Fatty Acid Composition of Catfish (Clarias gariepinus) Viscera Oil

B.N. Effiong and J.O. Fakunle
Fish Processing and Storage Technology Unit, Federal College of Freshwater Fisheries Technology, New Bussa, Nigeria

Corresponding Author: B.N. Effiong, Fish Processing and Storage Technology Unit, Federal College of Freshwater Fisheries Technology, New Bussa, Nigeria

ABSTRACT
Recent researches have shown fish oil as a rich source of omega-3 (n-3) Polyunsaturated Fatty Acids (PUFA), which lower total serum cholesterol level. Fish viscera are usually discarded during processing by the fisher folks around lake Kainji. This study was therefore conducted to assess the suitability or otherwise of catfish (Clarias gariepinus) viscera as a possible source of fish oil. Fish viscera were collected during processing of freshly caught C. gariepinus and the oil extracted. This was later analyzed to determine the fatty acids present. A total of 20 fatty acids were obtained out of which five were identified. Lauric acid (37.24%), palmitic acid (12.86%) and stearic acid (1.32%) were the main Saturated Fatty Acids (SFA) while oleic acid (6.04%) and linoleic acid (13.52%) were Monounsaturated Fatty Acid (MUFA) and Polyunsaturated Fatty Acid (PUFA), respectively. Lauric acid had the highest proportion while stearic acid was the least. Myristic acid was not detected. The result shows the possibility of utilizing fish viscera as a source of fish oil for health benefits especially due to the presence of the omega-3 polyunsaturated fatty acid.

Key words: Extraction, mono-unsaturated fatty acid, poly-unsaturated fatty acid, palmitic acid, stearic acid

INTRODUCTION
Fish has been an integral part of diets in most parts of the world as a good source of reliable food nutrients. Its nutrients particularly fatty acid and protein has not only served as direct nutrients but also as components of healing process in many health conditions. Fish oil have been shown to offer outstanding health benefits to consumers due to the presence of the omega-3 polyunsaturated fatty acids (PUFA) such as Eicosapentaenoic Acid (EPA) and Docosahexaenoic Acid (DHA) (Neil, 1997). Oily fish and fish oil supplements aid in the prevention and management of Coronary Heart Disease (CHD) (Minis et al., 2006).

Seafood products enriched with omega-3 fatty acid have been reported to be effective in lowering serum triglycerides and blood pressure (Inga-Britt et al., 2004). They help in reducing the risk of developing an abnormal heart beat that can lead to heart problems and even sudden death. Fatty acids have particular importance in fish since their consumption contributes in the reduction of cardiovascular diseases (Nordov et al., 2001; Turkmen et al., 2005).

In Nigeria catfishes of the family Clariidae have adapted to nearly all parts of the country with a steady rise in its culture in recent years. This has resulted in the growth of aquaculture in the country (Oresegun et al., 2007). This is largely due to the environmentally friendly nature of these species coupled with its resistance to adverse conditions.
The by-products of catfish processing consists of frames and viscera which are often thrown away during processing. Catfish viscera could be used as a source of lipid rather than waste (Sathivel et al., 2003). From the foregoing therefore, this experiment was conducted to determine the fatty acid composition of oil extracted from catfish (Clarias gariepinus) viscera.

**MATERIALS AND METHODS**

**Collection of samples:** Freshly harvested samples of Clarias gariepinus were purchased from a private fish farm in New Bussa, Nigeria and taken to the Wet Laboratory of Federal College of Freshwater Fisheries Technology, New Bussa where they were processed for smoke drying. The viscera were collected during the processing. A total of 2 kg of viscera from 70 fish samples with average weight of 500 g were collected and stored at -5°C.

**Extraction of oil and fatty acid analysis:** Extraction of the crude oil was carried out at the Analytical laboratory, National Institute for Freshwater Fisheries Research (NIFFR), New Bussa using the method of Stewart et al. (1974). The extracted oil of about 250 mL was stored at ambient temperature and thereafter taken to the Central Science laboratory, Obafemi Awolowo University, Ile-Ife, Nigeria for fatty acid determination.

The fatty acids were converted to their methyl esters and heptanes according to the method of Christy (1997). About 5 mL of the oil was esterified with acetone (59:41). The reaction mixture in vials was heated at 80°C on hot plate for 30 min, cooled and then diluted with water, extracted with diethyl ether and analyzed by High Pressure Liquid Chromatography (HPLC). Identification and quantification of fatty acids were carried out in HPLC using the methods of Christy (1997). Reference standards which had been developed with use of application of HPLC overtime was used to identify the components using relative retention time. A total of five fatty acids for which reference standards were available were identified.

Percentage composition of each fatty acid identified was calculated using peak area as follows:

\[
\text{Fatty acid} \text{ (%) } = \frac{\text{Peak area of sample} \times \text{conc. of std.} \times \text{dilution factor}}{\text{Peak area of standard}}
\]

**RESULTS AND DISCUSSION**

The profile and percentage composition of the 5 different fatty acids identified from the catfish (Clarias gariepinus) oil is presented in Table 1. Lauric acid was the dominant fatty acid (37.24%) followed by linoleic acid (13.52%). Oleic acid was low (6.04%) while myristic acid was not detected. The low content of oleic acid may be attributed to the poor quality of feed fed to the fish. Satoh et al. (1989) reported that diet had a major effect on the fatty acid composition of lipid.

<table>
<thead>
<tr>
<th>Fatty acid (%)</th>
<th>Composition (%)</th>
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<tbody>
<tr>
<td>Lauric acid</td>
<td>37.24</td>
</tr>
<tr>
<td>Oleic acid</td>
<td>6.04</td>
</tr>
<tr>
<td>Palmitic acid</td>
<td>12.86</td>
</tr>
<tr>
<td>Linoleic acid</td>
<td>13.52</td>
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<tr>
<td>Stearic acid</td>
<td>1.32</td>
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<td>Myristic acid</td>
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Linoleic acid was the dominant polyunsaturated fatty acid (13.52%). This finding is similar to the reports of Ollis et al. (1999), Sathivel et al. (2009) and Pourshamsian et al. (2012). Polyunsaturated Fatty Acids (PUFAs) are known to prevent/reverse insulin resistance by decreasing TNF-α level and possibly by enhancing adiponectin levels. This PUFAs are likely to be useful in preventing ad/or reversing some of the side effects of retroviral drugs. Das (2006) reported that direct intake of various PUFAs alters the cell membrane fatty acid composition, which in turn, modulates cell/tissue response to infection, injury and inflammatory actions.

CONCLUSION

From the findings of this experiment, catfish (C. gariepinus) viscera rather than being discarded as it is presently being done by most fish processors around lake Kainji, Nigeria, could be a rich source of PUFAs and invariably of immense health benefits to consumers.

REFERENCES