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# ANTIBACTERIAL EFFECT COMPARISON OF *JATROPHA CURCAS* LINN. LEAVES AND *CINNAMOMI BURMANII CORTEX* EXTRACT TOWARDS STAPHYLOCOCCUS EPIDERMIDIS

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## ABSTRACT

**Objective:** This study was aimed to compare the antibacterial effect of *Jatropha curcas* leaves and *Cinnamomi burmanii* cortex extract against *Staphylococcus epidermidis*. **Methods:** *Jatropha curcas* leaves and *C. burmanii* cortex were macerated in the 70% ethanol as the solvent. Then both extract's secondary metabolites were analyzed using a standard method. The antibacterial activity of both samples extract was evaluated on the growth of *S. epidermidis* in vitro using the agar diffusion method at various extract concentrations of 20, 40, 60, and 80 %w/v. Minimum inhibitory concentration (MIC) values of the extracts were determined using the broth dilution method at a dilution concentration of 0.3125. 0.625; 1.25; 2.5; 5.0 and 10% w/v. **Results:** *C. burmanii* cortex demonstrated stronger antibacterial activity against *S. epidermidis* in the MIC/MBC values of range 0. 3125 to 0.625%w/v than that of *J. curcas* extract with the MIC/MBC ranging from 0.625 to 1.25 %w/v. **Conclusion:** *C. burmanii* cortex can be furthered to be developed as a potential antiinfectious natural drug against *S. epidermidis*.

**KEYWORDS:** *Cinnamomi burmanii*, cortex, *Jatropha curcas*, leaves, *Staphylococcus epidermidis.*

## INTRODUCTION

The use of over-the-counter antibiotics commonly used without rational rules in the treatment of infections and the ability of bacteria to transmit their genetic resistance to bacteria of the same or different species has led to the use of new therapeutic agents.[1] Similar to reported cases of bacterial resistance, this is a resident flora of human skin and a potential human pathogen. However, it has been reported to be resistant to several previously used antibiotics. *Staphylococcus epidermidis* is the most commonly isolated Staphylococcus species from human epithelium and is found mainly in the axillary, head, and nares area.[2] *These* opportunistic bacteria infect individuals when the body's immune system is weak and cause bacteremia.[3,4] Currently, resistant *S. epidermidis* has become a serious problem in hospitals.[5-7] Resistant *S. epidermidis* strains are considered to be one of the major causes of human clinical infections in hospitals. Considering the antibiotic resistance growing of microorganisms pronounce increasing, the research of new antimicrobial agent inventions is being important. For *S. epidermidis* resistance data, it was reported that its resistance to methicillin is at 75–90%, higher than the correlate rate for *S. aureus*.[8] *S. epidermidis* is a common contaminating bacterium associated with infections due to contamination of prostheses and other medical devices.[9-11] *S. epidermidis* contribute to increased antimicrobial resistance, primarily to the antibiotic vancomycin. Infections caused by the bacteria are therefore more difficult to treat.

The medicinal use of plants around the world is gradually increasing due to their pharmacological actions for maintaining human health.[12] With the acceptance of traditional medicine as an alternative form of health care, and the development of microbial resistance to available antibiotics, the authors determined the antibacterial properties of *J. curcas* leaves and *C. burmanii* cortex and supporting the spectrum use of this plant. The main reason for the purpose of this study was based on the existence of supporting empirical data demonstrating the suitability of both plants for the treatment of infectious disease. Currently, it is uneconomical to use Jatropha trees only as planting fences and barrier areas. Jatropha curcas L.[13,14], also known as hazelnut, purplenut, or peanut, is used in folk medicine to treat various ailments such as skin infections, gonorrhea, jaundice, and fever.[15] Meanwhile, *C. burmanii* is a tree native to Indonesia and Southeast Asia.[16] The cortex of this plant has been used empirically in traditional medicine and the seasoning industry. One of the bioactive substances identified in *C. burmannii* is trans-cinnamaldehyde.[17] Another study reported that extracts from the cortex of *C. burmannii* exhibited high levels of phenols and had good

antibacterial activity. In addition, it was reported that *C. burmanii* cortex extract was closely associated with its phenolic compounds.[18,19]

## MATERIALS AND METHODS

### Samples

C. *burmannii* cortexs were collected at the Herbal Center in Bandung, West Java, Indonesia. *J. curcas* leaves were collected from the manoko plantation in Bandung, West Java, Indonesia. The plants were identified at the Laboratory of Plant Taxonomy, Department of Biology, Faculty of Mathematics and Natural Sciences, Padjadjaran University, Km 21, Bandung Sumedang, Jatinangor Sumedang, West Java, Indonesia. *Staphylococcus epidermidis* was obtained from the Microbiology Laboratory, Faculty of Pharmacy, Padjadjaran University.

### Extraction and Phytochemical Screening Analysis

In this study, we used 0.2 g C. *burmannii* cortexs simplicial and I Kg *J. curcas* dried leaves to be each macerated in ethanol 70% as the solvent and the macerates were collected every 24 h for 3 d. The collected maserates were evaporated by a rotary evaporator in 40-50°C untill the thick extract achieved in a constantly weigh. The extracts were screened using Fansworth method to detect the content of secondary metabolites such as alkaloids, polyphenols, flavonoids, tannins, quinone, triterpenoid, monoterpenoid, sesquiterpenoid, steroid, and saponins.[20]

### Antibacterial Activity Test

The antibacterial activity of the extract was tested using the agar diffusion method. 20 µl of staphylococcal suspension was dropped into a sterile Petri dish, suspended in 20 ml of warm MHA medium (40-45 °C), then homogenized and allowed to solidify. The solid medium was then pierced to form extract storage holes in the medium. Different concentrations of extract were pipetted to 50 µL and poured into wells. Positive and negative controls were run to confirm the results. Negative controls consisted of sterile agar media and were used to check the sterility of the environment, materials, and analyst handling. Positive controls consisted of agar plates inoculated with bacteria. Test media and control plates were incubated at 37°C for 18-24 hours. The inhibition zone diameter was measured with a vernier caliper.

### MIC Determination

A minimum inhibitory concentration test of the extract was performed using the microdilution method. 1 ml of Mueller Hinton Broth was added to each sterile tube. Extracts were solubilized in dimethyl sulfoxide (DMSO) and serially diluted 2-fold in MHB medium to obtain the following concentrations: 0.3125; 0.625; 1.25; 2.5; 5.0 and 10% w/v. Then 10 µl of bacterial suspension was added to each tube. The media tested were then incubated at a temperature of 370° C. for 24 h. The MIC value was determined from the lowest concentration at which no turbidity was observed.

## RESULTS AND DISCUSSION

### Phytochemical Analysis Result

Ethanol extracts of Jatropha leaves and *C. burmannii* cortex had shown the presence of tannins, flavonoids, steroids, and saponins**.** The result of phytochemical screening can be seen in Table 1.

**Table 1: Phytochemical screening.**

| Compounds | Results | |
|---|---|---|
| | ***J. curcas*** | ***C. burmannii*** |
| Alkaloids | - | - |
| Quinones | - | - |
| Tannins | + | + |
| Flavonoids | + | + |
| Saponins | + | + |
| Steroids/Triterpenoids | + | + |

Notes: (+) = present; (-) = absent

In another study, from the same phytochemical screening results of Jamblang leaves ethanol extract [*Syzygium cumini* (L.) Skeels] containing flavonoids, tannins, saponins and steroids, demonstrated anti-acne activity against *S. epidermidis*.[21] It is therefore hypothesized that the presence of these secondary metabolites may contribute to the antibacterial activity of both ethanol extracts against *S. epidermidis*.

### Antibacterial Activity Test Results

Data on the antibacterial potency of *J. curcas* leaves and *C. burmannii* cortex extracts are presented in Table 2. The susceptibility of staphylococcal strains increased gradually as the concentration of the extract increased. There was a significant correlation between extract concentration and inhibition diameter.

**Table 2: Diameter Inhibition of Antibacterial Activity Test.**

| Concentration (%w/v) | Diameter of Zones Inhibition (mm) | |
|---|---|---|
| | ***J. curcas*** | ***C. burmannii*** |
| 20 | 13.80 ± 0.00 | 21.45±0.0025 |
| 40 | 14.20 ± 0.01 | 22.00±0.0025 |
| 60 | 15.10 ± 0.00 | 22.65±0.0020 |
| 80 | 15.97 ± 0.00 | 23.05±0.0001 |

A cortex extract of *C. burmannii* showed potent antibacterial properties against *S. epidermidis* than *J. curcas*. This extract can inhibit the growth of staphylococci at low concentrations, it produced large inhibition diameters and thus had great potential as a medicinal plant for the treatment of *S. epidermidis* infections. The antibacterial activity of *C. burmannii* cortex extract was confirmed to be due to the potential of bioactive substances contained in the extract. However, based on the diameter of zones inhibition, *J. curcas* can be categorized as a strong or active antibacterial agent. The three categories of inhibition are assessed as follows: very active (>11 mm), moderately active (6-11 mm), inactive (6 mm).[22]

**MIC and MBC Determination Result**

The Minimum Inhibitory Concentration (MIC) is the lowest concentration of an antimicrobial agent that inhibits the apparent growth of microorganisms. After that, MIC was subcultured on the surface of an agar medium, and the MBC values shown in Table 3 were obtained.

**Table 3: Diameter Inhibition of Antibacterial Activity.**

| Concentration (%w/v) | Bacterial growth | |
|---|---|---|
| | ***J. curcas*** | ***C. burmannii*** |
| 20 | - | - |
| 10 | - | - |
| 5 | - | - |
| 2.5 | - | - |
| 1.25 | - | - |
| 0.625 | + | - |
| 0.3125 | + | + |
| 0.15 | + | + |
| 0.075 | + | + |

**Test**

*C. burmanii* cortex demonstrated stronger antibacterial activity against *S. epidermidis* in the MIC/MBC values of range 0. 3125 to 0.625%w/v than that of *J. curcas* extract with the MIC/MBC ranging from 0.625 to 1.25 %w/v.

## CONCLUSION

This invention study confirmed that *C. burmannii* cortex extract has a potential antibacterial activity and promising to be furthered developed as tha anti-infectious agent for *S. epidermidis* infection.

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