

# E-BOOK OF EXTENDED ABSTRACT

## THE 14<sup>TH</sup> INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025



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# SEAMILK: INNOVATION OF *TERMINALIA CATAPPA* L. SEEDS AS AN ALTERNATIVE RAW MATERIAL FOR PLANT-BASED “MILK”

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## ABSTRACT

SeaMilk is an innovative plant-based drink based on ketapang seeds (*Terminalia catappa* L.), a tropical plant that is abundant in Indonesia but has not been optimally utilised in the food industry. This study explores the potential of ketapang seeds as an alternative raw material for plant-based milk that is nutritious, sustainable, and relevant to a modern healthy lifestyle. The methods used include literature studies, problem identification, and laboratory tests on ketapang seed extract from Yogyakarta using titration and Atomic Absorption Spectroscopy (AAS) methods. The results showed a calcium content of 150 mg/100 mL, magnesium 50 mg/100 mL, and potassium 200 mg/100 mL, with an acidity level of 0.5%, which is safe for consumption. Sensory evaluation revealed that the taste and aroma were acceptable to panellists, comparable to those of soy or almond milk. The flavonoid and tannin content provides bioactive benefits such as antioxidants, anti-inflammatories, and regulation of glucose metabolism. SeaMilk is not only safe for individuals with lactose intolerance but also has the potential to support national nutrition programmes, including preventing stunting through free nutritious meal programmes. This product opens economic opportunities through empowering ketapang farmers and strengthening village food micro, small, and medium enterprises (MSMEs), therefore encouraging food security, as well as inclusive and sustainable local economic development.

**Keywords:** *Terminalia catappa* L., plant milk, SeaMilk, food innovation, stunting prevention, sustainable nutrition

## 1. INTRODUCTION

SeaMilk is a plant-based beverage innovation derived from the seeds of the tropical *Terminalia catappa* L. tree, which grows abundantly across Indonesia but remains largely underutilised. Its seeds contain bioactive compounds such as flavonoids and tannins that serve as antioxidants, anti-inflammatories, and antidiabetic agents, as well as modulate glucose metabolism. Amid rising public awareness of healthy diets and sustainable consumption, ketapang milk offers a nutritious, eco-friendly, and locally sourced alternative with significant strategic value.

Beyond being a health product, SeaMilk embodies the application of local wisdom to strengthen food security and village-based economies. Ketapang seeds, often found unused in residential areas or idle land, are now processed into a high-value product that creates opportunities for community empowerment by involving local farmers and MSMEs. This transformation not only optimises natural resources but also reinforces cultural identity while fostering an inclusive and sustainable food ecosystem.

SeaMilk holds great potential to support national priority programmes such as the free nutritious meal initiative aimed at reducing stunting. According to the 2024 Indonesian Nutrition Status Survey (SSGI), national stunting prevalence has decreased to 19.8%, affecting

approximately 4,482,340 children under five, yet it remains above the ideal target of under 14%. With its nutritional content that supports child growth and development, SeaMilk can serve as a local food solution in stunting intervention. Integrating this product into national programmes not only opens entrepreneurial opportunities but also strengthens community nutrition resilience from the grassroots level.

## **2. METHODOLOGY**

This study began by identifying the problems with ketapang milk products in Indonesia, covering related issues while exploring and analysing the potential of processing and utilising ketapang seeds as raw materials for plant-based milk. This includes exploring key issues, such as the low utilisation of ketapang seeds in the food industry and the lack of knowledge of the potential content of ketapang seeds. Furthermore, laboratory checks and in-depth analysis were carried out on the potential for processing and utilising ketapang seeds as alternative raw materials in the production of plant-based milk.

The use of ketapang seeds as the main ingredient in milk production is aimed at replacing cow's milk, which currently dominates the market, while also providing a more local and affordable alternative to almond milk, an expensive and imported product. This innovation is expected to be able to present products that are not only environmentally friendly but also have high nutritional value. Ketapang milk is an alternative to plant-based milk that is safe for consumption by individuals with allergies to animal products, inclusive of people with lactose intolerance, and contributes to supporting food security through the use of local resources.

The initial step in supporting this development is to conduct a comprehensive literature study on the nutritional content and potential of ketapang seeds as a raw material for plant-based milk, followed by laboratory tests to analyse their nutritional properties and suitability. The results of the study are the basis for the development of healthy ketapang milk products and are competitive in local and international markets.

## **3. FINDINGS**

The main ingredient used in this study was ketapang seeds (*Terminalia catappa* L.) obtained from the Yogyakarta area, which were then processed into vegetable milk through extraction and formulation processes. This study aims to explore the potential of ketapang seeds as an alternative raw material for nutritious and sustainable vegetable milk. Analysis of nutritional content was carried out using the titration method to measure the acidity level and the Atomic Absorption Spectroscopy (AAS) method to determine the levels of essential minerals contained in the extract. Laboratory results showed that ketapang seed extract contained 150 mg/100 mL of calcium, 50 mg/100 mL of magnesium, and 200 mg/100 mL of potassium, which are important components in supporting bone growth, muscle function, and body electrolyte balance. The measured acidity level of 0.5% in the extract indicates that it is suitable and safe for development as a beverage product.

In addition to its promising nutritional content, ketapang seed extract also showed good functional properties, including emulsification and stabilisation capabilities that are important in the formulation of liquid products such as plant-based milk. Initial sensory evaluation of the resulting milk product showed that the beverage had a taste and aroma that was well accepted by panellists, with organoleptic qualities comparable to soy or almond-based plant-based milk products. These findings are in line with the main objective of SeaMilk development, which is to make ketapang seeds, which have so far been

underutilised, a nutritious, natural, and functional local food source. The extract's bioactive compounds, such as flavonoids and tannins, support antioxidant and anti-inflammatory functions, as well as the regulation of glucose metabolism, key factors in preventing nutritional disorders like stunting. Thus, this study strengthens the potential of SeaMilk as part of an innovative strategy in providing healthy intake for children, encouraging the use of local resources, and contributing to food security and sustainable economic development in Indonesia.

#### 4. CONCLUSION

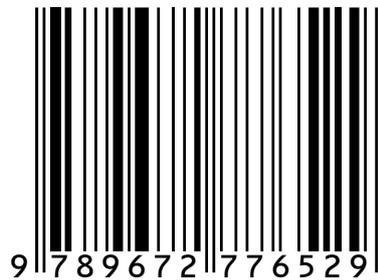
This study proves that ketapang seeds (*Terminalia catappa* L.) have great potential as raw materials for plant-based milk. Laboratory test results show that ketapang seed extract contains important minerals such as calcium (150 mg/100 mL), potassium (200 mg/100 mL), and magnesium (50 mg/100 mL), which play an important role in bone growth, muscle function, and maintaining the body's electrolyte balance. In addition, bioactive compounds such as flavonoids and tannins in the extract function as antioxidants and anti-inflammatories, thus helping regulate glucose metabolism. The measured acidity level of 0.5% in the extract indicates that the product is safe for consumption. In terms of sensory, ketapang milk products have a taste and aroma that are well accepted, comparable to other plant-based milks such as soy or almond milk. With this nutritional content and functional properties, SeaMilk has the potential to be an alternative local plant-based milk that is not only healthy but also supports the reduction of stunting rates, utilisation of local resources, community empowerment, and strengthening of the food MSME sector in Indonesia.

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