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JATROPHA CURCAS L. LEAF EXTRACT: VALUABLE NATURAL ANTIBACTERIAL FOR STAPHYLOCOCCUS EPIDERMIDIS

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ABSTRACT

Objective: This study was purposed to determine the potential of *Jatropha curcas* L. leaf ethanolic extract as natural antibacterial substance to overcome skin infection caused by *Staphylococcus epidermidis*. **Methods:** The antibacterial activity of *J. curcas* extract was evaluated on the growth of *S. epidermidis* bacteria in vitro by agar diffusion method in various extract concentration of 20, 40, 60 and 80 % w/v. The minimum inhibitory concentration (MIC) value was determined with the broth dilution method with diluted concentration of 0.3125; 0.625; 1.25; 2.5; 5.0 and 10 % w/v. **Results:** The increased concentration of the extract displayed the bigger formation of the inhibition zones. This strongly indicated the potential of the extract as antibacterial candidate for *S. epidermidis*. The Jatropha leaf extract could inhibit *S. epidermidis* growth with a minimum inhibitory response in the concentration range of 0.625 % and 1.25 % w/v. **Conclusion:** These results highlight the potential of *J. curcas* leaf extracts as a naturally antibacterial substance suitable for skin infection treatment, mainly caused by S. *epidermidis.*

KEYWORDS: *Jatropha curcas* L., leaf, extract, antibacterial, *Staphylococcus epidermidis.*

INTRODUCTION

Staphylococcus epidermidis is the most commonly isolated Staphylococcus species from human epithelium and is found mainly in the axillary, head, and nares area.[1] These

opportunistic bacteria infect individuals when the body's immune system is weak and cause bacteremia.[2,3] Currently, resistant *S. epidermidis* has become a serious problem in hospitals.[4-6] 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*.[7]

Natural antimicrobial agents from medicinal plant have been trusted due to their valuable phytochemical compounds, safe and documented as effective herbal in the disease treatment empirically. Medicinal products of higher plants may provide an evidently new candidate of antimicrobial agents with new mechanism of action.[8,9] Nowadays, utilization of Jatropha trees (*Jatropha curcas* L.) just as a plant fence or barrier fields because uneconomical. *Jatropha curcas* variously known as physic nut, purging nut or pignut[10,11] is used in folklore remedies for treatment of various ailments such as skin infections, gonorrhea, jaundice and fever.[12]

MATERIALS AND METHODS

Materials

The growth media used in this study were Mueller-Hinton Agar (MHA-Oxoid) and Mueller-Hinton Broth (MHB-Oxoid). The chemicals used are normal saline solution, barium chloride solution (Merck), sulfuric acid solution (Merck), and distilled water. *S. epidermidis* was obtained from Laboratory of Microbiology, Faculty of Pharmacy, Padjadjaran University. *J. curcas* leaves were collected from Manoko Plantation, Bandung, West Java, Indonesia.

Extraction and Phytochemical screening analysis

A weight of I Kg *J. curcas* dried leaves were macerated with ethanol 70% as the solvent and the macerates were collected every 24 h for 3 d. The extracts were evaporated using a rotary evaporator at 40-50 ^{O}C, then continued to evaporate on a water bath until dried extract with a constant weight was obtained. 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.[13]

Preparation of bacterial suspension

Preparation of *S. epidermidis* was conducted by taking one Ose of *S. epidermidis* colony from slant agar, then suspended into sterile physiological saline. Bacterial turbidity was measured using a spectrophotometer and compared with a standard 0.5 Mc Farland.

Antibacterial Activity

The antibacterial activity of *J. curcas* extract was examined using the agar diffusion method using a perforation technique. The ethanolic extract was diluted to achieve graded test concentration as follows: 20, 40, 60 and 80% w/v. A total of 20µL bacterial suspension was poured into a sterile petri dish, then a volume of 20 mL MHA was poured into the petri dish. The medium was homogenized, allowed to solidify and drilled using perforator aseptically. Each hole is then filled with the extract and tetracycline in accordance with the variations of concentration in 50 uL. All the medium test was incubated at 37 ° C for 18-24 h. The diameter of inhibition value was measured by a caliper.

MIC Determination

The minimum inhibitory concentration test of *J. curcas* leaf ethanolic extract was done using microdilution method. The volume of 1 ml *Mueller-Hinton Broth* was added to every sterilized tube. The extract was solubilized in dimethyl sulfoxide (DMSO) and then serially two-fold diluted MHB medium to obtain a concentration as follows: 0.3125; 0.625; 1.25; 2.5; 5.0 and 10 %w/v. Then 10 µL of bacterial suspension was added to every tube. The tested media, then were incubated for 24 h with temperature at 37^0C. The MIC value was determined from the smallest concentration which did not show any turbidity.

RESULTS AND DISCUSSION

Phytochemical analysis result

Ethanol extracts of Jatropha leaves 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	
	Simplisia	Extract
Alkaloids	-	-
Quinones	-	-
Tannins	+	+
Flavonoids	+	+
Saponins	+	+

Steroids/Triterpenoids	+	+

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

In another study stated that the same phytochemical screening result of Jamblang leaves [*Syzygium cumini* (L.) Skeels], that contained flavonoids, tannins, saponins, and steroids, revealed that the ethanol extract of Jamblang leaves possesses antibacterial activity against *S. epidermidis*.[14] So, it can be hypothesized that the presence of these secondary metabolites may contribute for antibacterial activity of Jatropha leaves ethanol extracts against *S. epidermidis*.

Antibacterial activity result

The antibacterial activity test was done using the agar diffusion method with perforation technique. Ethanol extract of Jatropha leaves had showed antibacterial activity against *S. epidermidis.* The result of the antibacterial activity test can be seen in Table 2.

Table 2: Diameter of zone inhibition.

Concentration (%$^{w}/_{v}$)	Inhibitory zone diameter (mm)
20	13.80 ± 0.00
40	14.20 ± 0.01
60	15.10 ± 0.00
80	15.97 ± 0.00

Note: Perforator diameter = 6 mm

The evaluation of inhibition can be classified into three categories based on the diameter of zones of inhibition; very active (above 11 mm), medium activity (active) (between 6-11 mm), while non-active (6 mm). According to this criterion, the ethanol extract of Jatropha leaves was active since the diameter of zones of inhibition was between 6-11 mm.[15] Based on those criteria, the inhibitory potency of the *J. curcas* leaf extract can be classified as very active antibacterial candidate against *S. epidermidis.*

MIC Result

Minimum inhibitory concentrations (MIC) refer to the lowest concentration of an antimicrobial that will inhibit the visible growth of a microorganism. The result of MIC determination can be seen in Table 3.

Table 3: MIC Result.

Extract Concentration (%w/v)	Turbidity
0.3125	(+)
0.625	(+)
1.25	(-)
2.5	(-)
5.0	(-)
10.0	(-)

Notes: (+) = Turbid; (–) = Clear

The extracts showed the value of MIC ranged between 0.625 and 1.25 $\%^{w}/_{v}$. The lower concentration of MIC of the extract has been proving its antibacterial capabilities.

CONCLUSION

The antibacterial activity of *J. curcas* leaf ethanolic extract was confirmed and contributed to the ability of contained phytochemical substances to disturb *S. epidermidis* cell.

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