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Antioxidant Activity and Total Phenolic Contents in Methanol Extracts from *Swietenia Mahagoni and Andrographis Paniculata*

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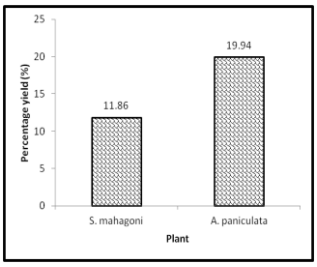
Graphical abstract



Abstract

Traditional medicinal plants such as *Swietenia mahagoni* and *Andrographis paniculata* are rich with bioactive compounds. The phenolic composition and antioxidant activity of methanol extract from *Swietenia mahagoni* and *Andrographis paniculata* were studied. They were extracted by Soxhlet extraction of 70% methanol solvent. The results obtained from this study showed *Andrographis paniculata* gave highest percentage yield by 19.94% compared to *Swietenia mahagoni* at 11.86%. In antioxidant activity, *Andrographis paniculata* and *Swietenia mahagoni* showed 89.93% and 60.77% respectively. While for total phenolic content highest in extract of *Swietenia mahagoni* by 55.0 mg/g and *Andrographis paniculata* only 7.7 mg/g.

Keywords: Antioxidant; total phenolic contents; methanol extracts; *Swietenia mahagoni*; *Andrographis paniculata*

1.0 INTRODUCTION

Swietenia mahagoni (Linn.) Jacq. mainly grows in tropical areas of Asia such as India, Malaysia, Indonesia and southern mainland of China. It is also known as "Tunjuk Langit" by the local people. Its seeds have been applied as folk medicine for treatment of hypertension, diabetes and malaria, while the decoction of its bark has been used as a febrifuge[1]. The biologically active ingredients, tetranortriterpenoid and fatty acids are considered to be responsible for these therapeutic effects[2]. The seed of *S. mahagoni* has been reported for its anti-inflammatory, antimutagenecity, and antitumour activities [3]. The plant extracts have been accounted to possess antibacterial and antifungal activities. Limnoid obtained from *S. mahagoni* has antifungal activity and diabetes therapy[4].

Andrographis paniculata, locally known as Hempedu Bumi and commonly called the King of Bitter grows widely in tropical area of South East Asia, India, and China with plant height of 30-70 cm. In Malaysia and Indonesia, this plant has been extensively used for traditional medicine and help against fever, dysentery, diarrhoea, inflammation, and sore throat[5]. Furthermore, it is a promising new way for the treatment of several diseases, including HIV, AIDS, and numerous symptoms associated with immune disorders[6]. The three main diterpenoid lactones identified in *A. paniculata* leaves were andrographolide, neo-andrographolide and deoxyandrographolide[7-8].The objective of this work is to determine antioxidant activity and total phenolic content of methanol extract of the *S. mahagoni* and *A. paniculata*.

2.0 EXPERIMENTAL

2.1 Raw Material and Sample Preparation

The *S.mahagoni* seeds were collected from Indonesia. Then, the seeds were rinsed with water to remove any foreign particles and dirt prior to drying. Then, the cleaned seeds were cut into small pieces and dried using oven at 50˚C for one week to remove moisture. The seeds were grinded into powder by using blender (Panasonic). *A. paniculata* sample was purchased from Malaysia, where it was grinded into powder form.

2.2 Soxhlet Extraction (SE)

A conventional method of soxhlet extraction was performed. 5 g of *S.mahagoni* and *A. paniculata* powder were weight respectively and were placed in the thimble. 150 ml solvent of

70% methanol was used for each plant. The extraction processes were done for 6 hours at temperature 65ºC. Then, the extraction yields were put in the rotary evaporator at 50˚C to remove the solvent.

$$\% \text{ yield} = [m_1/m_0] \times 100 \quad (1)$$

Where m_0 = mass of sample (g)
m_1 = mass of the extract (g)

2.3 The 2,2-Diphenyl-1-Picrylhydrazyl (DPPH) Free Radical Scavenging

The free radical scavenging activity was measured using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. This assay was carried out according to the method with a slight modification[9]. Extract solution were prepared by dissolving 0.025 g of dry extract in 10 ml of methanol to give final concentration at 2.5 mg/ml. Then, 77 µL of the extract solution were mixed with 3 ml of 6 x 10^{-5} M methanolic solution of DPPH. After that, the mixtures were placed in the dark for 30 minutes at room temperature and the decreases in the absorption were measured at 517 nm using spectrophotometer. The DPPH radical concentration was calculated by using the following equation:

$$\text{DPPH radical concentration (\%)} = \frac{\text{A Control} - \text{A Sample}}{\text{A Control}} \text{x } 100 \quad (2)$$

Where $A_{Control}$ is the absorbance value of the control reaction and A_{Sample} is the absorbance value with the presence of the tested extracts in the sample.

2.4 Total Phenolic Content (TPC)

The TPC was determined according to the Folin-Ciocalteau method with slight modification[10]. The reaction mixture was composed by 1 mL of the extract (concentration of 0.01 g/mL), 5 mL of Folin-Ciocalteu reagent and 4 mL of sodium carbonate (75 g/L) and was incubated for 1 hour in the dark at room temperature. The absorbance was measured at 765 nm against a reagent blank (containing all test reagents except for sample). The TPC was calculated according to a standard curve. The concentration of total phenolic compounds in the extract was expressed as milligrams of gallic acid equivalent per gram of dry weight (mg GAE/g) of extract.

■3.0 RESULTS AND DISCUSSION

3.1 Percentage Yield of *S. mahagoni* and *A. paniculata*

The result in Figure 1 shows the difference between the percentage of extraction yield for *S.mahagoni* and *A. paniculata.* Generally, the extraction of *A.paniculata*gave higher percentage yield (19.94%) compared to *S. mahagoni* (11.86%). The selection of suitable solvent to extract the desired compounds should be considered thoroughly since the extracted compound will be depended on the type of solvent used[11]. A polar solvent will favour polar compound more and vice versa, thus the differences of solvents used will defer the extracts and their composition.Based on the findings, the extract had the highest percentage yield when 70% of methanol was used as solvent.

Polar solvents could extract andrographolide at higher yield and methanol was found to be the best solvent for the extraction of andrographolide[12]. *S. mahagoni* seeds are non-polar because most of the yield extract from seeds contained fatty acid mostly. In this study, *A. paniculata* was showing higher yield compared than *S. mahagoni* due to the bioactive compound in *A. paniculata* more polar than *S. mahagoni* where its seed contained more non-polar compound [13].The used of methanol, ethanol or mixture of these solvents with water usually give high yield of the extracts. This theory was proven by one study where isolation of phenolic compound from cherry liqueur pomace using 70% solvent-mixture was more effective than using pure solvent only[14].

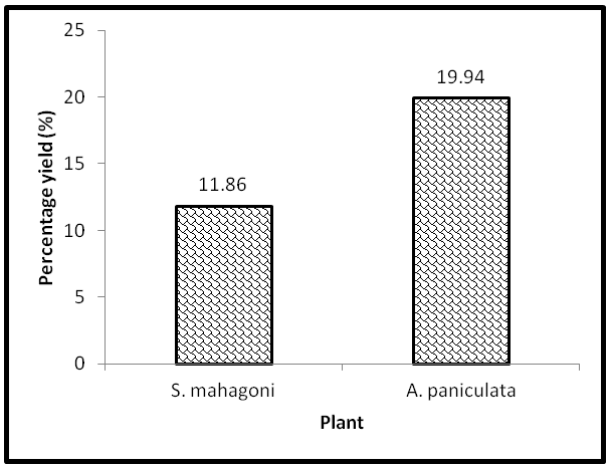


Figure 1 Comparison of percentage yield of *S. mahagoni*and *A.paniculata*by using Soxhlet extraction

3.2 DPPH Free Radical Scavenging Activity of *S. Mahagoni* and *A. Paniculata*

The antioxidant activity assay was carried out to examine the ability of *S. mahagoni* and *A. paniculata* to scavenge free radicals in vitro by the improved of scavenging activity percentage. Figure 2 shown that *A. paniculata* extracts gave the higher DPPH scavenging activity (89.83) compared to *S. mahagoni* (60.77%). These results may explained by the fact that these extract enriched with phenolic compounds which always play an important role in the antioxidant activity of the plant[15].

3.3 Total Phenolic Content (TPC) of *S. Mahagoni* and *A. Paniculata*

Total phenolic content (TPC), as determined by the Folin-Ciocalteu method, was reported as gallic acid equivalents (mg GA/g sample). This analysis was used to investigate contribution in antioxidant activity of the plant extracts. The total phenolic content extract is shown in Figure 3.

TPC in *S. mahagoni*extract was found given better content of phenolic compound (55 mg GAE/g sample) compared to the *A.paniculata*and it is well-matched with the result previously since it has higher percentage yield.

Meanwhile, *A.paniculata* had lower phenolic content (7.78 mg GAE/g sample) in the extracts. The methanol 70% extract shows significant amount of phenolic compound in the *S.mahagoni* extract. This might be contributed by the antioxidative activities of this extract. Phenols and polyphenolic compounds, such as the flavonoid, are widely found in food products derived from plant sources, and they have been proven to have significant antioxidant activities[10].

Basically, both of the extract contain high amount of phenolic compound and it is useful for the prevention of oxidative activities of the plants' extracts.

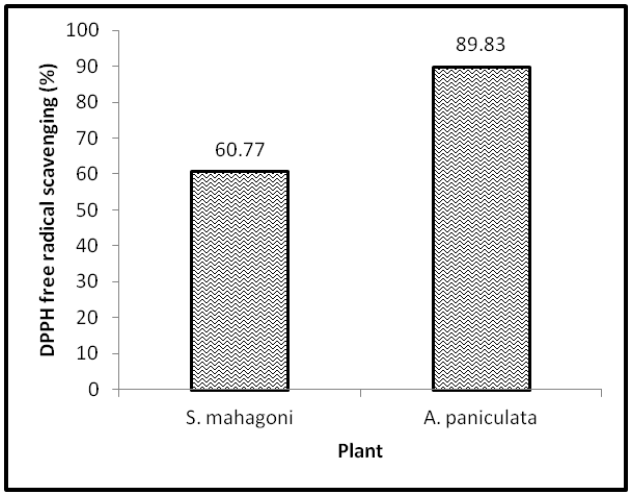


Figure 2 DPPH free radical scavenging activity of *S. mahagoni*and *A. paniculata*

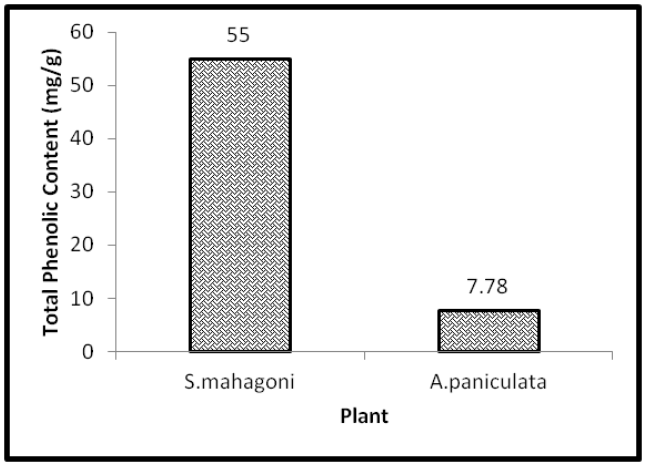


Figure 3 Total Phenolic Content of *S. mahagoni*and *A. paniculata*

4.0 CONCLUSION

The methanolic extracts (70%) of *S. mahagoni* seed and *A. paniculata* leaves extract contained total phenolic compounds and were capable of inhibiting, quenching free radicals to terminate the free radical chain reaction, and acting as reducing agents.

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