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Research Article

Exploration of the Potential of Local Plants of *Melastoma malabatchricum* Fruit for Food Fortification

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ABSTRACT

Endurance can be increased by maintaining nutritional intake, one of which is by consuming local plants such as *Melastoma malabatchricum* Fruit. This study aims to explore the nutritional content of *M. malabatchricum* fresh fruit, flour and processed products from flour. This research was conducted at the Baristand Laboratory of the Banjar Baru Industrial Center, South Kalimantan. The results showed that flour and processed products from *M. malabatchricum* flour had higher nutritional content of cal, ca and Fe than fresh *M. malabatchricum* fruit. Fruit flour calorie (cal) content of 176.69 Cal/100g and fresh fruit calorie (cal) content of 79.65 Cal/100 g. Fruit flour calcium (ca) content of 7317.439 mg/Kg and fresh fruit calcium (ca) content of 3017.018 mg/Kg. Fruit flour iron (Fe) content of 26.74 mg/Kg and fresh fruit iron (Fe) content of 5.301 mg/Kg. These results indicate that *M. malabatchricum* has the potential to be developed as an ingredient for food fortification.

Keywords: Food fortification, Local plant, Melastoma malabathrchricum,

Introduction

The pandemic caused by the Novel Coronavirus disease 2019 (Covid-19) has led to various changes in the pattern of people's lives in various fields. 2019-nCoV transmission can be prevented by diligently washing hands using soap or a hand sanitizer, using masks, maintaining social distancing, and consuming foods that can increase endurance. Endurance can be increased by maintaining personal hygiene and living environment, DOIng physical activities such as exercise [1], getting adequate rest, and managing stress [2].

Several important nutrients, both macro and micro needs, which can increase body resistance (immunonutrition) can be obtained from several foods [3, 4]. Good and healthy food can be a medicine for the body when the body needs to regenerate damaged cells, including due to infection. The properties of bioactive ingredients from foods and herbs can support the human immune system against infections, including viral infections [5]. Access to safe and nutritious food is everyone's right, but many factors can influence how food is obtained. Some factors include; pandemic situation [6], inappropriate use of natural resources, education level, socio-political, and income levels. These factors affect household food security status as well as community food security at large.

Food security is defined as a situation when all people, at all times, have adequate physical, social, and economic access, as well as safe and nutritious food preferences that meet food needs for an active and healthy life. The health consequences of food insecurity often lead to cognitive impairment, work disorders, depression, anxiety, and social isolation. Food insecurity also puts children at risk of developmental delays, which can affect concentration, academic success, and social relationships and are associated with behavioral problems. The sustainability of food security becomes very important when considering these things. Several research results [4], show a positive relationship between food diversity and consumption of certain

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food groups with household-scale food security.

Various types of food consumed contain nutrients that can complement one another. Lack of macro and micronutrients can lead to a number of health complications [7], so in the latest food technology developments, food fortification efforts are made to complement deficiencies of certain nutrients in food [8]. Food fortification is an important nutritional intervention to combat and reduce the risk of micronutrient deficiencies in many low- and middle-income countries [9]. According to Alina et al. [10], fortification in additional foods is generally caused by the need for bioactive compounds, such as vitamins, minerals, sugars, organic acids, dietary fibre, phenolic compounds, essential amino acids, and antioxidants. Some of the ingredients of spices, fruit extracts, and herbal extracts that are added to dairy products are known to improve product quality [11].

Bioactive components play a role in giving color, taste, and aroma to a plant and have various immunological and physiological health benefits [12]. Minerals are one of the components of bioactive compounds, which are in the form of calories (Cal), calcium (Ca), and iron (Fe).

The human body needs calories to survive because calories (Cal) are useful for preparing energy for humans but also have a negative impact if consumed excessively, causing hypertension and stroke [13]. Calcium (Ca) is essential plays a role in bone growth [14] and in preventing preeclampsia during pregnancy [15]. And also, iron (Fe) plays a role in oxygen transport and haemoglobin formation [16].

Fruits provide vitamins and minerals for daily diet and are a major source of phytoestrogens, anti-inflammatory agents, and antioxidants [17]. One type of herb whose fruit contains antioxidants is *Melastoma malabatchricum* fruit (*M. malabathricum* Merr) [18]; [19]. *M. malabatchricum* (*M. mabathricum* Merr) is a quite abundant shrub in Central Kalimantan. *Melastoma malabatchricum* grows wild, especially in areas that are allowed to grow after forest and land fires. *Melastoma malabatchricum* plants are not yet popularly cultivated as garden plants or as garden plants. Empirically, *M. malabatchricum* plants have been known and used by the community as ingredients for traditional medicine [20], consumption vegetables, and dark purple ripe fruits are usually consumed by children while playing in fresh form with a slightly sweet taste. Several research results state that certain parts of the *M. malabatchricum* plant have several benefits, including leaf extract as an antifungal and anti-microbial [21]. Other studies have revealed some of the benefits of *M. malabatchricum* fruit as a natural textile dye, natural food coloring, and antioxidant effects [18]; [19].

Research that reveals the potential of *M. malabatchricum* fruit as a substitute for food additives as well as food fortification is still minimal and has not even been found. Exploration of the potential of *M. malabatchricum* fruit as a food fortification material, both in the form of fresh and processed preparations, is very important considering its natural availability is quite abundant, easy to obtain, and has long been empirically consumed in fresh form by the community (especially the people living around the forest). However, its broader benefits as food additives with economic value have not yet been revealed.

The results of this study are expected to reveal the important value of *M. malabatchricum* fruit as a food additive, and to increase its economic value so that it is beneficial for economic resilience and food security for families, especially families affected by Covid-19. Until now, there are still no reports on the nutritional content (both macro and micro) and the effects of toxins on *M. malabatchricum* fruit, whether consumed in the form of fresh fruit or processed products of *M. malabatchricum* fruit (*M. malabatchricum* fruit flour). The aim is that *M. malabathricum* can be developed into food fortification materials, especially to prevent micronutrient deficiency in Indonesia [22].

Based on this description, the purpose of this study is to analyse the nutritional content profile (fresh *M. malabatchricum* fruit, flour and processed food) based on proximate test results, calorie profile, iron (Fe) and Calcium (Ca) content in fresh *M. malabatchricum* fruit, flour and on processed food.

Material and Methods

Data collection technique

At the initial stage of the research, a fresh extract of *M. malabatchricum* fruit was made and *M. malabatchricum* fruit flour was made for further testing of its nutritional content. The research data were obtained through the test results of macro nutrition content (protein, fat, carbohydrate), Calorie test, and micronutrient

content tests (iron and calcium) from fresh extracts and *M. malabatchricum* fruit flour and processed foods made from *M. malabatchricum* fruit. In addition, organoleptic tests were also carried out on food products substituted with *M. malabatchricum* fruit flour. The sensory acceptance of *M. malabatchricum* sponge products and *M. malabatchricum* cookies were tested by 20 moderately trained panelists through organoleptic testing. The colour, texture, aroma, and taste by score scale are 1 – 5.

Sample Preparation

The research was conducted at the Baristand Laboratory of the Banjar Baru Industrial Center, South Kalimantan, Indonesia. The sample of this research is *M. malabatchricum* flour. *Melastoma malabatchricum* flour is made by drying fresh fruit that is old, ripe, and mashed. Drying is done by aerating the *M. malabatchricum* fruit at room temperature and protected from direct sunlight for 1 day, then followed by drying using an oven at 150°C for 40 minutes. Then, after chilling, the *M. malabatchricum* fruit that has been roasted is mashed in a blender and sieved, so that the *M. malabatchricum* flour is really smooth. Fresh *M. malabatchricum* fruit juice is obtained by smoothing *M. malabatchricum* fresh fruit using a blender, with a ratio of 100 g of *M. malabatchricum* fruit to 100 g of water. Flour and fresh fruit juices are substituted for the manufacture of *M. malabatchricum* sponge and cookies, producing the final product with a distinctive and unique taste.

Results and Discussion

Organoleptic test results

Several processed food products made from *M. malabatchricum* fruit have been successfully prepared with several formulations. The food products are *M. malabatchricum* sponge and *M. malabatchricum* cookies. The types of sponge and cookies were chosen for the initial sample of the product for several reasons. Generally, they tend to be preferred and have a relatively longer shelf life than other types of wet food. Bolu and cookies are made with several substitution formulations made from *M. malabatchricum* fruit, namely for cakes using fresh *M. malabatchricum* fruit juice and for cookies using *M. malabatchricum* fruit flour. The procedure for manufacturing processed products is carried out simply and easily, so it is hoped that the community participating in the product socialization and its prospects will be easy to understand and practice.

The sensory acceptance of *M. malabatchricum* sponge products and *M. malabatchricum* cookies were tested by 20 moderately trained panelists through organoleptic testing. The mean scores for the organoleptic test results for *M. Malabatchricum* sponge and *M. malabatchricum* cookies are shown in Tables 1 and 2. *M. malabatchricum* cake is made with two kinds of *M. Malabatchricum* fresh fruit juice formulations. Formulation A (sample A) used juice from 100 grams of fresh *M. malabatchricum* fruit, while formulation B (sample B) used juice from 150 grams of fresh *M. malabatchricum* fruit. Overall it can be seen in Table 1, that the sample with formulation A received a higher organoleptic score than the sample with formulation B. The highest score of all the criteria was 5. This indicates that the use of *M. malabatchricum* fruit juice with a higher volume (formulation B) results in a relatively less favorable end product for the panelists compared to formulation A fruit juice.

Table 2 shows the mean score of the organoleptic test results for *M. malabatchricum* cookies. *M. malabatchricum* cookies are made using two formulations. Formulation A uses wheat flour with *M. malabatchricum* fruit flour substitution, with a ratio of 1:1. Formulation B uses wheat flour with *M. malabatchricum* fruit flour substitution, with a ratio of 1:2. Overall, cookies with formulation A (sample A) had the highest mean score compared to cookies with for-

Table 1. Organoleptic mean score of *M. malabatchricum* sponge

Sample code	Color	Texture	Aroma	Taste	Organoleptic
A	4.65	4.7	4.75	4.9	4.75
B	4.45	4.2	4.6	4.2	4.3

Table 2. Organoleptic mean score of *M. malabatchricum* cookies

Sample code	Color	Texture	Aroma	Taste	Organoleptic
A	4.8	4.7	4.8	4.9	4,8
B	4.45	4.4	4.65	4.4	4.4

Table 3. Laboratory test results for fresh fruit, fruit flour, and several food products made from *M. malabatchricum* fruit

Parameter	Fresh fruit	Fruit flour	Cookies of *M. malabatchricum* (1)	Cookies of *M. malabatchricum* (2)
Calories (Cal/100 g)	79.65	176.69	258.97	225.99
Ca (mg/Kg)	3017.018	7317.439	1403.643	1619.288
Fe (mg/Kg)	5.301	26.741	7.248	13.944
Water content (%)	76.80	1.14	0.60	2.03
Ash content (%)	1.59	5.88	1.38	1.82
Fat (%)	5.49	4.49	6.49	4.31
Protein (%)	5.11	10.17	7.34	6.81
Carbohydrate (%)	2.45	24.40	42.80	39.99

mulation B (sample B). This means that panelist acceptance tends to cookies with formulation A.

Laboratory test results of M. Malabatchricum fresh fruit, fruit flour, and processed products

The preparation of sampling for laboratory testing was initially constrained by the weather entering the rainy season and some test parameters that could not be carried out in Palangka Raya, due to technical constraints. The parameter testing was finally carried out at the Baristand Industri Banjar Baru laboratory, South Kalimantan. Samples were sent on 22 November 2020, and laboratory test results were received on 5 January 2021. The laboratory test results for fresh fruit, fruit flour, and several food products made from *M. malabatchricum* fruit can be seen in Table 3.

The chemical compound based on Tabel 3, Ca, is highest than other compounds. This is the potential to contribute to food fortification food, and natural food coloring. Ca has approved as food coloring [23]. Natural colors have the advantage of low cost and high color stability [24]. Natural colorants are considered healthier than synthetic colorants [25], so the role of natural colors as food colorants is becoming increasingly important [26]. The next compound that contributes to fortification is Fe, the fortification used must be precise so that sufficient Fe is obtained and is easily absorbed by the body [27]. This result shows that *M. malabatchricum* has the potential to be developed as an ingredient for food fortification.

Conclusion

M. malabatchricum is one of the local fruits from Central Kalimantan. This plant usually grows wild and is not used economically by the community. Based on the results of testing the nutritional content of *M. malabatchricum* fruit and flour and its processed products, it can be concluded that *M. malabatchricum* has a large enough potential to be developed as an ingredient for food fortification. These results indicate that *M. malabatchricum* can be developed into a product with high economic value for the welfare of society.

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