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Effect of Different Bleaching Temperatures on the Quality of Refined Catfish (*Clarias gariepinus*) Oil

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Abstract

Catfish (*Clarias gariepinus*) oil contains a high amount of unsaturated fatty acids, however process of refining will damage the double bond of unsaturated fatty acids. This study was aimed at develop a better refining process of catfish oil. The material used in this research were crude catfish oil as a by product from flouring industry, and magnesol XL as its adsorbent. Oil was purified by two-step, neutralization and bleaching. The various bleaching temperatures (25^0 C; 70^0 C; 100^0 C) were applied. The study showed that refined oil at temperature of 25^0C resulted in a best value of FFA, PV, anisidin numbers, and the lowest number of total oxidation.

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Keywords: refining, bleaching temperature, catfish (*Clarias gariepinus*) oil, unsaturated fatty acid

INTRODUCTION

Catfish is one of fisheries commodity in Indonesia and the production has increased every year. Therefore, now a day catfish processing has grown with a variety of ways, for example flouring production for the manufacture of catfish biscuits [1]. Flouring process produces a byproduct that still contain high amount of unsaturated oils.

The increase in the catfish processing industry resulting in the increase of by product volume. The main nutrients contained in these oils are unsaturated fatty acids which is known to have positive benefits on health, such as preventing the incidence of coronary heart disease [2], lowering cholesterol [3], improving cognitive function [4], and serving as anti-inflammatory function [5].

Catfish oil from the flouring must be processed before consumption. One of the process is called purification. Purification is done with the aim at improving the quality of this oil. A purification process includes four stages;

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degumming, neutralization, bleaching, and deodorization [6]. Degumming is done to separate the gum with the oil fraction, this stage is usually performed on vegetable oil. Neutralization aims at reducing levels of FFA, bleaching aims to improve the color quality of the oil, deodorization aims to reduce of unwanted odor from fish oil [7]. However, the oil processed by high temperatures can damage the bond of unsaturated fatty acids (both MUFA and PUFA). Therefore, it is necessary to study the process of purification that can maintain the bond of unsaturated fatty acids contained in catfish oil. Conventional bleaching process, usually carried out at temperatures above 100^0C, it will damage the double bond of unsaturated chain [8]. The purpose of this study is to find the best method of bleaching temperature to maintain the bond of unsaturated fatty acids in catfish oil. The benefit of this research is to provide an alternative purification process of fish oil that are able to maintain the content of unsaturated fatty acids.

MATERIALS AND METHODS

The materials used in this study were a by product of flouring catfish. Materials for the neutralization process were NaOH, adsorbent used for the bleaching process was Magnesol XL as much as 5% [9]. The sample was homogenized and characterized (Free Fatty Acid, Peroxide Value, P-Anisidin, Total Oxidation Numbers, and Fatty Acid) before purification. Neutralization process is done by the addition of NaOH according to the amount of free fatty acid, then the oil in the bleaching treatment temperature difference (25^0C, 70^0C, 100^0C).

Free fatty acid (FFA)

Free Fatty Acids in this research was analyzed by a following procedures. First, oil was weighed into a flask followed by neutralized 95% ethyl alcohol and phenolphthalein indicator. The mixture was then titrated against sodium hydroxide solution until a permanent pink color persisted for at least 30 s. Percentage of FFA by weight was calculated on either an oleic, palmitic, orlauric acid basis, depending on the type of oil being analyzed [12]. Each sample was titrated in triplicate.

FFA percentage is calculated based on the following equation:

$$\%\text{FFA} = \frac{A \times N \times M}{10\,G}$$

A = the number of titration KOH (mL)

N = normality KOH

G = samples weight

M = Fatty acids dominant molecular weight

Peroxide Value

Peroxide value was analyzed by a few steps, first weight of oil sample (2 g) was dissolved in 30 mL chloroform: acetic acid (3:2, v/v) then 1 mL freshly prepared saturated KI (potassium iodide) solution was added and the mixture vortexed for exactly 1 min. Distilled water (30 mL) and stock solution (0.5 mL, starch 1%) were added and the liberated iodine was titrated with sodium thiosulfate (0.1 mol L-1). Determination of the peroxide value in the unit meq/kg was determined by the following equation [10]:

Peroxide value (mEq/kg) = (S-B) x N x 1000

S = volume of sodium thiosulfate sample

B = volume of sodium thiosulfate blanco

N = normality of sodium thiosulfate

G = samples weight