v by 13 mm, 4%w/v by 11 mm, 2%w/v by 9 mm and the *C. alata* n-Hexane leaves extract group 8%w/v by 14 mm, 4%w/v by 12 mm, 2% w/v by 9.3 mm.

## DISCUSSION

There are two ways to prove the presence or absence of antifungal substances in a natural product, namely by diffusion and elution methods (9). Activity testing in this study is using the diffusion method with the disc diffusion method technique. The diffusion method is a qualitative method that will provide certainty of the presence or absence of antibacterial/antifungal substances in a natural product. The diffusion method was chosen because this method has advantages compared to other methods, namely it is easier to measure the diameter of the inhibition zone formed because the isolates are active on the surface of the nutrient agar to the bottom (10). In this method, *C. albicans* can be observed clearly, making it easier to observe.

Based on the results of the study, the treatment groups with concentrations of 8%w/v and 4%w/v had a larger diameter of inhibition zone than 2%w/v. The results of this study are in accordance with the initial hypothesis, namely the higher the concentration of the extract, the higher the content of active substances in it,

so that the higher the inhibition zone produced. This antimicrobial can occur due to differences in the rate of diffusion of antimicrobial compounds.

Factors that may occur in this study are differences in the number of organisms inoculated, differences in the speed of fungus growth in each research sample, as well as in vitro microenvironmental conditions so that there is a need for speed standardization of conditions to obtain more accurate results (9). It can be concluded that the greater the concentration of *C. alata* ethyl acetate and n-hexane leaves extracts, the greater the antifungal effect in inhibiting the growth of *C. albicans*.

In this study, Nystatin was used as a positive control, because the drug is a polyene class that is effective in treating oral candidiasis and is able to provide optimal effects on inhibiting the growth of *C. albicans* (11).

The results of statistical tests using the application of SPSS in the treatment of 2%w/v, 4%w/v, and 8%w/v in inhibiting the growth of *C. albicans* by 9 mm, 11 mm, 13 mm for Ethyl Acetate extract and 9.3 mm, 12 mm, 14 mm for n-Hexane extract with a positive control of 14.6. Based on the Analysis of Variance (ANOVA) showed significant data ( $P < 0.05$ ) at the level of  $P =$

0.000  $< 0.05$  and homogeneous at the level of  $P = 0.000 < 0.05$ . In the treatment of 2% w/v, 4% w/v, and 8% w/v in inhibiting the growth of *C. albicans* by 9 mm, 11 mm, 13 mm for Ethyl Acetate extract and 9.3 mm, 12 mm, 14 mm for n-Hexane extract with a positive control of 14.6. Based on the analysis (ANOVA) showed significant data ( $P < 0.05$ ) at the level of  $P = 0.000 < 0.05$

## CONCLUSION

Based on the results of research and observations that have been carried out, it can be concluded that the *C. alata* ethyl acetate and n-Hexane leaves extract at concentrations of 2% w/v, 4% w/v and 8% w/v had activity against *C. albicans*. Both of *C. alata* ethyl acetate and n-hexane leaves extracts gave the greatest inhibitory power at a concentration of 8 w/v.

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