

Development of a fish base biscuit using Orinoco Sailfin catfish (*Pterygoplichthys multiradiatus*)

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Abstract

Inland fishery industry plays a major role of human nutrition and livelihoods in rural communities. Orinoco Sailfin Catfish (OSC) is an invasive alien species colonized inland water bodies has become a problematic fish. Although, it can be use as a food fish, the direct introduction to local consumers is arduous since it is popular as an aquarium fish. Because the abundance of the biscuit consumption by Sri Lankans, it is a good carrier to give the OSC as a food source. In this study, OSC flour incorporated about 19 % to a biscuit recipe and compared these with biscuits without fish flour. The sensory attributes between two types of biscuits were not significantly different. The moisture, ash, crude protein, and total fat contents in fish based biscuit and non-fish based biscuit were $02.28 \pm 0.06\%$, $03.69 \pm 0.13\%$, $29.04 \pm 0.36\%$, $13.61 \pm 0.26\%$, $02.38 \pm 0.026\%$, $03.81 \pm 0.02\%$, $10.71 \pm 0.06\%$, and $12.71 \pm 0.01\%$ indicating higher protein content in fish based biscuit. The SF, MUFA, and PUFA contents of OSC flour based biscuit and non-fish based biscuit were 26.35 %, 36.28 %, 37.18 %, 26.11%, 35.90 % and 37.81 % in total fat content. The S/U, omega6/omega3 ratios of OSC flour based biscuit and non-fish based biscuit were 0.36, 13.58, 0.35 and 14.82. The lower ratio of omega6: omega3 and 0.16 % of Eicosapentaenoic acid provide better nutritional benefits for the OSC incorporated biscuit. The pH, moisture content, water activity and free fatty acid value of the final product was within safety limits and their variations for a three week period were not significantly different. The peroxide value and Presumptive Coliforms were not detected and aerobic plate count, yeast and mold were below the maximum allowable limits within this period. The cost of 100 g of product was 40.48 LKR.

Keywords: Alien fish, fish biscuit

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Introduction

Orinoco Sailfin Catfish is an invasive alien species colonized inland water bodies has become a problematic fish because of higher growth rate, invasion of the native fish environment, economic losses to the fishermen and loss of biodiversity (Wijethunga and Epa, 2008). Although, its major portion of daily fish catch, the direct introduction to local consumers is arduous since it is famous as an aquarium fish.

Materials and Methods

Sample collection: The freshly caught *Pterygoplichthys multiradiatus* from the tanks in Polonnaruwa and Ampara areas were transported to NARA in the chilled condition.

Product preparation: The 100 g of biscuit was prepared according to a formulated recipe as 17.90 g of fish flour, 8.06 g of green gram flour, 17.90 g of wheat flour, 25.06 g of sugar powder, 9.00 g of skim milk powder, 0.65 g of baking powder were mixed together. Then 1.79 g of salt and 0.22 g of soya lecithin were mixed with 18.8 g of vegetable fat spread. Then the 00.13 g of potassium sorbate was dissolved in 7 ml of water. Then all of them were mixed together, kneaded for 30 min and moulded. The raw biscuit was baked at 180 °C for 15 min. After cooling to room temperature, the biscuits were packed in nylon and LDPE polymeric bags. Control biscuit was developed without fish flour using the same recipe and replacing fish flour with wheat flour. This is for identification, whether any effect of incorporation of fish flour to the biscuit in sensory attributes or nutritional properties.

Sensory analysis: Sensory analysis was done using 30 members of untrained panel and the 5 point hedonic scale. The sensory attributes checked were appearance, aroma, texture, taste and overall acceptability.

Proximate analysis: The moisture, ash, crude protein and total fat contents in fish based biscuit and non-fish based biscuit were analyzed. The fatty acid profile was determined using gas chromatography.

Shelf life analysis: Moisture content, water activity, peroxide value and free fatty acid value were checked for a 3 week period and the variation of each parameter was also analyzed in one way ANOVA. Presumptive coliform, aerobic plate count, yeast and mold counts were analyzed for this period.

Statistical analysis: Sensory evaluation was done according to the five point hedonic scale and results were analyzed using Minitab-Kruskal Wallis test.

Results and Discussion

Sensory analysis

Table 1. H values resulted from the Kruskal Wallis test for sensory attributes.

Sensory Attribute	H _{cal} value
Appearance	1.14
Aroma	1.22
Texture	0.46
Taste	2.32
Overall acceptability	2.25

For all sensory attributes, there were no significant difference between fish based biscuit and non-fish based biscuit under 0.05 levels of significance (Chi-square² value; 3.84 > H_{cal}). Incorporation of OSC flour to the biscuit has not contributed an unpleasant sensory attributes.

Results of proximate analysis

Having this compositional information in a table would be helpful. The moisture, ash, crude protein and total fat contents in fish based biscuit and non-fish based biscuit were $02.28 \pm 0.06\%$, $03.69 \pm 0.13\%$, $29.04 \pm 0.36\%$, $13.61 \pm 0.26\%$, $02.38 \pm 0.02\%$, $03.81 \pm 0.01\%$, $10.71 \pm 0.06\%$ and $12.71 \pm 0.01\%$ respectively, indicating considerably higher protein content and a some higher fat content in fish based biscuit. The SF, MUFA and PUFA contents of OSC flour based biscuit and non-fish based biscuit were 26.35%, 36.28%, 37.18%, 26.11%, 35.90% and 37.81% in total fat content. The S/U, omega6/omega3 ratios of OSC flour based biscuit and non-fish based biscuit were 0.36, 13.58, 0.35 and 14.82. The lower ratio of omega6: omega3 and 0.16% of Eicosapentaenoic acid provide better health and nutritional benefits. Eicosapentaenoic acid promotes children's brain development and can reduce the risk of cardiovascular diseases and the rheumatoid arthritis (Erdman J *et.al* .2011).

Results of shelf life analysis

Table 2. P-value results for shelf life determination parameters

Parameter	P-value
Moisture content	0.299
Water activity	0.648
Free fatty acids	0.319

Peroxide value was not detected and free fatty acid value, moisture content and water activity were within the safety limits for a 3 week period and their variations were not significant under 0.05 levels of significance ($P > 0.05$). Therefore the chemical deterioration rate of the biscuit was not significantly different from the control. The presumptive coliform was not detected and aerobic plate count, yeast and mold count were below the maximum allowable limit for this period and the shelf life analysis should be done further.

Results of cost analysis

The cost of 100g of biscuit was 40.48LKR.

Conclusion

OSC fish flour can be used successfully for the preparation of fish base biscuit.

References

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