Fortification of Plain Cracker With Fish Flour

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ABSTRACT

Fortification of plain crackers with Java tilapia flour to increase protein was conducted. Completely Randomized Design with five treatments was applied. The treatments were dough without fish flour addition as control, addition with 5%, 10%, 15%, and 20%, they were replicated four times The crackers were measured for crude protein content, relative volumetric expansion and sensory properties.

Results indicated that protein content in the crackers was increased proportionally with fish flour addition, but relative volumetric expansion, crispiness and consumer acceptance decreased. Addition of 5% fish flour is acceptable to consumers. Preparation to improve fish flour color and the use of agent to improve the sensory properties of the crackers are necessary.

***Keywords**: fortification, fish flour, crackers, crispiness, volumetric expansion*

INTRODUCTION

Crackers are popular snack in Indonesia (Soekarto 1997). It is made of flour, salt and water, mixed them to become dough, steamed, let it cool, sliced into thin piece, dry then fries. Addition of fish flour in the dough is hopefully will increase protein content in the crackers and improve its taste (Fawzya *et al.* 1986, Peranginangin *et al.* 1995). Crispiness is an important property of crackers (Yean 1991) which is affected by flour as the main raw material

Java tilapia (*Tilapia mossambica*) is a fast growing and easy to culture fish species (Anonymous 1996, Rustadi *et al.* 1985, Sugiarto 1998). Relatively it has less meat and a lot of bone, however it has 14.9% protein (Sugiarto 1998), and therefore process those into fish flour will add its value. One of those is to improve protein content in plain cracker that still acceptable to consumers, since addition of fish flour may reduce its crispiness (Rosalia 1993).

MATERIALS AND METHOD

Fish flour was made from fresh Java tilapia following method as described by Anonymous (1991). The fish were dressed, boiled for 20 minutes, ground and then was pressed with hydraulic pressure and dry at 60°C for 15 hours. After dried, it was blended and screened with a sieve (mesh size 30). The flour was mixed with tapioca flour and wheat flour proportionally according to the treatment plan (Table 1), where ratio between wheat flour and tapioca flour were 1:4. They were replicated four times. Cracker was prepared by mixing 500 g of each flour mixture with 20 g of sugar, 12.5 g salt, one chicken egg and 200 cc of water. They were mixed

homogenously until the dough was not licked with hands. The dough was molded cylindrically (diameter 3-4cm) and steamed for 1.5 hour, let it cool for one night and was sliced at 2-3 mm thick and dry under the sun for 2 days. Prior to parameter measurement the crackers were fried in deep fryer with medium flame.

Table 1. Proportion of flour mixture (weight base)

Treatment	Wheat flour	Tapioca flour	Fish flour	% fish flour
P1 (control)	100	400	0	0
P2	95	380	25	5
P3	90	360	50	10
P4	85	340	75	15
P5	80	320	100	20

Observations were made on crude protein content by Micro kjeldahl method (AOAC 1990), relative volumetric expansion after frying by Zulvani method (1992) *in* (Peranginangin *et al.* 1995), and sensory test (Soekarto 1985) with 30 panelists. Data were subjected to Analyses of Variance and were further with Least Significant Different (LSD) if there was any significant different (á = 5%).

RESULTS AND DISCUSSION

Fish flour that was prepared has greenish brown color, sandy texture, smells like boiled fish, and containing 52.00% protein. The greenish color possibly because the fish has dark color and the texture is due to high bone content, the protein content was in accordance with Sahwan (1999) measurement for protein content in Java tilapia, which is between 43.57-55.60%.

Measurement of protein content and relative volume expansion after frying of the crackers is shown in Table 2.

Table 2. Protein content in fortified crackers (%) and its relative volume expansion*)

Treatment	Crude protein content	Rel. Vol. expansion
P1	3.06 a	507.08 a
P2	5.05 b	322.27 b
P3	8.75 c	202.38 c
P4	11.22 d	105.51 d
P5	13.08 e	96.21 e

*) Value in the same column followed with different letter is differing significantly (α= 5%)

Table 2 shows that the more fish flour added into the dough would increase the protein content, since the more fish flour being added means the more tapioca and wheat flour mixed was replaced by fish flour which has higher protein content than the mixed flour; this mean more protein enter into the dough. At treatment P3 (10% fish flour) the cracker meets the class I fish cracker quality standard. (Anonymous 1992).

On the other hand the more fish flour added cause less relative volumetric expansion. Similar phenomenon was reported by Rosalia (1993) where addition of shark flour reduced relative area expansion in the fortified crackers. According to Yean (1991) the mixed flour granule interacts with protein and suppresses the crackers expansion during frying. Molecule bonding in carbohydrate is limited to hydrophobic and hydrogen bond which are weak and its structure is easy to be destructed by water. Protein on the other hand has covalent and ionic bond which is stronger than bonding of carbohydrate, therefore less soluble and has more stable structure during further process (Muchtadi *et al.* 1988). Therefore; crackers with higher protein content will not expand easily during frying.

Results of sensory properties of the fortified crackers is shown in Table 3 below

Table 3. The score of sensory measurement of the fortified crackers *)

Treatment	Appearance	Smell	Taste	Crispiness	Acceptance
P1	5.87 a	2.50 a	2.57 a	6.27 a	5.50 a
P2	4.57 b	3.03 b	3.33 ab	5.37 b	5.07 ab
P3	3.53 c	4.13 c	4.03 bc	4.50 b	4.37 b
P4	a 1.93 d	5.07 d	4.83 cd	3.53 c	2.90 c
P5	2.67 d	5.10 d	4.90 d	2.80 c	3.50 bc

*) Value in the same column followed with different letter is differing significantly ($\alpha = 5\%$)

Score for sensory test were fluctuated between 1 and 7, The smaller the score the less the fish flour affects the product. The higher the score the higher effect of fish flour on cracker quality.

Sensorily, fish flour from Java tilapia has dark color, and affects the color of the cracker. The more the addition of fish flour in the dough the darker appearance of the cracker, and this were disliked by panelists. Fish flour also affects fish smell and taste, the higher fish flour being added to the dough the stronger the fish smell and taste of the crackers. As protein fortification increase, the crackers crispiness decrease significantly, and also decrease panelist acceptance toward the cracker. Crispiness score of 5 or above indicated that cracker is slightly crispy, and acceptable as indicated by score of 5.07.

CONCLUSION

Fortification of plain cracker with Java tilapia fish flour increase protein content of plain cracker, but decrease relative volumetric expansion and sensory properties of the cracker. Fortification of the cracker with 5% of Java tilapia is acceptable.

Preparation of Java fish flour to improve its color is recommended. Addition of expansion agent and spices to improve sensory properties are deemed necessary to increase the cracker acceptance.

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