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REVIEW

# The Potential of Functional Cookies Based on Ambon Bananas, Mung Beans, and Dates as a Nutritious Snack for Child Athletes: A Review Article

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## ABSTRACT

**Background**: Child athletes have higher energy and nutrient needs than children in general, so they require nutritious snacks that can support performance and growth. Functional cookies are a suitable alternative because they are easy to consume and practical, and can be formulated with nutritious local ingredients such as Ambon bananas, mung beans, and dates. **Methods**: The study was conducted through a literature review of national and international scientific journals published between 2016 – 2024, using the keywords “functional cookies”, “banana flour”, “mung bean protein”, “dates nutritional value”, and “athlete children nutrition”. **Results**: Ambon bananas serve as a source of complex carbohydrates and potassium, which help maintain electrolyte balance and muscle function; mung beans contribute to increased vegetable protein and fiber intake with a low allergy risk; and dates, particularly the Sukari variety, provide quick energy and natural antioxidants that support the immune system. Several studies have shown that this combination of ingredients produces cookies with high energy, protein, and mineral content, as well as good organoleptic acceptance. **Conclusion**: Functional cookies made with Ambon bananas, mung beans, and dates have the potential to be a nutritious, functional snack that children will love and can support optimal health, growth, and performance in children's athletes.

**Keywords:** Ambon bananas, child athletes, dates, functional cookies, mung beans

## INTRODUCTION

Children's growth and development are influenced by nutritional intake. Active children require more energy and nutrients than less active children (Bell et al., 2023). Malnutrition in this group can negatively impact physical performance, endurance, and muscle growth and development (Herpandika et al., 2019). Therefore, it is crucial to provide snacks that are not only appealing to children but also nutrient-rich and easily digestible, helping meet their energy and micronutrient needs.

Functional cookies are a convenient and nutritious alternative to healthy snacks. These products can be combined with local ingredients rich in carbohydrates, protein, fiber, vitamins, minerals, and bioactive compounds (Fauziyah et al., 2024). Processing food ingredients into cookies can also preserve nutritional content while increasing consumer acceptance, especially among children (Nissa et al., 2023).

One high-potential ingredient is the Ambon banana. Ambon bananas are a source of complex carbohydrates, fiber, potassium, vitamin B6, and antioxidants, which are essential for energy and muscle function in children. Ambon bananas are relatively high in potassium compared to other local banana varieties, helping regulate electrolyte balance and prevent muscle cramps during physical activity. Using Ambon bananas in cookies can also reduce added sugar, making them a healthier snack for children (Nissa et al., 2023).

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Mung beans are a functional food rich in vegetable protein, fiber, vitamins, and minerals, including iron and magnesium. Their protein content supports muscle growth and tissue recovery after physical activity (Faqih, 2021). Mung beans are safer for children due to their higher fiber content and lower allergy risk than soybeans (Ratnasari et al., 2021). Formulating cookies with mung bean flour has been shown to improve the protein quality and nutritional value of the product (Sustanti et al., 2023).

Dates, particularly the Sukari variety, have great potential as a healthy snack. They contain simple carbohydrates that provide quick energy before or after exercise (Ayad et al., 2020). Furthermore, they are rich in iron, vitamin C, and antioxidants that support red blood cell maintenance, endurance, and muscle recovery (Siti Zamilatul & Rahimah, 2022). Sukari dates have a high natural sugar content but a moderate glycemic index, making them a safe source of quick energy without causing drastic blood sugar spikes (Fauziyah et al., 2024). The use of dates in cookies also serves as a substitute for added sugar, making the product healthier while remaining appealing to children (Ramadiani & Indrawati, 2024).

Several studies have shown that combining Ambon bananas, mung beans, and dates in cookie formulations can produce a delicious, nutritious, and acceptable snack for children (Safira et al., 2022). Cookies made from Ambon bananas, mung beans, and dates can be a source of energy, protein, fiber, vitamins, and minerals that support metabolic health and physical performance in child athletes (Fauziyah et al., 2024).

This study aims to explore the potential and nutritional benefits of functional cookies made with Ambon bananas, mung beans, and dates, and to examine the optimal formulation that supports the growth, performance, and health of child athletes.

## METHODS

This study used a literature review to explore the potential of functional cookies made with Ambon bananas, mung beans, and dates as a nutritious snack for child athletes. The literature search was conducted across several databases, including Google Scholar, Scopus, and PubMed, as well as in indexed national journals such as the Indonesian Journal of Food Science, Ghidza, HARENA, and the Journal of Food Technology and Nutrition. Keywords used in the search included "functional cookies," "banana flour," "mung bean protein," "dates nutritional value," "athlete children nutrition," and "high-protein snacks for youth athletes."

Journals used as sources of information were selected based on certain inclusion criteria. The selected journals were published between 2016 to 2024 to ensure the information used was still relevant and up-to-date. In addition, the journals used discussed Ambon bananas, mung beans, and dates, both as food ingredients and in cookie formulations. The journals also contained information on the nutritional content of foods, such as carbohydrates, protein, fiber, vitamins, and minerals, as well as the functional properties of food ingredients.

Furthermore, the research reviewed was relevant to children or adolescents who are active in sports. Selected articles could be published in either Indonesian or English. Exclusion criteria were applied to screen for less relevant journals to improve overall methodological rigor. Articles that did not present scientific data or were solely opinion-based, duplicate publications, or lacked full text, as well as studies unrelated to food ingredients, cookies, or nutrition for child athletes, were excluded from this review.

Data were analyzed using a descriptive and comparative approach based on research findings obtained from various literature sources to ensure systematic data interpretation. Data from national and international journals were analyzed to identify similarities, differences, and trends in findings on the formulation, nutritional content, and acceptability of functional cookies made with Ambon banana, mung beans, and dates. This approach allowed researchers to synthesize relevant information and present comprehensive conclusions regarding the product's potential as a nutritious snack for child athletes.

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## RESULTS AND DISCUSSION

The development of functional snacks made with Ambon bananas, mung beans, and dates has great potential as a source of additional nutrition for child athletes. These ingredients are rich in protein, fiber, energy, and essential minerals such as potassium and calcium, which support growth, muscle recovery, and physical performance in children. In addition to nutritional content, organoleptic acceptance is a crucial factor in ensuring regular product consumption. Children's preferred tastes, aromas, textures, and colors ensure that cookies are not only nutritious but also sensorially appealing.

Several studies have explored functional cookie formulations with these ingredient combinations, evaluating their nutritional content, organoleptic acceptance, and effects on children's nutritional status and performance. Analysis of these research results provides a scientific basis for developing products that are effective, safe, and acceptable to target consumers.

**Table 1.** Review of selected studies on the the potential of functional cookies made with Ambon bananas, mung beans, and dates as a nutritious snack for child athletes

| Title | Authors | Objectives | Results |
|---|---|---|---|
| Acceptability and Nutritional Content of Red Bean Flour and Date Substitute Cookies as an Alternative Supplement for School Children (6-12 Years Old) (2024) | Amanda Ramadiani & Veni Indrawati | To determine the acceptability (color, shape, aroma, texture, and taste) and nutritional content (energy, protein, and calcium) of cookies substituted with red bean flour and dates, the most preferred | Cookies made with red bean flour and date substitutes demonstrated good nutritional content, with adequate energy, protein, and calcium levels to meet the needs of schoolchildren. Organoleptic acceptability was also high, with an average hedonic score above 3 for color, taste, aroma, and texture. These cookies were well-liked by schoolchildren and could be a nutritious supplement |
| Analysis of the physical condition of athletes from the Kediri City Training Center (Puslatkot) in preparation for the 2019 Porprov (Provincial Sports Week) (2019) | Reo Prasetiyo Herpandika, Dhedhy Yuliawan & Muhammad Yanuar Rizky | To determine the physical condition and nutritional status of athletes from the Kediri City Training Center (Puslatkot) in preparation for the 2019 Porprov | This study shows that the physical condition of athletes from the Kediri City Training Center (Puslatkot) in 2019 was in the good and normal category. Of the 54 athletes tested, 76.63% were in the good and normal category, while 23.37% were in the poor category. The athletes' nutritional status also showed good condition, with 31% having a normal nutritional status |
| Antioxidant, Beta-Carotene, and Organoleptic Content of Cookies with Pumpkin Puré and Mung Bean Flour Substitution (2023) | Myisha Azizah, Arwin Muhlishoh, & Nastitie Cinintya Nurzihan | This study aimed to determine the effects of substituting pumpkin purée and mung bean flour on the organoleptic properties, antioxidant content, and beta-carotene content of cookies. | Substitution of pumpkin purée and mung bean flour in cookies increased antioxidant activity and beta-carotene content. The antioxidant activity of the cookies increased with increasing proportions of substituted ingredients, while the highest beta-carotene content was found in formulation F1. The best formulation was F1, consisting of 55% wheat flour, 15% pumpkin purée, and 30% mung bean flour, as it produced the color and |

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| Title | Authors | Objectives | Results |
|---|---|---|---|
| | | | texture most preferred by panelists and the highest antioxidant and beta-carotene content. Cookies using a combination of pumpkin purée and mung bean flour have potential as a functional food to reduce oxidative stress in obese adolescents. |
| Mung Bean Cookies Substituted with Ambon Banana Flour as a Snack for Athletes: Potassium Level and Likeability Test (2023) | Khairun Nissa, Yessi Alza & Roziana | To determine the potassium level, nutritional content, and likability of mung bean cookies substituted with Ambon banana flour as a snack for athletes. | Cookies made with mung bean and Ambon banana flours have a high potassium content, reaching 747.6 mg/100 g. This potassium content helps increase muscle endurance and reduce fatigue in athletes. Furthermore, the cookies were favored by the test panelists, with an average hedonic score of 3.8, indicating a high level of liking |
| Organoleptic Acceptability Test of Date Cookies with Rice Bran Flour and Kepok Banana Flour Substitution (2024) | Khoirotul Fauziyah, Eva Silviana Rahmawatia, Idcha Kusma Ristant | This study aimed to determine the effect of rice bran flour and Kepok banana flour substitution on the organoleptic acceptability of date cookies | The cookies tested with rice bran flour and Kepok banana flour substitutions demonstrated good organoleptic acceptability. Panelists appreciated the color, aroma, texture, and taste of the cookies, with an average hedonic score above 3. This indicates that these cookies are well-received by consumers and have the potential to be a healthy snack alternative |

Understanding the physical condition of athletes and the characteristics of raw materials is crucial before developing functional cookies as a nutritious snack for child athletes. Research by Herpandika et al. (2019) shows that most athletes at the Kediri City Training Center (Pemusatan Latihan Kota or Puslatkot) are in good physical condition and nutritional status, but a small number still lack these qualities. These findings emphasize the importance of providing nutritious supplementary food to support athlete performance and child growth, especially during intensive training and competition preparation.

Selecting the raw materials is crucial to enhancing a product's nutritional value. Research by Nissa et al. (2023) found that cookies made with mung bean flour and Ambon banana have a high potassium content of 747.6 mg/100 g, as well as protein and fiber content. Potassium plays a role in muscle contraction and helps prevent fatigue during physical activity, so these cookies not only provide energy but also support athletes' functions. The cookies received a preference score from panelists, averaging 3.8 on the hedonic scale, indicating that the product is received by children and has potential for regular consumption.

The use of other additives also affects the sensory and nutritional quality of cookies. Research by Fauziyah et al. (2024) reported that substituting bran and plantain flours for date flour in date cookies increased fiber content without reducing organoleptic acceptability. Panelists liked the color, aroma, texture, and taste of the cookies, with an average hedonic score above 3. This indicates that increasing fiber content and reducing sugar content does not reduce consumer preference, making this combination of ingredients effective in producing a healthy yet delicious snack.

Furthermore, research conducted by Ramadiani & Indrawati (2024) showed that red

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bean and date-flour-substitute cookies provide energy, protein, and calcium that meet the nutritional needs of children aged 6–12 years. Organoleptic acceptability was also high, with an average score above 3 for color, aroma, texture, and taste. These findings confirm that the combination of red beans and dates not only increases nutritional value but is also sensorially acceptable, making it a healthy snack alternative that supports children's growth and physical performance.

Research conducted by Azizah et al. (2023) showed that substituting pumpkin puree and mung bean flour improved the functional quality of cookies by increasing antioxidant and beta-carotene levels. This is due to the high carotenoid content in pumpkin, especially beta-carotene, which serves as a precursor to vitamin A and helps neutralize free radicals that cause oxidative stress. Meanwhile, mung bean flour contains phenolic and flavonoid compounds that also contribute to the cookies' antioxidant activity.

The combination of these two ingredients resulted in a significant increase in antioxidant capacity as the proportion of pumpkin puree and mung bean flour increased. The best formulation was obtained with a composition of 55% wheat flour, 15% pumpkin puree, and 30% mung bean flour (F1). This formulation not only provided the highest antioxidant levels but also produced a more attractive cookie color with a natural yellowish hue from beta-carotene, as well as a crunchy texture favored by panelists.

Overall, it shows that functional cookies based on Ambon banana, mung beans, and dates have high potential as a nutritious snack for child athletes. The content of essential minerals such as potassium, protein, energy, fiber, and calcium can support muscle growth and recovery, while organoleptic testing indicates that this product is well-received by children. The right formulation can produce a snack that is enjoyable, nutritious, and functional, thus supporting the health, growth, and performance of young athletes. This product is suitable for daily consumption. Moreover, this product offers a practical and sustainable nutritional option that can help meet the daily dietary needs of child athletes.

## CONCLUSION

Functional cookies based on Ambon bananas, mung beans, and dates have great potential as a nutritious snack that supports the energy needs and muscle recovery of child athletes and micronutrient adequacy. These three ingredients provide complementary nutritional contributions: Ambon bananas as a source of complex carbohydrates and potassium to maintain electrolyte balance, mung beans as a source of vegetable protein and fiber for muscle growth and healthy digestion, and dates as a source of fast energy and antioxidants that support endurance. The results of the reviewed research indicate that cookies with this combination of ingredients have high nutritional content, good organoleptic acceptance, and potential as a healthy snack alternative favored by children. Through appropriate formulation, these cookies not only provide functional benefits but also play a vital role in maintaining the physical performance, growth, and overall health of child athletes.

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