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OPTIMIZATION OF ETHANOL AS A SOLVENT FOR FLAVONOID AND PHENOLIC COMPOUNDS OF CEGUK (*Quisqualis indica* L.) LEAVES WITH ULTRASOUND ASSISTED EXTRACTION (UAE) METHOD

Vera Ladeska [1], Ema Dewanti [2], Rizka Septiana [3]

Abstrak: Tanaman ceguk (*Quisqualis indica* L.) termasuk family Combretaceae, yang memiliki banyak khasiat secara tradisional. Penelitian ini bertujuan untuk mengamati pengaruh perbedaan konsentrasi etanol terhadap kadar senyawa flavonoid, fenol dan aktivitas antioksidan. Penetapan kadar flavonoid menggunakan metoda kolorimetri, fenol dengan metoda Folin-ciocalteu dan uji antioksidan dengan metoda DPPH. Hasil penetapan kadar flavonoid pada ekstrak etanol 50%, 70% dan 96% secara berturut-turut sebesar 72,4689 mgQE/g ± 0,8162, 78,7577 mgQE/g ± 2,1792 dan 65,1317 mgQE/g ± 2,3279. Dan hasil penetapan kadar fenolik pada ekstrak etanol 50%, 70% dan 96% secara berturut-turut sebesar 47,7213 mgGAE/g ± 0,7577, 52,7501 mgGAE/g ± 0,4442 dan 43,5588 mgGAE/g ± 0,0860. Pengujian aktivitas antioksidan dengan metode DPPH pada konsentrasi pelarut etanol 50%, 70% dan 96% dengan nilai IC_{50} berturut-turut sebesar 89,9511 µg/mL, 76,9409 µg/mL, dan 97,8825 µg/mL. Berdasarkan hasil penelitian menunjukkan bahwa konsentrasi terbaik untuk mendapatkan kadar flavonoid total, kadar fenolik total dan aktivitas antioksidan tertinggi adalah pada konsentrasi etanol 70%.

Abstract: Ceguk plant (*Quisqualis indica* L.) belongs to family Combretaceae, which has many properties traditionally. The aims study was to screen the best concentration of solvents against the determination of phenol levels, flavonoids and antioxidant activity. Flavonoid levels were determined using colorimetric, while phenolic levels were determined using the *Folin-Ciocalteu* method and antioxidant activity with DPPH method.The results showed of flavonoid levels in 50%, 70% and 96% ethanol extracts were 72.4689 mgQE/g ± 0.8162, 78.7577 mgQE/g ± 2.1792 and 65.1317 mgQE/g ± 2.3279. And the results of the determination of phenolic levels in the ethanol extract of 50%, 70% and 96% respectively were 47.7213 mgGAE/g ± 0.7577, 52.7501 mgGAE/g ± 0.4442 and 43.5588 mgGAE/g ± 0.0860.Testing of antioxidant activity using the DPPH method at 50%, 70% and 96% ethanol solvent concentrations with IC_{50} values of 89.9511 g/mL, 76.9409 g/mL, and 97.8825 g/mL, respectively. Based on the results of the study showed that the best concentration to obtain total flavonoid content, total phenolic content and the highest antioxidant activity was at 70% ethanol concentration.

Keywords: *Quisqualis indica* Linn, Flavonoid, Phenolic, Ultrasonic, Antioxidant.

Kata Kunci: *Quisqualis indica* Linn, Flavonoid, Fenolik, Ultrasonik, Antioksidan.

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1. Introduction

Antioxidants are compounds that can slow down or inhibit oxidation reactions, by donating electrons or reductants. Antioxidants are needed to protect the body from exposure to free radicals because of the large number of free radicals that come from outside the body such as from pollutants, cigarettes or certain drugs and ultraviolet radiation. Antioxidants are able to protect target molecules by capturing free radicals using proteins, reducing the formation of free radicals by converting them into less active free radicals or turning them into non-radical compounds, binding metal ions that can cause free radicals, repairing organs that have been damaged. damaged by free radicals and replace damaged cells with new cells (Priyanto, 2015).

Ceguk plant (*Quisqualis indica* L.) is one of the plants that has been widely used by the community as a traditional medicine because it has pharmacological activities such as anti-pyretic, anti-inflammatory, immunomodulatory, anti-septic, anti-staphylococcal, anti-oxidant and anti-inflammatory. anti-helment (Sahu et al., 2012). Ceguk plants are known to contain secondary metabolites such as alkaloids, flavonoids, phenolics, saponins, steroids, terpenoids and tannins (Ardana dkk., 2015).

In general, all plants have phenolic compounds. The term phenolic compound is used for compounds that are characterized by the presence of an aromatic ring and one or two hydroxyl groups attached to an aromatic ring so that they are easily oxidized by donating hydrogen atoms to free radicals. Phenol compounds that have more than two hydroxyl groups are called polyphenols, for example the tannin, flavonoid, melanin and lignin groups (Hanani, 2015).

One of the largest groups of phenolic compounds are flavonoids. Flavonoids are secondary metabolites that have a core structure of C6-C3-C6, namely two aromatic rings linked by 3 C atoms, usually with O atomic bonds in the form of heterocyclic oxygen bonds. Flavonoids are polar compounds because they can bind to sugars to form glycosides which cause these compounds to be easily soluble in polar solvents, such as methanol, ethanol, butanol and ethyl acetate (Hanani, 2015).

Extraction is the process of separating compounds from the matrix or simplicia using an appropriate solvent (Hanani, 2015). Ultrasonic extraction method is a method that uses ultrasonic waves with a frequency of 20-2000 kHz (Hanani, 2015). The ultrasonic method can cause a cavitation effect that can break down plant cell walls so that compounds are easier to come out and get maximum extract results (Cong Cong et al., 2017). Factors affecting ultrasonic extraction are particle size, type of solvent, solvent ratio, extraction temperature, extraction time, sample height (liquid sample), and cycle of exposure to ultrasonic waves (Wijngaard et al., 2012).

One of the factors that affect the extraction results is the difference in solvent concentration. The difference in solvent concentration affects the extraction process because it can cause a change in the polarity of the solvent so that it can affect the solubility of bioactive compounds (Widarta & Arnata, 2017). Ceguk bark with chloroform solvent has a total phenolic content of 39.45 mgGAE/g, and has antioxidant activity with an IC_{50} value (30.65 g/mL) (Kaisar et al., 2009). Ceguk leaves with water solvent showed an IC_{50} value of (5.73 g/mL) which can help ward off free radicals (Islam et al., 2017). Optimization of the content of compounds contained in the extract of citronella leaves can be done using ultrasonic methods from various concentrations of different ethanol solvents, the ethanol solvent variations used are ethanol 50%, 70% and 96%.

2. Literature Review

Ceguk leaves are shrubs with vines that grow through seeds and stem cuttings that are often found in areas with tropical climates. In the wild, hives can grow up to 21 meters, when cultivated, they only grow from 2 to 9 meters. On the part of the fruit has an elliptical shape

measuring 2.5 - 3 cm accompanied by 5 sharp or longitudinal angles, the fruit seeds are flat and black with a length of 12-15 mm (Sahu et al., 2012). Ceguk leaves (*Quisqualis indica* L.) in its leaves contains compounds such as trigolline (alkaloids), amino acids, and rutin (flavonoids) (Singh et al., 2010). Extraction is the process of separating the material from the mixture by using a suitable solvent. The extraction process was stopped when an equilibrium was reached between the concentration of the compound in the solvent and the concentration in the plant cell. After the extraction process, the solvent is separated from the sample by filtration (Mukhriani, 2014). Dry extract is obtained if it does not contain a liquid filter (Hanani, 2015). Evaporation (concentration) of the extraction results is intended to obtain a more concentrated extract, with the aim that the concentration of compounds is greater and facilitates storage. thermolabile can be avoided (Hanani, 2015).

Several factors that affect the extraction results, one of which is the concentration of the solvent used. Differences in the concentration of ethanol can result in a change in the polarity of the solvent so that it affects the solubility of bioactive compounds (Suhendra et al., 2019). The solvent liquid in the extract manufacturing process is a good solvent for efficacious or active content compounds, thus these compounds can be separated from the material and from other content compounds, as well as extracts only contain most of the desired content compounds (Depkes RI, 2000). Polar solvents (water, methanol, ethanol, acetone, etc.) are selected to extract components, such as glycosides, polyphenols including tannins, and anthocyanins (Harborne, 1996). Polar solvents (water, methanol, ethanol, acetone, etc.) are selected to extract components, such as glycosides, polyphenols including tannins, and anthocyanins (Harborne, 1996). The price of the solvent should be as low as possible and non-flammable (Guenther, 1987;Susanti et al., 2012).

The extraction method used in this research is ultrasonic. The ultrasonic extraction method is a method that uses ultrasonic waves with a frequency greater than 16 – 20 kHz which is non-destructive and non-invasive, so it can be easily adapted to various application (Suslick, 1988). The advantage of the ultrasonic extraction method is that it increases the contact surface area. between the solid and liquid phases so that the solute diffuses quickly, the operating time is shorter and the extraction efficiency increases (Zou et al., 2014). Enzymatic and non-enzymatic antioxidants work together to combat the activity of oxidizing compounds in the body. The occurrence of oxidative stress can be inhibited by the work of antioxidant enzymes in the body and non-enzymatic antioxidants (Winarsi, 2007). The DPPH method is a simple, fast, antioxidant measurement that does not require a lot of reagents (Zakaria et al., 2008). The absorption of free radicals causes electrons to re-pair and causes color loss which will be proportional to the number of electrons taken (Jackie et al., 2018). The DPPH method can be used for solid or liquid samples and is not specific for a particular antioxidant component, but applies to the overall antioxidant capacity (Prakash et al., 2001).

The concentration of the analyte in the solution is determined by measuring the absorbance at a certain wavelength. UV light is at a wavelength of 200-400 nm while visible light is at a wavelength of 400-800 nm (Dachriyanus, 2004). This absorbance value will depend on the content of the substance contained in it. The more levels of substances contained in a sample, the more molecules that will absorb light at a certain wavelength, so that the absorbance value will be directly proportional to the concentration of the substance contained in a sample (Harmita, 2015). Flavonoid compounds are found in all parts of plants including leaves, roots, wood, bark, pollen, nectar, flowers, fruit, and seeds. Flavonoids are strong antioxidants because they have the ability to scavenge free radicals and inhibit lipid oxidation (Zuraida et al., 2017). Phenol compounds that have more than two hydroxyl groups are called polyphenols, for example, tannin, flavonoid, melanin, and lignin groups. Pure phenolic compounds can cause a burning sensation

when in contact with the skin (Hanani, 2015). The determination of total phenolic levels usually uses a comparison solution of gallic acid. Gallic acid has antifungal, antioxidant and antiviral properties. Gallic acid belongs to a class of natural antioxidants that are often used as food preservatives (López et al., 2003).

3. Method.

Preparation Simplicia Ceguk Leaves. Ceguk leaves were taken from the plantations of the Bogor Agricultural University. Ceguk leaves were harvested in March 2021. Then they were wet sorted from impurities. Selected ceguk leaves are green and have a length of 10 to 14 cm with a leaf width of 5 to 8 cm. The leaves are washed with running water until clean, drained, chopped, air dried, protected from direct sunlight and sorted dry. Furthermore, the dried simplicia was mashed using a blender and sieved with a mesh number 60 (Depkes RI, 1985).

Extraction . The powder of ceguk leaves was put into an ultrasonic cleaning bath plus ethanol in a ratio of (1:10) w/v. The powder was extracted with various concentrations of ethanol 50%, 70%, and 96% for 20 minutes, temperature 45º ultrasonically at a frequency of 40 KHz. The powder is filtered and evaporated with a rotary vacuum evaporator at a temperature of 40-50ºC until a thick extract is obtained (Guna dkk., 2020).

Measurement of Extract Characteristics. Yield calculation, organoleptic examination, drying loss and determination of total ash content were carried out.

Drying Loss by carefully weighing 2 grams of 50%, 70% and 96% ethanol extracts were put into a weighing bottle that had been incandescent and tara. Flatten the ingredients in a weighing bottle, put in the oven, open the lid, dry at 105ºC for 30 minutes until the weight remains. Before drying, allow the closed bottle to cool in the desiccatorup to room temperature (Depkes RI, 2017).

Determination of ash content. Determination is done bycarefully weighed 2 grams of 50%, 70% and 96% ethanol extracts, put them in a kiln, ignited and heated at a temperature of 500-600ºC until carbon-free. The ash is cooled in a desiccator and weighed. Ash content is calculated against the weight of the test material expressed in % b/b (Depkes RI, 2008).

Phytochemical Screening. Identification of secondary metabolites using color reagents and precipitants. For Alkaloids using (Dragendroff, Mayer, Bouchardat, Wagner), Flavonoids (Cyanide Test), Phenolics ($FeCl_3$), Tannins (10% gelatin), Saponins (foam test), Steroids and Terpenoids (Liebermann Burchat)(Hanani, 2015)(Depkes RI, 2008).

Determination of Total Flavonoid Level. Determination of Total Flavonoid Levels using the colorimetric method (Chang et al., 2002). A total of 10.0 mg of extract of ceguk leaf with various solvent concentrations was dissolved in a 10 mL volumetric flask to obtain a concentration of 1000 ppm. Make a dilution to 500 ppm by pipetting 0.5 L added 1.5 mL of methanol pa, 0.1 AlCl3 10%, 0.1 mL of potassium acetate (1M) and 2.8 mL of distilled water. The mixture of the solution was allowed to stand for 30 minutes and the absorbance was measured at a wavelength of 432 nm.

Total flavonoid levels are expressed as quercetin equivalent (Quercetin Equivalent/QE) based on the formula:

$$\textbf{Flavonoid content (\%QE)} = \frac{\textbf{C x V x fp x } 10^{-6}}{\textbf{m}}$$

Information:

C = Equivalence of quercetin levels based on calibration curve (µg/mL)
V = Total volume of extract (mL)
fp = dilution factor
m = Sample weight (g)

Determination of Total Phenolic Levels. Determination of phenol content using the Folin-Ciocalteau method (Alfian & Susanti, 2012). A total of 10.0 mg of ethanol extract with various solvent concentrations was dissolved in a mixture of methanol pa: aquadest (1:1) to a volume of 10.0 mL. Diluted to 500 ppm then pipette 0.3 mL 1.5 mL of Folin-Ciocalteau 10% was added, allowed to stand for 3 minutes, then 1.2 mL of the solution was added Na_2CO_3 7.5% and allowed to stand for 40 minutes. The absorbance of the extract solution was measured by UV-Vis spectrophotometer at a maximum wavelength of 765 nm. Total phenol content was expressed as gallic acid equivalent (GAE) based on the equation.

$$\text{Phenol content (\%GAE)} = \frac{C \times V \times fp \times 10^{-6}}{m}$$

Information:

C = Equivalence of gallic acid levels based on calibration curve(µg/mL)
V = Total volume of extract (mL)
Fp = Dilution factor
M = Sample weight (g)

Antioxidant Activity Test.

A total of 10 mg of ethanol extract of 50%, 70%, 96% of ceguk leaves were dissolved with methanol pa in a 10 mL volumetric flask to the limit mark, so that a concentration of 1000 ppm was obtained. 1 mL of each sample concentration was taken, added with 3 mL of 0.1 mM DPPH solution, then shaken until homogeneous and left for 30 minutes in a dark place. Then the absorbance was measured at a maximum wavelength of 516 nm (Molyneux, 2004).

4. Results and Discussion

Determination is the initial stage in this research, with the aim of getting the correct identity of the plant that will be used as research test material. This is intended to avoid errors in the plants used. Determination of ceguk plants was carried out at the Herbarium Bogoriense for Botanical Research Center for Biology (LIPI) Bogor Botanical Gardens.

From organoleptic observations, the extract was generally green in color, thick, with a distinctive taste and distinctive smell.

The yield value, drying shrinkage and ash content of the extract can be seen in table 1. below:

Table 1. Extract yield, drying loss and ash content

Parameters	Ethanol Extract 50%	Ethanol Extract 70%	Ethanol Extract 96%
Extract Yield	19.91 g	21.72 g	18.42 g
Drying Loss	6.93%	6.02%	5.68%
Ash Level	7.16%	7.14%	7.11%

The results of phytochemical screening can be seen in Table 2.

Table 2. Phytochemical Screening Results

No.	Uji Identifikasi	Etanol 50%	Etanol 70%	Etanol 96%	Hasil
1.	Alkaloid	+	+	+	Endapan Putih
		+	+	+	Endapan Coklat
		+	+	+	Endapan Oranye
		+	+	+	Endapan Coklat
2.	Flavonoid	+	+	+	Warna Jingga
3.	Fenolik	+	+	+	Warna Hitam
4.	Tanin	+	+	+	Endapan Putih
5.	Saponin	+	+	+	Buih 1 cm
6.	Steroid	+	+	+	Warna Hijau
7.	Terpenoid	+	+	+	Warna Merah

Information :
(+) = Contains a group of compounds
(-) = Does not contain a group of compounds

A. Determination of Total Flavonoid Level

Flavonoids are secondary metabolites that have a C6-C3-C6 core structure, namely two aromatic rings linked by 3 C atoms, with O atoms bonded which is a heterocyclic oxygen bond. These compounds can be included as polyphenol compounds because they contain two or more hydroxyl groups, are slightly acidic so they can be soluble in bases. The method of quantitative analysis of flavonoid content was carried out by the Chang method with quercetin as the standard.In this method, flavonoids that have ortho-dihydroxy and hydroxy ketone groups will form complex compounds with aluminum metal, resulting in a bathochromic shift. Meanwhile, potassium acetate is used to maintain and stabilize the structure by ionizing uncomplexed 3 and 4'-OH groups with Al3+ and 7-OH groups so that the structure still provides absorption in the visible region (Cornard & Merlin, 2002). The results of the determination of flavonoid levels can be seen in table 3.

Table 3. Results of Determination of Total Flavonoid Levels

Pelarut Ekstraksi	Abs	Kadar mgQE/g	Rata-rata Kadar mgQE/g
Etanol 50%	0,3579	73,2157	
	0,3528	71,5976	72,4689 ± 0,8162
	0,3565	72,5934	
Etanol 70%	0,3826	81,2402	
	0,3740	77,8730	78,7577 ± 2,1792
	0,3726	77,1600	
Etanol 96%	0,3280	64,5664	
	0,3235	63,1386	65,1317 ± 2,3279
	0,3395	67,6903	

The total flavonoid content in the extract was expressed as Quercetin Equivalents (QE) from the quercetin equation. Based on the results of the study, it is known that the flavonoid

levels in ethanol concentrations of 50%, 70% and 96% are 72.4689 mgQE/g ± 0.8162, 78.7577 mgQE/g ± 2.1792, and 65.1317 mgQE/g ± 2.3279. This is in accordance with the principle like dissolves like because a compound will dissolve in a solvent of the same polarity. Ethanol has an OH group that can form hydrogen bonds with the hydroxyl (OH) group of flavonoid compounds, causing an increase in the solubility of flavonoid compounds in ethanol. Flavonoids are divided into several types (Harborne, 1996). The results of the lowest flavonoid levels were found at a concentration of 96% ethanol. This is because the higher the concentration of ethanol, the lower the polarity of the solvent. The use of higher ethanol concentrations of up to 90% resulted in a decrease in the total flavonoids obtained because ethanol solvents above 70% were less effective at dissolving flavonoid compounds that have low molecular weights (Suhendra dkk., 2019).

B. Determination of Total Phenolic Levels

Determination of total phenolic content was carried out using the Folin Ciocalteau method. This method is the most commonly used method to determine the total phenolic content in a plant with the consideration that by using this technique the process is simpler and the Folin Ciocalteau reagent was chosen because phenolic compounds can react with Folin to form a solution whose absorbance can be measured. Analysis of the total phenolic content using the Folin Ciocalteau method whose absorbance was measured at a wavelength of 765 nm (Pourmorad et al., 2006). The standard solution used in this study is gallic acid which is a simple phenol group and is relatively stable and easy to obtain. Gallic acid was reacted with Folin Ciocalteau reagent to produce a blue color indicating the presence of phenolics, after which 7.5% Na_2CO_3 solution was added as an alkaline agent. During the reaction, the hydroxyl group in the phenolic reacts with Folin Ciocalteau reagent, forming a blue tungsten molybdenum complex with an unknown structure and can be detected using UV-Vis spectrophotometry. The blue color formed will be more concentrated, equivalent to the concentration of phenolic ions formed.

Table 4. Results of Determination of Total Phenolic Levels

Pelarut Ekstraksi	Abs	Kadar mgQE/g	Rata-rata Kadar mgQE/g
Etanol 50%	0,3382	47,8500	
	0,3340	46,9075	47,7213 ± 0,7577
	0,3421	48,4065	
Etanol 70%	0,3629	52,6210	
	0,3682	53,2447	52,7501 ± 0,4442
	0,3640	52,3848	
Etanol 96%	0,3146	43,4762	
	0,3158	43,6479	43,5588 ± 0,0860
	0,3143	43,5524	

The total phenolic content in the extract was expressed as Gallic Acid Equivalents (GAE) of the gallic acid equation. In the results of this study, the highest total phenolic content was found at 70% ethanol concentration. This is because ethanol is a solvent that can dissolve compounds from less polar to polar. Ethanol has a hydroxyl group that can bind to a hydrogen group from the hydroxyl group of phenolic compounds which causes an increase in the solubility of phenolic compounds in ethanol. Differences in ethanol concentration can affect the solubility of phenolic compounds in the solvent (Prayitno dkk., 2016)(Suhendra dkk., 2019). The higher the ethanol concentration, the lower the polarity of the solvent. A substance will be dissolved and extracted well if the solvent used has the same polarity level (Suhendra dkk., 2019).

C. Antioxidant Activity of DPPH Method

Determination of antioxidant activity using the DPPH (1,1-diphenyl-2-picrihydrazil) method. The antioxidant activity test method with DPPH was chosen because this method is a simple, easy, fast method and only requires a small sample to evaluate the antioxidant activity of natural compounds, so it is widely used to test the ability of compounds that act as electron donors. The mechanism of DPPH radical scavenging so that atoms with unpaired electrons get electron pairs and are no longer radicals which are characterized by a decrease in absorbance value and a change in the color of the solution from purple to yellow. Theoretically, the maximum wavelength of DPPH solution is 515-520 nm (Molyneux, 2004). The results of the research that have been carried out show that the maximum wavelength of the DPPH solution is 516 nm with an absorbance value of 0.7086. Test results of quarcetin antioxidant activity against DPPH listed in Table 5.

Table 5. Results of Quercetin Antioxidant Activity Test Against DPPH

Kons. (ppm)	Absorbansi				Rata-rata % Inhibisi	IC_{50} (ppm)
	I	II	III	Rata-rata		
2	0,6241	0,6353	0,6134	0,6242	11,9014	7,4330
4	0,5462	0,5254	0,5151	0,5289	25,3599	
6	0,4217	0,4161	0,4573	0,4317	39,0771	
8	0,3168	0,3324	0,3036	0,3176	55,1792	
10	0,2439	0,2272	0,2141	0,2284	67,7974	

In the measurement of standard solution quercetin has an IC_{50} value of 7.4330 g/ml with a linear regression equation y = 7.0776x - 2.6085 and a value of (R2) 0.9988. Then continued antioxidant testing of 70% ethanol extract of ceguk leaves made with series of concentrations of 20, 40, 60, 80 and 100 ppm, on 50% ethanol extract of ceguk leaves with series of concentrations of 40, 60, 80, 100 and 120 ppm, and on ethanol extract 96% of hives leaves with a series of

concentrations of 30, 50, 70, 90 and 110 ppm. The results of the concentration of each extract obtained from the orientation results at the lowest concentration there was a decrease in the absorbance value and at the highest concentration it did not exceed the lower limit value of the Lambert-Beer law.

Table 6. Test Results of Antioxidant Activity of 50% Ethanol Extract of Ceguk Leaves

Konsentrai (ppm)	Absorbansi				Rata-rata % Inhibisi	IC_{50} (ppm)
	I	II	III	Rata-rata		
40	0,5751	0,5690	0,5642	0,5694	19,6397	
60	0,4682	0,4624	0,4573	0,4626	34,7116	89,9511
80	0,4151	0,4045	0,4014	0,4070	42,5628	
100	0,3201	0,3102	0,3023	0,3108	56,1295	
120	0,2340	0,2281	0,2243	0,2288	67,7110	

Table 7. Results of Antioxidant Activity Test of 70% Ethanol Extract of Ceguk Leaves Against DPPH

Konsentrai (ppm)	Absorbansi				Rata-rata % Inhibisi	IC_{50} (ppm)
	I	II	III	Rata-rata		
20	0,6351	0,6280	0,6322	0,6317	10,8430	
40	0,5664	0,5521	0,5470	0,5551	21,6530	76,9409
60	0,4583	0,4535	0,4462	0,4526	36,1182	
80	0,3231	0,3193	0,3140	0,3188	55,0099	
100	0,2470	0,2422	0,2390	0,2427	65,7447	

Table 8. Test Results of Antioxidant Activity of 96% Ethanol Extract of Ceguk Leaves Against DPPH

Konsentrai (ppm)	Absorbansi				Rata-rata % Inhibisi	IC_{50} (ppm)
	I	II	III	Rata-rata		
30	0,6672	0,6631	0,6584	0,6629	6,4493	
50	0,5663	0,5602	0,5532	0,5599	20,9850	97,8825
70	0,4851	0,4815	0,4760	0,4808	32,1385	
90	0,3990	0,3961	0,3871	0,3940	44,3880	
110	0,3062	0,3020	0,2860	0,2980	57,9358	

The results showed that the difference in the concentration of ethanol solvent had a very significant effect on the DPPH radical inhibitory activity of the extract of ceguk leaf. From the results of the study, it can be seen that the lowest antioxidant activity was produced at a concentration of 96% ethanol with an IC_{50} value of 97.8825 g/mL, then at a 50% ethanol concentration with an IC_{50} value of 89.9511µg/mL, and the highest antioxidant activity value was produced at a concentration of 89.9511µg/mL. 70% with an IC_{50} value of 76.9409µg/mL. The results showed that the antioxidant activity increased in the treatment using ethanol solvent with a concentration of 70%. However, after 70% ethanol concentration, the antioxidant activity decreased.

5. Conclusion

The effect of differences in the concentration of solvent extraction with ultrasonic can affect the total flavonoid and phenolic levels as well as antioxidant activity. The results of total flavonoid and total phenolic content in 70% ethanol extract were 78.7577 mgQE/g ± 2.1792, 52.7501 mgGAE/g ± 0.4442 with an IC_{50} value of 76.9509 g/mL. From these data, it was shown that the 70% ethanol extract of the leaves of ceguk (*Quisqualis indica* L.) had strong antioxidant activity.

FUTURE RESEARCH

Further research is needed to test the antioxidant activity of ethanol extract leaves of ceguk on test animals in vivo.

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