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## Chemical Characteristics of Fish Nugget with Mangrove Fruit Flour Substitution

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### Abstract

Mangrove fruit has been widely used in various countries. In Indonesia the fruit is not used optimally. The advantages of utilization mangrove fruit in the processing of fish nuggets could reduce imports. The different proportion (0 %, 20 %, 30 %, 40 %) of mangrove fruit flour as a substituted for wheat flour gave significant effect ( $P < 0.05$ ) on the value of water content, fat content, protein content and ash content. The higher substitution of mangrove fruit flour raised protein content of fish nugget products. Thus, its showed that mangrove fruit flour are potentially to improve the nutritional value of fish nugget.

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*Keywords:* Fish nugget; flour; mangrove fruit; nutritional value; protein

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### 1. Introduction

Mangrove is one of fisheries raw has been used in various countries, in the Solomon Islands the fruit is often used as a vegetable and sold in the market, in Cambodia made malaria drugs even in some countries, this plant is used to make paint, perfume and as a cure for cancer or tumors (Duke and Allen, 2006). Mangrove fruit species [*Bruguiera gymnorrhiza* (L) Lam.] which are conventionally processed into cakes, mixed with rice or eaten directly with coconut flavoring contains high carbohydrates, even beyond the different kinds of foods commonly consumed carbohydrate source communities such as rice, corn cassava or sago. Mangrove fruit also potent to decreasing blood glucose level after processing into flour contained 7.50% soluble dietary fiber and 38.60% insoluble dietary fiber. Thus the mangrove fruit flour is a candidate as functional food source especially antidiabetic (Hardoko et al., 2015). In addition, the previous study Fortuna (2005) have showed the energy content of mangrove fruit of this kind was 371 cal · 100 g<sup>-1</sup>, is higher than rice (360 cal · 100 g<sup>-1</sup>) and corn (307 cal · 100 g<sup>-1</sup>). Carbohydrates are the main

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source of calories for humans. As many as 60 % to 80 % of the calories obtained from carbohydrates body (Hwanhlem et al., 2014). Some of the mangrove plant parts are used for food purposes. Fruits of *Bruguiera gymnorhiza*, *Phoenix*, *Paludosa*, *Sonneratia alba*, *Sonneratia caseolaris*, and *Terminalia catappa* are used as vegetables (Pattanaik et al., 2008).

Mangroves are unique inter-tidal ecosystems of the tropics, which support genetically diverse groups of aquatic and terrestrial organisms (Hwanhlem et al., 2014). An important ecological function attributed to mangroves is the export of leaf litter carried by currents to adjacent coastal waters, where they can be a potential source of organic matter and nutrients for commercially important fisheries (Day et al., 2012). In Indonesia, mangrove fruits can combine with fish on fish nugget production. The advantages of utilization mangrove fruit flour in fish nuggets can be reduce wheat imports. This study aims to determine the substitution effect of mangrove fruit flour on chemical characteristic of fish nuggets.

## 2. Materials and methods

### 2.1. Preparation of Mangrove Fruit Flour (MFF)

Mangrove fruit used for this study were *Bruguiera gymnorhiza* (L) Lam. which taken the old half that with long brownish-green color of approximately 15 cm, obtained from Jepara, Central Java, Indonesia.. The fruit must be had a good physical condition, no damage. The first stage began by boil mangrove fruits (500 g) with 1 500 mL of water at 80 °C for 30 min then peel skin and soaking mangrove fruit for 48 h with change of water every 4 h. After soaking, mangrove fruit were cut into slices and dry under the sun. The second stage began by grinding of mangrove fruit slices using a food processor (Philips HR-7627) until became a flour.

### 2.2. Fish nugget preparation and processing

By caught trash fish was selected from Pekalongan, Central Java, Indonesia. About 300 g fish meat was obtained from 1 kg whole round fish. The meat was conditioned in a refrigerator at  $(4 \pm 1)$  °C for about 4 h till further use. The meat was cut into small pieces and minced with a mincer (Kenwood Model A920 PK001). This fish minced was used in nugget formulations. For this study, there were four nugget formulations with different treatment in terms of additional Mangrove Fruit Flour (MFF) as a substitute for some wheat flour and bread flour. Table 1 shows the nugget formulation in this study.

Table 1. The nugget formulation with different additional of mangrove fruit flour

Components	Nugget Formulation			
	Control (A)	MFF 20 % (B)	MFF 30 % (C)	MFF 40 % (D)
Fish minced (%)	45	45	45	45
MFF (%)	-	20	30	40
Wheat flour (%)	15	-	-	-
Bread flour (%)	25	20	10	-
Crushed ice (%)	5	5	5	5
Condiments (%)	5	5	5	5
Battermix (%)	5	5	5	5
Breadcrumb (%)	5	5	5	5

Fig. 1. shows the method of fish nugget processing. All components except battermix and breadcrumb were thoroughly mixed to provide a uniform blend. The dough was formed and steamed at 80 °C for 30 min. The fish nugget samples were formed into characteristic shapes ( $4 \times 2 \times 1$ ) cm and were chilled to below  $-18$  °C for 30 min. The frozen pieces of nugget were dipped in the prepared battermix for 10 s (wheat flour 80 %, tapioca flour 5 %, salt 2 %, skim powder 13 %). This battered nuggets were covered with breadcrumb and packed in polyethylene bags and stored at  $-18$  °C to  $-20$  °C until use. Fish nuggets and ready to be analyzed chemically as well organoleptic. Chemical test to be performed is the proximate test (water, crude ash, lipid, crude protein and carbohydrates) and tannin levels. The experimental design research is completely randomized design of the factors with two replications. The factors to be observed was the substitution of MFF (0 %, 20 %, 30 % and 40 %). The main

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