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Effectiveness of Inhibition of Jatropha (*Jatropha curcas L.*) Leaf Extract Against *Porphyromonas gingivalis* Bacteria

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Abstract: ***Introduction: Jatropha curcas L. leaf extract can overcome periodontal disease because it contains compounds such as flavonoids, saponins, and tannins that are antibacterial. Objective: To determine the effectiveness and inhibition of Jatropha (Jatropha curcas L.) leaf extract against Porphyromonas gingivalis bacteria. Materials and Methods: Paper discs placed on MHA media containing test bacteria, then ethanol extracts of jatropha leaves with concentrations of 20%, 40%, 60%, and 80%. Results: At a concentration of 20% Jatropha curcas L leaf extract compared with a concentration of 40%, 60%, 80% Jatropha curcas L leaf extract and negative control using distilled water had a p-value <0.05. At a concentration of 80% Jatropha curcas L leaf extract compared with negative control using distilled water and positive control using Metronidazole had a p-value <0.05. Conclusion: At a concentration of 40% Jatropha curcas L leaf extract was sufficient to have an antibacterial effect with an average of inhibition zones formed was 7.96 mm while 80% concentration was the most optimal condition in inhibiting bacteria.***

Keywords: Periodontitis, Porphyromonas gingivalis, Jatropha curcas L, Tannin

1. Introduction

In Indonesia, periodontal disease ranks second at 96.58%. Periodontal disease is a disease that loses its collagen structure in the area that supports the teeth, in response to the accumulation of bacteria in periodontal tissue. The accumulation of plaque bacteria on the surface of the teeth is a major cause of periodontal disease. [1]Porphyromonas gingivalis, Actinobacillus actinomycetemcomitans, and Bacteroides forsythias are the most common types of bacteria found in periodontitis. [2]Periodontal infections often cause no complaints so they are not diagnosed and ignored by sufferers. But research evidence clearly shows the role of periodontal infection in potentially systemic diseases can be life-threatening, such as cardiovascular disease, diabetes mellitus and the birth of premature low birth weight babies. This has led to the concept of "Periodontal infection is a silent killer" among researchers. Health practitioners are important to understand this so that they can take appropriate action for their patients Effectiveness of inhibition of Jatropha (Jatropha curcas L.) leaf extract against Porphyromonas gingivalis bacteria.[2]

Since more than twenty years ago, the world community not only in Eastern countries but also in Western countries began to look back and are interested in using natural medicines which we know as the "back to nature." The tendency of this "back to nature" lifestyle is triggered by the belief that taking natural medicines is relatively safer compared with synthetic drugs that have many negative side effects. [3]

To overcome the problem of periodontal disease, there are plants as traditional medicine, namely jatropha. Jatropha is a plant that is found in almost all regions in Indonesia. [4]This is very beneficial for the people of Indonesia because the raw materials are easily available, relatively inexpensive and can be mixed at home. [5, 6]The results of research using thin-layer chromatography (TLC) method obtained positive jatropha leaves containing active compounds such as flavonoids, saponins, and tannins which are active compounds that are antibacterial[7, 8]. The research conducted by Nwokocha et al (2011) shows that among the four species of Jatropha, Jatropha curcas which has the highest tannin and saponin content. The tannin concentration in the leaves observed was 7.43% for Jatropha curcas [7, 9].

2. Material and Methods

This type of research is a laboratory experiment. The research was carried out in the organic chemistry laboratory of the Faculty of Mathematics and Natural Sciences, Hasanuddin University, to produce jatropha leaf extract and continued in the microbiology laboratory of the Faculty of Medicine, Hasanuddin University, to test antibacterial activity from May 2019 to completion. The principle of this study is that the administration of Porphyromonas gingivalis bacteria to Jatropha leaf extract (Jatropha curcas L.) on MHA media is expected to be seen how much the inhibition zone that will be produced by each extract concentration on bacterial growth than compared with positive control of metronidazole and control negative distilled water.

The stage of this study was a pure strain of the bacteria Porphyromonas gingivalis suspended on Mueller Hinton Agar (MHA), then the media was incubated at 37^{o}C for 24 hours. The bacterial suspension was diluted using sterile 0.9% NaCl (Sodium Chloride). Sterile stick cotton is inserted into a tube containing a bacterial suspension, then etched evenly on the MHA media. Paper disc (disk) is

placed on top of the MHA media that has contained test bacteria, then drops of jatropha leave ethanol extract with a concentration of 20%, 40%, 60%, and 80%. Inhibitory Diameter (DDH) observed using a ruler or calipers.

3. Result

The results of inhibition testing of Jatropha curcas L. extract against Porphyromonas gingivalis bacteria had a positive value. The average diameter of inhibition zones in extracts of 20%, 40%, 60%, and 80% respectively was 7 mm, 7.96 mm, 8.23 mm and 8.95 mm (Table 1).

Table 1: Measured diameter in inhibitory zones

Type	Concentration	Intervention of Power of Inhibitory (mm)				
		I	II	III	IV	Averaged
Jatropa Leaf Extract	20%	6.5	6.2	7.6	7.7	7
	40%	8.0	7.15	8.1	8.6	7.96
	60%	8.3	7.4	8.2	9.0	8.23
	80%	9.0	8.0	9.0	9.8	8.95
Control (+) Metronidazole		7.1	7.15	7.6	8.4	7.56
Control (-) Distilled water		5.6	5.6	5.6	5.6	5.6

Source: (Primary Data)

At a concentration of 20% Jatropha curcas L. leaf extract compared with a concentration of 40%, 60%, 80% Jatropha curcas L. leaf extract and negative control using distilled water had a p-value <0.05. At a concentration of 80% Jatropha curcas L. leaf extract compared with negative control using distilled water and positive control using Metronidazole had a p-value <0.05.

4. Discussion

Jatropha leaf extract is more effective than other parts of Jatropha plant extracts (such as seeds) in inhibiting bacterial growth, this is because the levels of active compounds namely secondary metabolites in jatropha seed extract are lower than jatropha leaf extract. The water content in seeds is 6.73% while that in leaves is 9.31%.[10, 11] The ash content of the seeds is 4.75% while that of the leaves is 10.58%. The carbohydrate content of the seeds is 9.88% while that of the leaves is 20.04%. The process of forming secondary metabolites is sourced from water, ash, carbohydrates, and fats. So the higher the water content, ash, carbohydrates, and fat, the higher the content of secondary metabolite compounds, and vice versa. [12, 13, 14]

Leaf extracts have higher levels of secondary metabolite compounds than seed extracts because leaves are the organ where photosynthesis occurs, where photosynthesis produces the most carbohydrates, fats and amino acids compared to other organs. Secondary metabolites are formed from primary metabolites that result from photosynthesis. [15, 16, 17]

Negative control uses distilled water (distilled water) solvent because it is a neutral compound, does not contain toxins or substances that can inhibit and kill the growth of Porphyromonas gingivalis bacteria. Water serves to help the ongoing metabolic reaction. Antimicrobial test using distilled water did not show any inhibition zone. Distilled water (distilled water) is a neutral compound, does not contain toxins or substances that can inhibit and kill the growth of Porphyromonas gingivalis bacteria. This is because water has no antimicrobial power but is an essential requirement of every living thing. [18, 19, 20]

The results obtained can be interpreted that the higher the concentration of the extract, the wider the inhibitory zone formed. This is consistent with the opinion of Lestari (2013) that the diameter of inhibitory zones that are formed varies due to different concentrations of Jatropha leaf extract given. The higher the concentration given, the wider the inhibitory zone formed due to the higher content of the active substance in the extract and its effectiveness in inhibiting bacterial growth will also be better. This happens because of the greater content of phyticomia which is antimicrobial at the highest concentration. The results of this study are in line with the results of Indriani's (2005) study which states that increasing concentrations can have a wider toxic effect marked by increasing zones of inhibition. [21, 22]

5. Conclusion

Based on the results of the study, it can be concluded that at a concentration of 40% it is quite clear in Porphyromonas gingivalis bacteria with an average of inhibition zone formed is 7.96 mm while at 80% concentration is the most optimal condition in inhibiting the Porphyromonas gingivalis bacteria with an average inhibition zone formed is 8.95 mm.

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