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(Original Article)

Phytochemical Screening and Antioxidant Activity of Ethanol Exctract of Mekai Leaves (*Albertisia papuana* Becc.) Using the DPPH Method

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Abstract

Mekai (*Albertisia papuana* Becc.) has been traditionally used by the Dayak communities in Kalimantan, yet scientific evidence regarding its antioxidant activity remains limited. This study aimed to determine the phytochemical profile and antioxidant activity of the ethanol extract of Mekai leaves. The extract was obtained through maceration using 96% ethanol, followed by qualitative phytochemical screening to identify secondary metabolites. Antioxidant activity was evaluated using the DPPH radical-scavenging method by measuring the percentage of inhibition at concentrations of 5, 10, 15, 20, and 25 ppm, and calculating the IC_{50} value through linear regression. The extract contained tannins, phenolics, flavonoids, alkaloids, saponins, steroids, and triterpenoids. Antioxidant testing showed strong radical-scavenging activity, with an IC_{50} value of 95.583 ppm. These findings indicate that Mekai leaves possess the ability to neutralize free radicals, thereby providing scientific support for their traditional use in medicinal applications.

Keywords: *Albertisia papuana*; DPPH; Phytochemicals; Antioxidant

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1 Introduction

Times Oxidative stress is widely recognized as a major pathological factor contributing to chronic and degenerative diseases, arising from an imbalance between reactive oxygen species (ROS) and endogenous antioxidant defenses. Natural antioxidants derived from plants have gained increasing research attention due to their ability to neutralize free radicals through hydrogen or electron donation mechanisms. Recent studies have highlighted the strong antioxidant potential of phenolic- and flavonoid-rich plant extracts, which exhibit concentration-dependent radical-scavenging activity and reinforce the importance of secondary metabolites in mitigating oxidative damage [1].

Flavonoids such as vitexin have also been shown to interact with biological targets associated with oxidative stress, providing molecular evidence supporting their antioxidant relevance. Computational analyses indicate that flavonoid structures contribute to effective ROS inhibition and stabilization of free radicals [2]. These findings support the need for further exploration of traditional medicinal plants as potential sources of antioxidants.

Mekai (*Albertisia papuana* Becc.), an indigenous species traditionally used in Kalimantan, particularly in the regions of North and East Kalimantan where it is widely harvested and utilized by Dayak communities, has not been scientifically analyzed for its antioxidant activity despite its ethnobotanical significance. Preliminary data from other species within the Menispermaceae family indicate the presence of alkaloids, phenolics, tannins, and flavonoids—metabolite classes commonly associated with free radical-scavenging activity [3]. Although quantitative data on metabolite concentrations in Mekai leaves have not yet been reported, studies on related Menispermaceae plants show that phenolic and flavonoid compounds typically occur at higher levels and are considered the dominant contributors to antioxidant activity. Therefore, identifying the antioxidant potential of Mekai is crucial for validating traditional claims and advancing the scientific understanding of this plant.

Complementary findings from studies on fermented botanical matrices, including kombucha derived from *Clitoria ternatea*, show that phenolic composition is strongly correlated with DPPH radical-scavenging activity [4]. These studies further emphasize that antioxidant performance depends not only on total phenolic content but also on the specific types and reactivities of individual phenolic compounds. Such evidence aligns with the understanding that structural diversity among metabolites contributes differently to antioxidant outcomes.

The DPPH method remains one of the most widely used analytical techniques for evaluating antioxidant capacity, particularly for determining IC_{50} values. Publications in recent years consistently describe DPPH-based IC_{50} values as reliable parameters for comparing antioxidant strength across plant extracts [5]. Its broad applicability in botanical studies makes this method an appropriate choice for characterizing the antioxidant potential of Mekai.

Given the limited scientific information available on Mekai leaves and the importance of scientifically validating ethnomedicinal plants using standardized assays, this study aims to identify the phytochemical composition and antioxidant activity of the ethanol extract of Mekai leaves using the DPPH method. By integrating qualitative phytochemical screening with quantitative IC_{50} determination, this research provides the first structured scientific evidence of Mekai's antioxidant properties and offers a valuable foundation for further pharmacological exploration.

2 Method

2.1 Plant Material Collection and Preparation

Mekai (*Albertisia papuana* Becc.) leaves used in this study were collected from Desa Long Nawang, Kecamatan Kayan Hulu, Kabupaten Malinau, Kalimantan Utara. Fresh leaves were manually harvested and subjected to wet sorting to remove soil and other impurities. The cleaned leaves were dried under indirect sunlight until completely dehydrated, then ground into fine simplicia powder to increase surface area for extraction. The plant material was identified at the Herbarium Mulawarman, Laboratory of Ecology and Tropical Forest Biodiversity Conservation, Faculty of Forestry, Universitas Mulawarman,

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and authenticated as *Albertisia papuana* Becc. However, no voucher identification number was provided for this specimen.

2.2 Extraction

Extraction of Mekai (Albertisia papuana Becc.) leaf powder was performed using the maceration method with 96% ethanol as the solvent [5]. A total of 2300 g of powdered leaves was immersed in the solvent and allowed to stand for 24 hours with occasional stirring to facilitate metabolite diffusion. The mixture was then filtered, and the residue was re-macerated using fresh solvent until the filtrate became noticeably lighter in color. All filtrates were combined and concentrated using a rotary evaporator to obtain a thick ethanol extract, which was subsequently stored in a desiccator until further analysis.

2.3 Phytochemical Screening

Qualitative phytochemical screening of the ethanol extract of Mekai (*Albertisia papuana* Becc.) leaves was performed using standard reagent-based methods [6]. Tannins were detected using $FeCl_3$, producing a bluish–green color, while alkaloids were identified through chloroform–ammonia treatment followed by Mayer, Wagner, and Dragendorff reagents. Flavonoids were confirmed via the Shinoda reaction, yielding an orange–red color, and saponins were indicated by stable foam formation after boiling and shaking. The Liebermann–Burchard test produced a green color for steroids and a reddish–brown color for triterpenoids. Phenolics were identified using NaCl and gelatin reagents, indicated by turbidity or precipitate formation. All metabolite groups were interpreted based on characteristic color changes or precipitates.

2.4 DPPH Solution Preparation and Determination of λmax

0.01% (b/v) solution of DPPH in methanol was prepared and placed into a cuvette. Absorbance was scanned in the wavelength range 511–517 nm to determine the maximum absorbance wavelength (λmax). The highest absorbance was recorded at 517 nm, which was used for all subsequent antioxidant measurements [7].

2.5 Preparation of Standard and Sample Solutions

A stock DPPH solution was prepared by dissolving 0.01 g of DPPH in 100 mL methanol (100 ppm), and dilutions were made to obtain 5, 10, 15, 20, and 25 ppm standards. Sample stock solutions for the Mekai extract were prepared by dissolving 0.01 g of extract in 100 mL methanol, followed by serial dilution to the same five concentrations: 5, 10, 15, 20, and 25 ppm.

2.6 Antioxidant Activity Test

Antioxidant activity was measured according to the standard DPPH method [5]. For each concentration, 3 mL of extract solution was mixed with 3 mL of 0.004% DPPH solution, followed by incubation for 30 minutes at room temperature in the dark. Absorbance was measured at 517 nm using a UV–Vis spectrophotometer.

The percentage of radical inhibition was calculated using:

$$\%\text{Inhibition} = \frac{A_{\text{control}} - A_{\text{sample}}}{A_{\text{control}}} \times 100$$

The IC_{50} value was determined from the linear regression curve of concentration versus % inhibition.

3 Result and Discussion

The maceration process of Mekai (*Albertisia papuana* Becc.) leaves produced a thick dark green–brown ethanol extract with a yield of 9.6%, as shown in Table 1 and visually confirmed in Figure 1. This yield reflects the ability of ethanol as a semi-polar solvent to draw out various bioactive metabolites from leaf tissues. This finding is consistent with literature indicating that ethanol is an optimal solvent for

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extracting phenolic and flavonoid compounds from tropical plants due to its wide polarity range and stability against compound degradation [3].

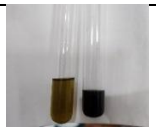
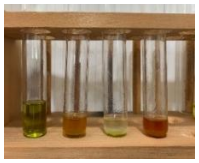
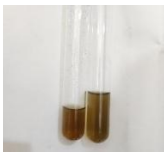
Table 1. Yield of Mekai Leaf Ethanol Extract

Sample	Weight (g)	Yield (%)
Simplicia Powder	2300	
Concentrated Extract	28,8	9,6

Figure 1. Ethanol extract of Mekai leaves

Phytochemical screening revealed that the ethanol extract of Mekai leaves contains alkaloids, flavonoids, tannins, phenolics, saponins, steroids, and triterpenoids, which were indicated by characteristic color changes and precipitate formation in each qualitative test, as visualized and summarized in Table 2. The presence of flavonoids, phenolics, and tannins is known to contribute significantly to redox properties and the ability to donate electrons or hydrogen atoms in the neutralization of free radicals. This observation is consistent with the study by Hasan et al. [8], who reported that the phenolic- and flavonoid-rich bark extract of *Pometia pinnata* exhibited strong antioxidant activity through an electron-donation mechanism. Additionally, research on species within the Menispermaceae family, such as *Tinospora crispa*, has also demonstrated high levels of phenolic and flavonoid compounds accompanied by significant antioxidant activity, further supporting the role of this family as a source of radical-scavenging metabolites [9].

Table 2. Phytochemical Screening of Mekai Leaf Ethanol Extract

Secondary Metabolite	Result	
Tannins	+	
Alkaloids Wagner's reagent Mayer's reagent Dragendroff's reagent	 + +	
Flavonoids	+	

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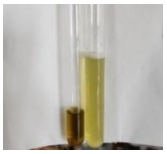
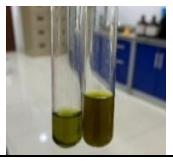
Saponins	+	
Steroids	+	
Triterpenoids	+	
Phenolics	+	

The antioxidant activity of the Mekai extract was determined using the DPPH radical scavenging assay. Increasing extract concentrations resulted in higher percentages of inhibition, indicating a linear relationship between concentration and radical scavenging capacity. Linear regression analysis yielded an IC_{50} value of 95.583 ppm, classifying the extract as a strong antioxidant based on commonly used DPPH criteria. The IC_{50} value is presented in Table 3, and the regression curve is visualized in Figure 2. This value aligns with the findings of Mashile et al. [7], who reported an IC_{50} of 82 ppm for phenolic-rich *Vachellia infausta* extract, as well as the study by Andriani and Murtisiwi [1], which found an IC_{50} of 90 ppm in flavonoid-rich butterfly pea (*Clitoria ternatea*) flower extract. Both studies emphasize that hydroxylated aromatic structures in flavonoids and phenolics play a major role in single electron transfer (SET) and hydrogen atom transfer (HAT) mechanisms that stabilize free radicals.

Table 3. IC_{50} Value of Mekai Leaf Ethanol Extract

Sample	IC_{50} Value (ppm)	Category
Mekai Leaf Ethanol Extract	95,583	Strong

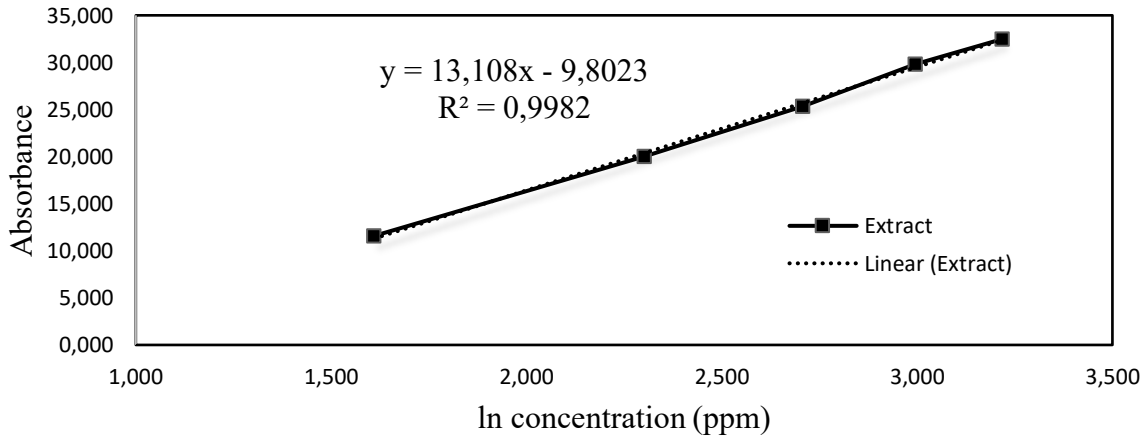


Figure 2. Linear Regression Curve of the Mekai Extract in the DPPH Assay

Comparisons with other studies further reinforce the antioxidant potential of Mekai. Skrzypiński et al. [10] demonstrated that the antioxidant strength of phenolic compounds is strongly influenced by the number of aromatic hydroxyl groups and the presence of conjugated double-bond systems, which correspond to the metabolite classes detected in Mekai. At the family level, Asrifaturofingah et al. [11] reported that high polyphenol content in Menispermaceae herbal leaves strongly correlates with DPPH inhibition, a pattern that is similarly reflected in the Mekai extract.

Overall, the strong antioxidant activity exhibited by the Mekai extract may be attributed to the synergistic interaction among its secondary metabolites. Phenolics, flavonoids, and tannins are likely the primary radical scavengers, while alkaloids, saponins, steroids, and triterpenoids contribute additional effects that enhance the extract's overall redox profile. Although these results are promising, relying solely on the DPPH assay provides a limited perspective on the antioxidant capacity of Mekai. Therefore, further analyses using ABTS, FRAP, ORAC, as well as quantitative assessments such as total phenolic content (TPC) and total flavonoid content (TFC), are recommended to gain a more comprehensive understanding of Mekai's antioxidant mechanisms. These findings establish an initial scientific foundation for the antioxidant potential of Mekai leaves and open further opportunities for exploration through active compound isolation and advanced chromatographic profiling (LC–MS/MS) for potential pharmaceutical and nutraceutical applications.

4. Conclusion

This study demonstrates that the ethanol extract of Mekai (*Albertisia papuana* Becc.) leaves possesses strong antioxidant potential, as indicated by its IC_{50} value of 95.583 ppm. Phytochemical screening revealed the presence of phenolics, flavonoids, tannins, alkaloids, saponins, steroids, and triterpenoids, which contribute to free radical-scavenging activity. These findings support the traditional use of Mekai and highlight its potential as a natural antioxidant source. Further studies are recommended to identify specific active compounds and to evaluate antioxidant activity using additional methods.

5. Declarations

5.1 Author Contributions

Raisa Fadilla led the research and was primarily responsible for conducting the experiments, analyzing the data, and preparing the manuscript. Leny Eka Tyas Wahyuni contributed to data interpretation and provided supervision and revision during the manuscript preparation.

5.2 Ethics

No ethics approval required.

5.3 Conflict of Interest

The author declares no conflict of interest.

5.4 Funding Statement

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6. Bibliography

[1] Andriani, D., & Murtisiwi, L. 2020. Uji aktivitas antioksidan ekstrak etanol 70% bunga telang (Clitoria ternatea L.) dari daerah Sleman dengan metode DPPH. *Pharmacon: Jurnal Farmasi Indonesia*, *17*(1), 72–80. https://doi.org/10.23917/pharmacon.v17i1.9321

[2] Fadillah, M. F., Rezaldi, F., Fadila, R., & others. 2024. Computational biotechnology (bioinformatics) study of vitexin compounds in telang flower kombucha as an antioxidant and anticancer. *Jurnal Gizi Kerja Dan Produktivitas*, *5*(1), 60–67.

[3] Chen, X., Yu, H., Yang, H., Zhang, C., Lu, Y., & Chen, Y. 2020. Analytical methods used in determining antioxidant activity: A review. *Antioxidants*, *9*(5), 347. https://doi.org/10.3390/antiox9050347

[4] Nguyen, T., Le, T., & Pham, H. 2023. Phenolic composition and antioxidant correlations in fermented plant beverages: A case study on Clitoria ternatea kombucha. *Journal of Food Biochemistry*, *47*(2), e14352. https://doi.org/10.1111/jfbc.14352

[5] Rohmah, S., Isnindar, I., & Mubarok, W. 2020. Penentuan aktivitas antioksidan dengan metode DPPH dan penetapan kadar fenolik total ekstrak etanol kulit buah naga (Hylocereus polyrhizus). *Jurnal Ilmiah Farmasi*, *16*(1), 12–20.

[6] Harborne, J. B. 1998. *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis*. Springer.

[7] Mashile, P., Motaung, T. E., Mphahlele, M. J., & others. 2024. Phytochemical analysis and DPPH radical scavenging activity of extracts from Vachellia infausta. *Plants*, *13*(3), 428. https://doi.org/10.3390/plants13030428

[8] Hasan, H., Thomas, N. A., Hiola, F., Ramadhani, F. N., & Ibrahim, P. A. S. 2022. Skrining fitokimia dan uji aktivitas antioksidan kulit batang matoa (Pometia pinnata) dengan metode DPPH. *Indonesian Journal of Pharmaceutical Education*, *2*(1), 67–73.

[9] Yusoff, N. I., Ahmad, W., Ibrahim, N., & others. 2021. Phytochemical profiling and antioxidant properties of Tinospora crispa (Menispermaceae) stem extracts. *Journal of Applied Pharmaceutical Science*, *11*(5), 120–127. https://doi.org/10.7324/JAPS.2021.110516

[10] Skrzypiński, J., Pietrzyk, N., & Chmiel, T. 2023. DPPH measurements and structure–activity relationship studies of 169 phenols. *Antioxidants*, *13*(3), 309. https://doi.org/10.3390/antiox13030309

[11] Asrifaturofingah, A., Listiowati, E., Uzlifati, F., & others. 2022. Analisis aktivitas senyawa antioksidan pada berbagai daun tanaman herbal dengan metode DPPH. *Pharmascience Journal*, *9*(2), 1–9.