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Antioxidant activity of flavonoid constituents from the leaves of *Macaranga tanarius*

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Antioxidant activity of flavonoid constituents from the leaves of *Macaranga tanarius*

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Abstract. The beneficial health effect of natural flavonoids in plants is mainly because of their antioxidant properties. In the present study, antioxidant activity of isolated compounds from the leaves of *Macaranga tanarius* including nymphaeol C (**1**), solophenol D (**2**), nymphaeol A (**3**) and nymphaeol B (**4**) was conducted using 2,2-diphenyl-1-picrylhidrazyl (DPPH) method. The result showed that compound **2** revealed potential antioxidant activity followed by 1 and 4 with IC_{50} values of 55.13, 62.14 and 72.83 µM, respectively. While compound **3** showed antioxidant activity with IC_{50} value of 102.12 µM.

1. Introduction

The genus Macaranga is belong to family Euphorbiaceae which produces phenolic compounds including flavonoids and stilbenoids which are integrated with terpenoid types. *Macaranga tanarius* is one of the plants which had been use as a traditional medicinal plant as antipyretic, antitussive, ametic agent and anti-inflammatory [1]. The uniqueness of flavonoids and stilbenoids from the plant is the presence of substituted terphenyl compounds including isoprenyl, geranyl, farnesyl and geranyl geranyl [2-4]. There are significant numbers of bioactivities of flavonoids and stilbenoid constituents were reported such as antioxidant, cyclooxygenase (COX) inhibitory, anticancer, antitumor, antimalarial activities and as a regulator of growth [4, 5]. Regarding to the wide spectrum of pharmacological activity of the constituents from the plant, hence the chemical constituents isolated by Marliana (2018) were investigated for those antioxidant activity by 2,2-diphenyl-1-picrylhidrazyl (DPPH) scavenging method [6].

The difference in the strength of the activity of antioxidant of flavonoid derivatives that was successfully isolated was an interesting study to evaluate the effect of the substituents of the compounds on their antioxidant activity.

2. Methods

2.1. General information

All reagents that used in this research were bought from Merck Chemical, Co. The activity of antioxidant of the chemical constituents was analyzed by SHIMADZU 1800 spectrophotometer.

2.2. Plant material

The leaves of *Macaranga tanarius* were obtained from Samboja, East Kalimantan, Indonesia. The species of this plant was identified by Herbarium of Wanariset, East Kalimantan, Indonesia.

2.3. Evaluation of antioxidant activity

Antioxidant activity of chemical constituents was conducted by using DPPH method and measured by spectrophotometry UV-Vis at 517 nm [7]. Various concentrations of each compound were prepared. About 200 µL of acetate buffer solution 0.1 M (pH 5.5) and was added into 200 µL each compound. The mixture of solution was incubated at 20^{o}C for 30 minutes. Afterward, 100 µL DPPH solution (10^{-4} M) was added. The IC_{50} value was measured based on ability of the compounds to inhibit 50% against DPPH radical scavenging. In this research, rutin was employed as a positive control while negative control was DPPH-methanol and acetate buffer without active compound.

The ability of the compounds to reduce DPPH radical was conducted by using the equation (1).

$$\%\ DPPH\ scavenging = \frac{Absorbance\ of\ control - Absorbance\ of\ sample}{Absorbance\ of\ control} x\ 100\% \quad (1)$$

Furthermore, the data of antioxidant activity of the chemical constituents was analyzed by IC_{50} value determination based on linier regression analysis of the absorbance of compounds concentration [8].

3. Results and discussion

Four compounds (**1-4**) isolated from *M. tanarius* were previously reported [6] and investigated the antioxidant activity in this research. The structures of those compounds were shown in figure 1.

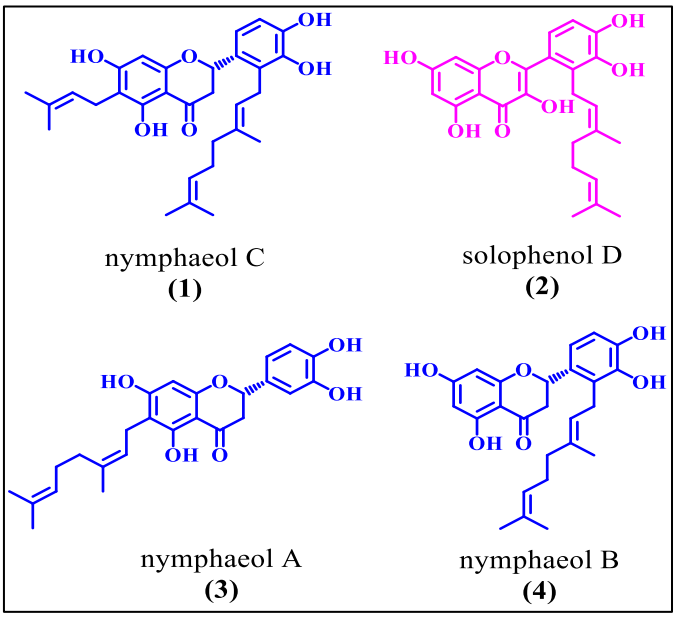

Figure 1. The structures of chemical constituents from *M. tanarius*.

Antioxidant activity of flavonoid derivatives was effected by the position and number of hydroxyl group. The effect of hydroxyl group against antioxidant activity neutralized free radical and changed the stability of flavonoid radicals are formed by atom H from other hydroxyl group. The formation of flavonoid radical which is very stable occurs in flavone compounds that have 3-OH and 3´,4´-dihidroxyl [9]. Analysis of antioxidant activity by showing the IC_{50} value of four compounds (**1-4**) from *M. tanarius* was shown in figure 2.

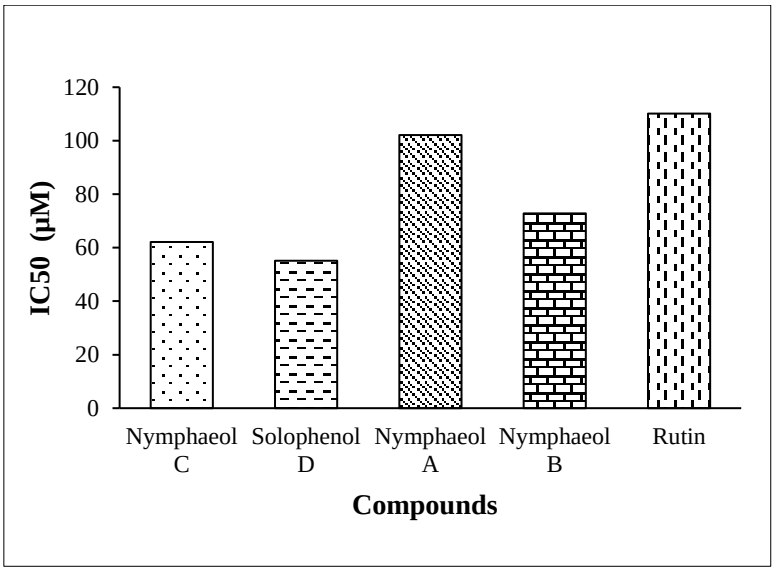

Figure 2. Antioxidant activity of isolated compounds from *M. tanarius*.

Antioxidant activity of the isolated compounds was effected by the substituents of the compounds. The isolated compounds from *M. tanarius* exhibited high antioxidant activity since the effect *ortho*-dihydroxyl substituent in aromatic ring B of the compounds. Among the isolated compounds,

solophenol D (**2**) which has *ortho*-dihydroxyl substituent in aromatic ring B is the most active compound. Its activity was also effected by double bond in C-2 and C-3 offered mesomeric effect that can stabilized a radical form. The presence of ortho-dihydroxyl on flavonoids can reacted with DPPH radical and formed an intramolecular hydrogen bridge between free hydrogen on hydroxyl group with phenoxyl radical as an intermediated and terminated compound can stabilized and offered diketone compound, respectively [10].

4. Conclusion

It could be concluded that solophenol (**2**) which has *ortho*-dihydroxyl substituent in aromatic ring B is the most potent compound as antioxidant agent. The presence of double bond in C-2 and C-3 played important role in antioxidant activity by stabilizing a radical form.

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