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THE ANTIOXIDANT ACTIVITY OF EXTRACT COMBINATION JUICE GINGER RHIZOME, TURMERIC, GALANGAL AND KAEMPFERIA GALANGA

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ABSTRACT

The Zingiberaceae family includes ginger (Zingiber officinale), turmeric (Curcuma longa Linn), galangal (Alpinia galanga), and Kaempferia galanga L contains many compounds, including gingerol, curcumin, and flavonoid, which have natural antioxidant properties. The purpose of this study was to determine the antioxidant activity of extract combination of juice from ginger, rhizome, turmeric, galangal, and Kaempferia galanga L using the DPPH (1,1-Diphenyl-2-Picrylhydrazyl) method and calculate the IC_{50} value. The combination of ginger rhizome, turmeric, galangal, and Kaempferia galanga L is taken with water or juice using a juicer and then filtered with an abatis cloth. The antioxidant activity test was carried out using a UV-Vis spectrophotometer at a wavelength of 500 nm at 30 minutes. The results showed that the combined extract juice ginger rhizome, turmeric, galangal, and Kaempferia galanga L extracts had antioxidant activity. In formula I, the IC_{50} value was 23.5 ppm (very strong), formula II IC_{50} value was 171 ppm (moderate), and formula III IC_{50} value was 552 ppm (very weak). The conclusion from this research, domination concentration of ginger in combination with rizhoma increases antioxidant activity.

Keywords : *Antioxidant; DPPH (1,1-Diphenyl-2- Picrylhydrazyl); IC_{50}*

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INTRODUCTION

In order to enhance public health at a reasonable cost, it is necessary to utilize natural Indonesian components as antioxidants [1]. Spice plants, such as ginger rhizome, turmeric, galangal, and kaempferia, are readily available and cheap sources of natural antioxidants that may be used in cooking. When the COVID-19 pandemic hit in 2020, Litbangkes' Public Relations department declared that using rhizomes as a supplement to boost immunity was safe[2]. According to research, the four rhizomes (ginger, turmeric, galangal, and Kaempferia) are often used in cooking as spices have various chemicals with anti-inflammatory effects.[3,4,5,6]. Ginger, also known as Zingiber officinale, comes in various forms, including red ginger, elephant ginger, and local ginger. It contains a

powerful chemical called gingerol, which has been shown to have many health benefits[7]. Gingerol molecules, according to research, exhibit significant levels of antioxidant activity[3]. Antioxidant rhizome turmeric (Curcuma longa Linn) is also known as koneng and is quite popular in the community. Curcumin molecules are abundant in turmeric, the primary currying component. Curcumin molecules are abundant in turmeric, the primary currying component[8]. Kaempferia (Kaemferia galangin L.) and galangal (Alpinia galangal Linn) have a unique fragrance and are often employed in the production of appetite-stimulating herbs rich in flavonoids[9,10].

The increased immune response from antioxidant compounds in natural substances may decrease viral infection risk or severity[11]. The sars-CoV-2 infection has been claimed to induce oxidative stress by increasing the generation of reactive oxygen species (ROS), which triggers a cytokine storm, worsening the patient's health. There is evidence to support this claim[12].

These rhizomes are often used in herbal formulations based on personal experience and trials in which part or all of the rhizomes are combined into a single component. In the case of antagonistic interactions, the use of several substances may either increase effectiveness[13] or reduce it[14].

With this background, the existing issues are defined by evaluating the antioxidant activity of the rhizome combination formula to show that community consumption practices may be an alternative to antioxidant herbal formulations.

MATERIAL AND METHODS

1. Instruments

The UV-Vis Spectrophotometer (Labo 7809 ™) was utilized in this research.

2. Fresh ginger (Zingiber officinale), turmeric (Curcuma longa Linn), galangal (Alpinia galanga), and kaempferia (Kaempferia galanga L) rhizomes were used in this study. They were obtained from farmer cultivation in the Dusun Jontor area, RT 01, RW 10, Werasari Village, Sadananya District, Ciamis Regency. DPPH, aqua dest, ethanol, ethyl chloroform, ethyl acetate, methanol, and N-hexane were employed as compounds in this research, while curcumin and quercetin served as reference standards.

3. Preparation of test materials

Each ginger (Zingiber officinale), turmeric (Curcuma longa Linn), galangal (Alpinia galanga), and kaempferia (Kaempferia galanga L) rhizome was obtained in quantities of up to 250 grams, then thoroughly washed under running water, and then juiced. -each rhizome was peeled and cut into approximately 1 cm pieces, then grated or blended until smooth and squeezed the juice.

4. Preparation of test formula

This study was made in 3 ingredients of a combination juice formula with 3 variations in the percentage of rhizomes (table 1).

Table 1. Formulation of % rhizome weight

Formulation	Ginger	Turmeric	Galangal	Kaempferia
I	50%	25%	10%	15%
II	25%	50%	15%	10%
III	10%	15%	50%	25%

5. Evaluation of Antioxidant Activity

a. DPPH solution preparation

Dissolve DPPH at a concentration of 100 parts per million by weighing 10 mg of DPPH in 100 mL of ethanol.

b. Squeeze Stock Solution Preparation Rhizome Extract Combination

A 1000 ppm standard slution was produced by weighing 100 mg of the combined extract of the rhizome and 100 mL of ethanol in a 100 mL volumetric flask. A series of 10, 20, 30, 40, 50, and 60 ppm solutions were prepared from the stock solution. They were poured into a 25 ml volumetric flask using 0.25 ml, 0.50 ml, 0.75 ml, 1 ml, 1.25 ml, and 1.15 ml[15].

c. Maximum Absorption

Maximum Absorption Wave for DPPH Measurement. Pipetting 4 mL of 40 ppm DPPH solution, covering it with aluminum foil, and allowing it to stand at 37°C shielded from sunlight, the absorbance was measured at a 500-600 nm wavelength.

d. Operating Time

Add 4 ml of DPPH solution and 4 ml of combined juice of rhizome extract in a cuvette. Absorption is measured at the highest wavelength achieved and then every five minutes for five to sixty minutes until a consistent time is reached.

e. Antioxidant Activity of Rhizome Extract Combination Extract.

The antioxidant activity power test modified procedure 16 by pipetting 4 mL of the combined juice of the rhizome extract into each, adding 4 mL of DPPH solution, and incubating at 37°C in a dark room for 30 minutes. The absorbance value at the highest wavelength achieved was then determined.

f. IC_{50} Value Determination.

The IC_{50} (Inhibitory Concentration at which 50% of DPPH activity is lost) value is the concentration at which 50% of DPPH activity is lost. To determine the IC_{50} value, one must first get data on the percentage of inhibition, which may be calculated using the following formula:

$$\% \text{ Inhibition} = \frac{\text{Abs. DPPH} - \text{Abs.Sampel}}{\text{Abs. DPPH}} \times 100\%$$

The IC_{50} value indicates the concentration of sample solution required to block 50% of DPPH free radicals. The IC_{50} value for each formulation may be found by solving the linear equation $y = ax + b$ with the sample concentration as the sample (x) and the percent inhibition value as the axis (y). The IC_{50} value is stated as the concentration needed to achieve 50% DPPH reduction activity; the lower the IC_{50} value, the higher the antioxidant activity.

RESULTS AND DISCUSSION

The antioxidant activity was determined in this research using the DPPH method. UV-Vis spectrophotometry measurements. Before doing the antioxidant study, the maximum wavelength of DPPH was determined to establish the length of the most excellent DPPH absorbance.

Because DPPH has a maximum wavelength of 500 nm and an absorbance of 0.232 and 0.174, it may be used as a reference for wavelength absorption during the DPPH inhibition test using the formula.

The operating time measurement revealed that the reaction between the test solution and DPPH had bound. According to the findings, the operating time achieved steady absorbance values between 15 and 30 minutes. Thus, it may be inferred that DPPH reacted entirely between 15 and 30 minutes.

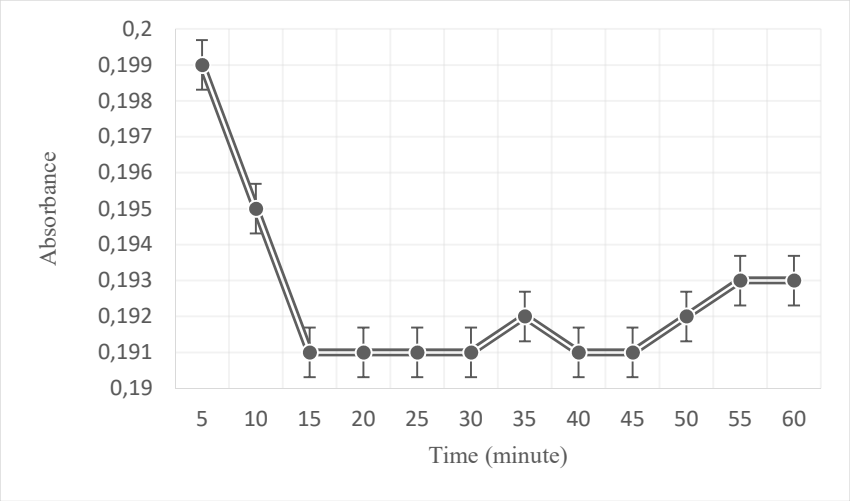

Figure 1. DPPH operating time

There were variations in the percent inhibition of each formula in this research (figure 2). The higher the quantity of ginger, turmeric, galangal, and kaempferia juice, the greater the attenuation of DPPH free radicals, as shown by the decreasing absorbance value as the concentration rises.

Thus, there is a correlation between increasing the concentration of the test sample and increasing the amount of free radical scavenging.

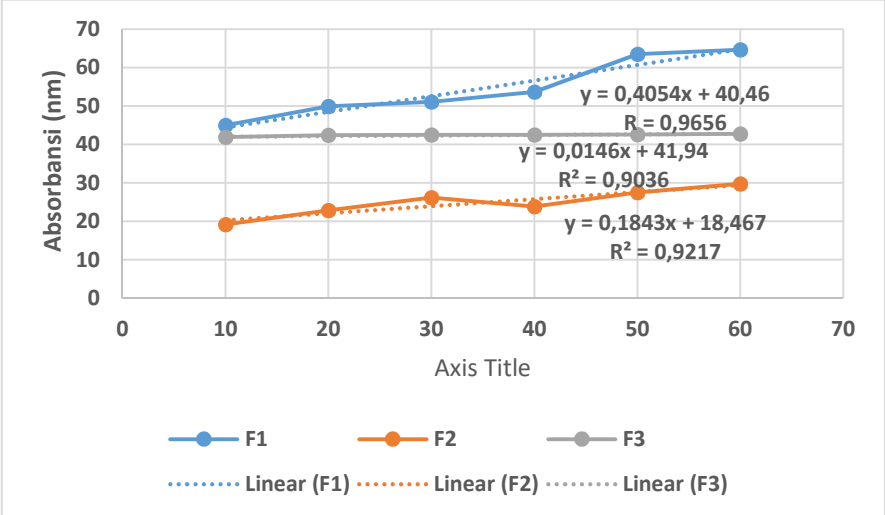

Figure 2. The % Inhibition Curve of Rhizome Extract Combination Juice

Antioxidants decrease radicals through an electron transfer process; in other words, the oxidizing agent oxidizes the radicals while the protected species are reduced or unchanged[17]. Formula 1 has the most significant percentage of inhibition when the percentage of inhibition is calculated.

Table 2. Average Percentage of Antioxidant Inhibition Combination of Ginger (Zingiber officinale), Turmeric (Curcuma longa Linn), Galangal (Alpinia galanga) and Kaempferia (Kaempferia galanga L) extracts for each formulation with varying concentrations of 10, 20, 30, 40 , 50 and 60 ppm

Formulation	% Inhibition (X±SD)						p-*Value*
	Concentration (ppm)						
	10	20	30	40	50	60	
FI	45±1,62	49,9±3,35	51,1±3,31	53,7±8,22	63,5±3,74	64,7±6,06	
FII	19,2±2,87	22,9±1,71	26,2±4,63	23,9±5,01	27,5±3,45	29,8±3,61	0,000
FIII	41,9±7,71	42,4±7,35	42,5±7,71	42,5±7,71	42,6±7,43	42,8±7,10	

In formulation I, ginger comprised 50% of the combination juice, turmeric 25%, galangal 15%, and kaempferia 10%.

Due to the preponderance of ginger in this composition, the presence of gingerol as a phenolic with an aromatic ring enables DPPH radical scavenging to be dominant[18].

Table 5. Comparison of IC_{50} Values Combination of Ginger (Zingiber officinale), Turmeric (Curcuma longa Linn), Galangal (Alpinia galanga) and Kaempferia (Kaempferia galanga L) extracts for each formulation

Sample	Graph equation	IC_{50} Value (ppm) X±SD	Category
Formulation 1	y = 0,4054x + 40,46	23,5±8,40	Very Strong
Formulation 2	y = 0,1843x + 18,48	216,1±4,81	Medium
Formulation 3	y = 0,0146x + 41,94	279,9±6,22	Very Weak

Antioxidants scavenge free radicals by pairing unpaired electrons in the presence of a hydrogen donor from the hydroxyl group[19], producing a stable DPPH[20]. Formula II with a 50% turmeric content came next, but the percent inhibitory formulation of Formula III did not substantially rise with increasing concentration.

According to Table 5, the average IC_{50} value for formulation 1 is 23.5 ppm, suggesting that the combination of ginger, turmeric, galangal, and galangal rhizome juice in the formulation I have a very strong antioxidant activity. In formulation 2, the average IC_{50} value of ginger, turmeric, galangal, and kaempferia extracts is 171 ppm, suggesting that the combination has moderate antioxidant activity. In contrast, the average IC50 value in formulation III is 552 ppm, showing that the average IC_{50} value for the formulation III combinations of ginger, turmeric, galangal, and kaempferia rhizome

extracts falls in the category of very weak antioxidant activity.

CONCLUSION

The combination of rhizome extracts may affect their antioxidant properties. These findings suggest that the combination of these four rhizomes affects one another. As shown by the chemical content identification test results using the TLC technique, not all active compounds are detectable, particularly the combination dominated by ginger. While it is conceivable that gingerols may affect curcumin and flavonoids, further study on the percentage content of each medicinal component from the rhizome is necessary to determine the connection between the combined formulation and antioxidant activity. Ginger's antioxidant activity has been shown to have a high antioxidant capacity.

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