Antioxidant activity of an invasive plant, *Melastoma malabathricum* and its potential as herbal tea product

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Abstract. East Kalimantan possesses abundant biodiversity of tropical medicinal plant. *Melastoma malabathricum* (known locally as karamunting, senduduk) is an invasive plant along with other species in the family of Melastomataceae with traditional medicinal purposes. This research explored the potential of Karamunting (*M. malabathricum*) plant for its antioxidant activity and the potential as a material for herbal tea product. The plant was macerated to yield ethanolic extract, and at the same time plant powder was packed into tea bags and extracted with hot water to obtain the infused water. Antioxidant activity was evaluated by DPPH radical scavenging assay. The results showed that the ethanol extracts of plant samples displayed ability to inhibit DPPH free radical formation by 82% at 50 ppm concentration. Evaluation of the tea water extract showed that the highest inhibition obtained by leaves powder by 90% and fruit 88% at 1 minutes immersion time. This finding suggest that leaves and fruit of *M. malabathricum* plants display potential as herbal tea material having antioxidant activity if the safety aspect can be assured.

1. Introduction

Indonesia is a tropical country with abundant natural resources. Various studies on medicinal plants are closely related to the local people have been widely published. Therefore, medicinal plants are believed to have various medicinal properties. Nowadays, traditional medicine show an increase developed populations. According to the World Health Organization [1], traditional medicine are the sum total of the knowledge and practice, also experiences to different cultures based on their beliefs through generations. Today, Asian population especially Indonesia prefers traditional plants as their health medicine. Beside the traditional plants being easy to obtain, it also had no side effect and safe to be consumed.

Melastomataceae plants are originally growth in the tropic and subtropic regions, there are more than 4000 species in the world. *Melastoma* genus in Southeast Asian region, were found around 22 species, 2 subspecies and 3 varieties [2].

*M. malabathricum* Linn is a shrub and an invasive plant commonly found in previously cleared land that belongs to the family *Melastomataceae*. Locally known in Indonesia as karamunting or senduduk, have been used as traditional medicinal purposed. Traditionally, the leaves can be used to heal wounds by chewing and applied to the wound. The leaves part is used to treat some disease such as haemorrhoid, dysentery, diarrhea and also prevent the scars [3,4]. *M. malabathricum* leaves,
scientifically have been reported to exert antibacterial [5], anti inflammatory and antipyretic [6,7], antioxidant and cytotoxic [8], antidiarrheal and antiulcer [9] also anticancer [10] activities.

Antioxidant are widely used to prevent oxidation in natural food system. Natural food system was using antioxidant to reduce oxidation. Antioxidant of plant are safe and natural when used in small scale based on natural source from local people. However while the plants used in large scale to reduce oxidation of the food system, the safety effects of the plants are unknown. The tea extracts are highly recommendly used as natural antioxidant. Many studies of antioxidant properties of green tea and black tea showed the highest antioxidant activity of the extracts [11].

Natural antioxidant was apply as food additives, bioactive nutraceuticals and bio-pharmaceuticals on daily activities. Related to the extraction, characterization and utilization of natural antioxidant insentively performed to find potential candidates in againts the aging process [12].

The present study aims to explore the potential of karamunting plant extract for its antioxidant activity and the potential of the plant as material for herbal tea product.

![Figure 1. Morphology of Melastoma malabathricum Plant (Photo source: personal doc.)](image)

2. Methods

2.1. Plant materials and chemical

The leaves and fruits of *M. malabathricum* Linn. were collected from Lempake, Samarinda, East Kalimantan. Voucher specimen was kept in our laboratory for future reference. DPPH (1,1 diphenyl-2-picrylhydrazyl) was purchased from Tokyo Kasei Kogyo (Tokyo, Japan). DMSO (dimethyl sulfoxide), sulfuric acid, hydrochloric acid, acetic anhydride, and potassium iodide were purchased from Merck (Darmstadt, Germany). Ascorbic acid, 1-naphtol and bismuth (III) nitrate were obtained from Sigma (St. Louis, MO, USA).

2.2. Preparation of extracts

Plant materials were washed thoroughly with water to remove the extraporeneous matter and prepared by drying for 3 days under the shade and milled with a blender. The leaves and fruit part of the samples were extracts with ethanol at room temperature with continuous shaking on a shaker (7400 Tubingen, Edmun Buchler, Germany) for 48 hours. Following filtration of the suspension through Whatman paper No. 2 (Maidstone, UK), the crude extracts were evaporated in a rotary evaporator at 40°C and put in a vacuum oven near dryness to yield the plant extract.

2.3. Preliminary phytochemical screening

The ethanol extracts of *M. malabathricum* was subjected to preliminary screening such as alkaloids, flavonoids, tannin, steroids, triterpenoids, carbohydrates and saponins [13,14].
2.4. Antioxidant activity

2.4.1. Ethanol extracts
The leaves and fruit part of the samples were dissolved in DMSO and used at 3 times dilution for the actual experiment. The DPPH radical scavenging method was performed as previously described by Shimizu et al [15] with slight modification. UV absorption was measured on a Shimadzu UV-VIS 1240 Spectrophotometer (Shimadzu Corp., Kyoto, Japan).

2.4.2. Tea extracts
The powdered of *M. malabathricum* leaves and fruit were weighed 2 gr and packed into tea bags. The tea extracts were obtained from infusion process for 1 minute, 3 minute and 5 minute of immersion time. The DPPH radical scavenging method was performed as previously described by Shimizu et al [15] with slight modification. UV absorption was measured on a Shimadzu UV-VIS 1240 Spectrophotometer (Shimadzu Corp., Kyoto, Japan).

3. Results and Discussion

3.1. Plant extracts
Leaves and fruit of *M. malabathricum* plants were macerated by ethanol at room temperature (Table 1). The ethanol maceration yielded 6.82-7.76% extracts on the basis of sample dry weight. The result showed that leaves part gave higher extract than the fruit.

| Plant Part | Yield (%) |
|------------|-----------|
| Leaves     | 6.82      |
| Fruit      | 7.76      |

*Yield was calculated on the basis of sample dry weight.

*M. malabathricum* fruit has purple color and solid that produce an extractive content more concentrated and caused the fruit extract having the highest yield.

3.2. Phytochemical screening
The leaves and fruit part of *M. malabathricum* plants showed the presence of secondary metabolites as shown as the table 2. The leaves part of plant contains steroids while the fruit contains triterpenoids.

| No | Plant Part | Compounds |
|----|------------|-----------|
|    |            | alkaloids | flavonoids | saponin | tannin | triterpenoids | steroids | carbohydrates |
| 1  | Leaves     | +         | +          | +       | +      | -          | +        | +            |
| 2  | Fruit      | +         | +          | +       | +      | -          | +        | -            |

*(+): Contained positive; (-) Contained negative

According to the research, tannin and flavonoids compound are known having antibacterial, antitumor, antiviral, also have strong antioxidant, anticancer and antimicrobial activities [16]. In a previous study, methanol extract of *M. Malabathricum* contained terpenoids, phenolic compound, tannin, flavonoids, triterpenes and saponin [17]. The result of our research were similar to those obtained in the literature.
3.3. Antioxidant activity

The DPPH radical scavenging of ethanol extracts was using Ascorbic acid as a positive control and DMSO as a negative control. Radical DPPH has been used to determination free radical scavenging activities of pure antioxidant compounds such as fruit and plant extracts and also food materials [18]. Radical scavenging activity was expressed as percentage according to the following formula:

\[
\% \text{ DPPH radical scavenging activity} = \frac{\Delta \text{control} - \Delta \text{sample}}{\Delta \text{control}} \times 100
\]  

Antioxidant assay of *M. malabathricum* leaves and fruit of ethanol extracts displayed ability to inhibit DPPH free radical formation by 82% at 50 ppm concentration on the leaves part while the fruit part by 77% at 25 ppm concentration (Fig. 2).

![Figure 2. Antioxidant activity of ethanol extracts against DPPH](image)

The DPPH radical scavenging of tea extracts was using a commercial Green tea (Tea A) and Black tea (Tea B) as a positive control and distilled water as a negative control. Tea extracts evaluation of *M. malabathricum* showed the leaves powder had the highest inhibition by 90% and the fruit powder by 88% at 1 minute immersion time (Fig. 3).

![Figure 3. Antioxidant activity of tea extracts against DPPH](image)
The results of antioxidant activity of *M. malabathricum* ethanol extracts showed that the lower concentration of sample, percentage of antioxidant activities were higher. This caused by the higher the concentration of extracts, the colour of sample more concentrated and the absorption of DPPH reduction are less than maximum.

Based on literature study of medicinal plants, *M. malabathricum* plant used to treat toothache disease, diarrhea and dysentery. *M. malabathricum* also contain ellagic acid, anthocyanin and nobotannin β [19]. Flavonoids, phenolics compounds, alkaloids, tannin, amino acids and volatile constituents were investigated as main active ingredients have a potential antioxidant activities [20]. In this research, the leaves and fruit part of *M. Malabathricum* presence of flavonoids and tannins known having potent as antioxidant properties.

The results of antioxidant activity of *M. Malabathricum* tea extracts showed that the longer time of immersion time, the lower percentage of antioxidants produced. This can be proven by the results of antioxidant *M. malabathricum* tea extracts that show the highest percentage of antioxidant at 1 minute immersion time. Therefore, the investigated of these plants confirmed have a potential effect on treating digestive system disorders.

4. Conclusions
The present study has proved that the extracts of leaves and fruit of *M. malabathricum* plants possess antioxidant properties. The results display that leaves and fruit of the plant having antioxidant activity as potential herbal tea material.

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