

Chemical and pharmaceutical technologies

DOI: <https://www.doi.org/10.53002/167>

PHYTOCHEMICAL SCREENING AND ANTIOXIDANT ACTIVITY OF ETHANOL EXTRACT OF SUNGKAI LEAVES (PERONEMA CANESCENS JACK)

^{1*}Primandari S.R.P., ²Kusnanda, A.J., ^{3,4}Elshaarani, T.^{1,2}Universitas Negeri Padang, West Sumatera, Indonesia³University of Khorfakkan, Sharjah, United Arab Emirates⁴Sudan Atomic Energy Commission, Khartoum, Sudan* Correspondent's E-mail: sri.primandari@ft.unp.ac.id

Author information:

Primandari Sri Rizki Putri, Universitas Negeri Padang, 25132, Padang, West Sumatera, Indonesia, ORCID ID: <https://orcid.org/0000-0002-1279-7331>, email: sri.primandari@ft.unp.ac.id**Kusnanda Arif Juliari**, Universitas Negeri Padang, 25132, Padang, West Sumatera, Indonesia, ORCID ID: <https://orcid.org/0000-0002-5538-0317>, email: arifjuliari@fmipa.unp.ac.id**Elshaarani Tarig**, University of Khorfakkan, Sharjah, United Arab Emirates, 887W+2P2, Sharjah, United Arab Emirates, Sudan Atomic Energy Commission, Khartoum, Sudan, ORCID ID: <https://orcid.org/0000-0002-5769-4758>, email: Tarig.Ali@ukf.ac.ae

Abstract — In Indonesia, sungkai leaves (*Peronema canescens* Jack) are popular as herbal plants and have the potential to be classified as a source of secondary metabolite compounds. This study aims to determine the characteristics of sungkai leaf extract and its secondary metabolite content. This study used a 70% ethanol solution to extract secondary metabolite compounds through the maceration method. Determination of antioxidant activity was carried out using the DPPH (2,2-diphenyl-1-picrylhydrazyl) method. Initial characterization was carried out through phytochemical screening of flavonoids and phenolics. Antioxidant activity was determined based on the extract's ability to inhibit DPPH radicals at a concentration of 10–50 ppm, then expressed as an inhibition percentage and IC₅₀ value. The results showed that sungkai leaf extract with 70% ethanol solvent contained flavonoids and phenolics. Increasing the extract concentration resulted in an increase in DPPH radical inhibition activity, with an inhibition percentage of 37.54–81.31%. Although the IC₅₀ of sungkai leaf extract is still below the value of Vitamin C, the IC₅₀ of the extract was 21.98 ppm, categorized as very strong. Therefore, the results of this study are still qualitative and require further quantitative study. This study also contributes to the support that sungkai leaf extract has the potential to be developed into an antioxidant compound.

Keywords — secondary metabolite, herbal compound, antioxidant resource, maceration.

СУНГКАЙ ЖАПЫРАҚТАРЫНЫҢ (PERONEMA CANESCENS JACK) ЭТАНОЛДЫҚ СЫҒЫНДЫСЫНЫҢ ФИТОХИМИЯЛЫҚ СКРИНИНГІ ЖӘНЕ АНТИОКСИДАНТТЫҚ БЕЛСЕНДІЛІГІ

^{1*}Primandari S.R.P., ²Куснанда А.Д., ³Эльшаарани Т.^{1,2}Паданг мемлекеттік университеті, Батыс Суматра, Индонезия³Хорфаккан университеті, Шарджа, Біріккен Араб Әмірліктері⁴Судан атом энергиясы жөніндегі комиссиясы, Хартум, Судан*Корреспондент E-mail: sri.primandari@ft.unp.ac.id

Авторлар туралы ақпарат:

Primandari Sri Rizki Putri, Паданг мемлекеттік университеті, 25132, Паданг қаласы, Батыс Суматра, Индонезия. ORCID идентификаторы: <https://orcid.org/0000-0002-1279-7331>. Электрондық пошта: sri.primandari@ft.unp.ac.id.**Куснанда Ариф Джулиари**, Паданг мемлекеттік университеті, 25132, Паданг қаласы, Батыс Суматра, Индонезия. ORCID идентификаторы: <https://orcid.org/0000-0002-5538-0317>. Электрондық пошта: arifjuliari@fmipa.unp.ac.id.**Эльшаарани Тариг**, Хорфаккан университеті, Шарджа қаласы, Біріккен Араб Әмірліктері, мекенжайы: 887W+2P2, Шарджа, Біріккен Араб Әмірліктері; Суданның Атом энергиясы жөніндегі комиссиясы, Хартум қаласы, Судан.ORCID идентификаторы: <https://orcid.org/0000-0002-5769-4758>. Электрондық пошта: Tarig.Ali@ukf.ac.ae.

Абстракт — Индонезияда сунгкай жапырақтары (*Peronema canescens* Jack) дәрілік өсімдік ретінде кеңінен қолданылады және екіншілік метаболиттер қосылыстарының көзі ретінде қарастырылады. Бұл зерттеудің мақсаты — сунгкай жапырақтары сығындысының сипаттамаларын және оның құрамындағы екіншілік метаболиттерді анықтау. Зерттеу барысында екіншілік метаболиттерді бөліп алу үшін мацерация әдісімен 70%-дық этанол ерітіндісі қолданылды. Антиоксиданттық белсенділікті анықтау DPPH (2,2-дифенил-1-пикрилгидразил) әдісі арқылы жүргізілді. Бастапқы сипаттамалар флавоноидтар мен фенолдық қосылыстарға фитохимиялық скрининг жүргізу арқылы анықталды. Антиоксиданттық белсенділік сығындының 10–50 ppm концентрацияларында DPPH радикалдарын тежеу қабілеті негізінде бағаланды. Нәтижелер тежеу пайызы және IC_{50} мәні түрінде көрсетілді. Зерттеу нәтижелері 70%-дық этанолмен алынған сунгкай жапырақтары сығындысының құрамында флавоноидтар мен фенолдық қосылыстар бар екенін көрсетті. Сығынды концентрациясының артуы DPPH радикалдарын тежеу белсенділігінің жоғарылауына әкеліп, тежеу пайызы 37,54–81,31% аралығында болды. Сунгкай жапырақтары сығындысының IC_{50} мәні С дәруменімен салыстырғанда жоғары болғанымен, 21,98 ppm құрады, бұл өте жоғары антиоксиданттық белсенділік санатына сәйкес келеді. Осыған байланысты зерттеу нәтижелері әзірге сапалық сипатқа ие және қосымша сандық зерттеулер жүргізуді қажет етеді. Сонымен қатар, бұл зерттеу сунгкай жапырақтары сығындысының антиоксиданттық қосылыс ретінде әрі қарай әзірлену әлеуетін растайды.

Кілт сөздер — екіншілік метаболиттер, өсімдік тектес дәрілік қосылыс, антиоксиданттық ресурс, мацерация.

ФИТОХИМИЧЕСКИЙ СКРИНИНГ И АНТИОКСИДАНТНАЯ АКТИВНОСТЬ ЭТАНОЛЬНОГО ЭКСТРАКТА ЛИСТЬЕВ СУНГКАЙ (*PERONEMA CANESCENS* JACK)

^{1*}Primandari S.R.P., ^{2*}Куснанда А.Д., ³Эльшаарани Т.

^{1,2} Университет Негери Паданг, Западная Суматра, Индонезия

³ Университет Хорфаккана, Шарджа, Объединённые Арабские Эмираты

⁴ Суданская комиссия по атомной энергии, Хартум, Судан

* E-mail корреспондента: sri.primandari@ft.unp.ac.id

Информация об авторах:

Primandari Sri Rizki Putri, Университет Негери Паданг, 25132, г. Паданг, Западная Суматра, Индонезия.

Идентификатор ORCID: <https://orcid.org/0000-0002-1279-7331>. Электронная почта: sri.primandari@ft.unp.ac.id.

Куснанда Ариф Джулиари, Университет Негери Паданг, 25132, г. Паданг, Западная Суматра, Индонезия.

Идентификатор ORCID: <https://orcid.org/0000-0002-5538-0317>. Электронная почта: arifjuliari@fmipa.unp.ac.id.

Эльшаарани Тариг, Университет Хорфаккана, г. Шарджа, Объединённые Арабские Эмираты, почтовый адрес:

887W+2P2, Шарджа, Объединённые Арабские Эмираты; Суданская комиссия по атомной энергии, г. Хартум, Судан.

Идентификатор ORCID: <https://orcid.org/0000-0002-5769-4758>. Электронная почта: Tarig.Ali@ukf.ac.ae.

Аннотация — В Индонезии листья сунгкай (*Peronema canescens* Jack) широко используются в качестве лекарственного растительного сырья и рассматриваются как потенциальный источник вторичных метаболитов. Цель данного исследования — определить характеристики экстракта листьев сунгкай и установить содержание в нём вторичных метаболитов. Для извлечения вторичных метаболитов использовали 70%-ный раствор этанола, а экстракцию проводили методом мацерации. Определение антиоксидантной активности осуществляли методом DPPH (2,2-дифенил-1-пикрилгидразил). Первичную характеристику экстракта проводили посредством фитохимического скрининга на наличие флавоноидов и фенольных соединений. Антиоксидантную активность оценивали по способности экстракта ингибировать радикалы DPPH при концентрациях 10–50 ppm. Полученные результаты выражали в процентах ингибирования и значении IC_{50} . Результаты показали, что экстракт листьев сунгкай, полученный с использованием 70%-ного этанола, содержит флавоноиды и фенольные соединения. С увеличением концентрации экстракта антирадикальная активность в отношении DPPH возрастала, а процент ингибирования составлял 37,54–81,31%. Несмотря на то что значение IC_{50} экстракта листьев сунгкай выше, чем у витамина С, оно составило 21,98 ppm, что соответствует категории очень высокой антиоксидантной активности. Таким образом, результаты данного исследования пока имеют преимущественно качественный характер и требуют дальнейшего количественного изучения. Кроме того, полученные данные подтверждают перспективность дальнейшей разработки экстракта листьев сунгкай в качестве источника антиоксидантных соединений.

Ключевые слова — вторичные метаболиты, соединения растительного происхождения, источник антиоксидантов, мацерация.

MAIN PROVISION

- Penelitian ini menunjukkan bahwa ekstrak daun sungkai mengandung karakteristik fitokimia berupa flavonoid dan fenolik.
- Metode ekstraksi larutan etanol 70% dan maserasi menghasilkan rendemen 18.94%.
- Penelitian ini menunjukkan bahwa ekstrak daun sungkai memiliki IC_{50} sebesar 21.95.

INTRODUCTION

Indonesia is known as a country with a diverse range of traditional herbal plants. One such plant is the sungkai (*Peronema canescens* Jack), a member of the Verbenaceae family. This plant is abundant on the islands of Kalimantan and Sumatra [1]. Secondary metabolites commonly found in herbal plants include flavonoids, phenolics, saponins, steroids, alkaloids, and terpenoids. The content of these compounds can vary depending on the plant species, plant part, growing location, and the method and solvent used in the extraction process [2]. Several previous studies have shown that sungkai leaves contain several secondary metabolites, particularly flavonoids, phenolics, saponins, and steroids. The activity most associated with secondary metabolites in plants is antioxidant activity [3], [4]. This is because phenolic and flavonoid compounds are known to scavenge free radicals, making plants containing phenolic and flavonoid compounds potentially suitable for development as natural antioxidant sources.

Based on this description, sungkai leaves have the potential to be a source of natural ingredients containing secondary metabolites and possessing antioxidant activity [5]. This study was conducted to determine the characteristics of *Peronema canescens* Jack leaf extract through yield determination, phytochemical screening, and antioxidant activity testing using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method. The results are expected to provide information on the potential of sungkai leaves as a natural antioxidant source and serve as baseline information for further research [6].

Research Gap. Although research on sungkai leaves has reported the presence of several secondary metabolites and their antioxidant activity, studies linking the characteristics of secondary metabolites to the extract's ability to scavenge free radicals still need to be developed. Phytochemical screening only provides qualitative information about the compound class, while DPPH testing provides information about antioxidant activity without directly explaining the chemical components that potentially play a role. Therefore, this study was conducted to obtain an overview of the relationship between the secondary metabolite profile from phytochemical screening and the antioxidant activity of the ethanol extract of *Peronema canescens* Jack leaves.

Scientific Novelty. The novelty of this research lies in the re-evaluation of the characteristics of the ethanol extract of *Peronema canescens* Jack leaves obtained through certain extraction conditions and the study of the relationship between phytochemical screening results and DPPH radical scavenging activity. This study provides new experimental data on the characteristics of the extract and its antioxidant activity

as a basis for further research on the bioactive compounds of sungkai leaves.

LITERATURE REVIEW

A. Secondary Metabolites in Plants

The flavonoid, phenolic, alkaloid, terpenoid, steroid, and saponin compounds are classified as secondary metabolites. The presence of secondary metabolites in plants indicates their potential biological function. Flavonoids are a group of phenolic compounds that possess an aromatic ring system with several hydroxyl groups. These hydroxyl groups enable flavonoids to react with free radicals. This reaction occurs through the transfer of hydrogen atoms and electrons [7].

Like flavonoids, the hydroxyl groups in the aromatic structure of phenolic compounds also possess antioxidant properties. These groups donate hydrogen atoms to free radicals, producing phenoxy radicals. The phenoxy radicals are then stabilized by electron delocalization in the aromatic ring [2], [8].

Therefore, the presence of flavonoids and phenolics can be identified by their free radical scavenging ability. The presence of flavonoids and phenolics is usually determined through color reactions or complex formation using reagents in phytochemical screening. However, these tests are only qualitative and are therefore primarily used to provide initial information regarding the chemical composition of extracts.

C. Extraction of Secondary Metabolite Compounds

The process of separating specific compounds from natural materials using solvents is called extraction. The solvent used in extraction is selected based on the solubility of the compounds to be separated. The success of extraction depends on the type and concentration of the solvent, extraction time, particle size, and temperature [9].

One simple extraction method is maceration. In maceration, powdered medicinal plants are soaked in a solvent for a specified period of time, allowing soluble compounds to be drawn from the plant tissue into the solvent. Besides being simple, this method does not require high heat, making it often used for compounds that are relatively sensitive to temperature.

The most commonly used solvent is ethanol. Using ethanol in a mixture with water can help extract compounds with varying polarities. In research on sungkai leaves, ethanol at different concentrations has been used to obtain extracts, which were then analyzed for their phenolic content and antioxidant activity. One study reported that ethanol extracts of sungkai leaves had superior phenolic content and

antioxidant activity compared to water extracts under these test conditions [10].

Therefore, the choice of ethanol as a solvent in sungkai leaf research is expected to produce extracts containing various secondary metabolites, particularly polar and semipolar compounds that have the potential to provide antioxidant activity.

MATERIALS AND METHODS

The main material used in this study was sungkai leaves (*Peronema canescens* Jack) obtained from Nagari Palembayan, Agam Regency, West Sumatra, Indonesia. The chemicals used included 70% ethanol, ethanol p.a., DPPH (2,2-diphenyl-1-picrylhydrazyl), vitamin C, distilled water, magnesium powder, concentrated HCl, and 10% FeCl₃. The equipment used included an analytical balance, blender, maceration vessel, glassware, test tubes, pipettes, rotary evaporator, volumetric flask, and UV-Vis spectrophotometer.

A. *Simplicia preparation*

The sungkai leaves used were first cleaned of dirt and unnecessary plant parts. The samples were then dried in a place protected from direct sunlight until the leaves were dry. The dried leaves were then ground using a blender to obtain a powdered herbal medicine. The powdered herbal medicine was stored in a closed container and protected from moisture before being used in the extraction process.

B. *Extraction of Sungkai Leaves*

Extraction was carried out using a maceration method with 70% ethanol as the solvent. A total of 250 g of powdered sungkai leaves was placed in a maceration vessel, then 70% ethanol was added at a ratio of 1:10. The mixture was allowed to stand for three days, protected from light, with occasional stirring.

After the maceration process was complete, the mixture was filtered to separate the filtrate from the pulp. The resulting filtrate was then evaporated using a rotary evaporator to obtain a more concentrated extract. The extract was then weighed and stored in a sealed container before analysis.

This extraction step was used to obtain an extract containing various sungkai leaf secondary metabolites based on their solubility in 70% ethanol.

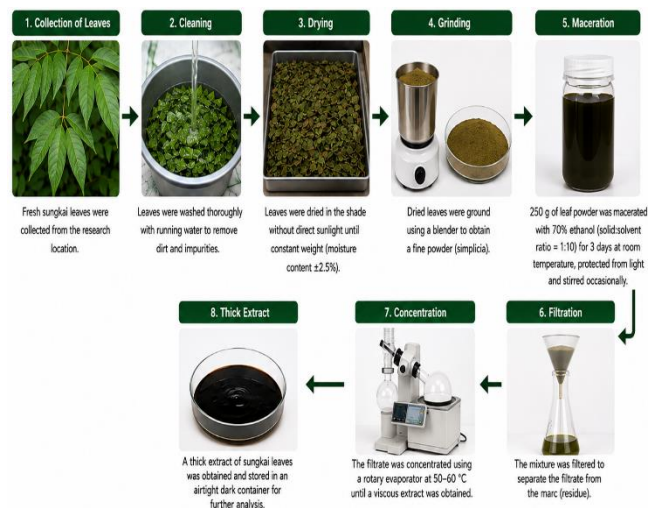


Figure B1 – procedures for Sungkai leaf extraction

C. *Determination of Extract Yield*

The yield is used to determine the percentage of extract obtained compared to the initial weight of the simplex. The yield is determined by using the equation:

$$\text{Yield (\%)} = \frac{\text{extract (g)}}{\text{simplicia (g)}} \times 100 \quad (1)$$

The yield results were used as one of the initial characterization parameters for sungkai leaf extract.

D. *Phytochemical Screening*

Phytochemical screening was conducted to determine the presence of several classes of secondary metabolites in sungkai leaf extract. The compounds analyzed included flavonoids and phenolics.

E. *Flavonoid Test (Shinoda Test)*

2 mL of the extract was placed in a test tube, then magnesium powder and 2-3 drops of concentrated HCl were added. The formation of an orange to red color indicates a positive result for flavonoids. This color change is used as a qualitative indicator of the presence of flavonoid compounds.

F. *Phenolic Test*

2 mL of sungkai leaf extract was placed in a test tube and 2-3 drops of a 5% FeCl₃ solution were added. Antioxidant Activity Testing Using the DPPH Method

The antioxidant activity of sungkai leaf extract was determined using the DPPH method. This method is based on the ability of antioxidant compounds in the extract to donate hydrogen atoms or electrons to the DPPH radical, thereby converting the radical into a more stable form.

G. *Preparation of Extract Solution*

A stock extract solution was prepared at a concentration of 1000 ppm. A 10 mg extract was

weighed and dissolved in ethanol p.a. in a 100 mL volumetric flask to the mark. From this stock solution, extract solutions were prepared at concentrations of 10, 20, 30, 40, and 50 ppm.

H. Preparation of DPPH Solution

A DPPH stock solution was prepared at a concentration of 100 ppm by dissolving 10 mg of DPPH in ethanol p.a. to a volume of 100 mL. The solution was then diluted to obtain a DPPH solution with a concentration of 35 ppm.

I. Antioxidant Activity Measurement

A total of 2 mL of the extract solution at each concentration was mixed with 4 mL of a 35 ppm DPPH solution. The mixture was then incubated for 30 minutes at 37°C under conditions protected from light.

The absorbance of the solution was measured using a UV-Vis spectrophotometer at a wavelength of 517 nm. Vitamin C was used as a reference. Vitamin C solutions were prepared at several concentrations and treated with the same procedure as the extract solutions. The color change was then observed. A blue color indicated the presence of phenolic compounds.

RESULT AND DISCUSSION

A. Characteristics of Sungkai leaves Extract

Sungkai leaf (*Peronema canescens* Jack) extraction was performed using a maceration method with 70% ethanol. The choice of 70% ethanol was based on its ability to extract secondary metabolites with varying polarities. The maceration process was carried out for three days with a 1:10 ratio of the crude drug to the solvent.

From 250 g of crude drug, 47.351 g of sungkai leaf extract was obtained, with a yield of 18.84%. The extraction results are presented in Table 1.

Table A1 – Sungkai Leaves Extract

Parameters	Results
Weight of simplicia	250 g
Solvent	Ethanol 70%
Time during maceration	3 days
Weight of extract	47.351 g
Yield	18.94%

The yield of 18.940% indicates that the maceration process was able to extract several components from sungkai leaf extract. The use of 70% ethanol allows for the extraction of polar to semi-polar compounds. The water in the 70% ethanol solution facilitates

solvent penetration into plant tissue, while the ethanol plays a role in dissolving various organic compounds. Therefore, the resulting extract is expected to contain a fairly diverse mixture of secondary metabolites.

B. Phytochemical Screening Results

Phytochemical screening was conducted to qualitatively determine the presence of several groups of secondary metabolites in the ethanol extract of sungkai leaves. The test results indicated the presence of flavonoids and phenolics.

Table B1 – Phytochemical Screening Results

Secondary metabolite group	Results
flavonoids	+
phenolics	+

(+) detected; (–) not detected

These results indicate that the ethanol extract of sungkai leaves contains several groups of secondary metabolites with the potential to exert biological activity. The presence of flavonoids and phenolics is of particular interest because these two groups of compounds have structures that allow them to react with free radicals [3].

Flavonoids

A positive flavonoid result is indicated by a color change after the addition of magnesium and HCl. This reaction is a commonly used qualitative method for detecting flavonoids. Simply put, the reaction can be described as:

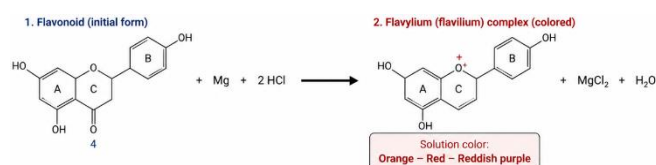


Figure B1 – Reaction of flavonoid test

Magnesium acts as a reducing agent, reducing the carbophilic groups of flavonoids under acidic conditions. This reduction and ring rearrangement leads to the formation of flavylium salts. Flavylium complexes are indicated by an orange to red color [11].

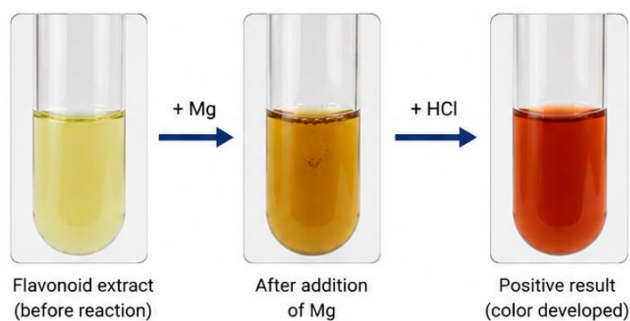


Figure B2 – Color change during flavonoid test

The color change is related to changes in the conjugation system of the flavonoid structure under acidic conditions. Flavonoids have an aromatic ring system and hydroxyl groups that allow for electron stabilization through resonance. The presence of flavonoids is also relevant to antioxidant activity. The hydroxyl groups in the flavonoid structure can donate hydrogen atoms to free radicals, thereby making them more stable [12].

Phenolic

The phenolic test using FeCl_3 yielded a positive result. The reaction between the Fe^{3+} ion and the phenolic group produces a colored complex. The formation of this complex causes a color change that can be observed visually.

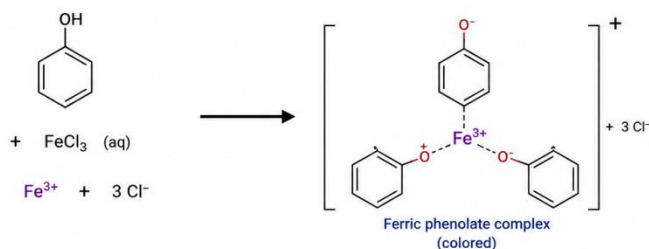


Figure B3 – Reaction of flavonoid test

In aqueous solution, FeCl_3 decomposes to produce Fe^{3+} . The Fe^{3+} ions react with phenolate oxygen (ArO^-) to form a complex compound. The charge transfer in the complex compound produces a blue color.

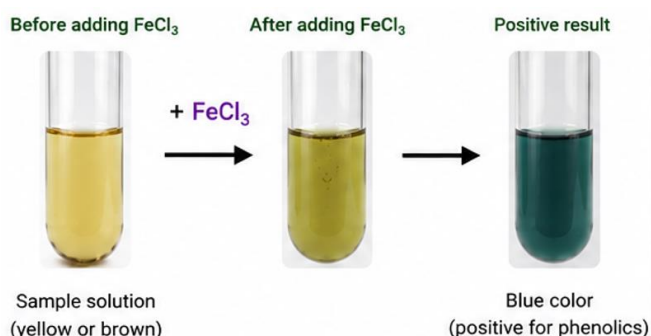


Figure B4 – Reaction of flavonoid test

Phenolic compounds are a group of secondary metabolites that have the potential to contribute to antioxidant activity. The hydrogen atom in the phenolic hydroxyl group can be transferred to a free radical, while the resulting phenoxy radical is relatively stable due to the delocalization of electrons in the aromatic ring [13].

C. Antioxidant Activity

The antioxidant activity of sungkai leaf extract was determined using the DPPH method. Tests were conducted at extract concentrations of 10, 20, 30, 40, and 50 ppm. The results showed an increase in the percentage of inhibition with increasing extract concentration.

Table C1 – DPPH radical scavenging activity of the extract

Extract concentration (ppm)	Absorbance	Inhibition (%)
10	0.343	37.84
20	0.292	47.37
30	0.235	58.99
40	0.176	68.51
50	0.108	81.42

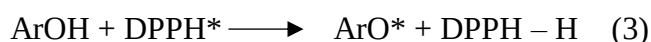
Increasing the extract concentration from 10 to 50 ppm resulted in a decrease in absorbance from 0.343 to 0.108. At the same time, the inhibition percentage increased from 37.84% to 81.42%. This pattern indicates that the higher the extract concentration, the greater the amount of antioxidant components available to react with DPPH radicals. Consequently, the remaining DPPH radical concentration decreases, and the measured absorbance also decreases.

D. Mechanism of Extract Reaction with DPPH Radicals

The antioxidant activity of extracts can be explained by the ability of hydrogen or electron donor compounds to reduce DPPH radicals. In general, the reaction can be written as:



AH is an antioxidant compound that releases a hydrogen atom to the DPPH radical. DPPH, which is originally in the form of a radical, changes to a more stable form. For phenolic compounds, the reaction can be described as:



ArO^* , or phenoxy radicals, produced from the reaction of phenolic compounds can be stabilized through resonance within the aromatic structure [6], [13]. These

two mechanisms give flavonoids and phenolic compounds the ability to scavenge free radicals (act as antioxidants). The color change is the basis for spectrophotometric measurements at a wavelength of 517 nm.

E. IC_{50} of Extract

Based on the relationship between extract concentration and inhibition percentage, the IC_{50} value of the extract was 21.95 ppm. Table 4. IC_{50} value of sungkai leaf extract.

Table E1 – IC_{50} value of sungkai leaf extract

Ssample	IC50 (ppm)	Intrepretation
Sungkai leaf extract	21.95	Very strong
Vitamin C	4.18	Very strong

Thus, sungkai leaf extract has antioxidant activity in the very strong category. However, the IC_{50} value of the extract is still higher than that of vitamin C. Higher values indicate that the concentration required to inhibit 50% of DPPH radicals is higher, so that the radical scavenging activity is lower. Based on these results, sungkai leaf extract shows lower activity than that of vitamin C. This indicates that not all elements in sungkai leaf extract play a role in scavenging DPPH radicals.

F. Relationship Between Secondary Metabolites And Antioxidant Activity

Phytochemical screening results indicated the presence of flavonoids and phenolics in sungkai leaf extract. These two groups of compounds are suspected to play a role in the observed antioxidant activity. This relationship can be explained by the ability of hydroxyl groups to donate hydrogen atoms:



Phenolic compounds that have lost a hydrogen atom form phenoxy radicals (ArO^*). These radicals are relatively stable because the unpaired electron can be delocalized within the aromatic system. Flavonoids also possess a structural system that allows radical stabilization through resonance. Therefore, the ability to reduce DPPH radicals depends on the number of compounds that can donate H atoms or electrons. The greater the number of donors, the greater the ability [12].

In this study, the presence of flavonoids and phenolics, along with the very strong DPPH activity, indicates that flavonoids and phenolics play a role in the antioxidant activity of sungkai leaf extract. However, because the phytochemical screening analysis was only qualitative, this relationship remains indicative.

CONCLUSION

This study showed that maceration using 70% ethanol can produce 18.10% sungkai leaf extract. The results also qualitatively confirmed the flavonoid and phenolic content of sungkai leaves, which exhibited very strong free radical scavenging abilities under the test conditions used. These findings suggest that the bioactive compounds from sungkai leaf extract can be further developed. Chemically, this activity is thought to be related primarily to the presence of flavonoids and phenolics, which have hydroxyl groups and are capable of donating hydrogen atoms or electrons to the DPPH radical. Thus, the ethanol extract of sungkai leaves has potential as a source of natural antioxidant compounds. Characterization using FTIR and GC-MS can be carried out in further research to obtain more specific information regarding the functional groups and chemical components that contribute to antioxidant activity.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Primandari SRP conceptualized and wrote the paper; Kusunda AJ conducted the research; Elshaarani T analyzed the data; all authors approved the final version.

Author Contribution Statement (CRediT Taxonomy): Author 1: Conceptualization (lead), Methodology, Writing – Original Draft. Author 2: Investigation, Resources. Author 3: Formal analysis, Data curation

ACKNOWLEDGMENT

The authors wish to thank to all parties who supported this study.

Copyright © 2026 by the author(s). This article is published as Open Access under the [Creative Commons Attribution-ShareAlike 4.0 International \(CC BY-SA 4.0\)](#) license. This license permits use, distribution, and reproduction in any medium, provided the original work is properly cited. Derivative works must be distributed under the same license

REFERENCES

- [1] Mohammad Kanedi, Kusuma Handayani, and Wawan Abdullah Setiawan, "Therapeutic potentials of sungkai (*Peronema canescens* Jack.) an Indonesian luxurious woody plant," *World Journal of Biology Pharmacy and Health Sciences*, vol. 11, no. 1, pp. 069–073, Jul. 2022, doi: 10.30574/wjbphs.2022.11.1.0110.

- [2] H. Doloking, N. Tahar, Mukhriani, and Surya Ningsi, "Flavonoids: a review on extraction, identification, quantification, and antioxidant activity," *Ad-Dawaa' Journal of Pharmaceutical Sciences*, vol. 5, no. 1, Aug. 2022, doi: 10.24252/djps.v5i1.29329.
- [3] J. Hayat *et al.*, "Phytochemical screening, polyphenols, flavonoids and tannin content, antioxidant activities and FTIR characterization of *Marrubium vulgare* L. from 2 different localities of Northeast of Morocco," *Heliyon*, vol. 6, no. 11, p. e05609, Nov. 2020, doi: 10.1016/j.heliyon.2020.e05609.
- [4] M. Jafari, Y. Ramezan, B. Tajeddin, and M. R. Khani, "Optimization of plasma-activated water-assisted extraction of basil seed (*Ocimum basilicum* L.) mucilage: Effect on phenols, flavonoids, antioxidant, thermal and morphological properties," *Innovative Food Science & Emerging Technologies*, vol. 99, p. 103876, Jan. 2025, doi: 10.1016/j.ifset.2024.103876.
- [5] A. Kokom, Yasmiwar Susilawati, Sri Adi Sumiwi, and Okta Nama Putra, "Pharmacological profile and therapeutic potential of sungkai plant (*Peronema canescens* Jack.): An emerging Indonesian herbal medicine," *Jurnal Sains Farmasi & Klinis*, vol. 11, no. 2, pp. 95–102, Nov. 2024, doi: 10.25077/jsfk.11.2.95-102.2024.
- [6] M. MUHARNI, F. FERLINAHAYATI, H. YOHANDINI, F. RIYANTI, and N. A. P. PAKPAHAN, "The anticholesterol activity of betulinic acid and stigmaterol isolated from the leaves of sungkai (*Paronema canescens* Jack)," *International Journal of Applied Pharmaceutics*, pp. 198–203, Mar. 2021, doi: 10.22159/ijap.2021v13i2.40372.
- [7] F. Fadlilaturrahmah, A. Khairunnisa, A. MP Putra, and I. Sinta, "Uji aktivitas tabir surya dan antioksidan ekstrak etanol daun sungkai (*Peronema canescens* jack)," *Jurnal Ilmiah Ibnu Sina (JIIS): Ilmu Farmasi dan Kesehatan*, vol. 6, no. 2, pp. 322–330, Oct. 2021, doi: 10.36387/jiis.v6i2.737.
- [8] M. Zhu, J. Bao, P. Liang, C. Zhang, S. Li, and F. Hu, "Extraction of flavonoids and phenolic acids from poplar-type propolis: optimization of maceration process, evaluation of antioxidant and antimicrobial activities," *LWT*, vol. 233, p. 118481, Oct. 2025, doi: 10.1016/j.lwt.2025.118481.
- [9] V.-L. Nguyen, "Effects of drying temperature and extraction conditions on phenolic compounds, flavonoids, and antioxidant activity of *Sonneratia caseolaris* (L.) Engl. fruit," *Biocatal. Agric. Biotechnol.*, vol. 73, p. 103991, Apr. 2026, doi: 10.1016/j.bcab.2026.103991.
- [10] B. Ouattara, I. Semay, J. C. W. Ouédraogo, Y. L. Bonzi-Coulibaly, P. Gerbaux, and I. W. K. Ouédraogo, "Phenolic compounds from *Cymbopogon citratus* (DC.) Stapf leaf extracts: extraction optimization, flavonoids LC-MS characterization and stability assessment," *Cleaner Chemical Engineering*, p. 100227, Jun. 2026, doi: 10.1016/j.clce.2026.100227.
- [11] W. Ahmada, N. Msuya, K. Janga, A. Itika, M. G. Mathias, and E. Elisante, "Solubility-guided carbon dioxide expanded liquid extraction of flavonoids and other phenolic compounds from *Garcinia buchananii* bark," *J. Supercrit. Fluids*, vol. 237, p. 107062, Nov. 2026, doi: 10.1016/j.supflu.2026.107062.
- [12] J.-S. Kim, "Flavonoids, an overview: Chemical structures, dietary sources, and biological properties," *Food Engineering Progress*, vol. 24, no. 3, pp. 151–163, Aug. 2020, doi: 10.13050/foodengprog.2020.24.3.151.
- [13] T. Maigoda, J. Judiono, D. B. Purkon, A. N. E. M. Haerussana, and G. P. E. Mulyo, "Evaluation of *Peronema canescens* leaves extract: Fourier Transform Infrared Analysis, total phenolic and flavonoid content, antioxidant capacity, and radical scavenger activity," *Open Access Maced. J. Med. Sci.*, vol. 10, no. A, pp. 117–124, Jan. 2022, doi: 10.3889/oamjms.2022.8221.