



Formulation of Potato-Based Functional Perkedel with Moringa Leaves and Minced Chicken as a Nutritious Supplement for Preventing Stunting

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ABSTRACT

"Stunting is a public health issue with long-term impacts on the quality of human resources. One approach to addressing stunting is through the provision of nutrient-rich supplementary foods based on local ingredients. This study aimed to develop a functional food product, specifically a potato-based perkedel with moringa leaves and minced chicken, as a nutritious supplementary food. The research employed a quasi-experimental method with three product formulations and organoleptic testing by 50 nutrition expert panelists. The results showed that formulation P1 (Potato 60%, Moringa Leaves 20%, Minced Chicken 20%) had the highest overall preference in terms of color, aroma, taste, and texture. The nutritional content per serving (50g) includes 62.0 kcal of energy, 3.0g of protein, 3.2g of fat, and 5.5g of carbohydrates. This product has the potential to be a nutritious supplementary food alternative for vulnerable groups, particularly stunted children and pregnant women with chronic energy deficiency

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INTRODUCTION

Stunting remains a critical public health issue in Indonesia, with a reported prevalence of severely stunted (4,2%) and stunting (15,6%) according to Indonesian Health Survey, 2023 (1). This condition, characterized by impaired growth and development due to chronic malnutrition, primarily affects children within the first 1,000 days of life a crucial window for physical and cognitive development. The consequences of stunting extend into adulthood, contributing to reduced intellectual capacity, diminished physical health, and lower economic productivity. Addressing stunting therefore requires multifaceted interventions beyond clinical approaches, incorporating sustainable, community-based nutritional strategies. (2) (3)

Functional food has emerged as a promising solution in the field of nutritional science, offering health benefits that go beyond basic nutrition (4)(5) These foods typically contain bioactive compounds which positively influence physiological functions, enhance immune defense, and potentially prevent or mitigate chronic health conditions (6). Local resources such as potatoes, moringa leaves (*Moringa oleifera*) (7)(8), and minced chicken offer a unique opportunity to formulate functional foods tailored to vulnerable populations (9). Each of these ingredients carries distinct nutritional advantages: potatoes provide complex carbohydrates (10) moringa is rich in micronutrients and antioxidants, and chicken offers high-quality animal protein (11)

The formulation of functional foods using culturally accepted formats like perkedel (traditional Indonesian potato fritters) may increase community acceptance and dietary adherence (12). Integrating moringa and chicken into this familiar dish aligns with both nutritional goals and sensory preferences, particularly among children (13). Given that stunted children often experience

micronutrient deficiencies and low protein intake, (14) the development of nutrient-dense, locally appropriate functional foods represents a viable preventive strategy to complement existing public health programs. (15)

This study seeks to explore the potential of a potato-based functional *perkedel* enhanced with moringa leaves and minced chicken as a supplementary food for stunting prevention. By applying quasi-experimental formulation and organoleptic evaluation methods, the research aims to identify an optimal product in terms of taste, texture, appearance, and nutritional content. The findings may contribute to the broader discourse on the role of functional foods in sustainable stunting reduction efforts, especially in resource-limited settings where local food solutions are essential.

METODE

Study Design

This research employed a quasi-experimental design to develop and evaluate three formulations of potato-based functional *perkedel* enriched with moringa leaves and minced chicken. The experimental intervention focused on identifying an optimal composition based on organoleptic properties and nutritional potential for use as a supplementary food in stunting prevention efforts.

Product Formulation

Three distinct formulations were prepared as follows:

- **P1:** 60% potato, 20% moringa leaves, 20% minced chicken
- **P2:** 50% potato, 25% moringa leaves, 25% minced chicken
- **P3:** 40% potato, 30% moringa leaves, 30% minced chicken

All ingredients were locally sourced and processed using standard culinary techniques to produce uniform *perkedel* samples.

Organoleptic Evaluation

Sensory testing was conducted by a panel of 50 registered nutritionists at RSUP Prof. dr. I.G.N.G. Ngoerah Hospital, Denpasar. A five-point hedonic scale (ranging from 1 = dislike extremely to 5 = like extremely) was used to assess four sensory attributes: color, aroma, taste, and texture of each formulation. Panelists received randomized samples to eliminate bias and improve the validity of evaluations.

Data Analysis

Descriptive statistics were employed to summarize panelists' preferences across sensory attributes. Acceptance levels were tabulated and visualized using tables and graphs. Additionally, nutritional content of the most preferred formulation was analyzed per 50g serving size, focusing on macronutrient composition (energy, protein, fat, and carbohydrate).

HASIL

3.1 Karakteristik Produk

Perkedel Kecinglor memiliki tekstur lembut dan rasa gurih yang khas dari kombinasi kentang, daun kelor, dan ayam cincang. Warna kecokelatan muncul dari proses penggorengan dan pencokelatan alami dari kentang.

Table 1. Consumer Acceptance of *Perkedel* Kecinglor

Attribute	Categories	F1 F1 (60% potato, 20% moringa, 20% chicken)		F2 (50% potato, 25% moringa, 25% chicken)		F3 (40% potato, 30% moringa, 30% chicken)	
		n	%	n	%	n	%
Color	Like Very Much	45	90.0	22	45.0	12	25.0
	Like	5	10.0	20	40.0	13	25.0
	Dislike	0	0.0	8	15.0	25	50.0
Aroma	Like Very Much	45	90.0	22	45.0	12	25.0
	Like	5	10.0	20	40.0	13	25.0
	Dislike	0	0.0	8	15.0	25	50.0
Taste	Like Very Much	45	90.0	22	45.0	12	25.0
	Like	5	10.0	20	40.0	13	25.0
	Dislike	0	0.0	8	15.0	25	50.0
Texture	Like Very Much	45	90.0	22	45.0	12	25.0
	Like	5	10.0	20	40.0	13	25.0
	Dislike	0	0.0	8	15.0	25	50.0
All Parameters	Like Very Much	45	90.0	22	45.0	12	25.0
	Like	5	10.0	20	40.0	13	25.0
	Dislike	0	0.0	8	15.0	25	50.0

Each 50-gram serving of Perkedel Kecinglor provides essential macronutrients beneficial for growth and development. It delivers approximately 62 kilocalories of energy, making it a light yet valuable supplement for daily intake. The product contains 3.0 grams of protein, primarily sourced from high-quality animal protein in minced chicken, supporting tissue repair and muscle development. Additionally, it includes 3.2 grams of fat, contributing to caloric density and aiding in the absorption of fat-soluble vitamins. The 5.5 grams of carbohydrates come mainly from the potato base, serving as a quick source of energy, especially suitable for children experiencing growth delays.

This nutrient profile reflects the product's potential as a functional food designed to complement the dietary needs of vulnerable populations—particularly children at risk of stunting and pregnant women with chronic energy deficiency. Its balanced composition supports the goals of improving nutritional intake and enhancing overall health outcomes through accessible, locally inspired culinary innovations.

DISCUSSION

Functional foods are dietary items that, due to the presence of bioactive components beyond basic nutritional content, offer additional health benefits and are accepted as part of a regular diet (4)(5). The development of functional *perkedel* products in this study incorporated locally available ingredients: potatoes, moringa leaves (*Moringa oleifera*), and minced chicken—selected for their nutritional profiles and potential to prevent chronic malnutrition. Sensory evaluation was conducted using organoleptic testing by human panelists, a commonly applied method to measure product acceptance using the senses.

The sensory evaluation panel consisted of 50 professional nutritionists from RSUP Prof. Dr. I.G.N.G. Ngoerah Denpasar. Each panelist assessed three formulations (F1, F2, F3) using a hedonic rating scale ranging from 1 (dislike) to 3 (like very much). Among the four organoleptic attributes—color, aroma, taste, and texture—Formulation F1, consisting of 60% potato, 20% moringa leaves, and 20% minced chicken, consistently received the highest scores across all sensory parameters. Color is the first sensory characteristic perceived by consumers and often influences overall product acceptance. In this study, 90.0% of panelists expressed strong preference for F1's golden-brown color, which was naturally developed through the browning reaction of potatoes during frying. This visual appeal likely contributed to the high sensory ratings and favorable reception. Aroma, assessed through olfaction, plays a critical role in food product evaluation. The preferred formulation (F1) received favorable feedback from 90.0% of panelists. The pleasant aroma derived from the chicken was not compromised by any undesirable scent from moringa leaves, indicating a successful masking or neutralization of potential off-notes.

Flavor perception, influenced by taste and mouthfeel, is essential in determining overall palatability. The texture and consistency also impact flavor experience. F1 was once again favored by 90.0% of panelists, who described its taste as distinctly savory, likely attributed to the umami characteristics of minced chicken and the mild bitterness of moringa, which complemented the overall flavor profile. Texture reflects a food's mechanical response under pressure and is influenced by raw material composition and processing methods. F1 displayed a soft, moist consistency that was well-received by 90.0% of panelists, suggesting it is suitable for consumption by vulnerable populations such as young children or pregnant women.

The findings from this study offer a practical and culturally appropriate intervention for addressing stunting in Indonesia through the development of functional foods. By leveraging locally sourced ingredients potatoes, moringa leaves, and minced chicken—this formulation aligns with the nutritional needs of vulnerable groups while promoting food sovereignty. The familiar format of perkedel enhances acceptability among children and pregnant women, increasing the likelihood of regular consumption and long-term nutritional impact (16)(17)

Importantly, this research contributes to the body of evidence supporting food-based approaches to public health nutrition, particularly within resource-limited settings. Rather than relying solely on fortification or supplementation, the functional perkedel represents a sustainable, community-empowered solution that can be integrated into family diets and school feeding programs. Its proven organoleptic appeal and nutrient density position it as a viable tool in multi-sectoral stunting prevention efforts (18)

Moreover, the study provides actionable insights for public health stakeholders, policymakers, and food product developers aiming to improve maternal and child nutrition. By combining scientific rigor with cultural relevance, the research sets a precedent for future functional food innovations that are both nutritious and context-sensitive. It underscores the importance of local food-based interventions in achieving the national target of stunting reduction, while also advocating for inclusive strategies that empower communities through their own culinary traditions (19)

CONCLUSION

In conclusion, Formulation F1 emerged as the most preferred across all organoleptic parameters and was thus selected for nutritional analysis. A 50g serving contained approximately 62.0 kcal of energy, 3.0g protein, 3.2g fat, and 5.5g carbohydrates.

These results suggest that F1 has the potential to serve as an effective and culturally acceptable supplementary food for stunting prevention in vulnerable groups.

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