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ANTIOXIDANT ACTIVITY OF METHANOLIC EXTRACT FROM DATE SEEDS (PHOENIX DACTYLIFERA L.) AS A POTENTIAL USE OF LOCAL FOOD WASTE

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ABSTRACT
Date seeds (Phoenix dactylifera L.) are by-products of the date processing industry that are often discarded, even though they contain potential antioxidant compounds. This study aimed to evaluate the antioxidant activity of methanolic extract from date seeds as a sustainable approach to valorizing food waste. The research was conducted at the Laboratory of the Center for Food and Nutrition Studies, Universitas Gadjah Mada. Date seeds were obtained from small-scale food industries in Klaten, Central Java, then cleaned, dried, macerated, and sieved through mesh 80. A total of 50 grams of powdered seeds were extracted using the Soxhlet method with methanol for 6 hours. The antioxidant activity was measured using the DPPH method by reading the absorbance at 515 nm. The results showed DPPH radical inhibition percentages of 58.87% and 48.75% in two replications, with an average of 53.81%. The data were analyzed descriptively based on the percentage of radical scavenging activity. These findings suggest that date seeds possess considerable antioxidant activity and can be utilized as a natural antioxidant source, while also supporting the upcycling of local food waste into functional food ingredients.

Keywords: antioxidant; date seed; DPPH; food waste

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INTRODUCTION

Dates (Phoenix dactylifera L.) is a tropical fruit crop that has been cultivated for thousands of years and is widely known in the Middle East, North Africa and South Asia. Apart from being a traditional food ingredient, dates have high religious, economic and nutritional value. In Indonesia, date consumption increases especially during Ramadan and Eid al-Fitr, both in the form of fresh, dried, and processed fruits such as date juice, jam, and stuffed dates.During the processing of dates by home industries and MSMEs, the seeds often become waste that is not utilized, even though the proportion is quite large, which is around 10-15% of the total weight of the fruit. On the other hand, an increase in the volume of food waste such as date seeds that are not handled properly can cause environmental problems. Therefore, processing date seeds into value-added functional products is a strategic step in supporting circular economy and sustainable waste management.

Several preclinical studies have shown that date seed extract has hypolipidemic (Bouhlali et al., 2020), anti-inflammatory (Saryono et al., 2020), antidiabetic (Abdelaziz et al., 2015), and even antibacterial (ALrajhi et al., 2019) effects. Another study showed that consumption of date seed extract can improve blood lipid profiles, reduce LDL and triglyceride levels, and increase HDL (Khan et al., 2018), making it a potential candidate in the management of dyslipidemia and prevention of cardiovascular disease. Several other studies have shown that date palm seeds have a potential chemical composition. Besides being rich in dietary fiber and minerals (iron, magnesium, calcium), date palm

seeds contain high levels of phenolic compounds and flavonoids, even exceeding the pulp (Elgindy, 2020; Warnasih et al., 2019). The content of compounds such as quercetin, rutin, p-coumaric acid, and caffeic acid is known to counteract free radicals and suppress oxidative damage to cells (Al-Meqbaali et al., 2017; Barakat et al., 2020). Research by Al-Farsi and Lee (2008) showed that the total phenolic content of date palm seeds can reach more than 3000 mg GAE/100 g. This reinforces the view that date palm seeds can be used as an antioxidant. This reinforces the view that date palm seeds are not only a functional ingredient, but also a potential therapeutic agent.

In addition, Ghnimi et al (2017) mentioned that date seeds are a material that can be industrialized as a value-added product due to their fiber, healthy fat and antioxidant content. In a further biochemical realm, Marzouk et al (2017) reported that polysaccharide extracts from date seeds also exhibit antiglycation activity, thus potentially preventing metabolic complications such as diabetes and premature aging.Free radicals are unstable molecules that are naturally formed in the body, for example from energy metabolism processes or exposure to foreign substances such as pollution and radiation. If not neutralized by antioxidants, free radicals can damage cell structures, proteins, and DNA, which in turn trigger various chronic diseases such as cancer, diabetes, heart disease, and premature aging (Barakat et al., 2020). Therefore, the need for safe, effective and easily obtainable sources of natural antioxidants is increasingly important in the context of degenerative disease prevention.

One of the most widely used methods to assess antioxidant capacity is the DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay. This method is frequently chosen because of its simplicity, rapidness, and sensitivity in measuring the free radical scavenging activity of natural compounds (Pisoschi et al., 2021).In Indonesia, research on the utilization of local food waste such as date seeds is still relatively limited. In fact, the development of derivative products from these wastes can provide added economic value, especially for food processing MSME players. The date seeds used in this study were obtained from the waste of MSMEs producing processed dates in Klaten Regency, Central Java, which generally discard the seeds after the production process. By utilizing this local waste as raw material for laboratory tests, this research also supports the zero-waste principle and opens up opportunities for the development of local functional products.This research was conducted at the Laboratory of the Center for Food and Nutrition Studies, Gadjah Mada University, Yogyakarta. The powdering process of date palm seeds was carried out using the maceration method, then sieved using an 80 mesh sieve to obtain a powder with a uniform particle size. Extraction was continued with the soxhletation method using methanol solvent. This extract was then tested for antioxidant activity using the DPPH method.With this background, this study aims to evaluate the antioxidant activity of date palm seed methanol extract, as one of the efforts to utilize local food waste into functional ingredients with health and environmental values.

METHOD

The research was conducted at the Laboratory of the Center for Food and Nutrition Studies, Gadjah Mada University, Yogyakarta.Date seeds were obtained from the waste of date processing MSMEs in Klaten, Central Java. Date seeds were cleaned, dried, and powdered using maceration method and sieved with mesh size 80. The solvent used was technical methanol. The main reagent for antioxidant test was 200 µM DPPH solution. Tools used include analytical scales, test tubes, pipettes, UV-Vis spectrophotometer, and room temperature incubator. A total of 50 grams of date palm seed powder was extracted using the soxhletation method with methanol solvent for 6 hours. The extract was then filtered and evaporated using a rotary evaporator to obtain a thick extract. The test was conducted based

on the DPPH method (Pisoschi et al., 2021). A total of 1 mL of date seed extract solution was mixed with 1 mL of 200 µM DPPH solution. The mixture was incubated for 30 minutes under dark conditions. Next, the solution was diluted with methanol to a volume of 5 mL, then measured the absorbance at a wavelength of 515 nm.

Antioxidant activity was calculated by the formula:

$$\text{Antioxidant Activity (\%)} = \frac{Ablanko - Asampel}{Ablanko} x\ 100\%$$

Where A is the absorbance value. Blank consists of 1 mL of DPPH solution + 4 mL of methanol. Measurements were taken twice (duplo).

RESULT

Table 1.
Antioxidant Activity Of Methanolic Date Seed Extract by Duplo Testing

Duplo Testing	IC_{50}	Antioxidant Activity
1	58,8661%	Strong
2	48,7454%	Very strong

The results of antioxidant activity testing of date palm seed methanol extract showed the DPPH radical inhibition value of 58.87% in the first replication and 48.75% in the second replication. The average antioxidant activity was 53.81%, which is classified in the strong category (Warnasih et al., 2019).

DISCUSSION

The results of antioxidant activity testing of date palm seed methanol extract showed the DPPH radical inhibition value of 58.87% in the first replication and 48.75% in the second replication. The average antioxidant activity was 53.81%, which is classified in the strong category (Warnasih et al., 2019).Differences in values between duplicates are still within a reasonable range and can be caused by small variations in sampling, reagent stability, or light intensity during incubation. Nevertheless, both results showed significant radical scavenging power.The content of phenolic and flavonoid compounds in date palm seeds is believed to be the main factor of this antioxidant activity. These compounds are able to donate electrons to neutralize free radicals, thus preventing cell and tissue damage due to oxidative stress (Barakat et al., 2020). In addition, the extraction method with polar methanol helps dissolve phenolic compounds efficiently.These results support the utilization of date palm seeds as raw materials for antioxidant supplements or functional food additives. The utilization of date seed waste from MSMEs also provides added value in economic and sustainability aspects.

CONCLUSION

Date palm seed methanol extract showed high antioxidant activity with an average DPPH inhibition of 53.81%. These results indicate that date palm seeds, which have been considered as waste, have great potential as a source of natural antioxidants. This study supports the development of date palm seeds as a value-added and environmentally friendly functional ingredient.

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