Characterization and Antioxidant Activity of Herbal Tea from Gambir Leaves (Uncaria gambir) with Different Drying Processes

Gusti Eva Tavita1, Mega Sari Juane Sofiana2, Asri Mulya Ashari3, Rita Kurnia Apindiati3, Lucky Hartanti3, Warsidah2*

1Forestry Department, Universitas Tanjungpura
2Marine Science Department, Universitas Tanjungpura
3Agrotechnology Department, Universitas Tanjungpura

Jln. Prof.Dr. H. Dokter H. Hadari Nawawi, Bansir Laut, Kec.Pontianak Tenggara, Kota Pontianak
*email: warsidah@fmipa.untan.ac.id

Article History
Received: 9 November 2022
Reviewed: 20 July 2023
Accepted: 16 October 2023
Published: 31 December 2023

Key Words
Gambir leaves; Uncaria gambir; Drying; Antioxidants.

Abstract
Recently, natural antioxidants have been explored to reduce the side effects of synthetic antioxidants. Plants from the Rubiaceae family have strong antioxidants and are widely used in food and cosmetic preparations. His study aims to determine gambir leaf herbal tea's physical-chemical characterization and antioxidant activity (Uncaria gambir) in different drying processes. The processing of drying is drying in direct sunlight and drying with an oven at 60°C for 7 hours. The physical-chemical characterizations are water and ash content, pH, and organoleptic of the herbal tea—the antioxidant activity of the herbal tea determination using the free radical scavenging method 2,2-diphenyl-1-picrylhydrazyl (DPPH). The characteristics compare with SNI 3836 of 2013. The herbal tea of Gambir with oven drying is the best yield (53.21%). The antioxidant activity (IC50) of herbal tea in direct sunlight and oven dryings are 122.44 ppm and 82.21 ppm, respectively.

INTRODUCTION
Free radicals can cause cardiovascular disease, diabetes, and neurodegenerative disorders. These radicals accumulate in the body and bind to biomolecules, triggering protein and DNA damage that ultimately causes cancer (Khan et al., 2016). Free radicals are not only formed naturally in physiological processes but also from external factors, such as exposure to tobacco smoke (Ściskalska et al., 2014), heavy metal pollutants (lead, cadmium, chromium, and arsenic), benzene and polycyclic aromatic hydrocarbons (PAHs) from the environment (Numan et al., 2015). Biological systems have defense mechanisms to respond to free radicals. However, high free radicals in the body will no longer be able to recover naturally. Therefore, the body needs antioxidants from external sources (Khan et al., 2016).

Herbal tea is a beverage that is widely used as a supplement in the human diet. It provides antioxidant compounds that are beneficial to health. Herbal tea is consumed worldwide because of its refreshing taste, aroma, and healthcare benefits (Fatanah et al., 2018). This tea is derived from leaves, seeds, flowers, roots, or dried fruit (Supartini et al., 2020). It can be a mixture of several ingredients from many different herbs (Ravikumar, 2018).

Uncaria gambir Roxb. is a species of the Rubiaceae family that has been used as an herbal tea. This species has been found in North Sumatra (Rauf et al., 2015), West Sumatra and
Riau (Sabarni, 2015), South Sumatra (Pambayun et al., 2007), East Nusa Tenggara (Sulistyaningrum et al., 2020), and West Kalimantan (Iskandar et al., 2020). The main ingredients are catechins and catechutannic acid, which have many benefits. Catechins are polyphenolic flavonoid compounds Gambir produces as secondary metabolites (Kamsina et al., 2020). This compound is an antioxidant compound present in Gambir. Catechins have been isolated from U. gambir Roxb. from Padang, West Sumatra. The antioxidant activity of catechins in 70% ethanol, 70% methanol, and ethyl acetate extracts had IC50 values of 2.72; 3.04; and 3.06 ppm, respectively (Ediningsih et al., 2018). Research on herbal tea from Gambir leaves with different fermentation times has been carried out. The highest antioxidant activity (IC50 228.39 ppm) was indicated by herbal tea with a fermentation time of 42 hours. Catechins and tannins obtained from the tea are 1.85% and 2.29%, respectively (Eviza, 2021). The different methods to get herbal tea affected the characteristics of tea. Therefore, this study aimed to determine the effect of drying on the herbal tea of Gambir leaves.

**METHOD**

**Sample Preparation**

Gambir leaves were obtained from Pontianak, West Kalimantan, in October 2021. Sample preparation follows the procedure of Wiratara and Ifadah (2022). The gambir leaves are picked from the 5th to 10th leaf from the leaf shoots, collected, cleaned with running water, and drained. Furthermore, the leaves wilthered at 30°C for 8 hours. Then, the wilted gambir leaves were dried in 2 methods. They are dried in direct sunlight daily and in an oven at 60°C for 7 hours. Dry leaves were powdered as herbal tea using a food chopper. Eq. 1 is used to calculate the yield of herbal tea (Ariva et al., 2020):

\[ \text{The yield(%) } = \frac{\text{weight of fresh leaves}}{\text{weight of dry leaves}} \times 100\% \quad (1) \]

**Water Content**

Water content is determined using SNI No 3836 (BSN, 2013). The petri dish was heated in an oven at 105°C for ± 1 hour. The petri dish is allowed to cool in a desiccator (± 15 min) and weighed (w1). Five grams of gambir leaves were inserted into the petri dish and weighed (w0). Furthermore, the sample was heated for 3 hours at 105°C for up-weighting constant. A constant weight was obtained if the difference in weight was ≤0.001 g (using eq.2).

\[ \text{water content(%) } = \frac{w_1-w}\times 100\% \quad (2) \]

**Ash Content**

Determination of total ash content using the procedure of SNI No 3836 (BSN, 2013). Empty crucibles were burned in a furnace at a temperature of 525±25°C. The crucibles were cooled in a desiccator and weighed (c0). Two grams of herbal tea were inserted into a crucible and weighed (c1). The samples were burnt in the furnace at 525±25°C. The ash was grayish. The crucible containing the ash is cooled in a desiccator and weighed (c2). The eq. 3 determined the ash content:

\[ \text{ash content(%) } = \frac{c_2-c_0}{c_1-c_0} \times 100\% \quad (3) \]

**Antioxidant activity**

The antioxidant activity was measured by the 1,1-diphenyl-2-picrylhydrazyl (DPPH) method (Shekhar & Anju, 2014). One gram of the sample was dissolved in 10 mL of hot distilled water, then shaken until homogeneous and cooled. This solution (0.2 mL) was dissolved into 6 mL of 0.1 mM DPPH solution in ethanol. The mixture was shaken vigorously and incubated for an hour in a dark room. Hereafter, the sample was measured by an ultraviolet-visible spectrophotometer at a wavelength of 517 nm. Ascorbic acid is a reference standard compound. The IC50 value of the sample determined free radical scavenging activity. The absorbance of the control and samples were notated as Ac and As, respectively (using eq. 4).

\[ \text{Inhibition(%) } = \frac{A_c-A_s}{A_c} \times 100\% \quad (4) \]

**RESULT AND DISCUSSION**

Herbal teas have bioactive compounds to prevent or treat a disease. They demonstrated clinical benefits for female and maternal health, diabetes, weight loss, heart disease, and high blood pressure (Poswal et al., 2019). Gambir is
one of the plants reported to have antioxidant activity, especially in its leaves. The predominant secondary metabolite of gambir leaves is catechins (Saad et al., 2020). This polyphenolic derivative has an antioxidative and antiinflammatory effect and prevents neurodegenerative disorders (Ide et al., 2018). The other bioactivity of gambir has been reported. They are antibacterial (Magdalena & Kusnadi, 2015), hepatoprotection (Suparni et al., 2020), antihypertension (Permatasari et al., 2022), atherosclerosis (Yunarto & Aini, 2015), and antihyperglycemic (Viena & Nizar, 2018).

Drying leaf samples affect the quality of the herbal tea produced. Drying aims to reduce water contents to extend the shelf life. The high moisture of the samples enhanced microbial growth (Zambrano et al., 2019). The drying temperature significantly affects the yield, ash content, total polyphenols and tannins, and antioxidants of herbal tea (Ismanto et al., 2020). This research uses indirect drying in sunlight for a day (the samples are covered with paper) and heating in an oven at 60°C for 7 hours. The physicochemical characteristics of each drying process are shown in Table 1. The odor and color met the SNI No 3836 requirements for tea.

The selection of the drying process with sunlight is based on considering the sun's intensity in the West Kalimantan area. Indirect drying in sunlight avoids damaging or decreasing bioactive compounds in the samples (Komariah et al., 2021). Meanwhile, selecting a temperature of 60°C for 7 hours is based on the research by Wiratara & Ifadah (2022). A temperature of 60°C produces the best tea quality than drying at 50°C (Wiratara & Ifadah, 2022). Both drying processes have the quality required by SNI 3836 (BSN, 2013).

The antioxidant activity of gambir herbal tea was determined. The IC$_{50}$ of sun drying (122.44 ppm) is classified as a weak antioxidant, and the IC$_{50}$ of oven drying (82.21 ppm) is classified as a strong antioxidant. The lower IC$_{50}$ value indicated the highest antioxidant activity (Cruz).

**Table 1. Characteristics of gambir herbal tea and antioxidant activity**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Drying in oven</th>
<th>Drying in sunlight</th>
<th>Standard SNI 3836:2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (%)</td>
<td>53.21</td>
<td>50.53</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>6.9</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Light brown</td>
<td>Light brown</td>
<td>characteristics of teas</td>
</tr>
<tr>
<td>Taste</td>
<td>Bitter</td>
<td>Bitter</td>
<td>characteristics of teas</td>
</tr>
<tr>
<td>Odor</td>
<td>Odor like green tea</td>
<td>Odor like green tea</td>
<td>characteristics of teas</td>
</tr>
<tr>
<td>Antioxidant (IC$_{50}$) ppm</td>
<td>82.21</td>
<td>122.44</td>
<td></td>
</tr>
</tbody>
</table>

**CONCLUSION**

We can conclude that the physicochemical characteristics of herbal tea gambir leaves require the standard of tea based on SNI No 3836:2013 in both dryings processed. The herbal tea has a green color and green tea aroma. Drying gambir leaves in the oven has a higher yield of 53.21% and the and highest antioxidant activity (IC$_{50}$ 82.21 ppm).

**REFERENCES**


Teh Kering Dalam Kemasan.
The Condition of Uncaria Gambir Roxb. as One of Important Medicinal Plants in North Sumatra Indonesia. Procedia Chemistry, 14, 3–10. 
https://doi.org/https://doi.org/10.1016/j.proche.2015.03.002


https://doi.org/10.4314/tjpr.v19i8.28


https://doi.org/10.1007/s12011-014-9984-9


https://doi.org/10.4269/ajtmh.19-0780

https://doi.org/10.22270/jddt.v10i6-s.4457

https://doi.org/10.1088/1755-1315/415/1/012022

https://doi.org/10.32672/jse.v3i1.352

https://doi.org/10.17969/jtipi.v14i1.21196

https://doi.org/10.22435/hsji.v6i2 Des.4768.105-110


Sainstek: Jurnal Sains dan Teknologi 
Vol 15 No 2, December 2020 ISSN: 2085-8019 (p), ISSN: 2580-278x (e)