Determination of total phenolic content and antioxidant activitity of methanol extract of Maranta arundinacea L fresh leaf and tuber

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Determination of total phenolic content and antioxidant activitity of methanol extract of *Maranta arundinacea* L fresh leaf and tuber

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Abstract. *Maranta arundinacea* L is one of herbaceous plants in Indonesia which have flavonoid content. Flavonoids has antioxidants activity by inhibition of free radical oxidation reactions. The study aims were to determination total phenolic content and antioxidant activity of methanol extract of fresh leaf and tuber of *M. arundinacea* L by UV-Vis spectrophotometer. The methanol extracts were obtained with maceration and remaseration method of fresh leaves and tubers. The total phenolic content was assayed with visible spectrophotometric using Folin Ciocalteau reagent. The antioxidant activity was assayed with 1,1-diphenyl-2-picrilhidrazil (DPPH) compared to gallic acid. The results showed that methanol extract of tuber and fresh leaf of *M. arundinacea* L contained phenolic compound with total phenolic content (TPC) in fresh tuber of 3.881±0.064 (% GAE) and fresh leaf is 6.518±0.163 (% b/b GAE). IC_{50} value from fresh tuber is 1.780±0.0005 µg/mL and IC_{50} fresh leaf values of 0.274±0.0004 µg/mL while the standard gallic acid is IC_{50} of 0.640±0.0002 µg/mL.

Keywords: *M. arundinacea* L, total phenolic, antioxidant activity.

1. Introduction

The modernization era brings the impact of changes in people's lifestyle. Protection against disease can be done with the provision of antioxidants [1]. Antioxidants are compounds that can inhibit reactive oxygen species/ reactive nitrogen species (ROS/ RNS) as well as free radicals. Moreover, antioxidants can prevent diseases associated with free radicals such as carcinogenesis, cardiovascular diseases and aging [2].

Antioxidant mechanism could neutralize and destroy the compounds in the oxidation process [3]. The sources of antioxidant can be either synthetic or natural[4]. The antioxidant compounds isolated from plants are generally phenolic compounds or polyphenols in the form of flavonoids, cinnamic acid derivatives, coumarin, and tocopherol. The natural antioxidant compounds of polyphenols can be reducers, free radical encapsulation, metal chugs and dampers of singlet oxygen [5].

M. arundinacea L included in the family Maranthaceae [6]. *M. arundinacea* L bulbs used to make starch to treat ulcer peptic [7] . It is also reported to treat the diarrhea, pain and antioxidant [8]. The tuber has an effect as anti-cholesterol [9] and has anti-ulcer effects [7]. And they has 32 glycemic index (IG) which belongs to food category with low glycemic index [10]. The *M. arundinacea* L was originated from the South American region of West Brazil. The tuber contains high carbohydrates

which can be utilized as thickener, stabilizer, food ingredient, condiments, soup, candy, pudding and ice cream [11]. *M. arundinacea* has phenolic, flavonoid, alkaloids and saponin compound that are potential as antioxidants [12].

Research on flavonoid levels present in the ethanol extract of dried tubers, leaves and flowers have a total value of 390±11mg GAE/100g phenol, total flavonoids 290± mg QE / 100g and total flavonol 150 ± 9 mg QE / 100g [13]. In addition, the ethanol extract which obtained by percolation from the mixture of rhizomes, leaves, and flowers of *M. arundinacea* L from India produces the IC_{50} value of 293.4 µg / mL. In addition, antioxidant activity with ABTS, hydrogen peroxide and radical oxide nitrate with IC_{50} values was 297.4, 336.1, and 258.7 µg / mL [14]. The methanol extract of tuber contains total phenol and flavonoid total of 0.16% and 0.15% [15].

The present study used the fresh leaves and tubers without drying and pollination to get the greater content of phenolic compound.

2. Materials and Methods

2.1. Plant material

The study was carried out on fresh tubers and leaves of *M. arundinacea* L . It was found from Banguntapan, Bantul district of Yogyakarta Indonesia on May 2016. The plants was washed and chopped and then made extract without driying.

2.2. Preparation of extracts

A total of 250.0 grams of fresh samples (tuber and leaf) which have been sliced were macerated and remaserated with methanol and then evaporated to obtain a concentrated extract.

2.3. Determination of total phenolic content

Determination of total phenol content in tuber extract and fresh leaf was done by using Folin Ciocalteu. A total of 25 mg of methanol extract was dissolved in mixture of methanol : distilled water (1: 1). The solution was then taken 300 µL and added 1.5 mL of the folin reagent (1:10), then shaken out and allowed to stand for 3 minutes. The solution was added with 1.2 mL of a 7.5% Na_2CO_3 solution was shaken out homogeneously and at room temperature. The absorbance was measured at a wavelength of 730 nm using a spectrophotometer. The gallic acid was used as standard. The total phenolic content is expressed with % equivalent of gallic acid (% w/w GAE).

2.4. DPPH radical scavenging activity

Free radical activity with DPPH was done by mixing 1 mL sample and solution of DPPH 0.15mM 1 mL then homogenized and let stand in dark place and measured its absorbance with a spectrophotometer at 516,0 nm. Gallic acids were used as a comparison.

3. Results and Discussion

3.1. Plant extraction

The extract was obtained through the process of maceration and remaseration by using methanol. In this study, methanol was used for isolating the secondary metabolites in the simplicia[15]. Methanol is a universal solvent, so it can dissolve in the polar and nonpolar compounds. Methanol can isolate the alkaloids, steroids, saponins, and flavonoids from plants [17]. The rendemen of extracts was presented in Table 1.

Table 1. The rendemen of extracts of fresh *M. arundinacea L* leaf and tuber

part of plant	Weight material (gram)	Weight extract	Rendemen (%)
leaves	1500	109.5	7.3
Tuber	600	80.35	13.39

3.2. *Determination of total phenolic content*

The total phenolic content is expressed by % gallic acid (GAE). Total phenolic determinations were performed using a visible spectrophotometer [18]. The results showed that total phenol content was presented in Table 2.

Table 2. Total phenolic content of fresh tuber and fresh leaves of *M. arundinacea* L

replication	fresh tuber extract (g GAE/100g extract)	fresh leaf extract (g GAE/100g)
1	3.875	6.543
2	3.942	6.683
3	3.948	6.660
4	3.841	6.391
5	3.798	6.313
Average	**3.881**	**6.518**
SD	0.064	0.163
CV	1.667	2.501

Total phenol in the leaf is higher than tuber because the flavonoid is more content. While the carbohydrate content in the tuber is higher. The total phenolic content and total flavonoid content of the *M. arundinacea* rhizome extract were found to be 0.16g/100 g and 0.15g/100g respectively [15].

3.3. *DPPH radical scaveging activity*

The parameter of antioxidant activity was used to IC_{50}. An antioxidant activity describes how large compounds can capture free radicals in the body. The antioxidant activity of fresh leaf extract and fresh tuber extract was presented in Table 3.

Table 3. The antioxidant activity of *M. arundinacea* L leaf extract and tuber extract.

Name	value IC_{50} (μg/mL) ± SD
Standard gallic acid	0.640±0.0002
Fresh tuber extract	1.780±0.0005
Fresh leaf extract	0.274±0.0004

IC_{50} values *M. arundinacea* extract and standard ascorbic acid for DPPH scavenging activity were found to be 30.28 µg/mL and 18.26µg/mL respectively [15]. The ethanolic extract of *M. arundinacea* L was screened for antioxidant activity using 1,1-diphenyl-2-picryl hydroxyl (DPPH) scavenging assay with IC_{50} value of 293.4 µg/mL respectively [15].

4. Conclusions

The methanol extract from *M. arundinacea* L of fresh leaves and the fresh tuber have antioxidant activity with DPPH methods.

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