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The Effectiveness of Bajakah Wood Extract (*Spatholobus Littoralis Hassk*) From South Kalimantan against *Candida Albicans* ATCC 10231

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ABSTRACT

Root canal treatment (RCT) is a procedure performed to remove inflamed or infected pulp tissue. *Candida albicans* is the most pathogenic type of fungus found in the oral cavity, accounting for 80%. Bajakah wood (*Spatholobus littoralis Hassk*) contains antifungal components such as phenols, flavonoids, tannins, and saponins. This research is to determine the antifungal effectiveness of Bajakah wood (*Spatholobus littoralis Hassk*) against *Candida albicans*. This research is an experimental laboratory study using the dilution method in the laboratory. A total of 20 samples of *Candida albicans* ATCC 10231 cultures in *Sabouraud Dextrose Broth* medium were tested. The treatment variations of Bajakah wood were concentrations of 50%, 75%, 100%, and 2.5% NaOCl (K+) with 5 repetitions. The results showed that the average number of fungal growths at 50% concentration was 387, at 75% concentration it was 449.4, while at 100% concentration it was 2.4, and in the positive control it was 1. Data analysis using the *Kruskal-Wallis* test showed significant differences ($p<0.05$) across all treatment groups. It can be concluded that Bajakah wood at 100% concentration has the highest antifungal content and is effective in inhibiting the growth of *Candida albicans*.

KEYWORD: Bajakah wood, *Candida albicans*, Root Canal Treatment

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INTRODUCTION

Root canal treatment (RCT) is a procedure performed to remove inflamed or infected pulp tissue.[1] Root canal treatment is indicated when the dental pulp tissue is damaged or infected due to decay, trauma, iatrogenic procedures, or deep cavity fillings.[2]

Candida albicans is the most common fungal pathogen in humans.[3] Waltimo et al. found yeast in 7% of culture samples from persistent root canal infections. *Candida albicans* is the most frequently isolated fungus, accounting for 80% of cases.[4]

Over the years, various irrigation materials have been used in endodontic treatment, one of which is sodium hypochlorite (NaOCl), which has consistently proven to be effective. Its effectiveness is determined by the concentration and the method of delivery into the root canal system.[5] NaOCl is used as a root canal irrigant at concentrations ranging from 0.5% to 6%. However, clinical studies show that both low and high concentrations are equally effective in reducing bacteria from the root canal system.[6]

Bajakah tampala (*Spatholobus littoralis Hassk*) has the potential as a traditional medicine due to its antifungal components such as phenols, flavonoids, tannins, and saponins.[7] The flavonoids found in bajakah wood can inhibit biofilm formation, thereby reducing fungal proliferation and decreasing fungal density.[8]

MATERIAL AND METHODS

This research is a laboratory experimental study with a post-test research design. This study was conducted at the BioCORE Laboratory of Trisakti University and the MiCORE Laboratory of Trisakti University. The extraction was carried out in March 2024, and the antifungal testing was conducted in April 2024. The samples used in this study are extracts of bajakah wood (*Spatholobus littoralis Hassk*) from South Kalimantan, and the fungus used is *Candida albicans*

ATCC 10231. The extraction of bajakah wood was performed by mixing powdered bajakah stems with 96% ethanol at a ratio of 1:5. The bajakah extract was soaked for 3 days in a maceration vessel, with stirring every 15 minutes for a duration of 8 hours.[9]

All obtained filtrates were then combined and concentrated using a rotary evaporator at a temperature of 78˚C. Finally, the filtrate was evaporated over a water bath at 78˚C until a thick extract was obtained.[10] The thick bajakah extract obtained was then divided into three concentrations: 50%, 75%, and 100%, and diluted by adding aquades.[11] The preparation of Sabouraud Dextrose Broth (SDB) involves mixing 0.2 grams of peptone, 0.4 grams of glucose, and 20 mL of aquades, then stirring and heating the mixture using a hot plate. The SDB is sterilized in an autoclave at a temperature of 121°C along with the equipment to be used.[12]

The antifungal potency test was conducted using the dilution method with concentrations of 50%, 75%, and 100%. A total of 10 µL of *Candida albicans* suspension was mixed with 1 mL of the extract at various concentrations and then incubated for 24 hours in an incubator at 35°C. After incubation, 10 µL of the *Candida albicans* suspension was inoculated into Sabouraud Dextrose Broth by streaking, and then incubated again for 24 hours. The number of developed *Candida albicans* colonies was determined by counting the CFU/mL.[13,14]

RESULT

The study results were obtained by conducting a comparative analysis of *Candida albicans* colony growth. The antifungal testing was divided into four treatment groups: 2.5% NaOCl as the positive control, and bajakah wood extract at concentrations of 50%, 75%, and 100%. The colony counts of *Candida albicans* were collected and recorded.

All the collected data were then statistically analyzed using IBM SPSS 29. The first statistical analysis performed was the Shapiro-Wilk test for normality, as the sample size was less than 50. The results of the Shapiro-Wilk normality test showed $p > 0.05$ for the four treatment groups, indicating that the data were not normally distributed. Since the data were not normally distributed, a non-parametric test, the Kruskal-Wallis test, was conducted. The average values for antifungal inhibition and the Kruskal-Wallis test results are presented in Table 1.1.

Table 1.1: Average *Candida albicans* Colony Growth

Experimental Group	*Candida albicans* Fungus Colony					Average (CFU/ml) ± SD
	1	2	3	4	5	
NaOCl 2,5%	0	0	0	0	1	0.2 ± 0.447
Concentration 50%	699	402	216	222	396	387 ± 196.29
Concentration 75%	510	225	486	537	516	454 ± 129.74
Concentration 100%	0	0	12	0	0	2.4 ± 5.36

This table shows the average *Candida albicans* colony counts (in CFU/ml) for each treatment group, with NaOCl 2.5% as a positive control and bajakah wood extract at 50%, 75%, and 100% concentrations. The results indicate a significant difference in antifungal activity ($p < 0.001$) in the NaOCl group, while higher bajakah concentrations (especially 100%) also show strong antifungal effects.

DISCUSSION

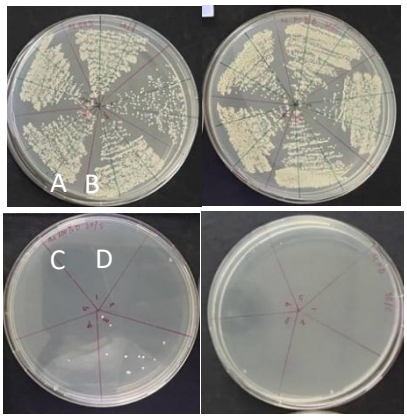

Figure 1.1: Results of Testing Using the Dilution Method. (A) 50% Concentration, (B) 75% Concentration, (C) 100% Concentration, (D) Positive Control NaOCl 2.5%.

Based on the test results shown in Figure 1.1, the antifungal activity of bajakah wood extract against *Candida albicans* demonstrates that bajakah has a reasonably good inhibitory effect at concentrations of 50%, 100%, and in the NaOCl 2.5% positive control. However, at the 75% concentration, no inhibitory effect was observed. According to research conducted by Hasyrul et al. in 2022, ethanol extract of bajakah wood showed antifungal activity against *Candida albicans* at 82.31% with a lower concentration of 1%.[15]

Research conducted by Herdian et al. in 2022 using concentrations of 1.56%, 3.125%, 6.25%, 12.5%, 25%, 50%, and 100% also demonstrated that the lowest concentration of bajakah wood extract was more effective in inhibiting the growth of *Candida albicans* colonies.[16,17] The study by

Herdian et al. also stated that antifungal effectiveness can be influenced by factors such as the concentration of the test substance, the extraction solvent, the extraction method, the tested microorganisms, and the antifungal testing method used.[16,18,19,20]

CONCLUSION

Based on the results of the study on the antifungal effectiveness of South Kalimantan bajakah wood (*Spatholobus littoralis Hassk*) against *Candida albicans*, the following conclusions are bajakah wood extract at a 75% concentration has the weakest antifungal effectiveness against *Candida albicans* compared to the 50% and 100% concentrations and bajakah wood extract at a 100% concentration exhibits antifungal effectiveness nearly equivalent to the positive control NaOCl 2.5% against *Candida albicans.*

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