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Physical analysis and hedonic quality of ilabulo crackers skipjack (*Katsuwonus pelamis*) fortified nanocalcium bone

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Ilabulo crackers of skipjack fish (*Katsuwonus pelamis*) is one of the traditional food diversification products. The aim of this research in Indonesia was to analyze the physical and hedonic quality of fortified crackers of skipjack fish nanocalcium bone on a different formula. Physical testing using TA-XT2i and hedonic quality using Kruskal Wallis non-parameter analysis and using SPSS 16 software. Data analysis using *analysis of variance* and if significant effect is continued by *Duncan* test. The results of research physically showed formula B higher 17875.7 g / f than formula A 14366.2 g / f, formula C 10142.8 g / f and D 4884 g / f and all formulas were significantly different. The hedonic quality of formula A was chosen with the criteria of full appearance, flat surface, neutral texture, brownish yellow color, slightly fishy, rather savory.

Keyword : crackers, formulation, organoleptic, physis,

Introduction

Ilabulo crackers made from skipjack fish (*Katsuwonus pelamis*) have been fortified with nanocalcium flour from skipjack fish bone waste. Skipjack fish bone waste when preparing fish meat can be used as bone flour containing calcium. Calcium levels produced in ilabulo crackers of skipjack fish from nanocalcium fortification results of skipjack fish bone meal were 29351,363 ppm higher than the fortification of skipjack fish bone meal was 16432,131 ppm.

Generally, calcium consumed by humans contained in food in the form of microcalcium which is still not optimally absorbed by the body so that it still causes calcium deficiency which affects various complaints on the bones, teeth, blood, nerves and body metabolism (Tongchan *et al.*, 2009). The size reduction technology is nano technology by producing very small calcium sizes (10 - 1000 nm). Nanocalcium can be absorbed directly by the body more optimally and more efficiently compared to the usual calcium consumed by the community (Suptijah 2009).

The bioavailability of vannamei shrimp shells (*Litopenaeus vannamei*) is quite high at 63.3% (Suptijah *et al.*, 2012). The 20% fortification of catfish (*Pangasius* sp.) Bone as much as 20% in catfish ilabulo produces hedonic organoleptic values ranging from like-neutral (Harmain *et.al.*, 2017). Ilabulo products of semi-wet catfish and chewy texture but do not last long so that diversification is made into crispy and long-lasting crackers by replacing the raw material of catfish as freshwater fish with a pelagic fish are easily obtained and economically valuable a skipjack meat. The skipjack fish waste produced when making the preparation is made into nanocalcium flour as a more optimal fulfillment of calcium intake.

In this research was conducted to analyze the physical texture and hedonic quality of ilabulo crackers of skipjack fish fortified nanocalcium bone. Diversification of skipjack fish ilabulo crackers products that are crispy, intact and have nutritional content, especially calcium in the form of nanocalcium fortified from the waste of skipjack fish bones are easily absorbed by the body.

Material and Methodology

The material used meat skipjack fish, nanocalcium skipjack fish bone, wheat flour, sago flour, spices and coconut milk.

The tool used *scoorsheet* SNI 01-2346-2006 about hedonic quality test (BSN, 2006) and the phisic used *TA-XT2i texture analyzer*.

a. Preparation of Skipjack Fish Meat

Preparation of skipjack fish includes weeding, evisceration, and fillet making. Making fish meat based on the method of Lanier (1992) concerning the making of fish pulp, namely fish fillets washed using cold water temperature 5-10 °C, three minutes.

b. Fish Bone Flour (Trilaksani *et al.* (2006) Modification by Harmain *et al.* 2016)

Fish bones were boiled at 80 °C for 30 minutes, washed and autoclaved at 121 °C, 1 atm for 30 minutes. The size of 5-10 cm was reduced, and dried at 100 °C for 60 minutes using an oven.

c. Precipitation Method of nanocalcium (APHA (2005) in Suptijah *et al.* 2012)

Precipitation of nanocalcium using method with 48 hours of shrimp shell immersion time (Suptijah (2009) *modified*), then nanocalcium yield was calculated (%), nanocalcium size with SEM, white degree, pH value. Mineral content was measured by AAS and spectrophotometer (APHA 2005).

d. Crackers formulation (Murtuza *et al* (2016) modification by Harmain *et al.* (2018))

The crackers formulation consists of crushed meat of skipjack fish, nanocalcium of skipjack fish bones, wheat flour, sago flour, spices and coconut milk. The mixture is mixed with coconut milk and homogenized for 20 minutes and allowed to stand for \pm 2 hours until the mixture expands. The mixture is mixed and added water and homogenized for 20 minutes. The dough is flattened with 1-2mm thickness and baked in an oven \pm 25 minutes at 110 °C.

e. Formulation and Optimization of Ilabulo Crackers Formula Skipjack Fish Fortified Nanocalcium Bone

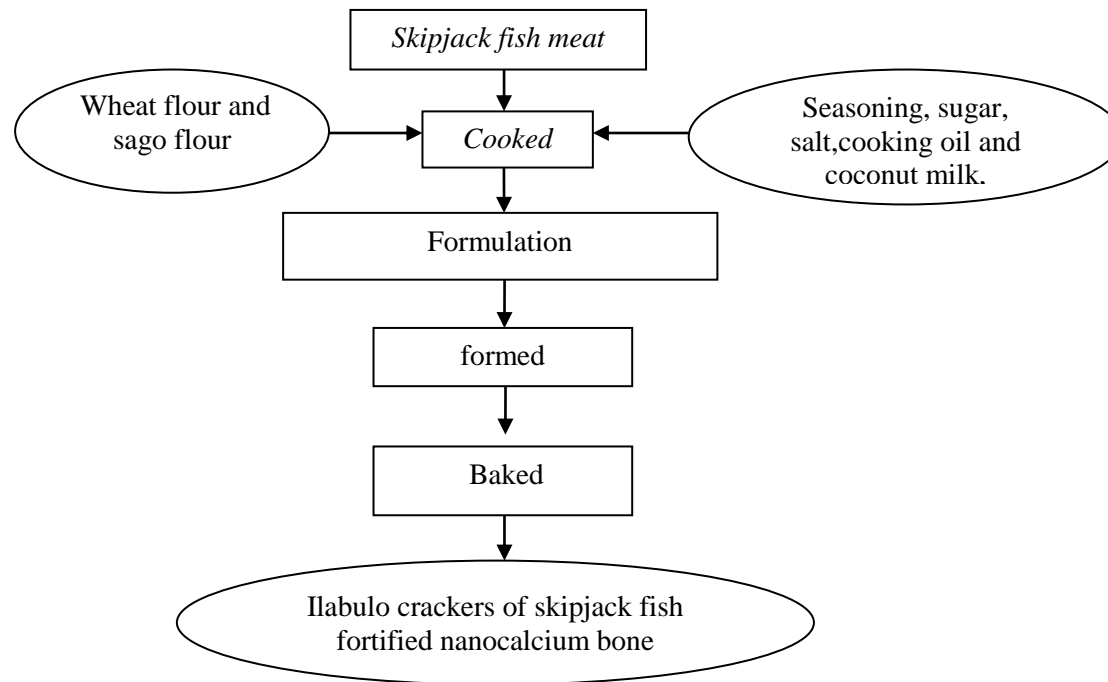
The formulation and optimization of the ilabulo crackers form skipjack fish based on *try and error* to obtain the best formulation by organoleptic test of hedonic quality. Formulations of skipjack fish ilabulo are shown in table 1.

Table 1. Formulation of ilabulo crackers of skipjack fish

Material	Treatment Material Composition			
	A	B	C	D (control)
Skipjack fish (g)	500	500	500	500
Nanocalcium (g)	20	20	20	20
Wheat flour (g)	500	250	100	-
Sago flour (g)	50	50	50	50
Seasoning (g)	20	20	20	20
Sugar (g)	50	50	50	50
Salt (g)	10	10	10	10
Santan (mL)	500	500	500	500
Cooking oil (mL)	50	50	50	50

Source based on *try and error*

The flow of making ilabulo crackers of skipjack fish fortified nanocalcium bone was presented in figure 1.



Physical analysis (*Crispness*) Ilabulo Crackers Skipjack Fish Nanocalcium Fortification of Skipjack Fish Bone using *TA-XT2i texture analyzer* (Chen *et al.* (2013) ; Apriyantono *et al.* (1989), The crisp value is calculated using the formula:

$$\text{Crispness (g cm)} = \text{gel force (gf)} \times \text{distance (cm)}$$

Ilabulo crackers skipjack fish fortification nanocalcium bone were then performed for hedonic quality (SNI 01-2346-2006) based on Kruskal Wallis non parametric statistics. Significantly different is used Duncan test. Hedonic quality analysis using SPSS 16 software.

Results and Discussion

Physical analysis of ilabulo crackers of skipjack fish fortified nanocalcium bone

The data physical analysis of ilabulo crackers of skipjack fish nanocalcium bone were shown in table 2.

Table 2. The result physical analysis of ilabulo crackers of skipjack fish fortified nanocalcium bone

Repeat	A (gf)	B (gf)	C (gf)	(control)(gf)
1	4746,7	5746,8	3355,3	1648
2	4959,7	5960,4	3382,8	1632
3	4659,8	6168,5	3404,7	1604
Average	14366,2	17875,7	10142,8	4884

The highest physic texture value an addition of wheat flour 250 g is 17875.7 / gf (B) and the lowest a control without nanocalcium treatment and wheat flour which is 4884 / gf. Physical analysis is the crispness of ilabulo crackers of skipjack fish fortified nanocalcium bone is B formulation because the addition of wheat flour is not too much. Whereas in the control treatment the value a crispness ilabulo crackers was low because only addition of sago flour. The crispness of ilabulo crackers skipjack fish is thought to be due to the different starch content in wheat flour and sago flour which also influences the crispness level of ilabulo crackers of skipjack fish fortified nanocalcium bone.

The results of the analysis of variance data show that each formula has a significant effect and the results of Duncan's test further show that each formula is significantly different.

Hedonic quality analysis of ilabulo crackers skipjack fish fortified nanocalcium bone

The results analyze of the hedonic quality of ilabulo crackers of skipjack fish are shown in figure 2.

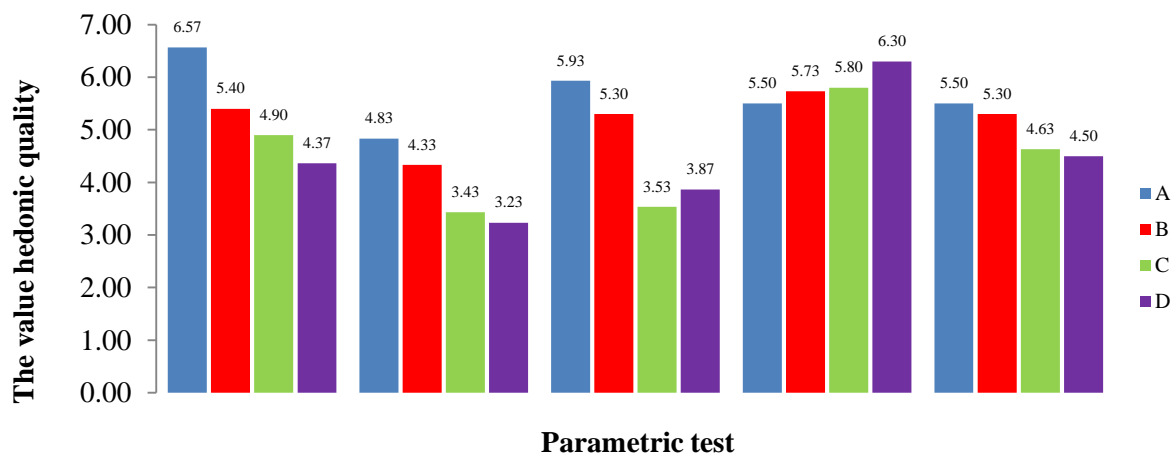


Figure 2. Histogram of hedonic quality analyze of ilabulo crackers skipjack fish fortified nanocalcium bone on different formulas on the criteria of appearance, texture, color, aroma and taste.

Figure 2 visualize that the hedonic quality value of the appearance of ilabulo crackers of the highest fortified nanocalcium bone is formulation A. The surface is flat with a value of 6.57.33. Hedonic quality value is the lowest appearance of ilabulo crackers fortified nanocalcium bone a formulation D with a value of 4.83.

The Kruskal-Wallis test showed that the appearance of ilabulo crackers skipjack fish fortified nanocalcium bone showed that the place of the formulation showed significant results ($p < 0.05$). Based on Duncan's further test results obtained that. Formulation A is significantly different from formulation B, C and D.

The value highest of hedonic quality textures of ilabulo crackers skipjack fish fortified nanocalcium bone is formulation A neutral criteria with a value of 4.83 and the lowest in formulation D with a rather harsh criteria with a value of 3.23. The Kruskal-Wallis test showed the texture of ilabulo crackers skipjack fish fortified nanokalsium bone showed that all four formulation significant

results ($p < 0.05$). Based on the results of Duncan's test, it was found that formulation A was significantly different from the formulation C and D.

Figure 2 showed the panelist prefer formulation A because the addition of the same flour composition with crushed meat produces non-hard crackers. The highest color hedonic quality analyze results in formulation A with criteria of brownish yellow with a value of 5.93 and the lowest in formulation D with a slightly brownish criteria with a value of 3.87. Based on the Kruskal-Wallis test that the color of ilabulo crackers of skipjack fish fortified nanocalcium bone showed significant results ($p < 0.05$). Duncan's further test results showed that formulation A was significantly different from C and D but not significantly different formulation B. This was due to the fortification nanocalcium bone which also influenced the color of the ilabulo crackers of skipjack fish fortified nanocalcium bone roasting process. The treatment process during heating and roasting also contributes to the formation of color, namely the *Maillard* reaction. The *Maillard* reaction is an enzymatic browning non reaction that occurs between reducing genes with amino acids that produce brownish color in food ingredients when experiencing a heating process.

Figure 2 showed the hedonic quality of aroma ilabulo crackers skipjack fish fortified nanocalcium bone obtained the highest value in formulation D with fish scented quality criteria with a value of 6.30 and the lowest formulation A with a slightly fish scented criteria with a value of 5.50. The results of Kruskal wallis analysis showed that all formulations had significant effect. Duncan's test results showed formulation A was significantly different formulation D.

The formulation significantly different is due to the difference in the composition of wheat flour. Aroma of fish crackers ilabulo derived from raw material skipjack fish and nanocalcium bone although with addition of the same seasoning. In addition due to the processing including beaking who contribute to the aroma of ilabulo crackers skipjack fish fortified nanocalcium bone.

The highest taste hedonic quality analyze in formulation A with a slightly fishy, slightly savory criteria with a value of 6.30 and the lowest in formulation D with neutral criteria with a value of 4.50. The results of Kruskal wallis analyze showed that all formulations had significant effect. Duncan's test results showed formulation A was significantly different formulation C and D.

Conclusion

Based on the results of the research, it was concluded that ilabulo crackers skipjack fish fortified nanocalcium bone were the highest physical texture a formulation B 17875.7 /gf and the lowest in control treatment was 4884 /gf. The hedonic quality analyze found a formulation A as the selected formula the criteria of appearing intact, flat surface, neutral texture, brownish yellow color, slightly flavorful fish aroma and somewhat tastefully.

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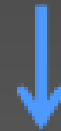
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**PHYSICAL ANALYSIS AND HEDONIC QUALITY OF
ILABULO CRACKERS SKIP JACK (*Katsuwonus
pelamis*) FORTIFIED NANOCALSIUM BONE**

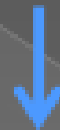
**Rita Marsuci Harmain
Faiza A.Dali
Rahim Husain**

**BOGOR
9-10 OCT 2018**

Ilabulo crackers of skipjack fish → fungsional food



have been fortified with nanocalcium flour from skipjack fish bone waste



Diversification of skipjack fish ilabulo crackers that are Crispy, intact and have nutritional content, especially Calcium in the form of nanocalcium fortification from the waste of skipjack fish bones that are easily absorbed by the body

The research was conducted

To analyze the physical and hedonic quality of ilabulo crackers of skipjack fish fortified nanocalcium bone

Material and Methodology

- ① Preparation of Skipjack Fish Meat
- ② Fish Bone Flour (Trilaksani *et al* (2006) Modified by Harmain *et al* 2016)
- ③ Precipitation Method of nanocalcium (APHA (2005))
- ④ Crackers formulation (Murtuza *et al* (2016) modified 05) in Suptijah *et al* 2012)
- ⑤ Formulation and Optimization of Ilabulo Crackers Formula Skipjack Fish Fortified Nanocalcium Bone

Table 1. Formulation of ilabulo crackers for 500 grams of skipjack fish meat

Material	Treatment Material Composition			
	A	B	C	D (control)
Skipjack fish meat (g)	500	500	500	500
Nanocalcium (g)	20	20	20	20
Wheat flour (g)	500	250	100	-
Sagoflour (g)	50	50	50	50
Seasoning (g)	20	20	20	20
Sugar (g)	50	50	50	50
Salt (g)	10	10	10	10
Santan (mL)	500	500	500	500
Cooking oil (mL)	50	50	50	50

Data analyze

Physical analysis (*Crispness*) liabulo Crackers Skipjack Fish Nanocalcium Fortification of Skipjack Fish Bone using *TA-XT2i texture analyzer* (Chen, et.al 2013 ; Apriyantono et.al 1989), The crisp value is calculated using the formula:

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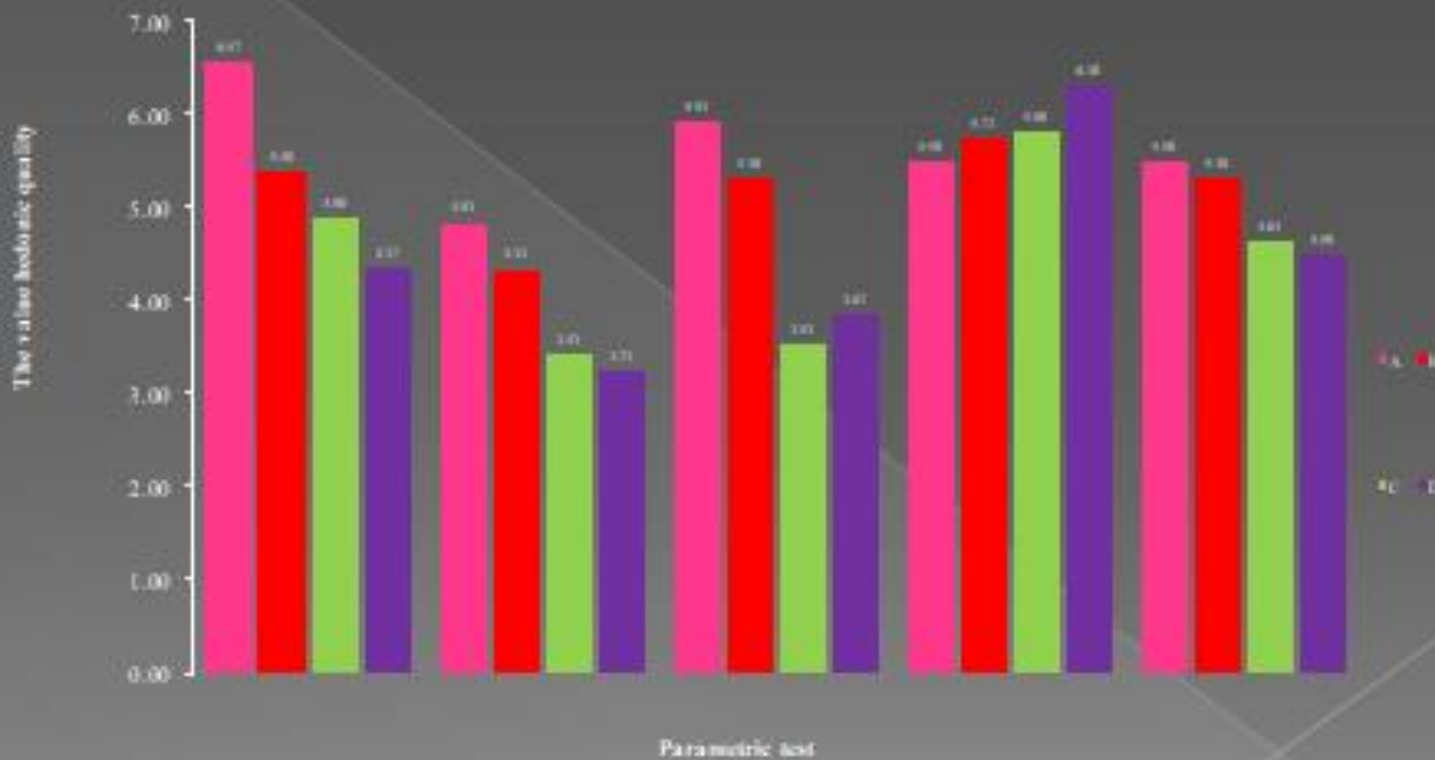
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Results and Discussion

Table 2. The data physical analysis of ilabulo crackers of skipjack fish nanocalcium bone

Repeat	A (gf)	B (gf)	C (gf)	(control)(gf)
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The results analysis hedonic quality of ilabulo crackers of skipjack fish are shown in Figure 2.



Conclusion

Based on the results of the research, it was concluded that ilabulo crackers of skipjack fish fortified nanocalcium bone were the highest physical fortification of Skipjack fish bones in Formula B 17875.7 / gf and the lowest in control treatment was 4884 g / f. The hedonic quality analysis found that formula A as the selected formula the criteria of appearing intact, flat surface, neutral texture, brownish yellow color, slightly flavorful fish aroma and somewhat tasteful taste.

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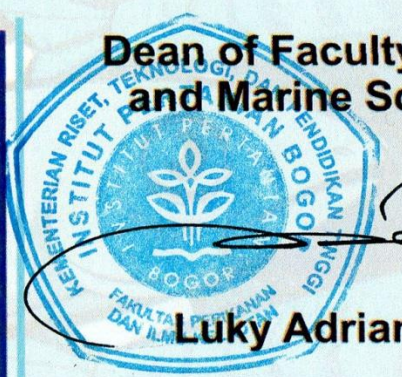
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