

The Effectiveness of *Peperomia Pellucida* Extract Against Acne Bacteria

Susan Kosasih^{a*}, Chrismis Novalinda Ginting^b, Linda Chiuman^c, I Nyoman Ehrich Lister^d

^aMaster Program of Biomedical Science, Faculty of Medicine, University of Prima Indonesia, Medan, Indonesia

^{b,c,d}Faculty of Medicine, University of Prima Indonesia, Medan, South Sumatra Indonesia

^aEmail: susan.yes88@gmail.com

Abstract

Background: Acne vulgaris is a common inflammatory condition in the pilosebaceous unit that occurs in adolescents and young adults characterized by blackheads, papules, pustules, nodules. Among all of these bacteria, *Propionibacterium acnes* have the most important role in the pathogenesis of acne. Some leaves called tumpang air (*Peperomia pellucida*) are one type of plant that is widely used for treatment. This leaf has various pharmaceutical effects includes antimicrobial, anticancer, antipyretic, anti-inflammatory, antioxidant, analgesic, and anti-oedematogenic activities. Objective: This study was aimed to examine the effectiveness of *Peperomia pellucida* in inhibiting the growth of *Propionibacterium acnes* bacteria. Methods: Evaluation of antibacterial used agar diffusion method Which used ethanol extract of *Peperomia pellucida* (0.3 gr/ml, 0.5 gr/ml, 0.7 gr/ml and 1 gr/ml) as samples, gentamycin as positive, and DMSO as the negative control. Results: The higher concentration show higher antibacterial activity against *Propionibacterium acnes* while the average of inhibition zone for 0.3 gr/ml, 0.5 gr/ml, 0.7 gr/ml and 1 gr/ml of ethanol extract from *Peperomia pellucida* were 9.53mm, 10.53mm, 0.7mm, 13.36 mm, and 15.70 mm, respectively. Conclusion: With the results, can be concluded that *Peperomia pellucida* extracts are anti-bacterial to inhibit the growth of *Propionibacterium acnes* bacteria.

Keywords: *Peperomia pellucida*; *Propionibacterium acnes*; Anti-Bacterial; Agar Diffusion.

* Corresponding author.

1. Introduction

Some modalities were used to treat acne vulgaris include benzoyl peroxide, retinoids, isotretinoin, keratolytic soaps, alpha hydroxyl acids, azelaic acid, salicylic acid, and hormonal treatments. However, recently herbal medicine becomes more popular due to its advantages, such as better patient tolerance, long history of use, fewer side-effects and relatively less expensive. Herbal medicine was used alone or in combination with synthetic drugs to treat diseases [1]. *Peperomia pellucida* has various regional names, among others are suruhan (Java), saladaan (Sunda), tumpangan air (Sumatra, Jakarta), gofu goroho (Ternate), ulasiman bato (Philippines), cao hu jiao (China) [2]. *Peperomia pellucida* has been studied that aimed to look for various pharmacological activities including antimicrobial, anticancer, antipyretic, anti-inflammatory, antioxidant, analgesic, and anti-oedematogenic activities. This Antimicrobial activity was shown against gram-positive (*Staphylococcus aureus* and *Bacillus subtilis*) and gram-negative bacteria (*Escherichia coli*, *Pseudomonas aureginosa*, *Klebsiella pneumonia*, *Salmonella thypii*, *Enterobacter aerogenes*, *Edwardsiella tarda*, *Flavobacterium sp.*, *Aeromonas hydrophila*, *Virbrio cholera*, and *Vibrio alginplyticus*, and *Vibrio parahaemolyticus*) [3]. Chemical compounds contained in *Peperomia pellucida* include alkaloids, kardenolid, tannins, saponins [4], flavonoids [5]. Various studies have been conducted and show that this plant has analgesic, antipyretic, anti-inflammatory, hypoglycemic [6] anti-bacterial [7], antifungal [8], anti-microbial and anti-cancer activities [9]. *Propionibacterium acnes* is a gram-positive that doesn't form spore (Non-spore-forming) for human skin commensal that prefers anaerobic growth condition. This bacteria has some gene that encodes some metabolic enzymes, enabling it to survive and lipase for degradation of lipids in the pilosebaceous follicle, providing energy that was needed. This bacteria has been implicated in the pathophysiology of some disease especially Acne vulgaris [10]. The mechanism of the occurrence of acne is the bacterium *Propionibacterium acnes* which modulates the differentiation of keratocytes and increases local inflammation. Furthermore, this bacteria has been implicated in lipogenesis and sebum production, as it stimulates the sebaceous glands and sebum synthesis via corticotropin-releasing hormone pathways [10]. Based on the description above and the lack of knowledge from the public about the benefits and efficacy of *Peperomia pellucida*, the author was interested in conducting this research.

2. Methods

The materials used in this study were Tumpangan air leaves (*Peperomia pellucida*), isolates of *Propionibacterium acnes* bacterial, MHA media, disc antibiotics, blank paper disc, *Dimethyl Sulfoxide* (DMSO), aquadest, ethanol 96%. This study uses a Disc Diffusion method to see the effects of *Peperomia pellucida* extract on the growth of *Propionibacterium acnes* bacteria. This study was performed in pharmaceutical research laboratories, University of North Sumatra, Medan, North Sumatra.

Formulation of Extract: *Peperomia pellucida* was washed and then aerated, then dried in an oven at a temperature of 40°C to dry, then kneaded and mashed until it becomes a powder using a blender. Then, The powder was macerated by ethanol 96%, after that, it was filtrated and the filtrate was evaporated in the rotary vacuum evaporator at 40°C. The extract that was obtained before was diluted with 10% DMSO into various concentrations.

Dilution of *Peperomia pellucida* extract and filling of paper disks: The concentrations of *Peperomia pellucida* extract were 0.3 g/ml, 0.5 g/ml, 0.7 g/ml and 1 g/ml. After that, the blank disc paper was diffused into the various concentration of extract until it became saturated.

Preparation of Bacteria: The amount of *Propionibacterium acnes* was inoculated by the inoculum loop into Sterile NaCl. The liquid media for bacteria was equalized with 0.5 McFarland agar (10^5 - 10^8 /ml).

Antibacterial Assay: *Propionibacterium acnes* in sterile NaCl was cultured into MHA. MHA was made by mixing 19 gram MHA powder into 500 ml aquadest and it was heated and sterilized using an autoclave for 120 minutes. After that, the disc paper that had been diffused by various *Peperomia pellucida* extract and the antibiotic disc was placed in the MHA and they were incubated for 24 hours in 37°C.

Observes Changes: The changes were observed by the formation of a clear zone around the disc paper. The clear zones were measured by a plastic ruler.

Data Analysis: The clear zone was expressed as Mean \pm SD. The comparison of the clear zone for each concentration were analyzed by Tukey HSD as the post hoc test. The confidence level of these analyses was 95% ($\alpha = 0.05$).

3. Result

The antibacterial effect of *Peperomia pellucida* extract against *Propionibacterium acnes* was showed by following figure 1 below and the comparison of the antibacterial effect was shown by following table 1 below.

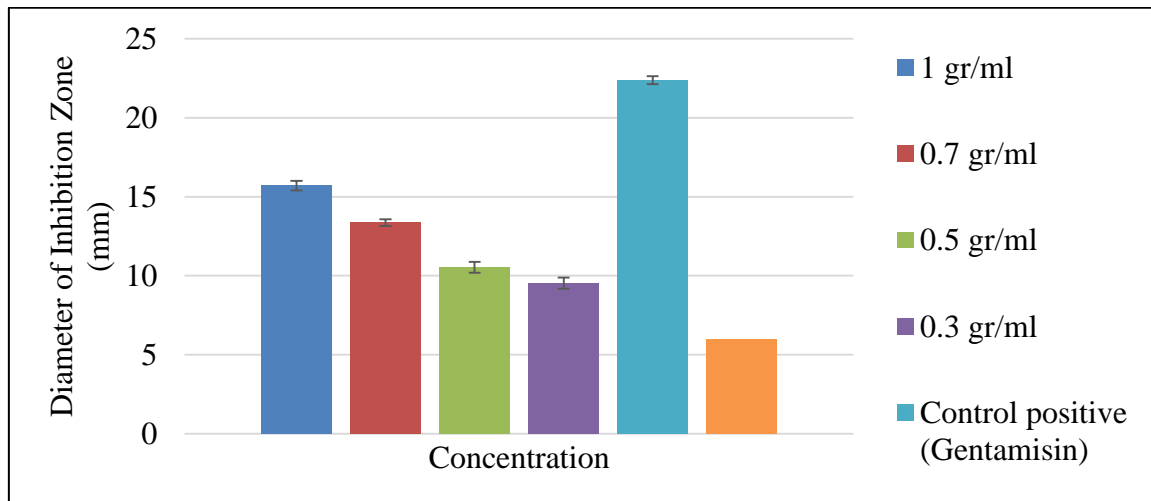


Figure 1: Effect Various Concentration of *Peperomia pellucida* Extract against *Propionibacterium acnes*

Based on figure 1 above, the widest clear zone was formed by the highest concentration (1 gr/ml), while the most narrow clear zone was formed by the lowest concentration (0.3 gr/ml). However, the widest clear zone in the highest concentration was not wider than control positive (gentamicin).

Table 1: Comparison *Peperomia pellucida* extract effect against *Propionibacterium acne* (Tukey HSD test)

Group of Samples	Diameter of Inhibition Zone (mm) [Mean ± SD]
1 gr/ml	15.70 ± 0.30 ^a
0.7 gr/ml	13.36 ± 0.21 ^b
0.5 gr/ml	10.53 ± 0.35 ^c
0.3 gr/ml	9.53 ± 0.35 ^d
Control positive (Gentamicin)	22.37 ± 0.25 ^e
Control negative	6.00 ± 0.00 ^f

Data were presented as mean ± standard deviation. Different small letters in the same column are significant at $P < 0.05$

Based on table 1 above, there were significant differences that were observed in all groups of samples. It means that the highest concentration (1 gr/ml) had the most effective antibacterial effect than lower concentration. However, it was not as effective as control positive group which were gentamicin.

4. Discussion

Based on the result that *Peperomia pellucida* extract was able to inhibit the growth of *Propionibacterium acnes*, which had higher antimicrobial effect at the highest concentration in 3 repetitions. While the use of gentamicin antibiotics used as control positive showed a strong resistance response. The antimicrobial effect of the extract was classified according to the table below [11].

Table 2: Classification of Inhibition Effect

Inhibition Zone (mm)	Inhibition effect
> 20	Potent
16-20	Moderate
10-15	Weak
< 10	None

According to table 2 above. There was no inhibition effect at the lowest concentration (0.3 gr/ml). While the higher concentration (0.5 gr/ml) of extract had weak inhibition effect and the two highest concentrations (0.7 gr/ml and 1 gr/ml) had a moderate inhibition effect. However, the inhibition effect of the highest concentration from the extract was not as well as gentamicin as a positive control.

The antimicrobial effects were supported by a phytochemical compound that includes tannin, flavonoid, cardiac, xanthone and other glycosides, alkaloids, saponin, inulins, terpenes, phenolic compounds, phytosterols, and other steroids, resin, and carbohydrate [3]. So *Peperomia pellucida* can be used in skin health products to prevent acne. This plant *Peperomia pellucida* is also widespread in Indonesia, making it easier for people from all groups to be able to use this plant as an ingredient to treat acne.

5. Conclusion

Peperomia pellucida extract had a potential antibacterial effect against *Propionibacterium acnes* at the highest concentration, However, It was not as potent as gentamicin as the positive control.

References

- [1] H. Nasri, M. Bahmani, N. Shahinfard, A. M. Nafchi, S. Saberianpour, and M. R. Kopaei, 'Medicinal plants for the treatment of acne vulgaris: A review of recent evidences', *Jundishapur J. Microbiol.*, vol. 8, no. 11, pp. 1–9, 2015.
- [2] A. Hariana, *Tumbuhan Obat dan Khasiatnya Seri 3*. Jakarta: Penembar Swadaya, 2011.
- [3] A. A. M. D. D. N. Amarathunga and S. U. Kankanamge, 'a Review on Pharmacognostic, Phytochemical and Ethnopharmacological Findings of *Peperomia Pellucida* (L.) Kunth: Pepper Elder', *Int. Res. J. Pharm.*, vol. 8, no. 11, pp. 16–23, 2017.
- [4] R. U. Egwuche, A. A. Odetola, and O. Erukainure, 'Preliminary Investigation into the Chemical Properties of *Peperomia pellucida* L.', *Res. J. Phytochem.*, vol. 5, pp. 48–53, 2011.
- [5] P. Majumder, 'Phytochemical, Pharmacognostical, and Physicochemical Standardization of *Peperomia pellucida* (L.) HBK.', *Int. J. Compr. Pharm.*, vol. 8, no. 6, pp. 1–4, 2011.
- [6] H. Sheikh, S. Sikder, S. K. Paul, A. M. R. Hasan, M. Rahaman, and S. P. Kundu, 'Hypoglycemic, Anti-Inflammatory and Analgesic Activity of *Peperomea Pellucida* (L.) HBK (Piperaceae)', *IJPSR*, vol. 4, no. 1, pp. 458–463, 2013.
- [7] S. Xu, N. Li, M.-M. Ning, C.-H. Zhou, Q.-R. Yang, and M.-W. Wang, 'Bioactive Compounds from *Peperomia pellucida*', *J. Nat. Prod.*, vol. 69, no. 2, pp. 247–250, Feb. 2006.
- [8] P. Majumder, P. Abraham, and S. V, 'Ethno-medicinal, Phytochemical and Pharmacological review of an amazing medicinal herb *Peperomia pellucida* (L.) HBK.', *Res. J. Pharm. Biol. Chem. Sci.*, vol. 2, no. 4, pp. 358–364, 2011.
- [9] L. S. Wei, W. Wee, J. Yong, F. Siong, and D. F. Syamsumir, 'Characterization of Anticancer , Antimicrobial , Antioxidant Properties and Chemical Compositions of *Peperomia pellucida* Leaf Extract', *Acta Med. Iran.*, vol. 49, no. 10, pp. 3–7, 2011.
- [10] E. Platsidaki and C. Dessinioti, 'Recent advances in understanding *Propionibacterium acnes* (*Cutibacterium acnes*) in acne [version 1; referees: 2 approved]', *FI000Research*, vol. 7, no. 0, 2018.
- [11] N. Milah, S. H. Bintari, and D. Mustikaningtyas, 'Pengaruh Konsentrasi Antibakteri Propolis terhadap Pertumbuhan Bakteri *Streptococcus pyogenes* secara In Vitro', *Life Sci.*, vol. 5, no. 2, pp. 95–99, 2016.