

Phytochemical screening and antioxidant activity of Gyrinops tea from agarwood plantation on Lombok island, Indonesia

by Aluh Nikmatullah

Submission date: 10-Dec-2021 03:23PM (UTC+0700)

Submission ID: 1726416070

File name: 36_Phytochemical_screening_and_antioxidant_activity.pdf (765.51K)

Word count: 3129

Character count: 17747

Phytochemical screening and antioxidant activity of Gyrinops tea from agarwood plantation on Lombok island, Indonesia

I G A S Wangiyana^{1*}, Supriadi², A Nikmatullah³, Sunarpi⁴, D S Putri⁵, and S Rosidah⁴

¹Forestry Department, Universitas Pendidikan Mandalika, Mataram, Indonesia

²Veterinary Department, Universitas Pendidikan Mandalika, Mataram, Indonesia

³Agro-technology Department, Mataram University, Mataram, Indonesia

⁴Biology Department, Mataram University, Mataram, Indonesia

⁵Food Processing Technology Department, Universitas Muhammadiyah Matram, Mataram, Indonesia

*corresponding author e-mail: dede.consultant@gmail.com

Abstract. Phytochemical screening and antioxidant analysis are essential standardization procedure for the agarwood tea product. Gyrinops tea is an agarwood tea that has been emerged on Lombok Island recently. This research aims to carry qualitative phytochemical analysis and antioxidant activity assay of Gyrinops tea from several agarwood plantations on Lombok Island. *Gyrinops versteegii* leaves as the raw material of Gyrinops tea were taken from several agarwood plantations on Lombok Island, including Lingsar, Rarung, Kekait, Pejaring, and Mataram. There are three steps on *G. versteegii* leaves processing method into Gyrinops tea, including sterilization, drying, and chopping. *G. versteegii* leaves were brewed in distilled water at 70°C for 5 minutes to make Gyrinops tea. Phytochemical screening of Gyrinops tea was conducted with a qualitative assay identification of Flavonoid, Alkaloid, Saponin, and Tannin. The antioxidant assay of Gyrinops tea was investigated based on DPPH radicals scavenging activity. The result shows that Gyrinops tea positively contains tannin in high dosage and Flavonoid in a moderate dose with no alkaloid and saponin. Gyrinops tea samples have various antioxidant activity from moderate to strong based on IC50 measurement. It could be concluded that different sampling location has affected antioxidant activity of Gyrinops tea.

1. Introduction

Agarwood tea is an excellent alternative utilization of agarwood commodities [1]. This product was made from agarwood leaves that could be harvested periodically by agarwood farmers [2] [3]. The agarwood leaves utilization into agarwood tea could give agarwood farmers additional income during the waiting period of agarwood resin harvesting. Moreover, agarwood tea production involves a simple method quickly learned by agarwood farmers [4].

Agarwood species from Aquilaria genus are well known as the raw material of agarwood tea products [3]. In Indonesia, Agarwood tea products from Aquilaria genus are mostly well developed on Sumatra Island [5], [6]. This agarwood tea product is well known as “Aqila Tea” with good economic feasibility [1]. However, agarwood species well distributed on Lombok Island is *Gyrinops versteegii* instead of Aquilaria sp [7]. Thus, the development of agarwood tea on Lombok Island should be focused on *Gyrinops versteegii* as the raw material source [2]



Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

Published under licence by IOP Publishing Ltd

Gyrinops tea is an agarwood tea made from *Gyrinops versteegii* leaves [8]. This product has been well developed by agarwood farmers on Lombok Island, mostly from the West Lombok region [9]. It is also well accepted by Lombok Island society based on hedonic assay [10]. Thus, Gyrinops tea has an excellent prospect to develop on Lombok Island. To further develop this product as a potential herbal tea commodity, it is essential to carry quality standardization.

Phytochemical screening and antioxidant assay are the most expected quality standardization on agarwood tea products [11]. Several studies have proven that agarwood tea from *Aquilaria* members contains a chemical compound with good antioxidant activity [6], [12]. This antioxidant activity is affected by the environmental condition of the *Aquilaria* habitat [13]. However, phytochemical screening and antioxidant assay of agarwood tea from *Gyrinops versteegii* have rarely been conducted. Phytochemical screening and antioxidant assay of Gyrinops tea are essential for developing this product, especially on Lombok Island [14]. *G. versteegii*, the raw material of this product, is well distributed on Lombok Island. Thus, the phytochemical assay and antioxidant activity of Gyrinops tea should represent a variant of this species in a different region of Lombok Island [15]. This research aims to carry qualitative phytochemical analysis and antioxidant activity assay of Gyrinops tea from several agarwood plantations on Lombok Island.

2. Materials and methods

2.1. Sampling location and Sample preparation

Gyrinops versteegii leaves were taken from 5 regions on Lombok Island, including Lingsar (West Lombok), Rarung (Central Lombok), Pejaring (East Lombok), Kekait (North Lombok), and Mataram (table 1). Leaves processing and Gyrinops tea extraction were conducted at General Forest Research Laboratory of Pendidikan Mandalika University. Phytochemical Screening was conducted at Agriculture Chemistry Laboratory of Muhammadiyah Mataram University. Antioxidant activity measurements were conducted at the Immunobiology Laboratory of Mataram University.

Table 1. Sampling location of *Gyrinops versteegii* leaves.

Location	Coordinate (Latitude-Longitude)	Elevation (m)
Rarung	8°33'26''S 116°17'38''E	410
Kekait	8°31'26''S 116°07'03''E	24
Mataram	8°33'58''S 116°07'47''E	42
Lingsar	8°33'32''S 116°09'25''E	72
Pejaring	8°42'28''S 116°27'11''E	200

2.2. Sample collection

G. versteegii tree was chosen from agarwood plantation on Lombok Islands (Table 1). Leaves were taken from *G. versteegii* tree after selection based on size, shape, and condition. Leaves with length from 5 cm – 15 cm with no chlorosis and necrosis were chosen as a sample for Gyrinops tea production [9]

2.3. Raw material preparation

G. versteegii leaves were washed with flowing water for three times to clear dirt and dust on them. The leaves then were dried on a drying rack at room temperature for 2 – 3 days until they lost 10% of water content. Dried leaves were chopped using a grinding machine to form a 1 – 2 mm particle size [4]. The particles were stored for further analysis.

2.4. Gyrinops tea extraction

G. versteegii particle leaves were extracted using distilled water to form Gyrinops tea products. Five-gram particles were extracted on 250 ml (concentration 0.02 gr/ml) distilled water and were heated 70°C for 5 minutes. The filtrate was taken by filtration using a qualitative filter paper [14]. The Gyrinops tea samples were stored for further analysis.

2.5. Phytochemical screening

Phytochemical screening is carried by a qualitative chemical assay to examine compounds that have antioxidant activity. Four chemical compounds were examined in this study by qualitative chemical tests, including Tannin, Flavonoid, Alkaloids, and Saponins. These tests using a different method and chemical reagent (Table 2).

Table 2. Phytochemical screening procedure.

Assay	Reagent	Indicator	Reference
Tannin test	FeCl ₃	Changing solution into blackish brown	[16]
Flavonoid test	PbCH ₃ COO	Formation of white precipitates	[17]
Alkaloid test	Wagner's reagent Dragendroff's reagent Mayer's reagent	Formation of precipitant on the solution	[18]
Saponins test	HCl	Formation of stable foam for 5 minutes	[19]

2.6. Antioxidant activity assay

The antioxidant activity of Gyrinops tea was carried by DPPH free radical scavenging method based on [20] with some modification. Serial dilution of Gyrinops tea were carried using absolute methanol to form different concentration including: 150 µg/ml, 125 µg/ml, 100 µg/ml, 75 µg/ml, 50n µg/ml. Pure vitamin C was used as a positive control. Absorbance measurement of each Gyrinops tea concentration was performed by a UV-Vis spectrophotometer at 516 nm wavelength.

Scavenging Activity Percentage were measured using equation [21]

$$\% \text{ Scavenging Activity} = \left(\frac{A_{\text{blanko}} - A_{\text{sample}}}{A_{\text{sample}}} \right) \times 100\%$$

IC₅₀ measurements were calculated based on the linear regression interpolation of scavenging activity percentage data. The IC₅₀ value is the concentration of Gyrinops tea that could give 50% of scavenging activity inhibition.

3. Results and Discussion

3.1. Phytochemical screening

Phytochemical screening is the preliminary test to examine secondary metabolites that have antioxidant activity. Secondary metabolites on the plant are commonly produced as a defense mechanism of the plant again pressure on its habitats. Two plant organisms but classified into the same species could have different secondary metabolites characteristic if they grow on different habitat conditions [22]. However, in this study, 5 Gyrinops tea samples taken from different regions with different environmental conditions on Lombok Island have shown the same characteristic of secondary metabolite profile (Table 3). All of these Gyrinops tea samples contain tannin and Flavonoid with no alkaloid and saponins. These two compounds are important secondary metabolites that commonly found on agarwood leaves from *Aquilaria* genus [23][24] and *Gyrinops* genus [25].

Gyrinops tea from Mataram is the only sample with an abundance of tannin concentration. Tannin is an important secondary metabolite that could determine the quality of herbal tea products. Moreover, tannin is a standard compound on agarwood tea product that has mostly been examined. Tannin content on agarwood tea products has a positive correlation with the antioxidant capacity [13]. Thus it could be hypothesized that Gyrinops tea from Mataram region has the highest antioxidant capacity among other regions.

Table 3. Phytochemical screening result of Gyrinops tea sample.

Compounds	Sampling Location				
	Mataram	Langko	Pejaring	Rarung	Kekait
Tannin	++	+	+	+	+
Flavonoid	+	+	+	+	+
Alkaloid	-	-	-	-	-
Saponins	-	-	-	-	-

Gyrinops tea from all regions has shown flavonoid content. Flavonoid is a compound that has been responsible for the antioxidant activity of *G. versteegii* leaves extract [26]. This result could support the hypothesis that Gyrinops tea from all regions should have antioxidant activity.

Saponins compound could not be found on Gyrinops tea from all regions. This chemical characteristic of Gyrinops agarwood tea is different from the chemical characteristic of Aquilaria agarwood tea. Agarwood tea from Aquilaria has been reported to contain saponin based on phytochemical screening [24]. Thus, the taste of Gyrinops agarwood tea should be different from the taste of Aquilaria agarwood tea.

3.2. Antioxidant Assay

An antioxidant assay based on DPPH free radical scavenging method shown different antioxidant activity of Gyrinops tea from different regions. Based on the linear regression slope value, Gyrinops tea from Mataram regions has the highest antioxidant activity among other regions. This result has confirmed previous phytochemical screening results showing that Gyrinops tea from Mataram has the highest tannin concentration. Tannin concentration on agarwood tea has a positive correlation with its antioxidant activity.

3.3. Measurement of IC50

Different antioxidant activity of Gyrinops tea from different regions has affected its different IC50 values (Table 4). Gyrinops tea from the Mataram region has the highest IC50 value since it has the highest antioxidant activity. Gyrinops tea of Mataram also the only sample that has strong antioxidant strength based on its IC50 value.

Table 4. IC50 Measurement Result.

Region	IC50 (µg/ml)	Antioxidant Strength Category
Mataram	68.58 ± 4.69	Strong
Langko	142.78 ± 4.78	Moderate
Kekait	123.82 ± 5.23	Moderate
Rarung	233.4 ± 8.8	Weak
Pejaring	103.94 ± 3.61	Moderate

Standard Value of Antioxidant Power Category [11]

Very Strong : < 50 µg/ml
 Strong : 50 µg/ml – 100 µg/ml
 Moderate : 101 µg/ml – 150 µg/ml
 Weak : 151 µg/ml – 200 µg/ml

Environmental conditions of plant habitat play an essential role in secondary metabolite production. An unfavorable habitat that leads to plant stress conditions could improve several secondary metabolites for defensive mechanisms [22]. Mataram region is the only *G. versteegii* habitat on Lombok Island that located at urban area. This condition is much worse than the condition of *G. versteegii* natural habitat. Thus, *G. versteegii* from Mataram regions has been forced to produce higher secondary metabolites than the regions with similar conditions with *G. versteegii* natural habitat.

Gyrinops tea has a lower IC50 value compare to *G. versteegii* leaves extract. *G. versteegii* leaves extracted with methanol has very strong antioxidant strength with 22.13 µg/ml IC50 value. On the other hand, Gyrinops tea from this study only has 68.58 µg/ml IC50 value, which is classified into a strong antioxidant strength category. The lower antioxidant strength of Gyrinops tea hypothetically is caused by the low extracting power of water compare to the extracting power of methanol as an organic solvent [27]. However, this study could give the closest phytochemical data for the food industry since it directly using agarwood tea products as a sample. A study about agarwood antioxidant activity was used agarwood leaves extract instead of agarwood tea product.

4. Conclusion

Different sampling location with different environment condition has affected the antioxidant activity of Gyrinops tea. However, based on qualitative screening, no different chemical compounds were detected from Gyrinops tea from those different sampling locations.

3 Acknowledgments

The authors would like to thank the Indonesian Ministry of Research and Technology for research grant scheme "Penelitian Kerjasama Perguruan Tinggi" that supports this research.

References

- [1] Karsiningsih E 2016 Analisis Kelayakan Finansial dan Strategi Pengembangan Teh Gaharu di Kabupaten Bangka Tengah (Studi Kasus: Teh Gaharu 'Aqilla' Gapoktan Alam Jaya Lestari) *Agrar. J. Agribus. Rural Dev. Res.* **2**, pp.143–151.
- [2] Wangiyana I G A S and Samiun 2017 Characteristic of Agarwood Tea From *Gyrinops versteegii* Fresh and Dry Leaves *J. Sangkareang mataram* **4** pp. 41–44.
- [3] Adam A Z Lee S Y Lee and Mohamed,R Pharmacological properties of agarwood tea derived from *Aquilaria* (Thymelaeaceae) leaves: An emerging contemporary herbal drink," *J. Herb. Med.*, **10** pp 37–44
- [4] Wangiyana I G A S, Putri D S and Triandini I G G A H Pelatihan Pengolahan Daun Gaharu Menjadi Teh Herbal Untuk Istri Petani Anggota Kelompok Tani Desa Duman, *Logista J. Ilm. Pengabd. Kpd. Masy.* **3** pp 82–89
- [5] Adrianar N Batubara R and Julianti E 2015 Value of Consumers Preference Towards To Agarwood Tea Leaves (*Aquilaria malaccensis* Lamk) Based on The Location Of Leaves In The Trunk," *Peronema For. Sci. J.*, **4** pp 12–16
- [6] Simatupang J, Batubara R and Julianti E 2015 Consumers acceptance and antioxidant of the agarwood (*Aquilaria malaccensis* Lamk.) leaves tea based on the shape and size of leaves," *Peronema For. Sci. J.* **4**, pp 1–11
- [7] Mulyaningsih T and Yamada I 2008 Notes on some species of agarwood in Nusa Tenggara, Celebes and West Papua in *Natural Resource Management and Socio-economic transformation under decentralization in Indonesia: Toward Sulawesi area studies*, Kyoto: CSEAS Kyoto University pp 365–72.
- [8] Wangiyana I G A S, Triandini I G A A H, Putradi D and Wangiyana W 2018 Tannin concentration of gyrinops tea from leaves of juvenile and mature agarwood trees (*gyrinops versteegii* gilg (domke)) with different processing methods *J. Chem. Pharm. Res.* **10** pp 113–19
- [9] Wangiyana I G A S and Putri D S 2019 Teh gyrinops : produk inovatif dari istri petani desa duman kecamatan lingsar kabupaten lombok barat in *Prosiding PEPADU* **1** pp 388–96.
- [10] Wangiyana I G A S and Sami'un 2019 Pengolahan daun gaharu (*gyrinops versteegii*) menjadi teh herbal dengan kualitas warna dan rasa yang disukai in *Prosiding Seminar Sainstek* pp 156–62.
- [11] Surjanto, Batubara R, Hanum T I and Pulungan W 2019 Phytochemical and antioxidant activity

- of gaharu leaf tea (*aquilaria malaccensis* lamk) as raw material of tea from middle tapanuli reGENCY, north sumatera province in *IOP Conference Series: Earth and Environmental Science* **260** pp 1–6
- [12] Batubara R Hanum T I, Risnasari I, Ginting H and Lubis L A 2018 Antioxidant activity and preferences test of agarwood leaves tea (*aquilaria malaccensis* lamk) based on leaves drying methods in *Proceedings of BROMO Conference* **2018** pp 159–63
- [13] Batubara R, Hanum T I, Handika A and Affandi O 2020 The screening of phytochemical and antioxidant activity of agarwood leaves (*Aquilaria malaccensis*) from two sites in North Sumatra , Indonesia *Biodiversitas*, **21** pp 1588–96
- [14] Wangiyana I G A S, Sawaludin, Nizar W Y and Wangiyana W 2019 Tannin concentrations of gyrinops tea with different leaf processing methods and addition of herbal medicine ingredients tannin concentrations of gyrinops tea with different leaf processing methods and addition of herbal medicine ingredients in *AIP Conference Proceedings* **2199** pp. 1–7.
- [15] Iswanti W Mulyaningsih T and Muspiah A 2017 Karyomorphology and chromosome number of four groups of *Gyrinops versteegii* (Gilg.) Domke in Lombok *J. Ilmu Kehutan* **11**, pp. 205–11
- [16] Hidayah W W, Kusri D and Facriyah E 2016 Isolasi, identifikasi senyawa steroid dari daun getih-getihan (*Rivina humilis* L.) dan uji aktivitas sebagai antibakteri *J. Kim. Sains dan Apl.* **19** pp 32–37
- [17] Geoffrey K K, John K M, Naomi M and Simon K M 2014 Qualitative phytochemical screening of *camellia sinensis* and *psidium guajava* leave extracts from kericho and baringo counties *Int. J. Adv. Biotechnol. Res.* **5** pp. 506–12
- [18] Inamdar P, Jelamvazir, Desai S, Patel D and Meshram D 2014 Phytochemical screening and in vitro antifungal activity of *camellia sinensis* *Int. J. Pharm. Pharm. Sci.* **6** pp. 148–50
- [19] Novianti T, Zainuri M and Widowati I 2019 Aktivitas antioksidan dan identifikasi golongan senyawa aktif ekstrak kasar mikroalga *chlorella vulgaris* yang dikultivasi berdasarkan sumber cahaya yang berbeda *Barakuda* **45** **1** pp. 72–87
- [20] Molyneux P 2004 The use of the stable free radical diphenyl-picrylhydrazyl (dpph) for estimating antioxidant activity *Songklanakar J. Sci. Technol* **26** pp. 212–19
- [21] Prihantini A I and Rizqiani K D 2019 Various antioxidant assays of agarwood extracts (*Gyrinops versteegii*) from West Lombok, West Nusa Tenggara, Indonesia *Asian J. Agric.* **3** pp. 1–5
- [22] Mohiuddin A K 2019 Impact of various environmental factors on secondary metabolism of medicinal plants *J Pharmacol Clin Res* **7** pp 1–10
- [23] Wil N N A N, Omar N A M, Ibrahim N A and Tajuddin S N 2014 In vitro antioxidant activity and phytochemical screening of *Aquilaria malaccensis* leaf extracts *J. Chem. Pharm. Res.* **6** pp 688–93
- [24] Batubara R, Hanum T I and Surjanto 2018 Phytochemical and tannin content in two species of agarwood leaves from Mandailing Natal Regency North Sumatera Province Phytochemical and Tannin Content in Two Species of Agarwood Leaves From Mandailing Natal Regency North Sumatera Province in *AIP Conference Proceedings* **2049** pp. 1–5.
- [25] Parwata A, Manuba P, Yasa S and Bidura I G N G 2016 Characteristics and antioxidant activities of gaharu (*gyrinops versteegii*) leaves *J. Biol. Chem. Res.* **33** pp 294–301
- [26] Parwata A, Manuaba P and Yasa S 2018 The potency of flavonoid compounds in water extract *Gyrinops versteegii* leaves as natural antioxidants sources *Biomed. Pharmacol. J.* **11** pp. 1501–11
- [27] Sepahpour S, Selamat J, Manap M Y A, Khatib A and Razis A F A 2018 Comparative analysis of chemical composition, antioxidant activity and quantitative characterization of some phenolic compounds in selected herbs and spices in different solvent extraction systems *Molecules* **23** pp. 1–17

Phytochemical screening and antioxidant activity of Gyrinops tea from agarwood plantation on Lombok island, Indonesia

ORIGINALITY REPORT

12%

SIMILARITY INDEX

0%

INTERNET SOURCES

14%

PUBLICATIONS

3%

STUDENT PAPERS

PRIMARY SOURCES

- 1** I G A S Wangiyana, Supriadi, A Nikmatullah, Sunarpi, L Mulyaningsih. "Tannin Concentration of Gyrinops Tea Taken Form Different Agarwood Plantation and Different Processing Method", IOP Conference Series: Earth and Environmental Science, 2021
Publication **5%**
- 2** T Sjah, Halil, I Budastra, I G L P Tanaya. "Developing porang agribusiness for multiple stakeholder benefits and supporting sustainable development in dryland areas of Lombok", IOP Conference Series: Earth and Environmental Science, 2021
Publication **3%**
- 3** Submitted to Universitas Mataram
Student Paper **3%**

Exclude quotes On

Exclude matches < 3%

Exclude bibliography On

