J Prima Med Sains (2024) 6(2):155-159
doi.org/10.34012/jpms.v6i2.5552

ORIGINAL ARTICLE

Analysis of the potential of memelong leaves (*Philodendron giganteum*) as an antioxidant and antimicrobial

Martha Silitonga[1], Mutiara Rolika Putri Sitompul[2], Agnes Gulo[2], Elis Anggeria[3]*

Abstract

Ornamental plants are plants whose main function is to decorate. Many ornamental plants have benefits, one of which is the Philodendron plant. It is important to know the benefits of antioxidants and antimicrobials that ornamental plants have and can be used to improve health. The research aimed to determine the potential of Memelong (*Philodendron giganteum*) as an antioxidant and antimicrobial. The research carried out was empirical research at the FKKGIK UNPRI Laboratory for 1 month. The samples used were all Memelong leaves. Memelong leaf extract is made by maceration. Next, carry out phytochemical tests including alkaloid testing, flavonoid content testing, saponin testing, testing for the presence of tannins, and testing for triterpenoids and steroids. The antioxidant activity test was carried out using the DPPH (2,2-diphenyl-1-picrylhydrazyl) method. The antimicrobial activity test was carried out using the paper disc diffusion method. Data analysis using univariate presented in the form of tables and graphs descriptively. The results of this study have potential as antioxidants based on antioxidant tests using the DPPH method with sample concentrations of 400 ppm 14%, 600 ppm 16%, 800 ppm 19%, and 1000 ppm 27%, but the results are still smaller when compared to the vitamin C test results. However, in the antibacterial activity test on Memelong leaf extract, there was no inhibition zone in the 25% formulation, an average of 0.50%, an average of 0.75%, an average of 0, the K(+) was found to be an average of 18,85 diameter of inhibition zone. The research conclusion is that the leaves of Memelong are proven to contain antioxidants.

Keywords: potential, memelong, *Philodendron giganteum*, antioxidant, antibacterial

Introduction

Ornamental plants are cultivated primarily for their aesthetic value. This decorative function serves to enhance visual appeal, whether they are situated in outdoor or indoor environments. Thus, ornamental plants contribute to the aesthetic enhancement of a space or object through their attractive forms and coloration.[1] Various ornamental plants offer a range of benefits, one example being the *Philodendron* genus.[2] This genus underwent rapid diversification, resulting in its current distribution throughout the Neotropics.[3,4] Research by Fauzia et al.[5] indicated consistent weekly growth in *Philodendron* leaves, with harvest age estimations based on quantitative criteria. Specifically, their study found that *Philodendron giganteum* (Memelong) exhibited an average weekly increase in height of 1.8 cm.

Several previous studies, such as Kurniawan & Ropiqa[6], have conducted toxicity tests on the ethanol extract of cat's tail (*Acalypha hispida* Burm. f.) leaves. These ornamental plants contain triterpenoids and flavonoids, which, in some species, have demonstrated effective benefits and potential therapeutic effects.[2] Poljsak et al.[7], emphasize the importance of functionally determining the effects of antioxidants on organisms, particularly given that reduced or oxidized antioxidants and their metabolites may exhibit additive effects. Research by Hwang & Lee[8] demonstrates that antioxidant activity, expressed relative to a

Affiliation
[1]Undergraduate Programme in Nursing, Universitas Prima Indonesia, Medan, Indonesia
[2]Associate Degree in Nursing, Universitas Prima Indonesia, Medan, Indonesia
[3]Department of Nursing, Universitas Prima Indonesia, Medan, Indonesia

Correspondence
elisanggeria@unprimdn.ac.id

specific antioxidant standard, can be converted to an equivalent value relative to another standard. González-Henríquez et al.[9] identify microbial infections as a significant threat to human health. Antimicrobial resistance poses a serious challenge to modern medicine, which relies heavily on the effective prevention and treatment of bacterial infections[10], this underscores the importance of antimicrobial drugs, agents, and materials.

The aforementioned data highlight the potential health benefits of antioxidants and antimicrobials. While previous research has investigated the antioxidant and antibacterial properties of plants such as kaffir lime (*Citrus hystrix* DC.) leaf essential oil and red betel (*Piper crocatum* ruiz and pav.), no studies have examined the ornamental plant *Philodendron giganteum* (commonly known as Memelong). Therefore, this study investigates the antioxidant and antimicrobial potential of memelong.

Method

This research employed an empirical laboratory-based approach at the FKKGIK UNPRI Laboratory, conducted over one month under strict adherence to health protocols. The study investigated the properties of *Philodendron giganteum* leaves. The materials used included: *Philodendron giganteum* leaves; *Staphylococcus aureus* (obtained from the Universitas Prima Indonesia Laboratory); sterile distilled water; 96% ethanol; type 2 methanol; amoxicillin; 2,2-diphenyl-1-picrylhydrazyl (DPPH); Nutrient Agar (NA); 0.9% NaCl solution; labeling paper; aluminum foil; cotton; wrapping material; and vitamin C. The equipment utilized comprised: Erlenmeyer flasks; beakers; magnetic stir bars; a hot plate; spoons; an analytical balance; a stirrer; test tubes; a test tube rack; dropper pipettes; a blender; a water bath; a measuring cylinder; a rotary evaporator; inoculation loops; Petri dishes; tweezers; an incubator; paper discs; an autoclave; micropipettes; pipette tips; a Bunsen burner; a biological safety cabinet (BSC); and a UV-Vis spectrophotometer.

All samples consisted of *P. giganteum* leaves. Extraction was performed via maceration. Specifically, 127.95 g of dried *P. giganteum* leaf powder was macerated in 2 L of 96% ethanol for five days, with intermittent stirring (15 minutes daily). Following maceration, the extract was filtered, the marc discarded, and the solvent removed using a rotary evaporator for three hours. The resulting extract was then transferred to a glass beaker and further concentrated in a water bath for two days to yield a viscous extract.

Phytochemical screening was conducted to determine the presence of alkaloids, flavonoids, saponins, tannins, triterpenoids, and steroids. Antioxidant activity was assessed using the DPPH assay. Briefly, 20 mg of the extract was dissolved in 20 mL of methanol containing 1000 ppm DPPH. Antimicrobial activity was evaluated using the paper disc diffusion method. Data were analyzed and presented descriptively in tables and graphs.

Results

Table 1 presents the results of phytochemical screening of an ethanol extract of Memlong leaves. The analysis revealed the presence of alkaloids, flavonoids, saponins, tannins, and triterpenoids/steroids. These compounds were identified by the following visual indicators: a brown precipitate for alkaloids; an orange solution for flavonoids; stable foam formation for saponins; a dark blue solution for tannins; and a green solution for triterpenoids/steroids.

Table 1. Phytochemical ***screening test results***

Compound Classes	Results	Information
Alkaloids (Dragendrof Reagent)	+	A brown precipitate form
Flavonoids	+	Orange colored solution
Saponins	+	Stable foam
Tannin	+	The solution is dark blue
Triterpenoids/Steroids	+	The solution is green in color

The results of testing the antioxidant activity of the ethanol extract of Memelong leaves can be seen in the table 2. The results of the antioxidant activity test with the Memelong leaf extract test sample used the DPPH method with sample concentrations of 400 ppm, 600 ppm, 800 ppm, and 1000 ppm, with sample results of 14%, 16%, 19%, and

Table 2. Antioxidant activity test results with Memelong leaf extract samples

Sample Concentration	Sample
400 ppm	14%
600 ppm	16%
800 ppm	19%
1000 ppm	27%

Information: ppm (parts per million)= bpj (parts per million) is a unit of concentration of substances in a mixture

27%. Based on the data presented in Table 3, the antioxidant activity of methanol extracts, assessed using the DPPH assay, demonstrated the following results. At concentrations of 400 ppm, 600 ppm, 800 ppm, and 1000 ppm, the respective antioxidant activities were 94%, 94%, 95%, and 95%.

Table 3. Antioxidant activity test results with vitamin C methanol extract test sample as positive control

Vitamin C Concentration	Sample
400 ppm	94%
600 ppm	94%
800 ppm	95%
1000ppm	95%

Control Blank Description: 1.006

Antimicrobial activity assays using Memelong leaf extract demonstrated that the positive control (K+) exhibited the largest inhibitory zone diameter across all formulations (K-, K+, 25%, 50%, and 75%), each tested in triplicate. These findings contribute to a study analyzing the potential of Memelong leaves as both an antioxidant and antimicrobial agent.

Table 4. Antimicrobial activity test results with Memelong leaf extract test samples

Formulation	Inhibition Zone Diameter (mm)			
	Repetition 1	Repetition 2	Repetition 3	Average
Negative Control	0	0	0	0
Positive Control	19,17	20.96	16.42	18.85
25%	0	0	0	0
50%	0	0	0	0
75%	0	0	0	0

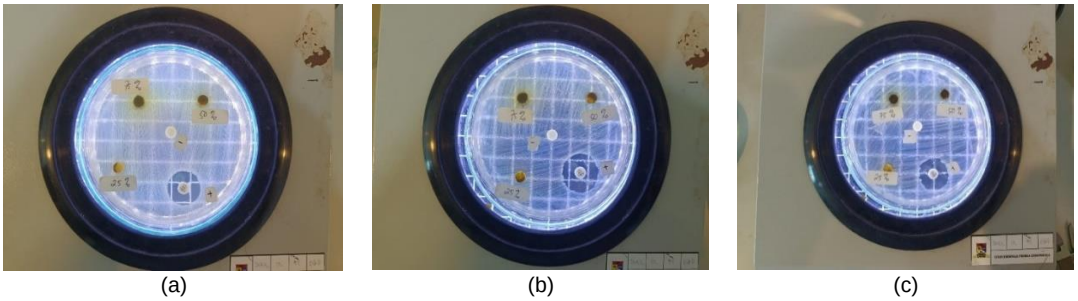
Discussion

The phytochemical analysis revealed that the formation of a brown precipitate indicated the presence of alkaloids. An orange coloration suggested the presence of flavonoids. Persistent foam formation upon shaking, which remained stable after the addition of concentrated hydrochloric acid (HCl), indicated the presence of saponins. A dark blue color indicated high tannin content, while a green color suggested elevated steroid levels.

The antioxidant potential of the extract was investigated, with the following percentage inhibitions observed at different concentrations: 14% at 400 ppm, 16% at 600 ppm, 19% at 800 ppm, and 27% at 1000 ppm. Antioxidant activity was assessed by measuring the change in color of the DPPH (2,2-diphenyl-1-picrylhydrazyl) radical, expressed as a percentage of inhibition. The IC_{50} (half maximal inhibitory concentration) value, representing the concentration of the test compound required to scavenge 50% of free radicals, was determined. A lower IC_{50} value signifies higher free radical scavenging activity. The obtained IC_{50} values suggest that the Philodendron giganteum leaf extract exhibited weak antioxidant activity, as higher IC_{50} values correlate with lower activity.

A lower IC_{50} value is indicative of greater antioxidant potency. Generally, a compound is classified as a very strong antioxidant if its IC_{50} value is below 50 ppm, strong if it ranges from 50 to 100 ppm, moderate if it is between 100 and 150 ppm, and weak if it falls between 151 and 200 ppm. This classification is consistent with the findings of Aminah et al.[12], who defined IC_{50} values below 10 ppm as indicative of very strong antioxidants; 10–50 ppm, strong; 50–100 ppm, moderate; and 100–250 ppm, weak.

Antioxidant activity can be evaluated using various assays, including hydrogen atom transfer (HAT), single electron transfer (ET), reducing power assays, and metal chelation assays. Understanding the mechanisms, advantages, and limitations of these methods is crucial for selecting the most appropriate



(a) (b) (c)

Figure 1. Antimicrobial activity test of memelong leaves

technique for specific applications.[13] The antioxidant properties of certain medicinal plants offer potential benefits to individuals, industries, and healthcare institutions.[14] Medicinal plants possess significant therapeutic properties due to the presence of bioactive compounds.[15]

The antibacterial activity of the Memelong leaf extract was also evaluated. No inhibition zones were observed at concentrations of 25%, 50%, and 75%. The positive control (K+) exhibited an average inhibition zone diameter of 18.85 mm. According to Hidayat et al.[16] the observed inhibition zones are influenced by the growth medium used, such as Mannitol Salt Agar (MSA), which contains peptones and beef extract. The 7.5% sodium chloride concentration in MSA inhibits the growth of many bacterial species, while mannitol fermentation produces acid, aiding in the differentiation of *Staphylococcus* species. Coagulase-positive *Staphylococci* produce yellow colonies and cause the medium to turn yellow.

A study by M. A. et al.[17] reported that methanolic leaf extracts at 500 mg/mL effectively inhibited S. aureus with a 20 mm zone of inhibition. Similarly, Miladiarsi et al.[18] found that topical formulations of moringa leaf ethanol extract were stable and effective against *Staphylococcus aureus*, with varying inhibition zone diameters observed at different extract concentrations (15%, 20%, and 25%), demonstrating strong inhibition.

The absence of inhibition zones in the antimicrobial assays in the present study may be attributed to the degradation or structural changes of antimicrobial compounds during extraction, storage, or testing, which can reduce their activity.[19] The weak antioxidant activity observed may be due to processing methods, such as heating, which can diminish the antioxidant capacity of the extract.[20]

Conclusion

The results of this research suggest potential antioxidant properties. Data analysis indicates the following sample concentrations and corresponding percentages: 400 ppm (14%), 600 ppm (16%), 800 ppm (19%), and 1000 ppm (27%). However, the antibacterial activity assay of *Philodendron giganteum* leaf extract did not demonstrate any inhibition zones at concentrations of 25%, 50%, and 75%. In contrast, the positive control (K+) exhibited a mean inhibition zone diameter of 18.85 mm.

References

1. Widyastuti T. Teknologi budidaya dan agribisnis tanaman hias. Yogyakarta: CV. Mine; 2018.
2. Nainwal P. Review on philodendron species-plant seeking for validation of Its therapeutic approaches. Journal of Pharmaceutical Sciences and Research. 2019;11(5).
3. Canal D, Köster N, Celis M, Croat TB, Borsch T, Jones KE. Out of amazonia and back again: historical biogeography of the species-rich neotropical genus philodendron (araceae). Annals of the Missouri Botanical Garden. 2019;104(1).
4. Loss-Oliveira L, Sakuragui C, Soares M de L, Schrago CG. Evolution of philodendron (araceae) species in neotropical biomes. PeerJ. 2016;2016(3).
5. Fauzia A, Sukma DrD, Krisantini. Budidaya, Panen, dan Pascapanen Philodendron giganteum, Philodendron selloum, dan Philodendron xanadu di Jawa Barat. Buletin Agrohorti. 2023;10(3).
6. Kurniawan H, Ropiqa M. Uji toksisitas ekstrak etanol daun ekor kucing (acalypha hispida burm.f.) dengan metode brine shrimp lethality test (BSLT). Journal Syifa Sciences and Clinical Research. 2021;3(2).
7. Poljsak B, Kovač V, Milisav I. Antioxidants, food processing and health. Antioxidants. 2021;10(3).
8. Hwang SJ, Lee JH. Comparison of antioxidant activities expressed as equivalents of standard antioxidant. Food Science and Technology (Brazil). 2023;43.
9. González-Henríquez CM, Sarabia-Vallejos MA, Rodriguez-Hernandez J. Advances in the fabrication of antimicrobial hydrogels for biomedical applications. Vol. 10, Materials. 2017.
10. Blaskovich MAT, Kavanagh AM, Elliott AG, Zhang B, Ramu S, Amado M, et al. The antimicrobial potential of cannabidiol. Commun Biol. 2021;4(1).
11. Molyneux P. The Use of the Stable Free Radical Diphenylpicryl-hydrazyl (DPPH) for Estimating Antioxidant Activity. Songklanakarin Journal of Science and Technology. 2004;26(December 2003).
12. Aminah A, Tomayahu N, Abidin Z. Penetapan kadar flavonoid total ekstrak etanol kulit buah alpukat (Persea americana Mill.) dengan metode spektrofotometri uv-vis. Jurnal Fitofarmaka Indonesia. 2017;4(2).
13. Shahidi F, Zhong Y. Measurement of antioxidant activity. Vol. 18, Journal of Functional Foods. 2015.
14. Nwozo OS, Effiong EM, Aja PM, Awuchi CG. Antioxidant, phytochemical, and therapeutic properties of medicinal plants: a review. Int J Food Prop. 2023;26(1).
15. Chanda S, Ramachandra T V. A review on some therapeutic aspects of phytochemicals present in medicinal plants. Pinternational Journal of Pharmacy & Life Sciences. 2019;1(10):6052–8.

16. Hidayat MT, Koentjoro MP, Prasetyo EN. Antimicrobial activity test of medicinal plant extract using antimicrobial disc and filter paper. Bioscientist: Jurnal Ilmiah Biologi. 2023;11(1).
17. M. A. G, S. B. M, A.B. R, H. T, M. A, M. A, et al. Antibacterial activity and phytochemical screening of Moringa oleifera lam. leaves and seeds extract on Staphylococcus aureus. International Journal of Research -GRANTHAALAYAH. 2020 Jun 13;7(11):276–84.
18. Miladiarsi, Basir N, Nurlindasari, Wahdaniar, Irma A. Antibacterial activity test of Moringa leaf ethanol extract ointment of Moringa oleifera Lamk. on Staphylococcus aureus bacteria. Journal of Health Sciences and Medical Development. 2023;2(01).
19. Olszowy M, Dawidowicz AL, Jóźwik-Dolęba M. Are mutual interactions between antioxidants the only factors responsible for antagonistic antioxidant effect of their mixtures? Additive and antagonistic antioxidant effects in mixtures of gallic, ferulic and caffeic acids. European Food Research and Technology. 2019;245(7).
20. Navajas-Porras B, Pérez-Burillo S, Valverde-Moya ÁJ, Hinojosa-Nogueira D, Pastoriza S, Rufián-Henares JÁ. Effect of cooking methods on the antioxidant capacity of plant foods submitted to in vitro digestion–fermentation. Antioxidants. 2020;9(12).