



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

Cassava and Tuna Fish Formula (*Sikantong*) and Application in The Product for Treating of Stunting Children

I Wayan Juniarsana^{1*}, Ni Putu Agustini²

^{1 2} Nutrition Department, Polytechnich of Health Denpasar

*Corresponding author: vyjuniarsana9@gmail.com

Article history

Posted : 2023-10-27
Reviewed : 2023-10-23
Received : 2023-10-09

ABSTRACT

Background: Stunting is a chronic malnutrition problem caused by insufficient nutritional intake for a long period. This study aims to produce a food formula made from cassava (*singkong*) and tuna fish (*tongkol*) with the name is *Sikantong* Formula. *Sikantong* contains high nutritional value, especially energy, carbohydrates, protein and minerals to overcome stunting problems. **Methods:** The study was designed with a randomized group trial design with five types of formulations such as P1, P2, P3, P4 and P5. The quality characters of the *Sikantong* formula that were tested included the analysis of nutrients in the form of energy, protein, fat, carbohydrates, zinc, iron and calcium. and organoleptic assesment covering color, aroma, texture, taste and overall acceptance. **Results:** The results of the study, the five formulations had high nutritional content (> 10% RDA) as a snack food. Based on organoleptic assessment in the application of nuggets and meatballs, the *Sikantong* P1 formula was chosen as the best formula with a composition of 70 g of cassava flour and 30 g of tuna fish flour. Organoleptic assessment of the P1 formula for nuggets product was significantly different ($p < 0.05$) compared to P2, P3, P4 and P5. The meatball product organoleptic assessment P1 was significantly different in texture, color and aroma ($p < 0.05$) and not significantly different from the taste with the P2, P3, P4 and P5 formulas. Based on the nutritional characteristics, P1 nugget and P1 meatballs formula can recommended as a snack because contains of 5 - 10% of the RDA, such as energy protein, fat, carbohydrates, zinc, Fe and calcium with 100 grams as a standard portion. In terms of product prices, the selected formula is the most economical formula compared to other formulas. **Conclusions :** The conclusion from this study is that *Sikantong* P1 formula as the chosen formula can be used as an alternative to the development of various food products in fulfilling nutritional adequacy in the prevention and management of stunting in children 1 – 5 years.

Keywords : *Sikantong* Formula, Applied Product, Stunting



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)

<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

INTRODUCTION

Stunting is a problem of chronic malnutrition caused by insufficient nutritional intake over a long period. The prevalence of stunting in Indonesia is quite high. Based on the results of Riskesdas (2013), the national prevalence of stunting reached 37.2 %, an increase in 2007 (36.8%). According to WHO, the maximum prevalence limit of stunting was 20% of children under five years old. The stunting problem are caused by four main factors ie; maternal and environmental factors, inadequate nutrition complementary feeding, inhibiting breastfeeding, and infection factors. Inadequate nutrition is a direct cause of stunting. Even though nutritional provision from food is available in sufficient quantities, incorrect feeding patterns can result in a lack of nutritional intake received by toddlers (Almatsier, 2002). Food diversity, especially food containing protein sourced from animal foods and energy nutrients or carbohydrates sourced from various cereals or tubers are most importance for children who suffered from stunting (WHO, 2005).

Protein plays a role in various metabolic processes for helping the absorption of micronutrients that support the physical growth and development. Meanwhile, micronutrients have one factor for influencing of stunting prevalence such as zink, iron and folic acid. Many research results state that consuming of fish will provide protein and micronutrient intake to support children's growth and development (Rachim and Pratiwi, 2017).

Fish is one food ingredient chosen to address the problem of stunting because it has an important role as a source of protein and a variety of essential nutrients which contributes around 20% of total animal protein. Indonesia as a maritime and archipelagic country whose territory consists mostly

of water, Indonesia has a wealth of animal food resources in the form of fish which are very abundant but are still not utilized optimally (Hendrawati and Zidni, 2017). Several research results indicate that there is a significant relationship between the consumption of fish and prevalence of stunting. Previous research states that marine fish have a higher range of Ca, Zn and Fe contents than fresh water fish. In the Indonesian Food Composition Table, tuna (*tongkol*) fish contains 13.7 g of protein per 100 g, which is higher than other types of fish (Rachim and Pratiwi, 2017). *Tongkol* as a source of protein in treating stunting with the other ingredients are also needed, ie; cassava. Cassava is a local food ingredient with abundant production in Indonesia, especially in Bali, but has not been utilized optimally. Cassava is a source of carbohydrates and high energy and also contains a source of micronutrients including beta carotene for children growth and development, preventing and treating stunting. The research results show that children who suffer from stunting experience less energy consumption and a deficit of 67.3% (Jumirahet *al.*, 2007).

METHOD

This research design was experimental with a randomized with 5 kinds treatment formulations of Cassava (singkong) and Tuna fish (*tongkol*) with the name is *Sikantong (Singkong Ikan Tongkol)* formulation. The standard for making this formula refers to the percentage of providing snacks in a balanced menu of around 5 – 10% of the total nutritional adequacy (Recommended Dietary Allowance/RDA), especially the need for calories, protein and carbohydrates and adequacy of the minerals zinc, iron and calcium.



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

Table 1. Sikantong
Formulation

Ma terial	P				
	1	2	3	4	5
Cassava (g)	0	0	0	0	0
Tuna Fish (g)	0	0	0	0	0

Based on Table 1, the nutritional composition such as energy in the range of 131.5 Kcal – 175.6 Kcal, protein 12.2 grams – 26.2 grams, carbohydrates 8.6 grams – 17.5 grams and Fe of 0.175 mg - 0.35 mg. Based on the composition of the nutritional value, this formulation can approach the recommended standard of nutritional adequacy in the guidelines for handling stunting as a snack at 5 - 10% of the recommended nutritional adequacy at the age of 1 - 5 years. The organoleptic test used in testing the *Sikantong* formula was the Liability Level Test (Hedonic Test) which was carried out by 30 trained panelists. The scale range used in this organoleptic test is a scale range of 5 (most like, like, neutral, don't like, and most don't like) for the quality characteristics of color, aroma, texture, taste and overall acceptability. The nutritional analysis includes; water content, protein analysis using the Kjeldahl method, fat analysis using the Soxhlet method, Data analysis to

determine the effect of different formulas on organoleptic quality characteristics and chemical quality was carried out using descriptive analysis. Determination of the selected formula is based on the results of chemical quality analysis and organoleptic tests. Applicable products from the selected formula in the form of nuggets and meatballs are then subjected to organoleptic testing so that they become products that can be enjoyed by children under five, especially stunting sufferers.

RESULTS

1. Proximate and Mineral Analysis of *Sikantong* Formula Raw Materials

The results of the analysis of water content, ash content, protein content, fat content, carbohydrate content, zinc (Zn), iron content (Fe) and calcium content (Ca) in raw materials including cassava flour and tuna flour are as shown in Table 2.

INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

Table 2
Average of Proximate and Mineral Analysis results
Sikantong Formula

Component	Unit	Cassav a flour	Tuna fish Flour
Water Rate	%	12,18	10,51
Ash Rate	%	1,57	4,65
Protein	%	14,42	79,63
Fat	%	10,60	3,95
Carbohydrate	%	61,23	1,26
Seng (Zn)	mg/kg	139,55	56,172
Iron (Fe)	mg/kg	ttd	98,002
Calcium (Ca)	mg/kg	ttd	1340,95

2. Proximate and Mineral Analysis of *Sikantong* Formula

To determine the various nutritional contents of the *Sikantong* Formula in P1, P2, P3, P4 and P5, a proximate analysis was carried out including of protein, fat and carbohydrates. Minerals were also analyzed including zinc (Zn), iron (Fe) and calcium (Ca) levels.

a). Macronutrients contained of *Sikantong* Formula

The macronutrients such as protein, fat and carbohydrates in a formula can determine the nutritional value. Analysis of the protein, fat and carbohydrate levels of the *Sikantong* formula can be seen in Figure 1

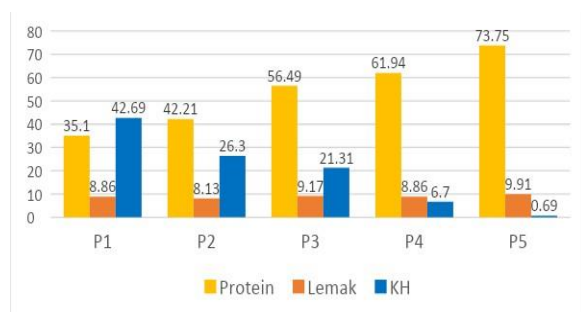


Figure 1. Protein, Fat and Carbohydrate in *Sikantong* Formula

b). The minerals contained of *Sikantong* formula

The mineral contained such as zinc (Zn), iron (Fe), Calcium (Ca), of the *Sikantong* formula can be seen in Figure 2, 3, and 4.

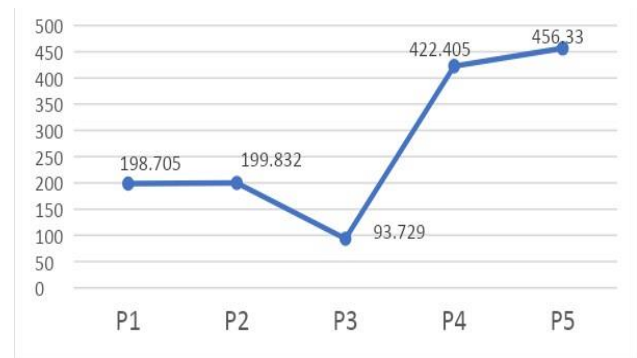


Figure 2. Zinc (Zn) levels in *Sikantong* Formula

INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

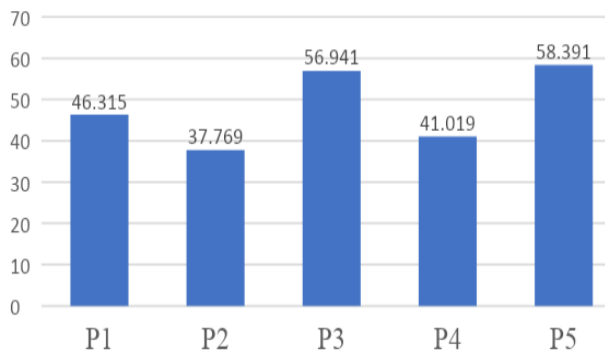


Figure 3. Iron (Fe) levels in Sikantong Formula

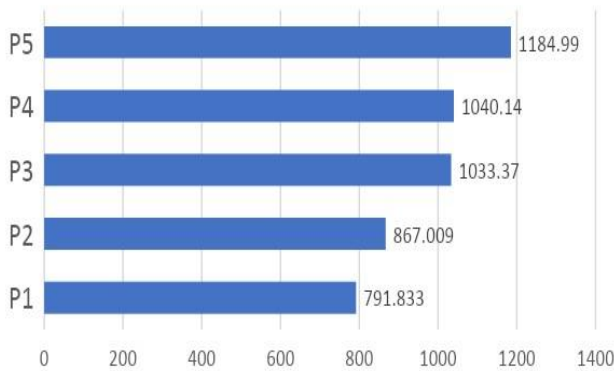


Figure 4. Calcium (Ca) level in Sikantong Formula

3. Applications of Sikantong Formula in Food Product

The *Sikantong* formula as a basic formula for preventing and treating stunting can be made into a variety of products, including nugget and meatball products. Nugget products are made from the *Sikantong* formula composition (P1, P2, P3, P4 and P5) plus other ingredients that are in accordance with the standard menu for making nuggets and meatballs (for 5 portions). To evaluate the sensory properties of the product, a Hedonic Test was carried out on color, aroma, texture, taste and acceptability with a scale range of 1-5 where the value 1 is very dislike and the value 5 was very like.

a). Nugget Products

Evaluation of the sensory of the *Sikantong* formula in Nugget products by looking at the average hedonic test can be seen in Table 3.

Table 3.
The Hedonic Test for Color, Aroma, Texture, Taste, and Overall Acceptance of Nugget Products

Treatment	Average value of Hedonic Test				
	Color	Aroma	Texture	Feel	Overall acceptance
P1	3,50 a	3 ,30 a	3,5 3 a	2,83 ab	3,27 ab
P2	3,40 ab	3 ,29 a	3,4 3 ab	3,27 a	3,433 a
P3	3,17 ab	3 ,10 ab	3,1 7 bc	2,90 ab	2,93 ab



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

P4	3,07 bc	2 ,8 bc	3,1 3 bc	2,87 ab	3,03 ab
P5	2,93 c	2 ,6 c	3,0 3 c	2,57 b	2,57 c

Average values followed by different letters in the same column indicate significantly different results in the Duncan test ($p < 0.05$).

Based on the results of the sensory evaluation on the average value of the Hedonic test as stated in Table 3 in this assessment, it was determined that the selected Nugget product from this research was Nugget Formula P1 with the ingredient formulation: cassava flour 70 g, tuna flour 30 g, crushed carrots 25 g, 5 g garlic, 5 g flour, 200 ml water and ¼ egg and 50 g brown sugar.

The results of the nutritional analysis of selected Nugget products can be seen in Table 4 below.

Table 4.
Nutrient Analysis of Selected Nugget Products

No.	Parameter	Unit	Results
1.	Protein	%	13,07
2.	Fat	%	1,17
3.	Carbohydrate	%	25,93
4.	Energy	Kcal	166,50
5.	Seng (Zn)	mg/kg	32,504
6.	Water level	%	58,82
7.	Ash Rate	%	1,02

Source ; UPT Analytical Laboratory Udayana University

Meatball Products

The *Sikantong* formula can also be used as a product application in the form of meatballs. To evaluate the sensory properties of the

Sikantong formula in meatball products by looking at the average value of the Hedonic test as shown in Table 5.



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

Table 5.

Average Hedonic Test Value of Color, Aroma, Texture, Taste, and Overall Acceptability of Sikantong Formula in Meatball Products

Treatment	Average value of Hedonic Test				
	Color	Aroma	Texture	Feel	Overall acceptance
P1	3,37 a	3,20 a	3,57 a	3,03 a	3,43 a
P2	3,07 ab	3,07 a	3,13 b	3,10 a	3,17 ab
P3	2,90 bc	3,13 a	2,83 b	2,93 a	2,90 bc
P4	2,63 bc	2,83 ab	2,97 b	2,90 a	2,83 bc
P5	2,60 c	2,60 b	2,87 b	2,73 a	2,63 c

The Average values followed by different letters in the same column are significantly different in the Duncan test ($p < 0.05$)

Based on the results of the sensory evaluation, it can be determined that the selected formula from this research is the P1 meatball product with ingredient composition

(per portion): 70 g cassava flour, 30 g tuna fish flour, ¼ egg, 5 g tapioca flour, sufficient spices such as shallots, garlic, pepper, spring leaves, sugar and 220 ml ice water.

The results of the nutritional analysis of selected meatball products can be seen in Table 6 below.

Table 6.

Nutrient Analysis of Selected Meatball Products
(per 100 gr of ingredients)

No.	Parameter	Unit	Results
1.	Protein	%	13,00
2.	Fat	%	10,26
3.	Carbohydrate	%	35,04
4.	Energy	Kcal	284,48
5.	Seng (Zn)	mg/kg	28,253
6.	Water level	%	40,38
7.	Ash Rate	%	1,32

Source ; UPT Analytical Laboratory Udayana University

DISCUSSION

Cassava (Singkong) and tuna fish (Tongkol) or Sikantong formula is an effort to make a food formula made from basic ingredients of cassava and tuna fish with the

aim of high nutritional adequacy, especially for stunted toddlers aged 1-5 years. Fulfillment of nutrients as snacks is expected to fulfill 5-10% of the recommended (Almatsier, 2005). Sikantong formula made from cassava and tuna fish



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)

<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

formulations in all treatments (P1, P2, P3, P4 and P5) per 100 grams of formula contains nutrients, especially energy, protein, carbohydrates, zinc and iron, with the category 5-10% RDA so that fulfills the requirements as a snack for preventing and treating stunting aged 1-5 years. This is in line with WHO (2005), which states that food diversity is one of the factors that contributes to providing adequate nutrition for stunted children, especially food containing protein sourced from animal foods and energy nutrients or carbohydrates sourced from various cereals.

The application of the *Sikantong* formula is aimed at making an attractive product so that it can be consumed by children under five, especially stunted children, such as nuggets and meatballs product. Nugget and meatball products are food products that are quick to prepare, very popular among the public, both children and adults, apart from tasting delicious, they are also relatively easy to make. (Sudarwati, 2007). Organoleptic assessment of food taste can be recognized and differentiated by the sense of taste. Based on the results of the organoleptic assessment including taste, color, aroma and texture as well as the results of the hedonic quality analysis, selected nugget and meatball products were obtained, ie ; the P1 nugget and the P1 meatball formula with a comparison of the basic ingredient composition formulation of 70 grams of cassava flour and 30 grams of tuna flour. The results of the organoleptic assessment of 30 trained panelists showed that the taste, aroma, color and texture were in the neutral - like range and the average value of the hedonic test variance as a whole was in the largest relative value range and showed significantly different results from the Duncan test ($p < 0.05$).

Assessment of the average hedonic test on texture from the selected meatballs (P1 meatballs) showed the greatest value in the neutral – like range and were significantly different ($p < 0.05$) compared to the other treatments. The color of the nugget and meatball products with a composition of 70 grams of cassava flour and 30 grams of tuna flour gives bright color to the product, while the composition of tuna fish above 30 grams as in P2, P3 and P4 is a darker color. The color assessment of the P1 nugget and P1 meatball products based on the results of various hedonic tests showed a neutral – favorable range and was significantly different ($p < 0.05$) compared to the other treatments. According to Winarno (2004) color is a very important component for the quality or degree of acceptance of a food ingredient because color appears first in the acceptance of a food ingredient.

The results of the product aroma assessment show that the P1 nugget product formulation is in the highest average value range and is significantly different from other treatments. Meanwhile, the panelists accepted the meatball product P1 the highest aroma was 3.20 (neutral-like) and the variance results showed that it was significantly different ($p < 0.05$), not significantly different at P4 and significantly different from P5. The difference in aroma is influenced by the basic ingredients of tuna fish through the drying process and tuna fish flour. The distinctive aroma of tuna fish meal products is influenced by the increasing protein and amino acid content of the product (Winarno, 2004).

This shows that the use of the highest portion of cassava flour of 70 grams and the lowest portion of tuna flour of 30 grams



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)

<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

organoleptically provides a sensory evaluation with a better level of acceptance compared to other treatments in terms of color, taste, aroma and texture characteristics. . The higher the composition of tuna fish will reduce the organoleptic quality value, but treatment P1 can contribute nutritional values of energy, protein, fat, carbohydrates, zinc, iron and calcium in accordance with the RDA in children 1 – 5 years.

The relationship between energy consumption and the impact of stunting is shown by the results of Oktarina's (2013) research, which shows that there is a relationship between the level of energy availability and intake with the incidence of stunting in toddlers. The results of research by Aridiyah (2015), which stated that the availability and intake of protein is related to stunting. Protein is a macronutrient needed by the body with the function as a building block, maintainer of body cells and tissues and assists in the metabolism of a person's immune system. The P1 formula in the nugget product application contributed 6.5 grams (26%) and in the meatball product 13.07 grams (52.28%). This shows that the protein contribution was more than 10%. This protein composition is mostly obtained from tuna as a high protein food source. The availability of protein in the body causes nitrogen balance. Nitrogen balance (*nitrogen balance*) in the body as an internal effort prevention of stunting (Winarno, 2004).

Protein intake is related to the amount of energy and zinc (Zn) intake, which is an essential nutrient in treating stunting for normal cellular function and metabolic processes. The use of cassava as a form of availability of food diversity in Indonesia must be substituted with other food ingredients that are high in protein and

zinc, such as tuna. This is in accordance with the research results of Esfarjani et al., (2013), which stated that efforts to make food formulas by combining a mixture of food ingredients high in carbohydrates such as cassava, cereals etc. with food sources high in protein (legumes, meat products and various fish) is associated with a reduction in the incidence of stunting in children.

The availability of various minerals in food or in formula form is an important part in preventing and treating of stunting. The group most at risk of zinc deficiency are toddlers who are still in their growth period influence on height growth (Almatsier, 2005). The contribution of zinc (Zn) to the P1 formulation of nugget and meatball products as a snack is 2.8 mg (28.2%) and 3.25 (65%) respectively, which is > 10% RDA. Based on the basic ingredients of the P1 formula, the contribution of zinc content is obtained from the high zinc content in cassava flour of 139.53 mg and in tuna fish flour which contains 56.17 mg per 100 grams of material. The combination of a formula made from cassava and tuna can be used as a source of zinc (Zn) for treating stunting. Bening's *et al.*, 2016, stated that zinc deficiency is a risk factor for stunting for children aged 2 – 5 years. The availability of fish, especially tuna in an area, is an alternative local food for consumption in an effort to prevent stunting (Ngaisyah and Rohman, 2019).

The nutritional adequacy rate (RDA) for the mineral iron (Fe) in selected nugget and meatball products is 4.63 mg (46.3%) and calcium is 79.18 (7.92%). Based on this, nutritional adequacy is in the range of more than 10% of the RDA. The composition of Ca levels in the formula is influenced by the portion of tuna used because tuna is a source of animal



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

food with a living habitat in the sea (Winarno, 2004).

It is necessary to provide nutrition such as the *Sikantong* formula in product applications for consumption by children under five to contribute iron. Insufficient iron intake in children causes stunted growth and if it lasts for a long time it will cause stunting. The micronutrient of calcium plays a role in children's linear growth. During growth the demands on bone mineralization are very high (Stuijvenberg, *et al.*, (2015). The results of Burckhardt's research (2010), the risk of stunting was 3.93 times greater in toddlers with calcium intake. The *Sikantong* formula provides a calcium intake of 7.92% of the RDA for children aged 1-5 years with the source of calcium being tuna. The existence of the P1 formula with the basic ingredients of 70 grams of cassava flour and 30 grams of tuna flour, is economically the cheapest formula compared to other formulas.

In this regard, the *Sikantong* P1 Formula can be recommended as a basic formula for preventing and treating stunting in children under five, whether applied to nugget and meatball products or other product applications as snacks. This is based on an assessment of organoleptic quality characteristics, nutritional composition and economics in terms of the cheapest price. According to Hermana (1997) in Munikah (2017) states that in preparing food formulas or Mixed Food Ingredients (BMC) must be follow the requirements; high nutritional value, high energy and protein content, source of vitamins and minerals, acceptable taste, affordable price within the purchasing power of the target group, can be made from locally produced food ingredients and has a long shelf life. According to FAO/WHO/UNU (1980), food

formulas can be prepared using two, three, or four food ingredients. The main ingredient is a source of calories. Other ingredients are added to supplement the small amounts of amino acids in the main ingredient. The main ingredients can also complement the amino acids in other food ingredients.

CONCLUSIONS AND SUGGESTIONS

1. The formulation of *Sikantong* formula produced for the prevention and treatment of stunting include the composition of cassava flour with tuna including; P1 (70 g ; 30 g), P2 (60 g ; 40 grams), P3 (50 g ; 50 g), P3 (40 g ; 60 g) and P5 (30 g ; 70 g).
2. Product applications from various formulas in the form of snack products for toddlers 1 – 5 years in the form of nuggets and meatballs.
3. The results of the sensory evaluation of color, aroma, texture and overall taste showed that the treatment of different ingredient formulations in making *Sikantong* formula nugget and meatball products was significantly different ($p < 0.05$).
4. The selected treatment from the formulation in *Sikantong* formula products is formula P1 in nugget and meatball products with the basic ingredient composition : cassava flour 70 grams and tuna flour 30 g. The nutritional content of the selected nugget products provides an energy contribution of 142.24 Kcal, protein 6.5 grams, fat 5.13 grams, carbohydrates 17.52 grams, zinc 1.41 mg, iron 2.32 mg and calcium 39.59 mg. The selected meatball products contributes of energy 166.5 Kcal, protein 13.07 grams, fat 1.17 grams, carbohydrates 25 .93 grams, zinc 3.25 mg, iron 4.63 mg, and calcium 79.183 mg.

Suggestions that can be given in this research are:



INTERNASIONAL CONFERENCE ON MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

1. For making stunting formula, it is necessary to recommend the Sikantong formula with a formulation ; 70 grams of cassava flour and 30 grams of tuna fish flour as well as the addition of other ingredients or spices as complements. Hendrawati and Zidni, 2017. Description of Fish Consumption in Families and Preschool Children RW 07 Cipinang Village, Journal of Community Service ISSN 1410 – 5675 Vol. 1, No. 2, April 2017: 101 – 106
2. The application of the P1 product still needs to be evaluated to be developed by adding various ingredients to improve the aroma and texture to increase the acceptability of the Sikantong formula product. Munikah and Mariam Razak, 2017. Teaching Materials for Nutrition Science, Food Technology, Jakarta; BPSDMK Health Human Resources Education Center, Ministry of Health of the Republic of Indonesia
3. Further research needs to be carried out by making various development products from the Sikantong formula, such as steak, cookies, muffins and various traditional Balinese snacks such as thymus, etc. Nisa, AF., 2018. Quality of Tuna Fish (*Euthynnus affinis*) Using Natural Preservative Ciplukan Leaf Extract and Varying Soaking Time. Study Program Thesis, Department of Biology, Faculty of Teacher Training and Education, Muhamadyah University of Surakarta

Ngaisyah and Rohman, 2019. Effect of Fish consumption as a local food alternative for the Reduction of Stunting in Toddlers, *Pakistan Journal of Nutrition*, Volume 18 No. 5 ; 496-500

Osredkar J, Sustar N. 2011. Copper and zinc, biological role and significance of copper/zinc imbalance. *J Clin Toxicol Suppl* 3: 1 – 18. doi: 10.4172/2161-0495.S3-001

Oktarina Zilda and Trini Sudiarti. 2013. Risk Factors for Stunting in Toddlers (24–59 Months) in Sumatra. *Journal of Nutrition and Food*, November 2013, 8(3): 175—180

Rachim and Pratiwi, 2017. The Relationship between Fish Consumption and Stunting in Children Aged 2-5 Years, *Diponegoro Medical Journal*, Volume 6, Number 1, January 2017 Online: <http://ejournal-s1.undip.ac.id/index.php/medico> ISSN Online : 2540-8844

Sudarwati . 2007 . Making Beef Meatballs with Chitosan. Thesis, Faculty of Agriculture, University of North Sumatra: North Sumatra

WHO (World Health Organization), 2016. Global nutrition targets 2025: stunting policy brief. Geneva [Internet]; 2012. [Cited 2016, Jan 20];

Conflict of Interest

Acknowledgment

REFERENCE

Almatsier, Sunita. 2005. Basic Principles of Nutrition Science. Jakarta: Gramedia Pustaka Utama.

Aridiyah, F. O., Rohmawati, N., & Ririanty, M. 2015. Factors Affecting Stunting in Toddlers in Rural and Urban Areas (The Factors Affecting Stunting on Toddlers in Rural and Urban Areas). *Health Literature*, 3(1), 163-170

Almatsier, S., 2002. Basic Principles of Nutrition Science. Jakarta: Gramedia Pustaka Utama Publisher

Burckhardt P, Dawson H, Weaver C., 2010. Nutritional influences on bone health. New York: Springer; 2010

Esfarjani. F., Roustae. Roshanak., Nasrabadi. FM. 2013. Major Dietary Patterns in Relation to Stunting among Children in Tehran, Iran, *Journal of Health Populations and Nutrition* 31(2)202-10



**INTERNASIONAL CONFERENCE ON
MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE**

VOLUME 1 TAHUN 2023, ISSN 3032-4408 (Online)
<https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs>

Available from:

http://www.who.int/nutrition/topics/globaltargets_stunting_policybrief.pdf 6.

Winarno, F.G. 2004. Food Chemistry and Nutrition.
Gramedia Pustaka Utama : Jakarta