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Acceptance Testing of Sate Lilit PAHU (Patin Fish and Tofu) Modification According to Infant and Child Feeding Principles as an Alternative to Prevent Stunting

Sherly Rahmawati[1], Taufiqurrahman*[2], Mujayanto[3], Nuning Marina Pengge[4], Fahmi Hafid[5], Lee Shoo Thien[6]
[1,2,3,4,5]Department of Nutrition, Politeknik Kesehatan Kemenkes Surabaya, Surabaya, Indonesia
[6]Department of Healthcare Professional, Faculty of Health and Life Sciences, Management and Science University, Malaysia
Email: taufiq@poltekkesdepkes-sby.ac.id

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ABSTRACT

Stunting for children under the age of 5 years is caused by long-term protein deficiency and it is a public health problem in Indonesia. Patin fish is rich in protein, selenium and taurine, which help stimulate the growth and development of children. The aim of study was to assess the acceptability of thigh skewers (made with Patin fish and tofu) as a potential alternative to prevent stunting in infants and children, based on the principles of proper nutrition. Experimental study was conducted on a control group and three treatment groups. Organoleptic test was conducted among 25 panelists by using indicators of color, taste, aroma and texture. The average distribution of formulas for SLT 0 (3.73), SLT 1 (3.91), SLT 2 (3.57), SLT 3 (2.85). The most preferred formula was SLT 1. The SLT 1 consisted of 70 grams of Patin fish and 30 grams of tofu. The protein content of one serving of Sate wrapped around the thigh (Patin fish and tofu) is adequate to meet the protein requirements of toddlers. It providing 7.55 g of protein per snack, with a protein energy ratio of 24.61% and energy density of 3.62.

INTRODUCTION

Malnutrition occurs while in the womb and during the first few days of life[1–4], and also after two years old[5–8]. Stunting for children under the age of 5 years is a condition of stunted in growth as a result of nutritional deficiencies[9]. Stunting is a chronic nutritional problem caused by long-term malnutrion. Stunting leads to disruption of the physical and cognitive development of the child[10–15]. Stunted children have a lower IQ (Intelligence Quotient) than normal children[16–18]. Height for age z score is used by comparing to the standard WHO-MGRS (as an indicator to identify the stunting level. Stunting is determined by classification of their height for age z score to the standard WHO-MGRS (Multicentre Growth Reference Study)[19–22].

The global prevalence of stunting in children under 5 years was about 22.3%. In Indonesia, Basic Health Research reported stunting among children was 30.8% in year 2018, this percentage was slightly decreased to 24.4%[23]. In year 2021 as reported in Indonesia Nutritional Status Survey in 2021[24]. Overall, stunting issue in Indonesia and particularly in East Java was a chronic community nutrition problems, as based on the guideline of 20% and more is considered as a

chronic community nutrition problems, as based on the guideline of 20% and more is considered as a chronic category[25].

In an effort to prevent stunting, the government Ministry of Health has 3 implemented three programs. These include providing iron-rich supplements, namely Blood Added Tablets for adolescent girls, pregnancy check-ups and Suplementary Feeding for pregnant women. The programs aim to adequate nutrition enchance nutritional knowledge about proper complementary feeding, and increase animal protein consumption for children aged 6-24 months[26].

Complementary food for breast milk or commonly referred to as complementary feeding, aconsists of solid or semi-solid foods that provide complete nutrition. The foods are introduced to infants starting at the age of 6 months, in addition to exclusive breastfeeding, to ensure optimal growth and development. When providing complementary feeding, it is essential to consider the type, frequency, portion, and method of administration[27]. Complementary feeding should meet the requirements of 4 foor groups (carbohydrates, animal protein, vegetable protein, fruit or vegetables) in order to meet the nutritional need of babies, in preventing malnutrition, low birth weight, and stunting[28]. However, in practice of complementary feeding, that the consumption of animal protein is often insufficient. This might possibly due to financial constraint of high cost of animal protein. There are other, cheaper animal protein sources, such as fish which are also rich in protein and other nutrients[29].

Patin fish is a good food choice for all ages due to its high protein and low levels of saturfated fat. Additionally, patin fish is a rich source of omega-3 fatty acids, selenium and taurine. Which function to stimulate the growth and development of brain cells, especially in toddlers and children[30]. Patin fish contains 15 amino acids including 9 essential amino acids (tryptophan lysine, histidine, threonine, leucine, isoleucine, methionine, phenylalanine and valine) and 6 non-essential amino acids (arginin, alanine, glutamic acid, tyrosine, glycine and serine)[31]. Amino acids are building blocks of protein Amino acids are building blocks of protein, which are vital for growth and development of body, particularly during the young children period (0-5 years). Inadequate consumption of protein-rich foods, especially those containing essential amino acids, can negatively impact the growth[32]. Stunting is the main malnutrition problems among Indonesian children. Insufficient food intake, particularly a lack of essential amino acids, is one of ther main contributing factors to stunting among toddlers[33]. A study showed that low concentrations of tryptophan, biogenic amines and sphingolipids levels are related to the stunting issue among children[34]. The purpose of this study is to assess the acceptance testing of Sate Lilit PAHU (Patin Fish and Tofu) modification according to infant and child feeding principles as an alternative to prevent stunting.

MATERIALS AND METHODS

This research was conducted at the Laboratory of the Department of Nutrition Poltekkes Kemenkes Surabaya, Jalan Pucang Jajar Selatam No. 24B. Present study applied True Experimental research design and randomly assigned subjects intro groups. There were one control group and three treatment groups in this study[35]. Table 1 shows the formulation of product Sate Lilit Pahu with different propotion of ingridients.

Table 1. Formulation of Product Sate Lilit Pahu (Patin Fish and Tofu)

Materials	Formulation of Sate Lilit Pahu (Patin Fish and Tofu)			
	SLT 0	SLT 1	SLT 2	SLT 3
Patin fish	100	70	50	40
Tofu	0	30	50	60
Potato	0	15	15	15
Carrot	0	10	10	10
Grated coconut	10	10	10	10
Coconut milk	5	5	5	5

Source: Primary Data, 2023

SLT: Sate Lilit Pahu

Organoleptic test conduction via sensory testing was conducted among 25 trained panelists. Assesment was expressed on a hedonic scale with the criteria: (1=very dislike, 2=dislike, 3=somewhat like, 4=like, 5=verylike). The hedonic scale is transformed into a numerical scale with a quality score according to preference. Inthis study, each formulation of Sate Lilit Pahu (Patin fish and Tofu) was tested hedonically with 4 indicators, namely color, taste, aroma, and texture.

The sensory test data was cleaned and analysed using SPSS 16.0. normality test was performed and found the data was not normally distributed. Hence, non-parametric test and significant level of 5% were used for dataanalysis. Kruskall-Wallis test was used to determine the differences of sensory test between the theeformulations of Sate Lilit Pahu (Patin fish and tofu). If the analysis was continued with Mann-Whitney test, which to determine the pair difference of sensory results.

RESULTS

Table 2. Characteristics of Different Formulation of Sate Lilit Pahu (Patin Fish and Tofu)

Indicator	SLT0 Formulation (Patin Fish)	SLT 1 Formulation (Patin Fish:Tofu) (70:30	SLT2 Formulation (Patin Fish:Tofu) (50:50)	SLT3 Formulation (Patin Fish:Tofu) (60:40)
Color	Golden yellow	Golden yellow	Golden yellow	Yellow
Taste	Savory	Savory	Savory	Savory
Aroma	Burnt aroma	Burnt aroma	Burnt aroma	Burnt aroma
Texture	Soft, slightly, chewy	Soft	Soft	Soft, slightly, watery

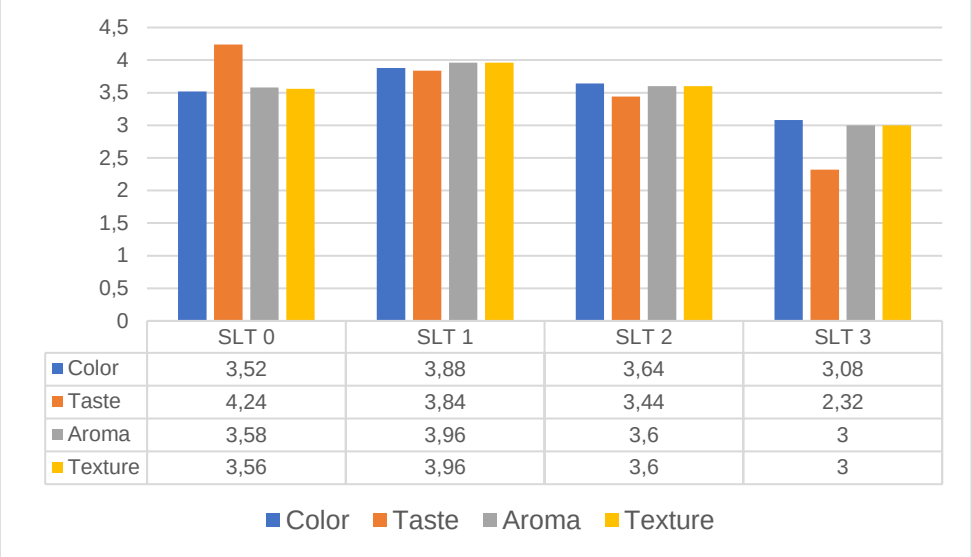
Source: Primary Data, 2023

SLT: Sate Lilit Pahu

Table 2 describes the characteristics of different formulation of SLT. The SLT 0 formulation produces a golden yellow color with a savory, slightly fishy taste. It has distinctive burnt aroma, a soft texture and his slightly chewy. The SLT 1 formulation produces a golden yellow colour with a savory taste and has distinctive burnt aroma, featuring a soft texture. The SLT 2 formulation also produces a golden yellow color with savory taste and a distinctive burnt aroma, along with a soft texture. The SLT 3 formulation produces a yellow color with savory taste, a distinctive burnt aroma, and a soft, slightly watery textur.

The SLT 1, SLT 2, SLT 3 formulations each contain different compositions of catfish and patin fish and tofu have the same basic ingredients for carbohydrate sources (potatoes) and carrot vegetables. The control formulation and each treatment formulation include coconut milk and grated coconut in the same proportions by weight.

Organoleptic Test of Sate Lilit Pahu (Patin Fish and Tofu)



	SLT 0	SLT 1	SLT 2	SLT 3
Color	3.52 [a]	3.88 [a]	3.64 [a]	3.08 [b]
Taste	4.24 [a]	3.84 [a]	3.44 [a]	2.32 [b]
Aroma	3.58 [a]	3.96 [a]	3.60 [a]	3.00 [b]
Texture	3.56 [a]	3.96 [a]	3.60 [a]	3.00 [b]

Figure 1. Average graph of Organoleptic test results

[abc]Different superscript indicate statistically significant different group at p<0.05 using Mann-Whitney test

Figure 1 displays the mean score of organoleptic tests different SLT formulation. The SLT 1 had the highest mean score of color (3.88), aroma (3.96) and texture (3.96). Meanwhile the control product. SLT 0 had the highest mean score of taste (4.24). the most unfavorable formulation was SLT 3, which had the lowest score all indicators. The mean score of color (3.08), taste (2.32), aroma (3.00) and texture (3.00) of SLT 3 were statiscally significantly lower than the SLT 0 (control), SLT 1 and SLT 2.

Table 3. Test Results Kruskall Wallis Formulation Sate Lilit Pahu (Patin Fish and Tofu)

No	Indicator	Kruskal Wallis Test Values
1	Color	0.008
2	Taste	0.007
3	Aroma	0.006
4	Texture	0.004

Source: Primary Data 2023

Table 4. Test Results of Mann Whitney Sate Lilit Pahu (Patin Fish and Tofu)

No	Indicator	Mann Whitney Test Values					
		SLT 1: SLT 2	SLT 1: SLT 3	SLT 1: SLT 0	SLT 2: SLT 3	SLT 2: SLT 0	SLT 3: SLT 0
1	Color	0.274	0.003	0.126	0.010	0.526	0.048
2	Taste	0.254	0.025	0.498	0.015	0.067	0.045
3	Aroma	0.120	0.004	0.992	0.013	0.067	0.030
4	Texture	0.130	0.001	0.185	0.012	0.747	0.021

Source: Primary Data, 2023

Nutritional Values, Protein Energy Ratio and Energy Density of Sate Lilit Pahu (Patin Fish and Tofu)

Table 5 Nutritional Content, protein energy ratio and energy density of Sate Lilit Pahu Formulation (Patin and Tofu)

Types of Nutrients	Formulation of Sate Lilit Pahu (Patin Fish and Tofu) One Portion (90 g)			
	SLT 0 (Patin Fish:Tofu) (100:0)	SLT 1 (Patin Fish:Tofu) (70:30)	SLT 2 (Patin Fish:Tofu) (50:50)	SLT 3 (Patin Fish:Tofu) (40:60)
Energy (g)	130.05	126.65	121.05	118.2
Protein (g)	8	7.55	6.65	6.2
Fat (g)	10	9.71	9.55	9.47
Carbohydrates (g)	0	6.57	6.75	6.84
PER (%)	24.61	23.85	21.97	20.98
K	3.72	3.62	3.46	3.38

Source: Primary Data, 2023

PER: Protein Energy Ratio; K: Energy Density

Table 3 shows the nutritional values, protein energy ratio and energi density of each formulation. The in nutritional content of the formulation is due to differences in the weight composition of patin fish and tofu. The highest Protein Energy Ratio (PER) and Energy Density (K) was found in SLT 0 (PER: 24,61%; K: 3.72), which consisted 100% of patin fish.

Selling Price Per Portion of Sate Lilit Pahu (Patin Fish and Tofu)

Table 6. List of Capital Ingredients of Sate Lilit Pahu (Patin Fish and Tofu)

Materials	Weight	Price
Patin fish	70 grams	IDR 1.750
Tofu	30 grams	IDR 500
Potato	10 grams	IDR 200
Carrot	10 grams	IDR 200
Grated coconut	10 grams	IDR 500
Coconut Milk	10 grams	IDR 500
Onion	20 grams	IDR 500
Garlic	20 grams	IDR 500
Citronella	2 segments	IDR 500
Ginger	1 segment	IDR 250
Galangal	1 segment	IDR 250
Lime leaves	3 leafs	IDR 250
Bay leaf	3 leafs	IDR 250
Nutmeg	1 seed	IDR 250
Clove	1/2 wrap	IDR 250
Pepper	1 /2 wrap	IDR 500

Materials	Weight	Price
Coriander	½ wrap	IDR 500
Salt	10 grams	IDR 500
Oil	20 grams	IDR 350
LPG	¼ tube	IDR 500
Mika	2 pcs	IDR 1.000
Capital		**IDR 10.000**

Selling Price = Capital + Profit
= 10.000 + (25% x 11.200)
= 10.000 + 2.000
= IDR 12.000, -

Selling Price Per Portion = Selling Price: Number of Servings
= 12.000: 2
= IDR 6.000, -

In one recipe of Sate Lilit Pahu (Patin Fish and Tofu) make 4 pieces. These 4 Sate Lilit Pahu (Patin Fish and Tofu) are sold in mika packaging, where each mika contains 2 pieces per mika. So, one pieces Sate Lilit Pahu (Patin Fish and Tofu) is sold at a price IDR 3.000, -

DISCUSSION

Organoleptic test include color, taste, aroma and texture were performed to determine the acceptability level of different formulation of Sate Lilit Pahu (Patin Fish and Tofu). Color is the first sense that can be perceived visually by panelists. This test was used color of reformulated products (SLT1, SLT2, SLT3) were not significantly deviated from the original product (SLT0). The most favored color was SLT1, meanwhile the least favored color was SLT3. The preferred golden color of SLT1 are comes from the tumeric spices used, while SLT consist higher proportion of tofu; which has lots of water content and resulting color to fade.

The taste indicator found the most preferred formulation is the control group (SLT0). And the SLT1 and SLT2 has slightly lower score, but it was not statistically significant. Formulation patin fish composition tends to be savorier to the fatty content in patin fish, which enhances the flavor to SLT. The addition of grated coconut and the application of coconut milk the roasting process also contribute to the savory taste. Winarno (2002) study reported the taste of food is one of the main factor that determine the consumer's choice of product[36]. Food flavors are a mixture of sensory tastes, aromas, and experiences that can affect the tongue[37]. Taste consists of sensations the combination of ingredients and composition, which are captured by the five senses vectors support the overall quality of a product[38].

Aroma is a benchmark that influences the taste of food. Aroma testing is crucial in industry because it provides a quick evaluation of product, helping in determine whether customers are satisfied with the product[39]. The most preferred aroma was SLT 1, which has a distinctive burnt aroma. The aroma in SLT 1 tends to be more concentrated than other treatment formulations because it contains lesser tofu. The aroma was obtained from the grilling process of SLT, meanwhile the savory aroma was produced from grated coconut, spices in it and coconut milk.The least preferred aroma was SLT3, which had higher composition of tofu. This higher tofu content resulted in a less intense aroma from the spices due to the increased of water content.

Texture is an indicator related to the composition of a material, consisting of three factors, namely mechanical factors (density, elasticity), geometry (sand, crumb) and oral taste (oil, water). The most preferred texture was SLT 1, ehich had a soft texture. The least preferred texture was for SLT3, which has a soft and slight watery texture.

Based on the overall organoleptic test indicators, the most preferred formulation is SLT1. The recipe produces two serving of product (180 gram) (about four pieces of sate lilit). One serving of sate lilit, SLT1 (90 gram) contains 126.65 kcal of energy; protein 7.55 grams; fat 9.71 grams and carbohydrates 6.57 grams. The formulation of satay lilit pahu (patin fish and tofu) can serve as an alternative snack for stunted toddlers. In addition, toddlers with normal nutritional status can also consume satay lilit pahu (patin fish and tofu) in order to meet the daily protein requirement. According to the Recommended Dietary Allowance (RDA) 2019[40], the protein needs of children aged 1 – 3 years is 20 grams / day, while for children aged 4 – 6 years it is 25 grams / day[26]. For toddlers, the snacks should ideally provide 10% of their daily protein needs (20-25 grams), equivalent to 2.0-2.5 gram per snack. The SLT 1 formulation contains 7.5 grams of protein in each serving of 2 sate lilit pahu (catfish and tofu), effectively fulfill the protein requirements of toddlers during snack time.

CONCLUSION

The formulation of Sate Lilit Pahu (Patin Fish and Tofu) with a composition of 70 grams of patin fish: 30 grams of tofu was more dominantly by panelists. Each serving of Sate Lilit Pahu (Patin Fish and Tofu) provides a sufficient protein intakes toddler, amounting to 7.55 grams per portion of snack.

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