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RESEARCH ARTICLE

EVALUATION OF ANTIOXIDANT ACTIVITY OF EXTRACT COMBINATION OF GINGER AND LEMONGRASS

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Abstract

Aim and objective: This study to determine the antioxidant activity of the combination of ginger (*Zingiber officinale*) and lemongrass (*Cymbopogon citratus*) on reducing DPPH (2,2-diphenyl-1-picrylhydrazyl).
Methods: Quantitative measurement of the antioxidant activity of ginger and lemongrass extracts, as well as a combination of both with a concentration ratio of 1:1, 2:1, 1:2 using a UV-Vis spectrophotometer at a wavelength of 516 nm to determine the IC_{50} value.
Results: IC_{50} value of ginger extract 10.76 µg/ml, lemongrass extract 26.69 µg/ml, IC_{50} value 6.69 µg/ml for combination with concentration ratio 1:1, IC_{50} value 3.32 µg/ml for combination with concentration ratio 2:1. IC_{50} value 9.34 µg/ml for combination with concentration ratio 1:2.
Conclusions: The combination of ginger and lemongrass extracts has synergistic antioxidant activity that can increase the antioxidant effect from the strong category to very strong category.
Keywords: Combination, *Cymbopogon citratus*, DPPH assay, free radical, IC_{50} value, *Zingiber officinale.*

INTRODUCTION

Antioxidants are compounds that can reduce, restrain and prevent the oxidation process by donating one or more electrons to free radicals so that free radicals can be muted[1]. Free radicals is a compound or molecule containing one or more unpaired electrons in its outer orbital. The existence of unpaired electrons cause the highly reactive compounds looking for a partner by attacking and electron binding molecules that are in the vicinity. Antioxidants have been widely used to prevent or slow down oxidation. Natural antioxidants found in most plants are phenolic groups such as tocopherols, flavonoids, lignin and phenolic acids[2,3].
The content of secondary metabolites or chemical content affects pharmacological activity. Ginger and lemongrass plants based on previous studies have been studied for their chemical content and antioxidant activity. Several previous studies obtained data on the antioxidant activity of white ginger leaves (*Z. officinale* Rosc. var. *Officinarum*) against DPPH free radicals using a UV-Vis spectrophotometer with a wavelength of 515 nm obtained an IC_{50} value of 156.4827 µg/ml. Red ginger extract positively contains flavonoids, tannins, saponins, alkaloids and terpenoids and the antioxidant activity test obtained an IC_{50} value of 10.35 µg/mL which is classified as very strong. The antioxidant activity of red ginger (*Z. officinale* var. Amarum) IC_{50} value obtained from the maceration method (ethanol 70%) of 56.58 µg/ml; remaceration (ethanol 70%) 22.1 µg/ml; maceration (ethanol 96%) 87.7 µg/ml; and remaceration (ethanol 96%) of 67.42 µg/ml[4,5]. Lemongrass has a total phenol of 42.959 mg/kg extract, free radical scavenging activity of 64.85%, and total antioxidants of 104 µmol/L. Lemongrass extract contains tannins, alkaloids, triterpenoids/steroids, saponins, phenolics, and flavonoids. The total phenolics in the extract are 81.67 mg GAE/sample[6,7].
The medicinal plant used is ginger (*Z. officinale*) and lemongrass (*C. citratus*) which are often used as raw materials for medicine. Chemical content greatly affects the pharmacological activity of a plant. Various studies have shown that ginger has positive activity against various symptoms of diseases such as anti-inflammatory, antioxidant, antiemetic, antibacterial, and antidiabetic. Antioxidant compounds found in ginger are phenolic compounds in the form of

flavonoids, cinnamic acid derivatives, coumarins, and polyfunctional organic acids[8,9]. Lemongrass contains bioactive substances such as alkaloids, flavonoids, saponins, tannins, phenolic acids, and terpenoids. In dried lemongrass, the most bioactive substances contained are phenolic acids, flavonoids and tannins which act as antioxidants that are useful in healing wounds[10,11]. The combination of medicinal plants have produce a synergistic effect, where two or more plants work together to increase the effectiveness of treatment. The novelty of this study is determining the antioxidant activity of the combination of ginger and lemongrass.

MATERIALS AND METHODS

The samples used in this research are rhizome of *Z. Officinale* and steam of *C. citratus* collected from Makassar, South Sulawesi. Voucher specimens were prepared and deposited at the Botanical Division, Laboratory of Pharmaconosy-Phytochemistry Faculty of Pharmacy, Universitas Muslim Indonesia. DPPH (Sigma Aldrich), Ascorbic acid (Sigma Aldrich).

This research was conducted through an experimental procedure carried out in the laboratory using the DPPH scavenging method which was measured using a UV-Vis spectrophotometer.

Extraction

Ginger powder of 100 mg was extracted with 1000 ml of ethanol 70% using UAE (Ultrasonic Assisted Extraction) with a frequency of 42 KHz at a temperature of 50ºC for 2 hours. Lemongrass powder of 100 mg was extracted with 1000 ml of ethanol 70% by maceration. Each liquid extract from the two samples was concentrated using rotary vacuum evaporator to obtain thick extract.

Qualitative test of antioxidant activity of extract samples

Preparation of DPPH

Determination of the maximum wavelength, namely the DPPH solution that has been made with a concentration of 35 µg/ml, the absorption spectrum is determined using a UV-Vis spectrophotometer at a wavelength of 400 to 700 nm.

Preparation Ascorbic acid Standard Solution

Ascorbic acid stock solution was made at a concentration of 1000 µg/ml, 5 mg of ascorbic acid was dissolved in 5 ml of methanol pro analysis. Then 5 series of concentrations of 5, 10, 15, 20, 25 µg/ml were made.

Preparation of ginger extract and lemongrass extract

Each extract sample was prepared in 5 series of concentrations of 5, 10, 15, 20, 25 µg/ml from a stock solution of 100 µg/mL.

Measurement of antioxidant activity of ascorbic acid standards and sample extracts with DPPH

Standard concentration series solutions of ascorbic acid and sample extracts of 1 ml each were put into a cuvette, 1 ml of DPPH solution was added and incubated for 30 minutes. After incubation, the absorbance was measured at a wavelength of 516 nm.

The IC_{50} value is calculated based on the percentage of inhibition against DPPH radicals from each concentration of sample solution with the formula:

$$\% \text{ Inhibition} = \frac{\text{Abs. blank} - \text{Abs. sample}}{\text{Abs. blank}} X100$$

After obtaining the percentage of inhibition from each concentration, the equation y = a + bx is determined by linear regression calculations where x is the concentration (µg/ml) and y is the percentage of inhibition (%). Antioxidant activity is expressed by Inhibition Concentration 50% (IC_{50}), which is the sample concentration that can reduce DPPH radicals by 50%. The IC_{50} value is obtained from the x value after replacing y = 50.

RESULTS AND DISCUSSION

The extraction of each sample was selected from different extraction methods, namely ginger samples using the ultrasonic method and lemongrass samples using the maceration method. This is based on the results of previous studies (13,14) obtained the largest percentage of ginger extract soaking results of 21.29% Ultrasonic Assisted Extraction (UAE) results compared to maceration and distillation. The largest percentage of lemongrass extract soaking was 14.83 % maceration results compared to Ultrasonic Assisted Extraction (UAE). The percentage of extract soaking indicates the number of chemical compounds from the sample that can be extracted using the appropriate solvent. The number of compounds extracted in large quantities has a great opportunity for active compounds to be extracted and provide great therapeutic activity. The results of the percentage of soaking of each sample are presented in the Table 1.

Table 1: Percentage yield from extraction of ginger and lemongrass samples.

Solvent	Sample	Extraction method	Weight of extracted sample (gm)	Weight of thick extract (gm)	Extract yield value (% v/v)
Ethanol 70%	Ginger	Ultrasonic Assisted Extraction (UAE)	100	10.18	10.18
Ethanol 70%	Lemongrass	Maceration	100	31.99	31.99

Each sample showed that in 100 grams of extracted sample powder, the number of chemical compounds produced was 10.18 % w/w for ginger and 31.99% w/w as the percentage of extract yield value.

Next, the extract of each sample was continued with antioxidant activity test using the DPPH radical scavenging method. The results of the comparative antioxidant activity test of ascorbic acid and each sample extract are presented in the Table 2.

Table 2: Comparative antioxidant activity test of ascorbic acid and sample extracts.

Standard and extract samples	Concentration (µg/ml)	Sample Abs	Blank Abs	% Inhibition	Equation	IC $_{50}$ (µg/ml)
Ascorbic acid	5	0.441	0.896	50.781	y = 3.2924x +46.217	1.15
	10	0.438		52.232		
	15	0.395		55.915		
	20	0.305		56.362		
	25	0.312		65.179		
Ginger	5	0.478	0.896	46.652	y = 0.4531x+45.123	10.76
	10	0.443		50.558		
	15	0.427		52.344		
	20	0.416		53.571		
	25	0.390		56.473		
Lemongrass	5	0.476	0.896	46.875	y = 0.1607x+45.871	26 .69
	10	0.471		47.433		
	15	0.466		47.991		
	20	0.457		48.995		
	25	0.447		50.111		
Combination of ginger and lemongrass (1:1)	5	0.449	0.896	49.888	y = 0.3281x+47.98	6.16
	10	0.441		50.781		
	15	0.423		52.790		
	20	0.402		55.133		
	25	0.395		55.915		
Combination of ginger and lemongrass (2:1)	5	0.439	0.896	51.004	y = 0.3192x+48.94	3.32
	10	0.436		51.339		
	15	0.411		54.129		
	20	0.403		55.022		
	25	0.384		57.145		
Combination of ginger and lemongrass (1:2)	5	0.460	0.896	48.660	y = 0.2879x+47.31	9.34
	10	0.439		51.004		
	15	0.438		51.116		
	20	0.430		52.008		
	25	0.400		55.357		

The comparative measurement results of ascorbic acid have very strong antioxidant activity with an IC_{50} value of 1.15 µg/ml. The measurement results of ginger rhizome have strong antioxidant activity with an IC_{50} value of 10.76 µg/ml. The measurement results of lemongrass stems have strong antioxidants with an IC_{50} value of 26.69 µg/ml. As quoted in a previous study[15], a compound is said to have very strong antioxidant activity if the IC_{50} value is <10 µg/ml, strong if the IC_{50} value is 10-50 µg/ml, moderate if the IC_{50} value is 50-100 µg/ml, weak if the IC_{50} value is 100-250 µg/mL, and inactive if the IC_{50} value is >250 µg/mL. The bioactive components in ginger are: gingerol, shogaol and zingiberone. Gingerol is an active compound in the group phenol which is heat resistant and has antioxidant properties[8]. Lemongrass has various pharmacological activities, one of which is antioxidants. Active compounds as antioxidants such as flavonoids, tannins, and phenols are compounds that can be found in lemongrass[11].

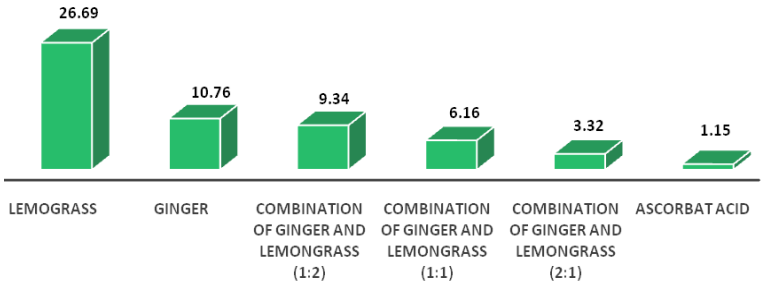

Figure 1: Comparison of IC_{50} values between single sample extracts standards and combination of extracts.

The combination of medicinal plants can produce a synergistic effect, where two or more plants work together to increase the effectiveness of treatment. The results of measuring the combination of ginger and lemongrass with a ratio of 1:1; 2:1; 1: 2 obtained IC_{50} of 6.16 µg/ml, 3.32 µg/ml, and 9.34 µg/ml, respectively. All three values are included in the category of very strong antioxidant activity because IC_{50} <10 µg/ml. The combination of the two medicinal plants showed a synergistic effect because there was an increase in antioxidant activity in each plant which was initially classified as strong to more strong after being combined. The combination of ginger and lemongrass with a ratio of 2:1 showed higher antioxidant activity than the combination of 1:2. This shows that the antioxidant compounds from ginger are stronger in

influencing the rate of oxidation than antioxidant compounds from lemongrass.

Limitations of the study

The limitation of this study is discusses the antioxidant activity of ginger rhizomes, lemongrass stems and a combination of both by determining the IC_{50} value as the observed parameter. The IC_{50} value is used to determine the antioxidant activity of the sample including the strong and very strong categories, and to know the synergistic effect of the combination of the two sample extracts. However, this study does not have in vivo antioxidant activity data needed to determine the pharmacological dosage.

CONCLUSIONS

The conclusion of this study is that ginger rhizome and lemongrass stalks each have strong antioxidant activity with an IC_{50} value of 10-50 µg/ml. The combination of the two sample extracts shows a synergistic effect causing the antioxidant activity to be stronger with an IC_{50} value of <10 µg/ml.

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AUTHOR'S CONTRIBUTION

Singh RAS: writing original draft, methodology, investigation. **Singh FA:** formal analysis, data curation, conceptualization. **Sigh AA and EP:** writing, review and editing, methodology. **Sigh ARA:** formal analysis, data curation, conceptualization. Final manuscript was checked and approved by all authors.

DATA AVAILABILITY

The data will be available to anyone upon request from the corresponding author.

CONFLICT OF INTEREST

None to declare.

REFERENCES

1. Munteanu IG, Apetrei C. Analytical Methods Used in Determining Antioxidant Activity: A review. Int J Mol Sci 2021; 22(7):2–30. *https://doi.org/10.3390/ijms22073380*
2. Taneva I, Mazova N, Nikolova I, Pancheva M. Content of biologically active substances and antioxidant activity of aqueous-ethanol extracts of cultivated Roseship fruit obtained by ultrasonic extraction. BIO Web of Conferences 2023. *https://doi.org/10.3390/ijms22073380*
3. Jia W, Wu X, Kang X. Integrated the embedding delivery system and targeted oxygen scavenger enhances free radical scavenging capacity. Food Chem 2023. *https://doi.org/10.1016/j.fochx.2022.100558*
4. Munadi R, Arifin L. Identification of metabolite compounds secondary and antioxidant activity test of white ginger leaf extract (*Zingiber officinale* Rosc. Var. Officinarum). Spin J Chem Education Chem 2022;4(22): 163–74. *https://doi.org/10.20414/spin.v4i2.5420*
5. Wahyudi A, Minarsih T. Effect of ethanol and concentration on total flavonoid content and antioxidant activity of emprit ginger extract (*Zingiber officinale* Var. Amarum). Indonesian J Pharmacy Natural Prod 2023;6(1):30–8. *https://doi.org/10.35473/ijpnp.v6i01.2208*
6. Sangi M, Katja D. Antioxidant activity in several minahasa cooking spices. J Chem Prog 2011; 4(2):66–74. *https://doi.org/10.35799/cp.4.2.2011.4976*
7. Najmah, Fitria R, Munandar H, Kurniawati E, Thayban. Phytochemical, total flavonoid and phenolic screening of lemongrass leaves (*Cymbopogon nardus* (L.) Rendle). Jurnal Crystal: Publication of Chemical Research and its Applications 2023;5(1):62–70. *https://doi.org/10.36526/jc.v5i1.2642*
8. Supu R, Diantini A, Levita J. Red Ginger (*Zingiber officinale* Var. Rubrum): Its chemical constituents. Phytopharmaca: J Pharm Sci 2018; 8(1):25–31. *https://doi.org/10.33751/jf.v8i1.1167*
9. Pebiningrum A, Kusnadi J. The effect of ginger varieties (*Zingiber officinale*) and the addition of honey on the antioxidant activity of ginger kombucha fermented drink. J Food Life Sci 2018; 1(2):33–42. *https://doi.org/10.21776/ub.jfls.2017.001.02.01*
10. Solekha R, Setiyowati P, Kusumanegara S, Sari. Phytochemical screening of ethanol extract on stems, leaves and roots of citronella grass (*Cymbopogon nardus* L). Best J Biol Education Sci Tech 2022; 5(1):141–7. *https://doi.org/10.30743/best.v5i1.5320*
11. Giroth JS, Bernadus JBB, Sorisi AMH. Efficacy Test of lemongrass (Cymbopogon citratus) on mortality level of Aedes mosquito larvae. J Ebiomedik 2021; 9(1):13–20. *https://doi.org/10.35790/ebm.v9i1.31716*
12. Tukiran, Suyatno, Sabila FI, Sari AK. Total flavonoid levels and anti-inflamatory activity of ethanol extract combination of Secang (Caesalpinia sappan L.) and red ginger (*Zingiber officinale* Roxb.) on inhibition of bovine serum albumin. Jc-T (Journal Cis-Trans) Jurnal Kimia Dan Terapannya 2023;7(1):31–9. *https://doi.org/10.17977/um0260v7i12023p031*
13. Syarif RA, Faradiba, Khaira MTA, Nirwana N. GC-MS analysis of lemongrass with various extraction method. Jurnal Fitofarmaka Indonesia 2023;10(3):101–6. *https://doi.org/10.33096/jffi.v10i3.1108*
14. Syarif RA, Faradiba, Alyanti TK, Savitri TA. GC-MS analysis and antiinflammation of ginger rhizome with various extraction methods. Book of Abstract Makassar International Conference on Pharmaceutical Sciences. 2023;2(1):31.*https://conference.umi.ac.id/index.php/micps-abstract/article/view/240*
15. Abriyani E, Fikayuniar F, Wichandar A. Phytochemical screening and antioxidant test of ipomea carnea leaf extract (*Ipomoea carnea* Jacq). Pharma Xplore: J Sains dan Ilmu Farmasi 2021;6(1):32–42. *https://doi.org/10.36805/jbf.v3i1.780*