Nutrient Content And Acceptability Of Snakehead Fish (Ophiocephalus Striatus) And Pumpkin (Cucurbita Moshata) Based Complementary Foods

by Etika Ratna Noer

Submission date: 04-Jun-2021 11:02AM (UTC+0700)
Submission ID: 1600098554
File name: atus_And_Pumpkin_Cucurbita_Moshata_Based_Complementary_Foods.pdf (1.02M)
Word count: 3845
Character count: 18861

IOP Conference Series: Earth and Environmental Science

PAPER · OPEN ACCESS

Nutrient Content And Acceptability Of Snakehead-Fish (*Ophiocephalus Striatus*) And Pumpkin (*Cucurbita Moschata*) Based Complementary Foods

To cite this article: Etika Ratna Noer *et al* 2017 *IOP Conf. Ser.: Earth Environ. Sci.* **55** 012037

Nutrient Content And Acceptability Of Snakehead-Fish (*Ophiocephalus Striatus*) And Pumpkin (*Cucurbita Moschata*) Based Complementary Foods

Etika Ratna Noer[1], Aryu Candra [1], Binar Panunggal [1]

[1]Department of Nutrition Science, Faculty of Medicine, Diponegoro University, Indonesia.

Email: etikaratna@undip.ac.id

Abstract. Poor nutrient-dense complementary foods is one of the common factors contributed for decline growth pattern in children. Snakehead-fish and Pumpkin Complementary Feeding (SPCF) base on locally food can help to reduce child malnutrition. Specifically, high protein and vitamin A in SPCF may improve immunity and nutrition status of malnutrition children. This study aimed to formulate low-cost, nutritive value and acceptable of SPCF on malnutrition children in coastal area. Carbohydrate content was determined by difference, protein by Kjeldahl, betacaroten by spectofotometri and sensory evaluation using a five point hedonic scale. Fe and zinc was determined by AAS. There is an effect of the substitution of snake-head fish flour and yellow pumpkin flour toward the nutrient content and the acceptability

Keywords: snake-head fish, pumpkin, complementary feeding, infant

1. Introduction

The increasing malnutrition of children becomes serious and urgent, so it has to be solved. Malnutrition is a condition in which our body is deficiency of energy, protein and other nutrient. In Semarang, the prevalence of malnutrition on 2013 was 0.9% or 801 cases [1]. Therefore, a good strategy is required to solve malnutrition problems.

Complementary Foods (CF) can be given based on the criteria of the infant, and usually it is served in soft or mushy. Instant porridge is considered more practical and hygienic for the consumption. In infant's malnutrition cases, the energy deficiency, protein and vitamin A, is associated each other. According to the Ministry of Health, CF instant porridge should meet the requirements of 100 gram nutrient of infant food. Those are minimum energy 400 Kcal, protein 15-22 gram, and vitamin A 250-350 µg [2]. The main sources to produce CF porridge generally made of mixture of rice flour, skim milk, refined sugar and palm oil. To enhance the nutritional content of the CF porridge, those sources can be substituted by high protein and vitamin A food source.

Protein, plays important role in infant's growth, cells maintenance, damage tissue replacement, and muscles tissue deposit [3]. Intake of dietary protein may stimulate the synthesis of albumin serum which play role in the protein regulation of the body [4]. Animal protein has a high quality because it contains the amino acid essential with the complete arrangement in accordance of the body needs and high digestibility [5]. One of the sources of animal protein can be retrieved from snake-head fish

(*Ophiocephalus striatus*). It contains 25,5% protein and the value of acceptability in digest system is good [6]. One of the products that can be produced from snake-head fish, which is suitable for CF, is by flouring. The snake-head fish flour, 76.9% per 100g flour, while it only contains 30g protein of 100g skim milk [7].

Vitamin A roles in immune system, protect the epithelial cell integrity, eyes surface, mouth and digest and respiration [3]. Vitamin A deficiency can reduce the immune of the body and it will increase the risk of infectious diseases that could aggravate the malnutrition of the infants [8]. The rich vitamin A food source is also needed to meet the requirements of vitamin A content in malnutrition infant, especially in their CF. Pumpkin (*Cucurbita moschata)* is one of the local food which contain a high beta-carotene at 1.569 µg/100g. Flouring can be an alternative way to optimize of food consumption because it is flexible and practical in the processing, especially in the porridge processing.

The SPCF, influence the content of the nutrient which also can affect the preference. The processing of the composition is aimed can produce the instant porridge of SPCF which can be accepted by the infant.

2. Materials and Methods

2.1 Formulation

The production of SPCF with the substation of snake-head flour and pumpkin flour were made by dry mixing method, in which all of the source were already process and mixed in the dry state. The initial composition of CF , before substitute could be called F0, 35% of rice flour, 46% skim milk, 14% vegetable oil and 5% of refined sugar. The formulation ofF1 which pumpkin 5% and snake-head 10%, F2 which pumpkin 8% and snake-head 10%, F3 which pumpkin 5% and 13% snake-head, F4 which pumpkin 8% and snake-head 13%. What is F0-F4

2.2 Preparation of samples

Snake-head flour which was used in this experiment is the result of flouring it, fresh snake head-fish (*Ophiocephalus striatus*), it weight was about 200-250g/fish and made by steam it, fillet, dried, milled and sieved. The result of yellow pumpkin flour was by flouring the pumpkin. In thin sliced, dried, milled and sieved with the 80 mesh sieve. The drying process of the snake-head fish was done with hot display $\pm 50^0$C for about ±4 hours, while the pumpkin dried at $\pm 50^0$C for about ±12 hour.

2.3 Analysis of samples

In the study, the data collected from dependent variable was the content of the nutrients and the level of the substitute MP-ASI instant porridge preference. The content of the nutrients which was analyzed are the content of protein by using Kjeldahl method, fat content by using *soxhlet*. The next was the analysis of the carbohydrate content by using difference method. Spectrophotometry was used to analyze the content of beta-carotene, zinc and Ferum (Fe).

To determine the preferences of this product, the method used was hedonic test. The effect of the variation in this product is tested by *One Ways Anova* and then continued by the *Wilcoxon Signed Rank Test*.

3. Results and Discussion

The result of the nutrients content in SPCF porridge, which had been substitute by snake-head flour and yellow pumpkin flour is briefly presented in Table 2 and 3.

Table 2. Mean Nutrient Content of SPCF **Porridge**

For mula	Protein (%)	Fat (%)	Carbohidrate (%)	Energy (kkal/100g)	Betakaroten (μg/100g)	Fe (mg/100g)	Zinc (mg/100g)
F0	2.23±0.22^{e}	0.17±0.06^{d}	86.03±0.90^{a}	354.57±2.39^{a}	0.76±0.13^{e}	0.56±0.03^{e}	0.16±0.02^{e}
F1	9.74±0.96^{d}	0.40±0.03^{c}	75.78±1.52^{b}	345.72±6.31^{ab}	12.77±0.71^{d}	1.27±0.21^{d}	0.46±0.61^{d}
F2	13.64±0.67^{c}	0.52±0.53^{bc}	69.94±1.58^{c}	338.96±7.54^{bc}	15.99±0.56^{c}	1.55±0.26^{c}	0.67±0.46^{c}
F3	16.07±0.79^{b}	0.66±0.10^{ab}	65.65±0.83^{d}	332.86±6.08^{bc}	19.95±0.91^{b}	1.66±0.31^{b}	0.87±0.10^{b}
F4	19.88±0.76^{a}	0.77±0.09^{a}	59.47±0.67^{e}	324.29±3.56^{c}	26.08±1.27^{a}	1.72±0.27^{a}	0.89±0.07^{a}
	p= 0.001	p= 0.001	p= 0.001	p= 0.001	p= 0.001	p= 0.001	p= 0.001

Note : *superscript* (a,b,c, d,e) shows significantly different.

There were differences of protein level between MP-ASI instant porridge (p=0.001). According to the further test result, it showed that the level of the protein of treatment group is significantly different from the control group. Based on the Table 2, the protein highest level in SPCF instant porridge is in the group of 13% substitution of snake-head flour and 8% of pumpkin flour (Formula F4).

Table 3. Delta *Mean* Nutrient contain in SPCF

Formula	Delta *Mean*						
	Δ Protein (%)	Δ Fat (%)	Δ Carbohidrate (%)	Δ Energy (kkal/100g)	ΔBetacarotene (μg/100g)	Δ Fe (mg/100g)	Δ Zink (mg/100g)
F1	7.51±0.96^{d}	0.23±0.03^{c}	-10.25±1.52^{b}	-8.85±6.31^{ab}	12.01±0.71^{d}	2.16±1.48^{bc}	0.34±0.07^{c}
F2	11.41±0.67^{c}	0.35±0.53^{bc}	-16.09±1.58^{c}	-15.61±7.54^{bc}	15.23±0.56^{c}	3.83±1.78^{b}	0.51±0.04^{b}
F3	13.84±0.79^{b}	0.49±0.10^{ab}	-20.38±0.83^{d}	-21.71±6.08^{bc}	19.19±0.91^{b}	5.41±1.37^{ab}	0.64±0.06^{ab}
F4	17.65±0.76^{a}	0.60±0.09^{a}	-26.56±0.67^{e}	-30.28±3.56^{c}	25.32±1.27^{a}	7.55±0.76^{a}	0.76±0.02^{a}

Note : *superscript* (a,b,c, d,e) shows significantly different.

Based on the Table 3, the increase of the protein level is happened after the substitution of snake head-flour and pumpkin flour. The more it is substituted, the higher level of protein level we can get.

Snake-head fish flour contains 76.9g/100g of protein while in the skim milk we only get 30g/100g. The substitution of snake-head fish flour in the SPCF instant porridge increases the protein level. It is because the protein from snake-head fish is higher than skim milk.

Pumpkin flour contains 7.81g/100g protein. Although it is not as high as the snake-head fish flour, the yellow pumpkin flour substitutions can increase the protein of SPCF porridge at 5% or 8%.

The high quality of protein, play important role in infant growth. Infant at the age 6-12 months, the growth is rapidly increase and the baby more dependent on food complementary [8]. The protein source which is used is snake-head fish flour and skim milk. Fish have biological protein value of 75, while the protein of cow milk is 93. Protein which has more 70 of biological protein value can be considered as the support for infant's growth process [9].

There were differences between the fat content of SPCF instant porridge formula (p=0.001). According to the further test result, it showed that the fat content among the treatment group was significantly different from the control group. The highest fat content in SPCF instant porridge were at the group of 13% of substation of snake-head fish flour and 8% of yellow pumpkin flour (Formula F4). Based on the Table 3, there were the increasing of fat content in MP-ASI instant porridge after substitute with the snake-head fish flour and yellow pumpkin flour.

The increasing level of the fat content in SPCF instant porridge can be affected by the fat content of the flour at 0.55 % of 100g flour [7]. The fat of the fish contains of fat acid long chain of omega 3 (EPA and DHA) which good for the growth process. Although the substitution of the snake-head fish flour can increase the fat level at 0.23g-0,6g, yet, it is not fulfill the requirements of the Technical Specification BMS Food Companions (Infant Complementery Foods). The Ministry of Health (2007), decided the content of fat for 6-12 months baby instant porridge should meet the requirements of 10-15g/100gr. It is because the fat content from SPCF material limited [2].

There are differences between the carbohydrate content of SPCF instant porridge formula (p=0.001). According to the further test result, it showed that the carbohydrate content among the treatment group was significantly different from the control group. The lowest carbohydrate content is in the group on 13% substitution of snake-head fish and 8% of pumpkin flour (Formula F4). Based on the Table 3, there was the decreased level of carbohydrate content after the substitution. The more it is substituted; we will get lower carbohydrate content.

The decreasing of carbohydrate contents is caused when the main material in instant porridge substitute with the yellow pumpkin flour which has high beta-carotene and the substitutions of the skim milk with the snake-head fish flour with lower carbohydrate content. The more we substitute the main material with the snake head fish and yellow pumpkin flour, the lower we will get the carbohydrate content. Carbohydrate is important for the toddlers' growth, but it is better if takes at least 52-54% of the energy needed and Formula F4 has already fulfill the requirements of baby's carbohydrate needed.

Based on the *Anova one Ways* test, it showed that there was a difference of energy level between the SPCF formula (p=0.001). The substitution of the snake-head fish and yellow pumpkin flour, decrease the energy level of SPCF instant porridge. Based on Table 3, there was energy level decreasing of SPCF instant porridge after the substitutions.

Based on the calculation result, the energy from the substituted biscuit of snake head fish flour and pumpkin flour is at the range of 324.29-345.72 kcal/100g. Among all of the substituted SPCF instants porridge, is below the minimum requirements of energy content (400kcal/100g). If the baby got the medium quantity and quality of breast feeding, the energy intake can be fulfill through the breast feeding and the shortage of 356 kcal is expected can also be fulfilled through the breast feeding, especially SPCF [10].

There are differences between the beta-carotene level of SPCF instant porridge formula (p=0.001). According to the further test result, it showed that the beta-carotene level among the treatment group was significantly different from the control group. The highest level of beta-carotene was fond on the group of 13% substitution of snake head fish flour and 8% substitution of pumpkin flour (Formula F4). Based on Table 3, there was improvement of beta-carotene level of substituted MP-ASI instant porridge.

The level of beta-carotene n baby's porridge produced more than the specification after it was converted into vitamin A, the level were at 12.77-26,08mg/100g or below 30 mg, so it will not the cause of carotenoids accumulations. Beta-carotene is an antioxidant which has role in immune system, maintenance the integrity of epithelial cell, visions and as well as for the growth [3]. Beta-carotene will be converted into vitamin A in the body and it will become the precursor of vitamin A. Vitamin A is essential for visions, growth, differentiation and proliferation, reproduction, and immune system [8].

There are differences between the Fe of MP-ASI instant porridge formula (p=0.001). Based on the Table 3, it showed that the highest level of Fe were at the group of 13% substitution of snake-head fish flour and 8% substitution of yellow pumpkin flour (Formula F4). The more we substitute the flour with both of the snake head fish and yellow pumpkin flour, the higher we will get the level of powder.

There are differences between the zinc level of MP-ASI instant porridge formula (p=0.001). The level of zinc in the instant porridge was at the group of 13% of snake-head fish and 8% of pumpkin flour (Formula F4). Based on the Table 3, there was an improvement of zinc level after the substitution. The more we substitute the flour, the more we will get the higher zinc level on it.

The level of preferences of color, senses, texture and taste of the MP-ASI instant porridge were presented in Table 4.

Table 4. Hedonic test of SPCF Instant Porridge

Formula	Color		Flavour		Texture		Taste	
	Rerata	Ket	Rerata	Ket	Rerata	Ket	Rerata	Ket
F0	3.08±0.95[a]	Netral	3.44±0.92	Netral	2.96±0.84	Netral	3.44±0.92[a]	Netral
F1	3.6 ± 0.71[a]	Like	3.16 ± 0.89	Netral	2.72±0.74	Netral	2.8 ± 1.00[b]	Netral
F2	3.44 ±0.71[a]	Netral	3.08 ±1.04	Netral	2.88±0.78	Netral	2.96 ±0.98[a]	Netral
F3	3.88 ±0.73[b]	Like	3.24 ±1.05	Netral	2.80±0.64	Netral	3.04 ± 0.98[a]	Netral
F4	3.52 ±0.77[a]	Like	3.08 ±1.04	Netral	2.72±0.89	Netral	2.72 ±0.94[b]	Netral
	p= 0.01		p=0.58		p=0.49		p=0.02	

Note : *superscript* (a,b,c, d,e) shows significantly different.

The highest preferences of SPCF instant porridge were at the 10% substitution of snake head-flour and 8% of yellow pumpkin flour (F3). Among all of the substitution (F1,F2,F3and F4) had a neutral assessment from the panelist.

Based on the hedonic test, the substitution of the flour with the snake head fish flour and yellow pumpkin flour could increase the preferences of the color in MP-ASI instant porridge. Statistically, there were some effects that could change the level of color preferences of the panelist toward the substitution of the flour.

Formulation of SPCF instant porridge which was produced, has a sweet and savory taste but it also has a fishy, strong flour taste and bitter after taste. The sweetness of the taste came from the sugar and yellow pumpkin flour, while the skim milk and the sanke-head fish flour gave a savory taste. The used of sugar would strengthen the taste of porridge, but remember, its use should be controlled.

Before the steaming process in making the snake-head flour, the fish had already soaked into the lime water for about an hour, but then, the fishy taste from still could be tasted on the porridge. Bitter after taste was caused by the hydrolysis of the amino acid that happened on the *Maillard* reaction in the flouring process.

The highest the protein content were at the substitution 13% of snake-head fish and 8% pumpkin flour (Formula 4). The highest levels of beta-carotene also were at F4 formula. Meanwhile, the energy content from the fourth formula was at the lower level compare to the requirements. The preferences level, did not show any significantly differences so any formula can be selected. Based on the consideration, the formula which can be used for infant is formula F4.

Determining the serving dosage is important for the sake of food labeling. The best amount of nutrient in SPCF, for the 7-11 months baby was presented in Table 5. The amount of the dose in SPCF was determined based on the calculation of the needed in energy level for 7-11 months baby.

Tabel 5. Contribution SCPF instant porridge per serving to Dietary Adequacy Index for infant (7-11 months)

Nutrient	Nutrient/100 g	Nutrient/servings	RDA	%RDA
Energy (kkal)	324.29	97.29	725	13
Protein (g)	19.88	5.96	18	33
Fat (g)	0.77	0.23	36	0.6
Carbohidrate (g)	59.47	17.84	82	22
Zinc (mg)	1.02	0,205	3	6,7
Fe (mg)	0.89	0.18	7	2.6
Vitamin A (μg)	2.173.3	652.00	400	163

RDA : Recommended Dietary Allowances

At the age of 7-11 months, the baby requires 30-45% additional energy which is divided into 2-3 of meal times. One serving of SPCF instant porridge was determined at 30 g which contribute 15% of sufficient energy for 7-11 months baby, based on the Recommended Dietary Allowance (RDA) 2013. Based on the contribution nutrients analysis, SPCF instant porridge can give the best protein level at 33,11% and vitamin A at 163% on the nutrients RDA for 7-11 months baby, 9 kg weight. Further research needs the use of MCT (*Medium Chain Triglycerides*) can be used to increase the fat level of SPCF it is also increase the energy level of the porridge so it can fulfill the requirements of energy level needed.

4. Conclusion

There is an effect of the substitution of snake-head fish flour and yellow pumpkin flour toward the nutrient content and the acceptability. The substitution could improve the level of protein, fat, beta-carotene, zinc, Fe and also the level of preference toward the SPCF instant porridge.

Based on the nutrient content value and the acceptability, MP-ASI instant porridge which is recommended, substitution SPCF instant porridge with 13% of snake-head fish and 8 % of pumpkin flour (Formula F4).

5. References

[1]. Ministry of Health 2013 *Semarang City Health Office in Nutrition Program Reports* (Semarang)
[2]. Ministry of Health 2007 Decision of the Ministry of Health Indonesia Number: 224/Menkes/SK/II/2007 Technical spesification of complementary infant feeding (Jakarta)
[3]. Trahms CM, McKean KN 2008 Nutrition during infancy in: Mahan LK, Escott-Stump S. Krause's Food and Nutrition Therapy 12th ed (Canada: Elsevier)
[4]. Caso G, Scalfi L, Marra M, Covino A, Muscaritoli M, Mc Nurian M, Garlick PJ and Contaldo F 2000 Albumin synthesis is diminished in men consuming a predominantly vegetarian diet Journal Nutrition 130:528-533
[5]. Muchtadi D 2010 Evaluation technique of protein value (Bandung:Alfabeta)
[6]. Santosa AH 2001 Extraction albumin of snake head fish (*Ophiocephalus striatus*) *[undergraduated thesis]* (Malang: Brawijaya University)
[7]. Sari DK, Marliyati, Sri A, Kustiyah, Lilik, Khomsan A, Gantohe, Tommy M 2014 Organoleptic test formulation biscuit based snake head fish *(Ophiocephalus Striatus)* Agritech 2(34)
[8]. Parízková J 2010 Nutrition, physical activity, and health in early life 2nd edition (USA: CRC Press)

[9]. Rolfes SR, Pinna K, and Whitney EN 2008 Understanding Normal and Clinical Nutrition (USA: Wadsworth Cengage Learning)
[10]. World Health Organization 2000 Complementary Feeding: Family Foods for Breastfed Children. Department of Nutrition and Development (Geneva: WHO)

.

Nutrient Content And Acceptability Of Snakehead Fish (Ophiocephalus Striatus) And Pumpkin (Cucurbita Moshata) Based Complementary Foods

ORIGINALITY REPORT

18%	13%	5%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Universitas Diponegoro Student Paper	7%
2	worldwidescience.org Internet Source	5%
3	eprints.undip.ac.id Internet Source	3%
4	docsdrive.com Internet Source	1%
5	ikee.lib.auth.gr Internet Source	1%
6	Y Sunaryo, D Purnomo, M T Darini, V R Cahyani. "Effects of goat manure liquid fertilizer combined with AB-MIX on foliage vegetables growth in hydroponic", IOP Conference Series: Earth and Environmental Science, 2018 Publication	1%

7	Q Li, Y B Li, Z H Liu, J Min, Y Cui, X H Gao. "Comparison and analysis of organic components of biogas slurry from eichhornia crassipes solms and corn straw biogas slurry", IOP Conference Series: Earth and Environmental Science, 2017 Publication	<1%
8	www.biomedcentral.com Internet Source	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		

Nutrient Content And Acceptability Of Snakehead Fish (Ophiocephalus Striatus) And Pumpkin (Cucurbita Moshata) Based Complementary Foods

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8