

# INNOVATION OF CORN SHEET (ZEA MAYS.L) AND AVOCADO SEEDS (PERSEA AMERICANA MILL) BISCUIT BASED ON ALTERNATIVE FOODS TO PREVENT STUNTING IN TODDLERS

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## Abstract

Stunting remains a critical issue in Indonesia due to chronic nutritional deficiencies. This study developed functional biscuits using corn silk and avocado seed flours in three ratios (25:75, 50:50, 75:25) to support toddler nutrition. Nutritional and sensory evaluations showed that the 50:50 formulation was optimal, containing 5.34% protein, 23.98% fat, and 68.01% carbohydrates. Although slightly below the SNI carbohydrate standard ( $\geq 70\%$ ), it met moisture and ash standards and was preferred in taste, color, and aroma. These findings highlight its potential as a supplementary food to help prevent stunting in early childhood.

**Keywords:** *cado seeds, biscuits, corn silk, functional food, stunting*

## INTRODUCTION

Parenting is a crucial factor in improving children's nutrition. Properly and accurately conveying nutrition and health information will change parents' mindsets about nutrition and health, thus positively impacting their children's nutritional status (Laswati, 2019). Consuming healthy foods and living a healthy lifestyle will determine their future growth and development. Insufficient nutritional intake can lead to nutritional problems, one of which is stunting. Stunting is a chronic nutritional problem that is a serious concern in Indonesia, as emphasized in Presidential Regulation No. 72 of 2021. Based on SSGI data, the prevalence of stunting in Indonesia reached 31.8% in 2020 and decreased to 21.6% in 2022, but still exceeds the WHO standard. Stunting has long-term impacts on brain development, physical development, intelligence, immunity, and the risk of degenerative diseases. Therefore, the government is targeting a reduction in stunting prevalence to 14% by 2024 as part of the 2020–2024 National Medium-Term Development Plan (RPJMN). This problem must be addressed by improving children's nutritional intake, especially during the first 1,000 days of life (Vidyatmoko, 2020). Indonesia has the potential for highly nutritious local food sources that are underutilized, such as avocado seeds and corn silk. Avocado seeds, often discarded, are rich in carbohydrates, protein, and antioxidants, while corn silk contains protein, fiber, and active compounds that are beneficial for health. Both of these ingredients have the potential to be processed into flour for functional foods, including biscuits. The innovation of processing avocado seed and corn silk waste into nutritious biscuits is a strategic step in supporting efforts to prevent stunting in toddlers. The urgency of this research is the use of corn silk and avocado seed waste as functional foods to prevent stunting in toddlers. The purpose of this study was to determine the use of corn silk and avocado seed waste as functional foods to prevent stunting in toddlers.

## **LITERATURE REVIEW**

Stunting is a failure to thrive in infants (0-11 months) and toddlers (12-59 months), caused by malnutrition, especially in the first 1,000 days of life, resulting in children being too short for their age. Research shows that toddlers with low energy intake are at risk of stunting. According to research (Oktarina & Sudiarti, 2014), the study found a link between nutritional intake and the incidence of stunting in toddlers. Toddlers with low nutrition are 1.28 times more likely to experience stunting than toddlers with adequate nutrition. This indicates that better energy consumption, better nutritional status (Azmy & Mundiastuti, 2018). Developing a supplementary feeding (PMT) formula for toddlers is a solution to meet the nutritional needs of toddlers and address the problem of malnutrition in Indonesia, especially among those from poor families (Irwan, Mery T, Sunarto Kadir, 2020). One PMT that can be used as a functional food is healthy biscuits, which can be made using corn silk flour and avocado seed flour to provide a higher nutritional value than regular biscuits. Corn (*Zea Mays L.*) is known as a source of carbohydrates. Every part of the corn, from the seeds, stems, leaves, skin, and silk, offers numerous benefits, both nutritionally and health-wise. However, with increasing harvests, corn silk is often left as waste due to its underutilization. This lack of utilization is due to the public's lack of awareness that corn silk is edible and offers numerous health benefits. (Damayanti et al., 2021). The abundant production of corn silk is not matched by processing options in Indonesia. Therefore, efforts to improve production are needed, one of which is to convert it into flour.

Avocado (*Persea Americana Mill*) is a fruit native to America and distributed throughout the world, including Indonesia. Avocados are rich in nutrients, one of which is their antioxidant content. Only the flesh of the avocado is consumed; the seeds and skin are discarded. The public is unaware that avocado seeds can be processed into food products. The high starch content of avocado seeds, at 80.10%, allows them to be processed into products (Halimah et al., 2014). Several studies have highlighted the importance of local food innovation as a preventative nutritional intervention against stunting. Avocado seeds, previously considered waste, are found to contain carbohydrates (48.11%), protein (17.94%), and high levels of antioxidants, all of which are beneficial for health (Lukman et al., 2022). Meanwhile, corn silk also has potential as a functional food ingredient due to its protein content (19.19%), fiber (19.84%), and bioactive compounds such as flavonoids and phenols, which support health (Ramli et al., 2021). However, the use of these two ingredients in food products is still very limited in the community. Several relevant studies have tested the sole use of these ingredients in food products. (Violita et al., 2021) showed that substituting avocado seed flour in cookies resulted in a product with nutritional content that meets Indonesian National Standards (SNI). Similarly, (Ramli et al., 2021) stated that corn silk flour is suitable for use as a food additive in healthy food processing. However, there are few studies combining these two ingredients in a single formulation, particularly in biscuits as a functional food product aimed at preventing stunting in toddlers. The weakness of previous studies is the focus on a single ingredient and the limited exploration of the synergy of nutritional content in the combination of ingredients.

## **METHOD**

This study used a laboratory experimental method aimed at developing food innovations in the form of functional biscuits based on avocado seed flour (*Persea americana Mill*) and corn silk (*Zea mays L.*) as an alternative supplementary food for preventing stunting in toddlers. Activities began with material determination, processing into flour, biscuit formulation with three ratios (25:75, 50:50, and 75:25), and product evaluation. The product was designed to be nutrient-dense, easy to consume, and sensory-friendly. Additional ingredients such as butter, egg yolk, powdered milk, salt, and sugar were used to enhance the flavor. The tools used included an oven, a no. 70 mesh sieve, a blender, a mixer, and laboratory equipment for chemical analysis (Kjeldahl, Soxhlet, Karl Fischer, and titration). Data collection was carried out through laboratory tests (protein, fat, carbohydrate, water, and ash content) and organoleptic tests (color, taste, aroma). All data were analyzed descriptively and compared with SNI standards to assess the feasibility of the formulation as a functional food for toddlers.

## RESULTS AND DISCUSSION

**Table 1 Test Results of Corn Silk Flour and Avocado Seed Flour Combination Biscuits**

Formula	Water content (%)	Ash Content (%)	Protein Content (%)	Fat Content (%)	Carbohydrate Content (%)
Formula 1	1.8	1.32	6.37	22.27	68.12
Formula 2	1.4	1.27	5.34	23.98	68.01
Formula 3	1.6	1.15	4.69	51.19	41.37

### Formula 1

The test results show that Formula 1 biscuits are of good quality and almost meet all the specified nutritional standards. The water content of 1.8% is relatively low and far below the maximum limit of 5%, which greatly supports the crunchy texture and shelf life of the product because low water can inhibit the growth of microorganisms that cause damage. The ash content was recorded at 1.32%, still within the safe range (maximum 1.5%), which indicates that the mineral content in these biscuits is not excessive and comes from fairly clean and quality raw materials. In terms of protein content, the value of 6.37% has exceeded the minimum limit of 5%, indicating that these biscuits have good nutritional value, especially as a source of protein which is important for metabolic processes, growth, and maintenance of body tissues.

The fat content in Formula 1 reaches 22.27%, which exceeds the minimum threshold of 9.5% and contributes to the soft texture, pleasant aroma, and savory taste that consumers generally enjoy. The high fat content also increases energy value, but must be controlled to avoid disrupting the overall nutritional balance. On the other hand, the carbohydrate content of only 68.12% is still slightly below the minimum standard of 70%. This low carbohydrate content is likely due to the relatively high proportion of protein and fat, which suppresses the overall carbohydrate percentage. To correct this, adjustments to the formula can be made by slightly reducing the fat content or adding carbohydrate-rich ingredients such as wheat flour, rice flour, or cassava starch. Overall, Formula 1 is very close to the ideal nutritional composition, and with minor modifications, this product has the potential to become a high-quality biscuit in terms of both taste and nutritional content.

### Formula 2

Based on the analysis results, Formula 2 biscuits demonstrated excellent quality across most tested parameters and generally approached the established quality standards. The moisture content of 1.4% is well below the maximum limit of 5%, which provides advantages in terms of product resistance to microbiological spoilage and helps maintain a crispy texture. The ash content of 1.27% is also within the safe range (maximum 1.5%), reflecting an appropriate and not excessive mineral content. In addition, the protein content of 5.34% has exceeded the minimum threshold of 5%, indicating that this product has a good nutritional contribution, especially as a source of vegetable protein which is important for growth and repair of body tissues. The fat content in Formula 2 reaches 23.98%, far exceeding the minimum limit of 9.5%.

This contributes to the product's flavor, softness, and caloric value, making it more sensorially appealing to consumers. However, the carbohydrate content is only 68.01%, still slightly below the minimum standard of 70%. The low carbohydrate content is likely due to the predominance of fat in the formula's composition, resulting in a proportionally smaller carbohydrate portion. This imbalance, while not significant, still requires attention, especially if the product is intended to primarily source energy from carbohydrates. To optimize nutritional value and compositional balance, ingredient adjustments are necessary, such as adding complex carbohydrate sources (e.g., wheat flour, cassava flour, or corn starch) and rebalancing the proportion of fatty ingredients. In addition to ingredient reformulation, appropriate processing such as adjusting the baking temperature or adding a binding agent can also help maintain the product's physical quality without compromising its nutritional value. With these minor improvements, Formula 2 biscuits have great potential to meet all established quality standards, both in terms of sensory and nutritional aspects.

### Formula 3

Based on the test results, Formula 3 biscuits only meet a small portion of the established quality standards. The water content of 1.6% is relatively low and is well below the maximum limit of 5%, so it is useful in maintaining crispness and extending the product's shelf life. The ash content of 1.15% is also still within the permitted limit (maximum 1.5%), indicating that the mineral content in these biscuits is still at a reasonable level.

However, the protein content only reaches 4.69%, not meeting the minimum threshold of 5%, which indicates that the nutritional value of the protein in this product is still less than optimal to support daily needs. Formula 3's fat content is very high, at 51.19%, far exceeding the minimum limit of 9.5%. While excess fat can improve texture and flavor, it also causes an imbalance in the overall nutritional composition. One of the main impacts is the low carbohydrate content, which is only 41.37%, far below the minimum requirement of 70%. Formula 3's failure to meet standards is likely due to the selection of high-fat ingredients or an unbalanced composition between carbohydrate, protein, and fat sources. To correct this, a comprehensive reformulation is needed, such as reducing high-fat ingredients (e.g., margarine or coconut milk) and adding complex carbohydrate sources (such as wheat flour, starch, or tuber flour). Additionally, increasing the use of plant-based protein ingredients such as nuts or soy flour should also be considered to rebalance the nutritional content to meet the expected quality standards.

## CONCLUSION

This research aims to develop food innovations in the form of functional biscuits made from a combination of corn silk flour (*Zea mays L.*) and avocado seeds (*Persea americana Mill*) as an alternative food to prevent stunting in toddlers. Based on the results of physical and chemical evaluations, all three biscuit formulas meet the requirements for water content and ash content according to the Indonesian National Standard (SNI). Formula 2 with a 50:50 ratio showed the best results, both in terms of protein content (5.34%), fat (23.98%), and carbohydrate (68.01%), and obtained the highest score in the organoleptic test (color, taste, and aroma). Although the carbohydrate content has not reached the minimum SNI standard ( $\geq 70\%$ ), the product still shows high potential as a safe, nutritious, and preferred supplementary food for toddlers. Overall, the research results indicate that utilizing local food waste such as corn silk and avocado seeds has significant added value in the development of functional food products. The resulting biscuits not only serve as a nutritious supplement for toddlers but also support waste reduction and local food security efforts. Further research is needed to refine the formula to meet all established nutritional quality standards, including increasing carbohydrate content. With further development, this product has great potential for commercialization and integration into the national program to accelerate stunting reduction as a nutritious, economical, and sustainable food solution.

## REFERENCES

- Azmy, U., & Mundiastuti, L. (2018). Nutrient Consumption of Stunted and Non-Stunted Children in Bangkalan Regency. *Amerta Nutrition*, 292–298. <https://doi.org/10.20473/amnt.v2.i3.2018.292-298>
- Damayanti, E.A., Gusnadi, D., Telkom, U., Jagung, R., & Tinggi, K. (2021). Utilization of Corn Silk Waste in Making Healthy Cookies for Patients. *E-Proceeding of Applied Science*, 7(5), 1648–1656. <https://openlibrarypublications.telkomuniversity.ac.id/index.php/appliedscience/article/view/15565>
- Halimah, ADN, Istiqomah, & Rohmah, SS (2014). Processing Avocado Seed Waste to Make Starch Dodol as an Alternative Kidney Treatment. *Student Scientific Journal*, 4(1), 32–37. <https://ejournal.undip.ac.id/index.php/jim/article/download/10888/8613>
- Irwan, Mery T, Sunarto Kadir, LA (2020). The Effectiveness of Providing Modified Food Supplements Based on Local Wisdom to Improve the Nutritional Status of Undernourished and Stunted Toddlers. *Journal of Health and Science; Gorontalo Journal of Health & Science Community*, 4, 59–67.
- Laswati, DT (2019). Nutritional Problems and the Role of Balanced Nutrition. *Agrotech: Scientific Journal of Agricultural Technology*, 2(1), 69–73. <https://doi.org/10.37631/agrotech.v2i1.12>
- Lukman, F. Kamilia, Murlida, E., & Noviasari, S. (2022). The Effect of Avocado Seed Flour Concentration on the Level of Likeability of Crackers. *Scientific Journal of Agricultural Students*, 7(1), 369–373. <https://doi.org/10.17969/jimfp.v7i1.19068>
- Oktarina, Z., & Sudiarti, T. (2014). Risk Factors for Stunting in Toddlers (24–59 Months) in Sumatra. *Journal of Nutrition and Food*, 8(3), 177. <https://doi.org/10.25182/jgp.2013.8.3.177-180>
- Ramli, S., Khumairah, R., & Zuhra, N. (2021). Utilization of Corn Silk as an Alternative Healthy Food Processing Material. *Journal of Environmentally Friendly Innovation (JIRL)*, 2(3), 10–15.
- Vidyatmoko. (2020). *Policy Analysis Journal* | Vol. 4 No. 2, 2020. *Policy Analysis Journal*, 4(2), 26–39.
- Violita, Lady, Purba, R., Emilia, E., Damanik, M., & Juliarti, J. (2021). Organoleptic Test and Nutritional Content Analysis of Avocado Seed Flour Substitute Cookies. *Journal of Nutrition and Culinary*, 1(2), 1. <https://doi.org/10.24114/jnc.v1i2.26854>