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Antioxidant Activity of Bajakah Kuning (*Arcangelisia flava* (L.) Merr)

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Abstract

Indonesia is a tropical country with potential plants that have been used as traditional medicine for generations. One of them is bajakah. This study aims to determine the phenolic content and antioxidant activity of yellow bajakah extract and the relationship between phenolic content and antioxidant activity. The study began with making yellow bajakah extract using maceration method. The bajakah extract obtained then analysed the phenolic content quantitatively using the Folin-Ciocalteu method. Antioxidant activity was tested using the DPPH and ABTS methods. The results showed that yellow bajakah extract contained phenolic compounds with levels of 27.15 ± 1.28 mg/g GAE. IC_{50} measurements to determine antioxidant activity obtained a value of 47.01 ± 1.16 µg / ml in the DPPH method and 61.21 ± 0.83 µg / ml in the ABTS method. Based on these results, yellow bajakah skin is known to have antioxidant activity with a strong category and phenolic content in yellow bajakah skin has an influence on antioxidant activity.

Keywords: Bajakah, antioxidant, phenolic, correlation

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1 Introduction

Indonesia is a tropical country that has the potential of plants that have been used as traditional medicine for generations. Medicinal plants in Indonesia have a very important role, especially for people in rural areas where health facilities are still very limited. Communities around forest areas utilise medicinal plants as medicinal raw materials based on knowledge about the use of medicinal plants that have been passed down from generation to generation. The use of traditional medicine is generally considered safer than the use of modern medicine. This is because traditional medicine has relatively fewer side effects compared to modern medicine.

Free radicals are molecules that are highly reactive and unstable because they have unpaired electrons in their outermost orbitals and can react with other molecules and cause chain reactions that result in cell damage [1] There are two sources of free radicals, namely endogenous through autoxidation, enzymatic oxidation, phagocytosis in respiration, transport in mitochondria and oxidation of transition metal ions. While exogenous originating from outside the body include ultraviolet (UV) light, radiation, cigarette smoke, carbon tertrachloride chemical compounds, baked goods and colouring agents. Free radicals can cause various diseases such as impaired kidney function, cataracts, cancer, even heart attacks, can cause autoimmunity, skin cell aging, and so on. To prevent the adverse effects of free radical exposure, compounds such as antioxidants are needed. Antioxidants have important functions for the health of the body by inhibiting and neutralising oxidation reactions involving free radicals [2].

Antioxidants are molecules or compounds that are stable enough to donate their electrons or hydrogens to free radical molecules or compounds and neutralise them, thereby reducing their ability to carry out free radical chain reactions. These antioxidants delay or inhibit cell damage mainly through their free radical scavenging properties. These antioxidants can safely interact with free radicals and stop the chain reaction, and prevent free radicals from damaging vital molecules [3]. Compounds that have potential as antioxidants are generally flavonoids, phenolic compounds and alkaloids. Flavonoids and phenolic compounds are antioxidant, antidiabetic, anticancer, antiseptic and anti-inflammatory. While alkaloids have antineoplastic properties that are also potent in inhibiting the growth of cancer cells [4].

Bajakah is one of the biodiversity plants that has potential as a traditional medicine. Bajakah is a simplisia with the Latin name Arcangelisia flava (L.) Merr. Bajakah plants with the genus uncaria are used in traditional medicine to overcome the symptoms of gastrointestinal disorders, microbacterial infections, hypertension, febrile nervous diseases and wound healing (5). Based on the results of secondary metabolite testing, yellow bajakah is known to contain secondary metabolite compounds such as flavonoids, tannins, and phenolic compounds. This study aims to determine the antioxidant activity of yellow bajakah extract and see the relationship between phenolic content and antioxidant activity.

2 Materials and Methods

2.1 Extraction

The dried plants were cut into small pieces and grinding and passed. A maceration process

was carried out to extract plant material using a solvent ratio of 1:10 (w/v). maceration using ethanol 95% for solvent. The macerate was filtered and concentrated using a rotary evaporator at temperature and vacuum pressure of 55°C and 630 mmHg, respectively. The obtained extract was stored in a food dehydrator for further analyses.

2.2 Total Phenolic Content Assay

The total phenolic content (TPC) in each extract was measured using the Folin-Ciocalteu assay, based on[6], after making minor modifications to the process. An accurate predetermined concentration of eachextract dissolved in ethanol was used as the sample. In addition, gallic acid was used as a standard, in a range of 10–160μg/mL. A 0.30 mL sample was mixed homogeneously with 1.50 mL of 10% Folin-Ciocalteu reagent (diluted 1:10with deionized water) for 5 min. The mixture was neutralized with 1.20 mL of 7.5% sodium carbonate solution andincubated along with shaking for 30 min according to the optimized operating time. The sample absorbance was recordedusing spectrophotometer UV-VIS at 764 nm. The TPC of eachextract was calculated according to the gallic acid standard calibration curve (y = 0.0116x + 0.2110, where x is gallic acid[μg/mL], and y is absorbance; R2 0.9968) and presented as the percentage of gallic acid equivalent (%w GAE).

2.3 DPPH Method

Extract dissolved and diluted using ethanol concentrations ranging from 0 to 200 μg/mL. A 1.0 mL sample was mixed with 1.0 mL DPPH (0.4 mM in methanol) and diluted with 3.0 mL of methanol. The reaction was incubated at dark conditions for 30 min according to the optimized operating time. The control solution was a sample concentration of 0 μg/mL. The absorbance of the sample (As) and control solution (Ac) was recorded at 517 nm [7].

2.4 ABTS Method

The ABTS radical was achieved by reacting 7.0 mM ABTS solution with 2.45 mM potassium persulfate. The mixture was stored in a dark room overnight. A 0.5 mL extract (0-200 μg/mL) was added to 1.0 mL ABTS+ radical and incubated for 15 min in a dark room according to the optimized operating time. The control solution was prepared by mixing the ABTS+ radical 1.0 mL with 0.5 mL double distilled water. The absorbance of the sample (As) and control (Ac) [8].

3 Results and Discussion

Yellow Bajakah was obtained from West Kutai, East Kalimantan. Before being used as research material, a determination process was carried out to ensure the authenticity of the research raw materials. Yellow bajakahsymplisia was pulverised to obtain simplisia powder. This aims to reduce the surface area of the simplisiaso as to facilitate the process of withdrawing metabolite compounds contained in yellow bajakah. The compound withdrawal process is carried out by maceration method. The maceration method is immersion using a solvent. The choice of solvent for maceration needs to be considered several things, one of which is the ability of the solvent to attract compounds contained in the simplisia. The extraction results showed that the yield obtained was 14%. The yield value of the extraction process required by a natural material when used as a basic ingredient of medicine must have a yield above 10% [9].

Determination of levels using folin-ciocalteau reagent. The principle of this method is the oxidation reaction of phenol compounds in an alkaline atmosphere by folin-ciocaltau reagent to produce a blue complex. The increase in the intensity of the blue colour will be proportional to the amount of phenolic compounds present in the sample. Determination of the total phenolic content of the extract was carried out based on the gallic acid standard curve. The use of gallic acid as a standard is because gallic acid is a derivative of hydrobenzoate which is a simple phenol acid that

is pure and stable. The reaction that occurs between gallic acid with folin reagent and sodium carbonate is the formation of a blue complex compound [10]. The phenol content of yellow bajakah can be seen in table 1.

Table 1 Phenolic Content

No	extract	Phenol Content (mg/gram GAE)
1.	EtOH	27.15 ± 1.28

Antioxidant activity of yellow bajakah extract was tested using DPPH and ABTS methods. DPPH and ABTS are used as radicals that will be neutralised with antioxidant compounds that will be used as the basis for antioxidant activity. Measurement of antioxidant activity with the DPPH and ABTS methods is carried out using a UV-Vis spectrophotometer, the maximum wavelength of measurement with the DPPH method is 517 nm [11] while the ABTS method uses a wavelength of 745.50 nm [12]. The amount of antioxidant activity is indicated by the IC50 value, IC50 is the concentration of sample solution needed to inhibit 50% of DPPH free radicals. The IC50 value of each method can be seen in Table 2.

Table 2 IC_{50} Value Radical Scavenging

No	Sample	IC_{50} (µg/ml)	
		DPPH	ABTS
1	BajakahKuning	47.01±1.16	61.21± 0.83
2	Ascorbic Acid	4.31±0.92	-
3	Trolox	-	8.49±0.78

Based on table 2, it is obtained that the antioxidant activity of yellow bajakah extract is antioxidant activity with a strong category. This can be seen in the IC_{50} value in the range (50-100 µg/ml). the strength of antioxidant activity is influenced by the content of secondary metabolites including phenolic compounds [2]. Phenolic compounds are reported to be able to donate H atoms so that they can neutralise free radicals.

4 Conclusions

Based on the results, it can be concluded that yellow bajakah extract has antioxidant activity with a strong category and phenolic content is directly proportional to antioxidant activity.

5 Declarations

5.1 Author Contributions

The names of the authors listed in this journal contributed to this research.

5.2 Funding Statement

This research was not supported by any funding sources.

5.3 Conflicts of Interest

The authors declare no conflict of interest.

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