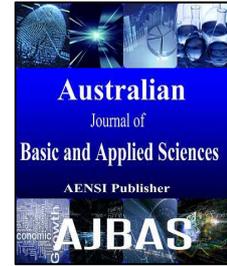




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### Utilization of Fish Protein Concentrate from Patin Fish (*Pangasius hypophthalmus*) on street foods for Under five years children at Kampar District, Riau Province

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#### ABSTRACT

**Background:** The Utilization of Indonesia freshwater fisheries sector is still minimum compared to others. therefore it needs to be increased by processing the fish into Fish Protein Concentrate (FPC). Patin fish (*Pangasius hypophthalmus*) is one of freshwater fish with a high content protein, therefore it's compatible for enhancing nutritional status because it is categorized as high quality food. Giving street foods with FPC as basic, probably one of the alternative way to provide street food with high protein that we give to children who had malnutrition status. The objective on this research was to produce Fish Protein Concentrate (FPC) of patin and street foods (instant porridge, chocolate cookies, and snack) with FPC patin for children with mal-nutrition status. The result showed that FPC of patin that produced before, gives extract about 10-12%, protein content 75,31%, and self life for 45 days in package with alluminium foil paper. sensory test or preference test the street foods can be accepted by panelist (children) and fulfills SNI standard. Also, There is an enhancing nutritional status of childrens for 30 days from malnutrition status to good nutrition status.

#### INTRODUCTION

A well known freshwater fisheries commodity particularly in Riau Province is Catfish (*Pangasius hypophthalmus*). Not only own reasonable price, but also contain high protein, catfish is potentially to utilize as a street foods material resource (FAO,2003 ; fellows & hilmi, 2012). Fish protein concentrate from catfish is believed as a high nutrient food to apply in making high protein street foods. The action is in line with Indonesian Government Programs through Fish Consumption Improving Program for the purpose of creating high quality product in the area of nutritional value of protein for children under five (Diskes, 2014; Oomen, 1953).

Fish concentrate protein products are defined as flour based products mixing with fish meat, by remove its lipid and water content, so that high protein percentage of new product is gained compared from its original materials (Ghaly *et al.*, 2013). Having a long shelf life without any changes represents as one of advantages of fish concentrate protein. However, the application of fish concentrate protein as a food material is less developed (FAO, 2003). therefore, street food fortified with fish concentrate protein from catfish is conducted particularly for under-five-years old children foods.

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The research was aimed to create fish protein concentrate from catfish (*Pangasius hypophthalmus*) and to analyze yields, proximate compositions and acid amino profile of it as potential substituent of food material in street foods (instant porridge, chocolate cookies and snacks). Furthermore, the street foods were applied to malnutrition children to determine their nutritional status. The research gave basic information related to several street foods products with high protein content for under-five-years old children that have been substituted by fish protein concentrate from catfish in the district of Kampar, Province of Riau.

### Method:

#### Materials and Tools:

Catfish from Koto Mesjid Village, District of Kampar was employed as primary material in this research. Moreover, the other materials used were NaHCO<sub>3</sub> 0,5 N, isopropil alcohol 70 % (food grade), and aluminum foil paper for packaging materials. Materials that involved in street foods were Fish protein concentrate from catfish, wheat flour, rice flour, fine sugar, vegetable oil, skim milk, margarine, eggs, baking powder, chocolates powder, soda, and seasoning. In addition, materials for proximate analysis, amino acid profile and staleness were employed in this research.

The tools used in this research were autoclave, hydraulic press, drum dryer, mixer, food processor, wiley mill with the size of 60 mesh. Analysis apparatus were analytical scale, desiccators, furnace, oven, crucible dish, table balance, and Kjhedhal tools as well as tools for organoleptics score tests. Fish Protein Concentrate Processing (Astawan,1990, modified by Dewita, 2011).

Fish protein concentrate from Catfish was processed by grind fish meat by using food process with addition of 0.5 % salts. Then steam was conducted then followed extracted by using solvent isopropil alcohol 70 % (food grade). The filtrate was dried in cabinet dryer in 40<sup>0</sup>C. Finally, it was refined by wiley mill with size of mesh 60.

#### Street Foods Formulation:

**Table 1:** Instant porridge fortified with protein concentrate from catfish.

Composition		F1	F2
Protein concentrate in catfish	(%)	10	15
Skim milk	(%)	50	50
Gelatinization of white rice flour	(%)	30	-
Gelatinization of red rice flour	(%)	-	25
Sugar powder	(%)	5	5
Vegetable oil	(%)	5	5

Instant Porridge was formulated using Amirullah (2008) Selection of formula and conducted by hedonic quality test to 25 panelists semi trained. To determine acceptable products, the chosen porridge formula was tested to under five years old children panelists as many as 80 children. Moreover, proximate analysis including water content, protein, lipid, ash and carbohydrate was established.

**Table 2:** Formula of chocolate cookies fortified with protein concentrate from catfish.

Composition	Total
Protein concentrate (g)	20
White flour (g)	200
Fine sugar (g)	120
Salt(g)	0,5
Margarine (g)	100
Baling soda (g)	0,5
Baking powder (g)	0,5
Chocolate powder(g)	10
Yellow eggs (egg)	4

Chocolate cookies formula was formulated using Faridah *et al* (2008), Panelists together with 90 under five years children were experienced acceptable test. Then, Proximate analysis including water content, protein, lipid, ash and carbohydrate was established.

**Table 3:** Formulation of snacks with addition of fish protein concentrate.

Composition	total
Protein content (g)	50
Wheat flour (g)	500
Garlic (g)	25
Salt (g)	10
Baking powder (g)	1
Pepper (g)	10
Ice water	adequateness

Snack formulation was point at Santoso *et al.*, (2006) formula with addition of fish protein concentrate. The formula was tested in order to determine consumer acceptance product by 80 children panelists using hedonic test. Furthermore, Proximate analysis including water content, protein, lipid, ash and carbohydrate was established.

#### **Determination of nutritional status:**

Determination of nutritional status of under than five years old children was conducted by feed them an instant porridge fortified with protein concentrate from catfish. The treatment to kill parasitic were given before addition of instant porridge to treat malnutrition children (1-2 years old). The medicine have already confirmed its safety fro, anemia and malnutrition. The dosage was two times per day x 10 mg. The objectives that give them parasitic drugs was to prevent absorbing nutritional disturbance by parasitic infection. Moreover, initial measurement of nutritional status of children panelists were studied by measure weight, height, head circumference, and chest circumference. The instant porridge were feed to children each week periodically during four weeks in Health and Nutrition Integrated Service Center (*POSYANDU*).

#### **Data Analysis:**

The results of hedonic test or consumers test was analyzed descriptively based on consumers acceptance percentage and score of treatment level. Acceptance levels were formulated as following: dislike extremely (2), dislike (3), neither like nor dislike (4) and like (5). The hedonic test was conducted in order to determine consumer's acceptance products.

## **RESULTS AND DISCUSSIONS**

#### **Parameters Analysis of Fish Protein Concentrate from Catfish:**

##### **Proximate Composition:**

Proximate analysis of fish protein concentrate from catfish was tabulated in the following Table 4.

**Table 4:** Proximate analysis of fish protein concentrate from catfish (%).

Proximate composition	Total (%)
Water	6,39
Protein	75,31
Lipid	2,79
Ash	2,14
Yield	12

Table 4 represented that fish protein concentrate from catfish contain 12 % yield, water content 6,39 %, protein 75, 31 %, lipid 2,79 % and ash 2,14 %. According to Suparno and Dwiponggo (1994) fish concentrate protein may classified based on lipid content namely Type A, B and C. Type A and B presents lower level (,3 %) of lipid, while type C owns higher level (> 3 %) of lipid. Therefore, fish protein concentrate from catfish in this research was confirmed as type A or type B.

#### **Organoleptic test:**

Organoleptic test results (taste, texture, color and odor) from 80 children panelists that presents in Table 5.

**Table 5:** Average of Organoleptics score percentage of fish protein concentrate from catfish (%).

Description	Organoleptics value			
	% taste	% Texture	% color	% odor
Extremely dislike	1,25	1,25	1,25	1,25
Dislike	10,00	15,00	12,50	25,00
Like	68,75	62,50	72,50	68,75
Extremely like	20,00	21,25	13,75	5,00

Table 5. showed that organoleptic score value (taste, texture, color and odor) of fish protein concentrate from catfish was dominated by consumers who accept the product. Hence, Fish protein concentrate from catfish can be used as fortified materials on street foods.

#### **Amino Acid Profile:**

According to Piliang and Djojosoebagio (2002), essential amino acid is defined as amino acid that cannot be synthesized by human body so that it was taken from foods. Profile of Amino acid in fish protein concentrate from catfish is showed in Table 6.

Based on Table 6, it was conclude that almost essential amino acid that human body needs can be found in fish protein concentrate from cat fish. Amino acids profiles determine type and number of essentials amino acids contain in a protein. The nutrition of essentials amino acid can be evaluated by amino acid score and chemical

score In order to determine limited type of amino acid. The analysis results on fish protein from catfish for less than five years old children requirements in these results is listed in Table 7.

**Table 6:** Amino acid profile (%) fish protein concentrate from catfish (%).

Amino acid	FPC catfish (%)
Leusine	6,35
Valine	4,18
Lysine	7,13
Threonyne	3,59
Methyonine + Systine	2,75
Tyrosin + Phenilalanyn	3,19
Tryptofan	0,09
Asam aspartate	8,09
Asam glutamate	12,34
Serine	3,06
Hystidine	1,93
Glycine	2,89
Arginine	5,17
Alanine	4,62
Phenilalanine	3,20
Isoleusine	4,46

**Table 7:** Amino acid essential compositions of fish protein concentrate from catfish and their requirement for children

Amino acid	FPC (mg/g protein)	AAE Requirements (mg/g protein)	Score of AAE (%)
Leusyne	6,35	55	11,5
Valine	4,18	32	13,1
Lysine	7,13	51	14,0
Threonine	3,59	27	13,3
Metionine + Siystine	2,75	25	11,0
Tirosinw + Phenilalanine	3,19	47	6,78
Tryptofane	0,14	7	2,0

Fish protein concentrate from catfish had 7,13% of lysine per protein content. This results have already fulfilled the minimum requirements concentration of fish protein concentrate according to Buckle *et al* (1987) which is 6.5 % of protein content.

#### **Durability of Fish Protein Concentrate from Catfish:**

Storing of fish protein concentrate from catfish was conducted in the room temperature due to determination of its durability of product using aluminum foil paper as packaging type. There were four time series observation which are 0, 15, 30 and 45 days. The parameters that measure in this research were water content and peroxide number. The results of this research during storing phase can be seen in Table 8.

**Table 8:** Average of water content concentration (%) and peroxide number (meq/1000 gr) in fish protein concentrate from catfish during storage time.

Storage Time (day)	Parameter	
	Water content (%)	Peroxide number (meq/1000 g)
0	5,90	ttd
15	6,22	2,43
30	7,11	5,10
45	8,24	7,51

From Table 8, it is determine that the water content fish protein concentrate from catfish at the end of storage ( 45 days ) of 8.24% and increased during storage. The water content indicates that the fish protein concentrate from catfish stored for 45 days classified as a good quality products. This is in accordance with LIPI (1999 ), which states that high -quality fish meal has a water content between 6 % to 10 %. Furthermore, according to Syarief and Halid (1993 ), the increase in water content during storage is caused by a process of evaporation and absorption of the food that is strongly influenced by the ambient air

Also can be seen from Table 8 that the peroxide number was increased during storage , it is presumably because the reaction occurs during storage of lipid in the Fish protein concentrate with oxygen resulting in the formation of peroxide. According Ketaren (1986) that the number of peroxide produced is highly dependent on light , water , oxygen , ultraviolet light, and the presence or absence of antioxidants . KPI peroxide content of catfish at 7.51 g meq/1000 on the 45th day of storage has not reached the limit of rejection, at 10 meq/1000 g sample ( in Sukadarisman Connell , 1993).

#### **Street food fortified with fish protein concentrate from catfish:**

##### **Instant Porridge:**

The results of hedonic tests for an instant porridge fortified with fish protein concentrate from catfish by organoleptics score (taste, texture, color, and odor) from 80 panelist is presented in Table 9.

**Table 9:** Average percentage of organoleptics score of an instant porridge fortified with fish protein concentrate from catfish.

Description	Organoleptics score			
	% taste	% Texture	% color	% Odor
Extremely dislike	1,25	1,25	1,25	1,25
dislike	7,25	10,00	12,50	25,00
like	70,50	66,50	68,75	68,75
Extremely like	21,00	22,25	17,50	5,00

The data in Table 9 shows the results of the acceptance of the panelists in organoleptics score for an instant porridge fortified with fish protein concentrate from catfish based on the attributes of taste, texture, color, and odor. This data was supported by the results of the proximate analysis that can be seen in Table 10.

**Table 10:** The results of proximate analysis of an instant porridge fortified with fish protein concentrate from catfish

Proximate Analysis %	Total	
	Instant Porridge fortified with FPC catfish	Standart PAG (1972)
Water	5,91	5 – 10 %
Lipid	10,34	Min 10 %
Protein	18,54	Min 15 %
Ash	2,41	Maks 5 %
Fiber	4,02	Maks 5 %
Carbohydrate	63,43	-
Calorie	5033	1.100-1.300

Table 10 described about nutritional materials in an instant porridge that fulfill requirements of instant porridge for under three years old children according to Protein Advisory Group (PAG, 1972) recommendations.

### Chocolate Cookies:

Initial formulation of chocolate cookies refers to results of previous study from Faridah *et al.*, (2008). This formulation then modified to produce chocolate cookies fortified with fish protein concentrate from catfish. The acceptance tests of this product using organoleptics score by the panelists is represented in Table 11.

**Table 11:** The acceptance level using organoleptics score in chocolate cookies fortified with fish protein concentrate from catfish.

Criteria	Consumers acceptance level							
	Color		Odor		Taste		Texture	
	Total	%	Total	%	Total	%	Total	%
Extremely like	28	35	34	42,5	24	30	34	42,5
Like	44	55	41	51,25	47	58,75	45	56,25
Moderate Like	8	10	5	6,25	9	11,25	1	1,25
Dislike	0	0	0	0	0	0	0	0

Table 11 shows that the total number of children who like chocolate cookies fortified with fish protein concentrate from catfish for color, odor, taste and texture were 90 %, 93,75 %, 88,75 % and 98,75 %, respectively. The results indicate that almost children as panelists accept or like this tested products. It can be seen from the organoleptics score that shows high percentage. Consequently, chocolate cookies product through this study were accepted as food supplement for children. The results of proximate analysis of chocolate cookies fortified with fish protein concentrate from catfish is showed in Table 12.

**Table 12:** Proximate analysis results of chocolate cookies fortified with fish protein concentrate from catfish.

Proximate Analysis	Total (%)	SNI Standart 7388-2009.
moisture	2,71	Maks. 4%
Ash	1,06	Maks. 2%
Protein	23,82	Min. 9%
Lipid	27,29	Min. 18%
Carbohydrate	56,19	Min 70 %

Table 12 shows that chocolate cookies products fortified with fish protein concentrate from catfish was fulfilled requirements of SNI Standard 7388-2009. The carbohydrate in this product was lower than SNI requirements. The fortified products use less wheat flour so that it can decrease carbohydrate sources in cookies.

### Snack:

Initial formula of snack is referred to the study of Santoso *et al* (2006). This formula was modified to gain snack products fortified with fish protein concentrate from catfish. The results of consumer's acceptance level test of the snack products by organoleptics score from panelists is listed in Table 13.

**Table 13:** Consumer's acceptance level test of the snack fortified with fish protein concentrate from catfish by organoleptics score.

criteria	Consumers acceptance level en							
	Color		Odor		Taste		Texture	
	Total	%	Total	%	Total	%	Total	%
Extremely like	37	46,25	23	28,75	32	40	27	33,75
Like	39	48,75	51	63,75	38	47,5	41	51,25
Moderate Like	4	5	6	7,5	10	12,5	12	15
Dislike	0	0	0	0	0	0	0	0

In Table 13, it can be concluded that the number of children who like snacks fortified with fish protein concentrate based on color, odor, taste and texture were 95%, 92.5%, 87.5% and 85%, respectively. It Means that nearly all panelists (children under five years old) may accept or like the tested snacks. It can be seen from toddlers who love snacks that provide high ratings for all attributes. Thus, the snack fortified with fish protein concentrate from catfish was acceptable as a supplementary food toddler. Moreover, the results of the proximate analysis of the same products are presented in Table 14.

**Table 14:** Proximate analysis of snacks fortified with fish protein concentrate from catfish.

Proximate composition	Total (%)	SNI Standard 7388-2009.
moisture	2,31	Maks. 4%
Ash	2,05	Maks. 2%
Protein	18,42	Min. 9%
Lipid	21,19	Maks. 30%
Carbohydrate	56,03	Min 70 %

In Table 14, it can be stated that the snack products fortified with fish protein concentrate from catfish was met SNI standard 7388-2009. The low carbohydrate found in this products due to the process of fortification using fish protein concentrate from catfish reduce the wheat flour that function as a major source of carbohydrate in the snacks.

#### ***Application of Street Foods Products fortified with Fish Protein Concentrate from Catfish:***

Application on feeding the street foods products (instant porridge, chocolate cookies, and snack) in less than five years old children were conducted in 30 days with interval observation each 10 days. Feeding snacks fortified with fish protein concentrate from catfish KPI aimed to determine changes in the nutritional status of malnutrition children under five years old. Acceptance of fortified street food from beginning to the end of this study given positive response. They were very like the fortified products. The pattern of growth and development of the nutritional status of children under five years old (panelists) after feeding fortified street foods products can be seen and

The results of hedonic tests for an instant porridge fortified with fish protein concentrate from catfish by organoleptics score (taste, texture, color, and odor) from 80 panelist is presented in Table 15.

**Table 15:** The pattern of growth and development of the nutritional status of children under five years old (panelists).

#### **Instant porridge**

Observation Time (days)	Variation			Nutritional Status	
	Age (Years)	Actual body weight (kg)	Ideal body weight (kg)	Malnutrition (%)	Good Nutrition (%)
0	1 - 2	8 - 10	10 - 13	100	-
10	1 - 2	8 - 10	10 - 13	100	-
20	1 - 2	9 - 11	10 - 13	30	70
30	1 - 2	10 - 12	10 - 13	-	100

#### **Chocolate Cookies**

Observation Time (days)	Variation			Nutritional Status	
	Age (Years)	Actual body weight (kg)	Ideal body weight (kg)	Malnutrition (%)	Good Nutrition (%)
0	2 - 3,5	7 - 12	10 - 17	100	-
10	2 - 3,5	7 - 13	10 - 17	60	40
20	2 - 3,5	7,5 - 14	10 - 17	60	40
30	2 - 3,5	10 - 14	10 - 17	-	100

#### **Snack**

Observation Time (days)	Variation			Nutritional Status	
	Age (Years)	Actual body weight (kg)	Ideal body weight (kg)	Malnutrition (%)	Good Nutrition (%)
0	3 - 5	7 - 13	10 - 20	100	-
10	3 - 5	7 - 15	10 - 20	70	30
20	3 - 5	8 - 15	10 - 20	50	50
30	3 - 5	10 - 16	10 - 20	-	100

The Tables shows that the results of measurements of panelists body weight in the beginning of this study or before feeding action of fortified street food (instant porridge, chocolate cookies, and snack) described the changing of the nutritional status of panelists. After the panelists feed the fortified street food products during this study, the changing was started to determine during 20 days. The significant changing of nutritional status was occurred during 30 days study observation. The results were all panelists who feed street food fortified with fish protein concentrate increasing their nutritional status.

### **Conclusion And Recommendation:**

#### **Conclusion:**

Fresh Catfish (*Pangasius hypophthalmus*) can be processed into fish protein concentrate flour that gain 12 % of yields, 75, 31 % of protein content as well as amino acids essentials. Organoleptics score conducted by panelists showed well acceptance of organoleptics attributes (texture, odor, taste and color) of fortified fish protein concentrate from catfish during 45 days of storage time. Street foods fortified with fish protein concentrate from catfish (instant porridge, chocolate cookies and snack) were very like the panelists (the under five years old children). The proximate analysis of there products fulfilled the SNI standard. The application of street food fortified with fish protein concentrate gain the changing of nutritional status during 30 days of study from malnutrition to good nutrition.

#### **Recommendation:**

Fish protein concentrate from cat fish (*Pangasius hypophthalmus*) is less developed. However it contain high nutrition that potential to fortified in food products particularly in street products for children. Hence street products diversifications based on fish protein concentrate from catfish is recommended to become supplementary foods especially for children who have malnutrition status.

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