Journal of Pharmaceuticals and Natural Sciences

B-CRETA Publisher
Pharma Insight Solutions

Article

Effect of Drying and Storage Temperature Simplicia on Antioxidant Activity of Herbal Tea Sungkai Leaf (*Peronema canescens* Jack)

Dima Alfiyah [1], Riski Sulistiarini [2,]*, Supriatno Salam [2]

[1] Pharmacy Study Program, Faculty of Pharmacy, Universitas Mulawarman, Samarinda, 75119 East Kalimantan, Indonesia
2 Pharmaceutical Research and Development Laboratory "FARMAKA TROPIS", Faculty of Pharmacy, Universitas Mulawarman, Samarinda, 75119 East Kalimantan, Indonesia
* Correspondence: riski@farmasi.unmul.ac.id

Citation: Alfiyah, D.; Sulistiarini, R.; Salam, S. Effect of drying and storage temperature simplicial on antioxsidant activity of herbal tea Sungkai leaf (*Peronema canescens* Jack). *J Pham Nat Sci* 2024, *1(3)*, 102-107. https://doi.org/10.70392/jpns.v1i3.102107

Academic Editor: Dr. Islamudin Ahmad

Received: 27 Oktober 2024
Revised: 27 November 2024
Accepted: 2 Desember 2024

Publisher's Note: B-CRETA publisher stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

ISSN: 3047-5457

Abstract

Sungkai leaves are plants used by the community as an alternative medicine in treating diseases 12 such as malaria, fever, poisoning, and child spasms, as well as postnatal treatment where sungkai 13 leaves are processed into herbal brew. This study aims to determine the best drying and storage 14 temperatures based on the antioxidant activity of sungkai leaf herbal brew. The research method 15 is drying with wind dry temperature, oven (40°C), and roast (80°C). Afterward, wind-dry drying 16 was stored for 1 week at room temperature in, an incubator (35°C), and refrigerator (4°C). Then it 17 was made into a brew and tested for antioxidant activity by the 1,1-diphenyl-pkrilhydrazil (DPPH) method. The results showed 18 that the best drying temperature antioxidant activity was obtained using oven temperature with 19 an IC_{50} value of 16.76 ppm. At the same time, the best storage temperature was obtained in 20 incubator storage with IC_{50} of 36.76 ppm.

Keywords: *Peronema canescens* Jack; 1,1-diphenyl-pikrylhydrazil (DPPH); Herbal Medicine

1. INTRODUCTION

Antioxidants are compounds that can slow down or prevent the formation of free radical reactions in the body [1]. In the body, these antioxidants have an important role as the body's defense mechanism to neutralize the free radicals formed [2]. One of the plants that has high antioxidant activity is Sungkai. According to research conducted [3], it is known that ethanol extract of sungkai leaves has an IC50 value of 50.838 ppm in ethanol extract of young sungkai leaves and 52.835 in ethanol extract of old sungkai leaves. In research

using aquadest and methanol extracts have antioxidant activity with IC50 values of 45.709 and 53.979 [4]. Based on the research data obtained, sungkai leaves have antioxidant activity that is classified as very strong and strong.

Sungkai (Paronema canescens Jack) is a wild plant that can be found in gardens, forests, and home yards. Sungkai plants are widely used as medicines such as malaria drugs, antiplasmodium, antiseptics, pesticide teratogenicity, im munity, pesticides, poisoning, fever, child spasms, and treating post-birth [5]. Chemical compounds contained in sungkai plants include flavonoids, tannins, phenolics, alkaloids, steroids, triterpenoids, and saponins [6]. Herbal drinks are drinks that have properties in curing diseases. This herbal drink is made from plants that have the potential to treat various diseases. One presentation of herbal drinks is made in the form of steeping [7].

Drying is one of the methods used to reduce the water content of a material by evaporating the water using heat energy. The purpose of drying is to reduce water content and enzyme activity that can cause decay in the material, so that the dried material can have a long shelf life [8]. Storage is one of the things that plays a very important role in maintaining the quality and quality of a product. Storage can be done using various temperatures, but the results obtained differ depending on the compound stored. This occurs due to several factors such as light, oxygen conditions, containers, temperature, and length of storage [9,10].

This study aims to determine the best drying temperature and storage temperature based on the antioxidant activity of sungkai leaf herbal brew. This study is expected to provide information related to the antioxidant activity of drying temperature and the best storage temperature of herbal sungkai leaf steeping.

2. MATERIALS AND METHODS

2.1 Materials

The materials used in this study are fresh sungkai leaves (*Paronema canescens* Jack), distilled water, methanol p.a, vitamin C, and DPPH (2-2-Diphenyl-1-Picrylhydrazi).

2.2 Instrument

The tools used in this research are metal spatel, analytical scales, blender, oven, pan, stove, refrigerator, incubator, thermometer, tea bag, beaker, measuring cup, horn spoon, porcelain cup, hot plate, dehydrator, vial, measuring flask, watch glass, glass funnel, brown bottle, aluminum foil, plastic wrap, stirring rod, micropipette, cuvette and UV-Vis spectrophotometer.

2.3 Method

2.3.1 Sample Preparation

Samples of fresh sungkai leaves were first collected and then cleaned from impurities attached to the sungkai leaves. Then the samples were washed with running water until clean and drained.

2.3.2 Sample Drying Process

The clean sungkai leaf samples were dried in three ways, namely wind-dried, oven (40^{o}C), and roasted (80^{o}C). After that, it was put into tea bags.

2.3.3 Sample Storage Process

The wind-dried sungkai leaf samples were put into tea bags. After that, it was stored for 1 week at 3 different temperatures, namely room temperature, incubator temperature (35^{o}C), and refrigerator temperature (4^{o}C). After that, it was put into tea bags.

2.3.4 Brewing Process

Sungkai leaves were weighed as much as 3 grams and put into tea bags. Then, 200 mL of water was heated to a temperature of 90°C. After that, the tea bag was inserted while moving up and down for 15 minutes.

2.3.5 Antioxidant Activity Testing of Samples

Antioxidant activity testing using the DPPH method. DPPH 40 ppm stock solution was made by weighing 4 mg and then dissolved in 100 mL of methanol. Then made a solution of 1000 ppm test concentration series with concentration variations of 250 ppm, 125 ppm, 62.5 ppm, 31.25 ppm, and 15.625 ppm. 2 mL of DPPH stock solution and 2 mL of sample solution were taken and incubated for 30 minutes. Then, the absorbance was read at a wavelength of 514 nm for the drying temperature method and 516 nm for the storage temperature method using a UV-Vis spectrophotometer.

2.3.6 Vitamin C Antioxidant Activity Testing

Antioxidant activity testing using the DPPH method. DPPH 40 ppm stock solution was made by weighing 4 mg and then dissolved in 100 mL of methanol. Then made a solution of 100 ppm test concentration series with concentration variations of 2 ppm, 4 ppm, 6 ppm, 8 ppm, and 10 ppm. 2 mL of DPPH stock solution and 2 mL of sample solution were taken and incubated for 30 minutes. Then, the absorbance was read at a wavelength of 515 nm using a UV-Vis spectrophotometer.

3. RESULT AND DISCUSSION

Determination of antioxidant activity value in this study using DPPH method. DPPH method (2-2-Diphenyl-1-Picrylhydrazi) is the most commonly used method because it is easy, fast, simple, and does not use many samples [11]. The principle of this method is the interaction between antioxidant activity and DPPH free radicals by donating electrons or hydrogen to DPPH radicals, so that the reaction becomes neutral which is marked by changing the color of the solution from purple to yellow. The higher the concentration of the sample, the higher the compound that donates electrons [12,13].

Table 1. Antioxidant Activity Data Drying Temperature of Sungkai Leaf Herbal Tea

No	Sample	Concentration	Average Absorbance ± SD	%Inhibition	Linear Regression Equation	IC_{50} (ppm)
1.	Blank	-	0.742 ± 0.001	-	-	-
2.	Wind Dry Drying	15.625	0.37567 ± 0.00058	49.371	y = 17.201x – 0.0682	18.37
		31.25	0.317 ± 0	57.277		
		62.5	0.238 ± 0.001	67.924		
		125	0.10233 ± 0.00058	86.208		
		250	0.04067 ± 0.00058	94.519		
3.	Oven Drying	15.625	0.36033 ± 0.00058	51.437	y = 17.24x + 1.3972	16.76
		31.25	0.32567 ± 0.00058	56.109		
		62.5	0.207 ± 0	72.102		
		125	0.081 ± 0	89.083		
		250	0.03933 ± 0.00058	94.699		
4.	Roast Drying	15.625	0.492 ± 0.001	33.692	y = 15.393x – 7.4876	41.87
		31.25	0.39133 ± 0.00153	47.259		
		62.5	0.325 ± 0.002	56.199		
		125	0.25233 ± 0.00252	65.992		
		250	0.16567 ± 0.00252	77.672		

The parameter used to determine the concentration of antioxidant activity is based on the IC_{50} (Inhibitory Concentration) value. IC_{50} value is a number that indicates the concentration of sample solution or extract that is able to inhibit DPPH activity by 50% [1]. The IC_{50} value is calculated using a linear regression equation with the formula y = bx + a, by relating the sample concentration on the (x) axis to the percent inhibition on the (y) axis [12]. Antioxidant activity data of drying temperature of sungkai leaf herbal brew can be seen in Table 1.

Room temperature drying obtained an IC_{50} value of 18.37 ppm, oven drying obtained an IC_{50} value of 16.76 ppm, and roasted drying obtained an IC_{50} of 41.87 ppm. All three drying temperatures had very strong activity, but the best antioxidant activity was found in oven drying. The roasted drying had the lowest antioxidant activity. This is thought to be because the compound content in roasted drying decreased due to heating. This condition resulted in the destruction of active substances contained in the material. Room temperature and oven drying had different antioxidant activities. Oven drying had higher activity than wind dry drying. This can occur due to several factors suchas air, wind, and temperature that are not settled so as to cause the wind dry drying process to be unstable, while inoven drying the temperature used is more stable so that the compounds are not damaged and have good temper-ature circulation so as to optimize the drying process [14].

Table 2. Antioxidant Activity Data Storage Temperature of Sungkai Leaf Herbal Tea

No	Sample	Concentration	Average Absorbance ± SD	% Inhibition	Linear Regression Equation	IC_{50} (ppm)
1.	Blank	-	0.78033 ± 0.00153	-	-	-
2.	Room Temperature Storage	15.625	0.56133 ± 0.00058	28.0649	y = 23.517x – 41.202	48.33
		31.25	0.51067 ± 0.00115	34.5579		
		62.5	0.36967 ± 0.00115	52.6271		
		125	0.18533 ± 0.00153	76.2495		
		250	0.088 ± 0.001	88.7228		
3.	Incubator Storage	15.625	0.49 ± 0	37.2063	y = 19.357 – 19.772	36.76
		31.25	0.44533 ± 0.00115	42.9304		
		62.5	0.318 ± 0.001	59.2482		
		125	0.215 ± 0.001	72.4477		
		250	0.08167 ± 0.00153	89.5344		
4.	Incubator Storage	15.625	0.587 ± 0	24.7757	y = 23.708x – 47.255	60.47
		31.25	0.54333 ± 0.00058	30.3716		
		62.5	0.44333 ± 0.00115	43.1867		
		125	0.25833 ± 0.00115	66.8945		
		250	0.08833 ± 0.00115	88.6801		

In the storage of tea bags for 1 week there is an increase in the IC_{50} value which before being stored the IC_{50} of wind dry is obtained at 18.37 ppm (Table 1). After being stored for 1 week at 3 different temperatures there was a decrease, namely at room temperature storage the IC_{50} value was 48.33 ppm, incubator storage obtained IC_{50} of 36.76 ppm, and refrigerator storage obtained IC_{50} of 60.47 ppm. This shows that the antioxidant activity will change along with the storage time.

Room temperature and oven storage included very strong antioxidant activity, while refrigerator storage included strong antioxidant activity. This can happen due to factors such as temperature, light, and oxygen conditions.

According to research conducted [10] storage at low temperatures is more stable than high temperature storage. However, in this study the best temperature was at the incubator temperature (35°C). This is influenced by light where light has a main component, namely ultraviolet (UV) which can reduce the quality of antioxidants. UV radiation causes the formation of Reactive Oxygen Species (ROS) through changes in the structure of oxygen molecules from triplets to singlets where these singlets have stronger energy, so they can become radicals. Incubator storage has minimal light, so incubator storage obtained better results than other storage [10].

Table 3. Vitamin C Antioxidant Activity Data

No	Sample	Concentration	Average Absorbance ± SD	%Inhibition	Linear Regression Equation	IC_{50} (ppm)
1.	Blank	-	0.759 ± 0,001	-	-	-
2.	Vitamin C	2	0.44633 ± 0.00057735	41.1946	y = 28.747x + 16.528	3.203
		4	0.378 ± 0	50.1976		
		6	0.28033 ± 0.00057735	63.0654		
		8	0.16033 ± 0.00057735	78.8757		
		10	0.102 ± 0	86.5613		

Vitamin C (Ascorbic Acid) was used as a comparator in antioxidant activity testing because vitamin C is a natural compound derived from nature [15]. Based on Table 3, it can be seen that drying temperature (Table 1) and storage temperature (Table 2) have lower antioxidant activity compared to vitamin C. This is evidenced by the IC_{50} value of 3.203 ppm. This is evidenced by the IC_{50} value of 3.203 ppm. Antioxidant activity in vitamin C is included in the very strong category. However, the sungkai leaves that underwent the drying and storage process had a very active anti-oxidant power.

4. CONCLUSION

Differences in drying temperature and storage temperature affect the strength of antioxidant activity of sungkai leaves. Based on the results of the research that has been done, it can be concluded that the best drying temperature antioxidant activity is in the use of oven temperature with IC_{50} of 16.76 ppm. While the best storage temperature is obtained in incubator storage with IC_{50} of 36.76 ppm.

AUTHOR CONTRIBUTION: -

FUNDING: -

ACKNOWLEDGMENT: -

CONFLICT OF INTEREST: The Author declares no conflict of interest.

REFERENCES

1. Lung, J.K.S., Destiani, D.P. Uji Aktivitas Antioksidan Vitamin A, C, E dengan Metode DPPH. *Farmaka* 2017, 15(1), 53-62.
2. Andarina, R., Djauhari, T. Antioksidan Dalam Dermatologi. *Jurnal Kedokteran dan Kesehatan* 2017, 4(1). 39-48.
3. Okfrianti, Y., Irnameria, D., Bertalina, B. Aktivitas Antioksidan Ekstrak Etanol Daun Sungkai (*Peronema canescens* Jack). *Jurnal*

Kesehatan 2022, 13(2), 333-339.

4. Irnameria, D., Okfrianti, Y. Perbedaan Aktivitas Antioksidan Ekstrak Daun Sungkai Dengan Menggunakan Pelarut Metanol dan Aquades. *Agritepa* 2023, 10(1). 219-229.
5. Rahman, A., Rengganis, G.P., Prayuni, S., Sari, T.N., Pratiwi, P.D., Pratama, S. Pengaruh Pemberian Infusa Daun Sungkai (*Peronema canescens*) Terhadap Jumlah Leukosit Pada Mencit. *Journal of Healthcare Technology and Medicine* 2021, 7(2), 614-620.
6. Kusriani, R.H., Nawawi, A., dan Turahman, T. Uji Aktivitas Antibakteri Ekstrak Dan Fraksi Kulit Batang Dan Daun Sungkai (*Peronema canescens* Jack) Terhadap *Staphylococcus aureus* Atcc 25923 dan *Escherichia coli* ATCC 25922. *Jurnal Farmasi Galenika* 2015, 2(1): 8-14.
7. Purwanto, N.B. Obat Herbal Andalan Keluarga. Surakarta: Flash books 2016.
8. Fahmi, N., Herdiana, I., Rubiyanti, R. Pengaruh Metode Pengeringan Terhadap Mutu Simplisia Daun Pulutan (Urena lobata L.). *Media Informasi* 2019, 15(2), 165-169.
9. Langkong, J., Sukendar, N.K., Ihsan, Z. Studi Pembuatan Minuman Isotonik Berbahan Baku Air Kelapa Tua (*Cocos nucifera* L) Dan Ekstrak Belimbing Wuluh (*Averhoa bilimbi* L) Menggunakan Metode Sterilisasi Non-Thermal Selama Penyimpanan. *Canrea Journal: Food Technology, Nutritions, and Culinary Journal* 2018, 53-62.
10. Mahardani, O.T., Yuanita, L. Efek Metode Pengolahan Dan Penyimpanan Terhadap Kadar Senyawa Fenolik dan Aktivitas Antioksidan. *Unesa Journal of Chemistry* 2021, 10(1), 64-78.
11. Julizan, N. Validasi Penentuan Aktifitas Antioksidan Dengan Metode DPPH. *Kandaga–Media Publikasi Ilmiah Jabatan Fungsional Tenaga Kependidikan* 2019, 1(1), 41-45.
12. Kiromah, N.Z.W., Fitriyati, L., Husein, S. Uji Aktivitas Antioksidan Ekstrak Metanol Dan Akuades Daun Ganitri (*Elaeocarpus ganitrus* Roxb.) Dengan Metode DPPH (2, 2-Difenil-1-Pikrihidrazil). *Prosiding University Research Colloquium* 2021, 79- 85.
13. Martiningsih, N.W., Widana, G.A.B., Kristiyanti, P.L.P. Skrining Fitokimia Dan Uji Aktivitas Antioksidan Ekstrak Etanol Daun Matoa (Pometia pinnata) dengan Metode DPPH. *In Prosiding Seminar Nasional MIPA* 2016.
14. Pertiwi, A.P. Pengaruh Metode Pengeringan Ekstrak Daun Kelor (Moringa oleifera Lam) Terhadap Aktivitas Antioksidan. *Jurnal Penelitian Farmasi & Herbal* 2023, 5(2), 57-69.
15. Syafrida, M., Darmanti, S., Izzati, M. Pengaruh Suhu Pengeringan Terhadap Kadar Air, Kadar Flavonoid dan Aktivitas Antioksidan Daun dan Umbi Rumput Teki (*Cyperus rotundus* L.). *Bioma: Berkala Ilmiah Biologi* 2018, 20(1), 44-50.