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Antioxidant Activity and Consumer Sensory Perceptions of Uru Lewu (*Eleusine indica*) Formulations

Agnescia Clarissa Sera[1,*], Prisilia Oktaviyani[1], Tommi Prayitno[2]

[1] Department of Nutrition, Poltekkes Kemenkes Palangka Raya, Indonesia.
[2] The National Population and Family Planning Board Representative of Central Kalimantan, Indonesia.

***Corresponding author's email:** agnescia@polkesraya.ac.id
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ABSTRACT

The Dayak indigenous people of Central Kalimantan have traditionally used native plants as food and medicine to alleviate ailments, boost stamina, and extend life. One of these is the goosegrass or uru lewu plant (*Eleusine indica*), which is thought to tighten female organs after birth. However, this has not been empirically confirmed. Phytochemical examinations revealed that this plant boasts three chemicals with anticancer properties and two compounds with antioxidant properties because its bioactive component concentration can be formulated into herbal drinks, such as tea. Three tea formulations were developed and evaluated on 100 consumer panelists to determine their sensory perceptions: F1 (100% uru lewu), F2 (80% uru lewu and 20% black tea), and F3 (60% uru lewu and 40% black tea). The IC50 values for Uru Lewu and black tea in the antioxidant activity test using the DPPH technique were 133.77 mg/kg and 345.01 mg/kg, respectively. This suggests that uru lewu had nearly three times the antioxidant activity of black tea. Uru lewu had moderate antioxidant activity (higher than black tea). Based on the tea's color, aroma, and taste, the F3 tea formulation with 60% uru lewu and 40% black tea was the most chosen formulation by consumers.

Keywords: *Antioxidant, Sensory, Tea, Goosegrass*.
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1. Introduction

Central Kalimantan, the Indonesia's largest province, offers tropical rainforests rich in biodiversity, notably medicinal plants (Aryadi, Fithria, Susilawati, & Fatria, 2014). The indigenous Dayak tribe of Central Kalimantan has recognized and used local plants as food and medicine for years to cure ailments, boost stamina, and prolong life (Setyawan, 2010). Additionally, for women, these herbs also serve as cosmetics, and the attractiveness of Dayak females is frequently associated with the qualities of local Kalimantan herbal plants.

This understanding of Central Kalimantan's particular botanical qualities evolved into indigenous wisdom and passed naturally from generation to generation (Julung, Supiandi, Ege, Mahanal, & Zubaidah, 2013). Unfortunately, much research has not been done to document and investigate the wide range of advantages from these herbal plants (Setyowati, 2012). It is certain that the forests of Kalimantan house hundreds of herbal plant species with characteristics comparable to current medications (Gunadi, Oramahi, & Tavita, 2017). As a result, the traditional medical wisdom based on these herbal constituents should be maintained and expanded through more empirical research.

Researchers identified 17 different varieties of medicinal plants and forest plants with medical qualities by 2020. Uru lewu (*Eleusine indica)* is one of the herbs recommended for further study. Uru lewu is thought to have characteristics that tighten a mother's feminine organs after giving birth. However, this is still limited to inherited cultural legacy, which has yet to be scientifically verified. Even though the uru lewu plant has significant potential as biomedicine, it is frequently considered a nuisance. In addition to its benefits, uru lewu was chosen based on several characteristics, including the fact that it is simple to access and cultivate, that little study has been conducted on it, and that it has the potential to be transformed into a variety of derivative functional food products. The antioxidant activity of uru lewu (blended into a herbal tea) and its consumers' sensory perceptions were investigated in this study.

2. Methods

Uru Lewu plant was collected in Murung Raya Regency, Central Kalimantan, Indonesia. The branches and panicles were cleaned and washed to remove debris, such as soil and dust on the plants. The samples were subsequently dried in a food dehydrator at 40ºC (shown in Figure 1). The drying process is crucial to maintain the chemical components in the plant. Inadequate drying processes can harm the active chemicals in uru lewu. The drying process took 26 hours to achieve samples with less than 10% moisture content. With the lowest possible moisture level, mold and fungus could be avoided in the models. After drying, the samples were transported to PT Saraswanti Indo Genetech's KAN Accredited Laboratory in Bogor, West Java, Indonesia to be evaluated for antioxidant activity using the DPPH technique (2,2-diphenyl-1-picrylhydrazyl).

The dried sample of uru lewu was transformed into three types of herbal tea formulations for the sensory impression test, namely F1: 100% uru lewu, F2: 80% uru lewu, 20% black tea, and F3: 60% uru lewu, 40% black tea. As black tea is a popular beverage among the general audience, uru lewu tea is the final product in this study. The consumer panelists were females aged 20 to 40 because postpartum women were the predominant consumers of this functional drink.

Figure 1. Uru Lewu before and after dehydrated process

The hedonic test was performed at the Organoleptic Laboratory of the Nutrition Department of Poltekkes Kemenkes Palangka Raya. The findings of the antioxidant activity tests were reported descriptively. The hedonic test data were tabulated and presented as a spider diagram to derive conclusions regarding consumers' sensory perceptions of uru lewu tea.

3. Results and Discussion

a. Antioxidant activity

Antioxidants are chemicals that help to inhibit the formation of free radicals in the form of reactive oxygen species (ROS). ROS harms cells in the human body, causing pathogenic diseases and oxidative stress. Antioxidants can neutralize ROS via the antioxidant network mechanism. Antioxidants are classified into two types: those created within the human body (endogenous) and those obtained outside the human body (exogenous). Superoxide dismutase (SOD), glutathione peroxidase (GSH Px), Coenzyme Q10 (CoQ10), and catalase are examples of endogenous antioxidants (Andarina & Djauhari, 2017). In general, the number of endogenous antioxidants available will not be sufficient to neutralize the body's numerous ROS sources. As a result, the body requires exogenous antioxidants from the diet. Exogenous antioxidants are commonly acquired from plants and fruits high in vitamins A, C, and E, as well as the selenium mineral and phytochemical substances such as flavonoids, anthocyanins, lycopene, and polyphenols.

The DPPH (2,2-diphenyl-1-picrylhydrazyl) technique, which employs a UV-Vis spectrophotometer, is a possible approach for determining a material's antioxidant activity (Lung & Destiani, 2017). DPPH is a radical molecule that indicates the reduction process of antioxidant compounds by changing its color from purple to yellow. Researchers frequently utilize this approach since it is straightforward with easy, rapid, and precise outcomes in polar and nonpolar solvents (Julizan, 2019).

Vitamin C is frequently used as a comparative sample (control) in antioxidant activity assessments to establish the IC50 value, the concentration of a model that may block 50% of the free radical oxidation process. The stronger the antioxidant activity, the lower the IC50 value. Antioxidant activity is defined as very strong if the IC50 value is less than 50 ppm, strong if the IC50 is between 50 and 100 ppm, moderate if the IC50 is between 100 and 150 ppm, weak if the IC50 is between 150 and 200 ppm, and very weak if the IC50 is greater than 200 ppm (Jamiáh et al., 2018).

Table 1 Antioxidant Activity of Uru Lewu and Black Tea

No.	Samples	IC50 value (mg/kg)
1.	Uru lewu	133.77
2.	Black tea	345.01

As shown in Table 1, the laboratory test suggests that uru lewu had nearly three times the antioxidant activity of black tea (Uru lewu had a moderate antioxidant activity, but black tea had a low antioxidant activity). Several studies shows that Uru Lewu from Murung Raya Regency, Central Kalimantan contains flavonoids, isochaftoside, and gentiatibetine and triterpenoid 11-O-p-coumarylnepeticin. All three components exhibit antioxidant activity that might be used as an anticancer drug (Bayliak et al., 2016; Bourgou et al., 2017; Firdaus et al., 2021). Catechins, polyphenol derivatives, provide antioxidant content in black tea.

b. Sensory perceptions of uru lewu tea

Tea is a popular beverage, particularly among individuals living in Asia. Tea is typically made by steeping *Camelia sinensis* leaves. Other plants, such as Dutch teak leaves, Chinese teak leaves, cherry leaves, soursop leaves, Moringa leaves, Chinese almond leaves, dragon fruit peel, and others, are dried and steeped to produce tea.

Indonesia has four varieties of tea: black tea, green tea, oolong tea, and white tea. Black tea has been fermented longer than other forms of tea, resulting in a darker color and a stronger scent. Green tea is produced without the use of fermentation. Tea shoots are collected and promptly cooked in an oven, roasted, or dried with hot steam. This is why the green tea variant is still green (Lelita et al., 2013).

Oolong tea is classified as semi-fermented since it is dried for one day before being rolled and stored until the leaves turn black. Furthermore, before the drying process begins, the fermentation process is halted by heating. White tea is made from young tea leaves that still have tiny hairs on them. The young leaves are dried immediately after being picked. Because the drying process gives the tea a silvery white hue, white tea is also known as silver tea.

The type of tea utilized as a combination in this investigation was black tea. Three types of beverage formulations were tested on the panelists: 100% uru lewu (F1), 80% uru lewu and 20% black tea (F2), and 60% uru lewu and 40% black tea (F3). The findings of organoleptic testing performed on 100 consumer panelists as shown in Figure 2 below:

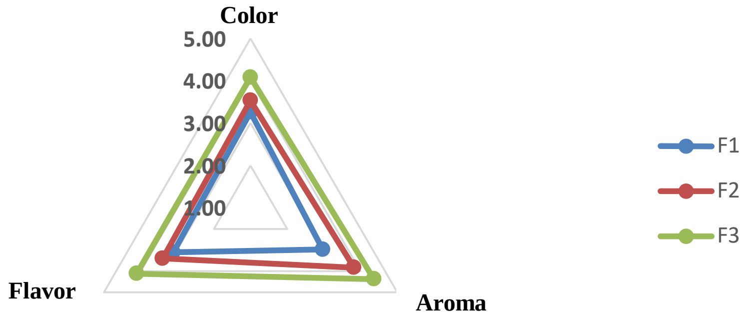

Figure 2. Uru Lewu Tea Hedonic Test Results

A Likert scale with a range of 1-5 is employed to express the panelists' sensory perception of the product, with a higher number indicating that the consumer favors the organoleptic features of the sample tasted. The third formulation, a mix of 60% uru lewu and 40% black tea is the most chosen beverage formulation by the panelists, with an average color of 4.09, scent of 4.37, and taste of 4.11. The panelists' least favorite beverage formulation was F1, with an average score on color, scent, and taste qualities of 3.24; 2.99; and 3.11, respectively.

Uru lewu F1 tea had an appeal similar to water (transparent and somewhat yellowish), whereas uru lewu F2 tea was pale yellow, and uru lewu F3 was traditionally reddish-brown. The F1 tea, made entirely of uru lewu, had a grassy aroma, but the F2 and F3 samples had a distinct scent of fragrance, which comes from a mixture of black tea. This appears to have influenced the panelists' preference for the F3 formulation (which contains 60% black tea and a stronger tea scent).

F1 tea had a distinct taste of uru lewu grass, while F2 and F3 teas were slightly astringent. This astringent flavor is attributed to the catechin chemicals in tea formulations, with F3 tea being more astringent than F2. Catechins are complex substances found in tea that are made up of epicatechin (EC), epicatechin gallate (ECG), epigallocatechin gallate (EGCG), and gallocatechol (GC) (Anjarsari, 2016). Gallate compounds have a bitter and astringent flavor. The tannin components in tea also contribute to the bitter taste (Wardani & Fernanda, 2016).

Catechins are frequently related to tea's color, scent, and taste (Anjarsari, 2016). Catechin levels in black tea are mostly affected by the variety, age of the leaves, height at which they grow, and plucking method. The initial shoot of the tea leaf has more catechins than the subsequent leaf (Anjarsari, 2016). However, processing, such as brewing with hot water, can lower the catechin level in black tea by up to 58% (Karori et al., 2007).

According to Adawiyah et al. (2019), one of the most essential characteristics of tea beverages is their aroma. The higher the hedonic value of a cup of tea, the more aromatic its scent. F1 tea had a faint grassy scent in this investigation, but F2 and F3 teas had a fragrant black tea aroma. Tea fragrance is a unique volatile scent produced throughout the tea-making process, such as during the fermentation and drying operations (Arisudin et al., 2021). Thus, a blend of black tea is still required to manufacture herbal tea derived from the uru lewu plant so that consumers may experience the refreshing, aromatic, and reddish-brown tone typical of tea.

4. Conclusion

Uru lewu contains about three times the antioxidant activity of black tea. Uru lewu had moderate antioxidant activity, but black tea had low antioxidant activity. This study concludes that 60% uru lewu and 40% black tea was the most popular formula based on the customers sensory perceptions.

Conflict of Interest

The authors declare no conflicts of interest, and no financial support.

References

Adawiyah, D. R., Azis, M. A., Ramadhani, A. S., & Chueamchaitrakun, P. (2019). Perbandingan profil sensori teh hijau menggunakan metode analisis deskripsi kuantitatif dan CATA (Check-All-That-Apply). *Jurnal Teknologi dan Industri Pangan*, *30*(2), 161-172.

Andarina, R., & Djauhari, T. (2017). Antioksidan dalam dermatologi. *Jurnal Kedokteran dan Kesehatan: Publikasi Ilmiah Fakultas Kedokteran Universitas Sriwijaya*, *4*(1), 39-48.

Anjarsari, I. R. D. (2016). Katekin teh Indonesia: prospek dan manfaatnya. *Kultivasi*, *15*(2).

Arisudin, A., Yahya, M., & Erwanto, D. (2021). Klasifikasi Aroma Teh Dengan Menggunakan Sensor Gas Berbasis Arduino Uno. *JASEE Journal of Application and Science on Electrical Engineering*, *2*(02), 115-127.

Aryadi, M., Fithria, A., Susilawati, S., & Fatria, F. (2014). Kearifan Lokal Masyarakat Dayak Terhadap Tumbuhan Berkhasiat Obat di Lahan Agroforest Kabupaten Barito Utara. *Jurnal Hutan Tropis*, *2*(3), 233–238. https://doi.org/10.20527/JHT.V2I3.2250

Bayliak, M. M., Burdyliuk, N. I., & Lushchak, V. I. (2016). Effects of pH on antioxidant and prooxidant properties of common medicinal herbs. *Open Life Sciences*, *11*(1), 298–307. https://doi.org/10.1515/biol-2016-0040

Bourgou, S., Bettaieb Rebey, I., Mkadmini, K., Isoda, H., Ksouri, R., & Ksouri, W. M. (2017). LC-ESI-TOF-MS and GC-MS profiling of Artemisia herba-alba and evaluation of its bioactive properties. *Food Research International*, *99*, 702–712. https://doi.org/10.1016/j.foodres.2017.06.009

Firdaus, M., Artanti, N., Hanafi, M., & Hanafi, M. (2021). Phytochemical Constituents and In vitro Antidiabetic and Antioxidant Properties of Various Extracts of Kenikir (*Cosmos caudatus*) Leaves. *Pharmacognosy Journal*, *13*(4), 890–895. https://doi.org/10.5530/pj.2021.13.114

Gunadi, D., Oramahi, H. A., & Tavita, G. E. (2017). Studi tumbuhan obat pada etnis dayak di desa gerantung kecamatan monterado kabupaten bengkayang. *Jurnal Hutan Lestari*, *5*(2), 425–436.

Jami'ah, S. R., Ifaya, M., Pusmarani, J., & Nurhikma, E. (2018). Uji aktivitas antioksidan ekstrak metanol kulit pisang raja (*Musa paradisiaca sapientum*) dengan metode DPPH (2, 2-difenil-1-pikrilhidrazil). *Jurnal Mandala Pharmacon Indonesia*, *4*(1), 33-38.

Julizan, N. (2019). Validasi penentuan aktifitas antioksidan dengan metode DPPH. *Kandaga–Media Publikasi Ilmiah Jabatan Fungsional Tenaga Kependidikan*, *1*(1).

Julung, H., Supiandi, M. I., Ege, B., Mahanal, S., & Zubaidah, S. (2013). Analisis Sumber Pengetahuan Tradisional Tanaman Obat yang Digunakan oleh Masyarakat Suku Dayak Desa. *Proceeding of Biology Education*, *2*(1), 67–74.

Karori, S. M., Wachira, F. N., Wanyoko, J. K., & Ngure, R. M. (2007). Antioxidant capacity of different types of tea products. *African journal of Biotechnology*, *6*(19).

Lelita, D. I., Rohadi, R., & Putri, A. S. (2013). Sifat Antioksidatif Ekstrak Teh (*Camellia Sinensis* Linn.) Jenis Teh Hijau, Teh Hitam, Teh Oolong dan Teh Putih dengan Pengeringan Beku (Freeze Drying). *Jurnal Teknologi Pangan dan Hasil Pertanian*, *13*(1), 15-30.

Lung, J. K. S., & Destiani, D. P. (2017). Uji aktivitas antioksidan vitamin A, C, E dengan metode DPPH. *Farmaka*, *15*(1), 53-62.

Setyawan, A. D. W. I. (2010). Biodiversity conservation strategy in a native perspective; case study of shifting cultivation at the Dayaks of Kalimantan. *Nusantara Bioscience*, *2*(2), 97–108. https://doi.org/10.13057/nusbiosci/n020208

Setyowati, F. M. (2012). Etnofarmakologi Dan Pemakaian Tanaman Obat Suku Dayak Tunjung Di Kalimantan Timur. *Media Litbang Kesehatan*, *20*(3), 104–112. https://doi.org/10.22435/mpk.v20i3Sept.789.

Wardani, R. K., & Fernanda, M. H. F. (2016). Analisis kadar kafein dari serbuk teh hitam, teh hijau dan teh putih (*Camellia sinensis* L.). *Journal Pharmasci (Journal of Pharmacy and Science)*, *1*(1), 15-17.

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