Journal of

Fisheries and Aquatic Science

ISSN 1816-4927

Academic Journals Inc.

www.academicjournals.com

Journal of Fisheries and Aquatic Science 8 (1): 299-301, 2013
ISSN 1816-4927 / DOI: 10.3923/jfas.2013.299.301

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 (*C. 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:

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

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 1: Fatty acid composition of *Clarias gariepinus* viscera oil

Fatty acid (%)	Composition (%)
Lauric acid	37.24
Oleic acid	6.04
Palmitic acid	12.86
Linoleic acid	13.52
Stearic acid	1.32
Myristic acid	-

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

Christy, W.W., 1997. Structural Analysis of Fatty Acids. In: Advances in Lipid Methodology, Christy, W.W. (Ed.). Oily Press, UK., pp: 119-167.

Das, U.N., 2006. Essential fatty acids: Biochemistry, physiology and pathology. Biotechnol. J., 1: 420-439.

Inga-Britt, G., O.B.O.E. Margaretta and V. Bergt, 2004. Moderate amounts of n-3 fatty acid enriched seafood products. J. Hum. Nutr. Dietetics, 17: 490-499.

Minis, R., I Haq, P.R. Jackson, W. Yeo and L. Ramsay, 2006. Oily fish and fish oil supplements in the prevention of coronary heart disease. J. Hum. Nutr. Dietetics, 5: 449-459.

Neil, J.S., 1997. Fish consumption, fish oil, lipids and coronary heart disease.. Am. J. Clin. Nutr., 65: 1083-1086.

Nordov, A., R. Marchioli, H. Arnesen and J. Videbaek, 2001. N-3 polyunsaturated fatty acids and cardiovascular diseases. Lipids, 36: S127-S129.

Ollis, T.E., B.J. Meyer and P.R. Howe, 1999. Australian food sources and intakes of omega-6 and Omega-3 polyunsaturated fatty acids. Ann. Nutri. Metab., 43: 346-355.

Oresegun, A., O.R. Oguntade and O.A. Ayinla, 2007. A review of catfish culture in Nigeria. Niger. J. Fish., 4: 27-52.

Pourshamsian, K., M.R. Ghomi and M. Nikoo, 2012. Fatty acid and proximate composition of farmed Great Sturgeon (Huso huso) affected by thawing methods, frying and chill storage. Adv. Stud. Biol., 4: 67-76.

Sathivel, S, H. Yin, W. Prinyawiwatkul and J.M. King, 2009. Comparison of chemical and physical properties of catfish oils prepared from different extraction processes. J. Food Sci., 74: E70-E76.

Sathivel, S, P. Witoon, M. Joan and C. Casay, 2003. Oil production from catfish viscera. J. Am. Oil Chem. Soc., 80: 377-382.

Satoh, S, W.E. Poe and R.P. Nelson, 1989. Effect of dietary n-3 fatty acids on weight gain and liver polar lipid fatty acid composition of fingerling channel catfish. J. Nutr., 119: 23-28.

Stewart, D.J., T.R. Manley, D.A. White, D.L. Harrison and E.A. Stringer, 1974. Natural fluorine levels in the Bluff area, New Zealand, part 1. Concentrations in wildlife and domestic animals. N. Zeal. J. Sci., 17: 105-113.

Turkmen, A., M. Turkmen, Y. Tepe and I. Akyurt, 2005. Heavy metals in three commercially valuable fish species from iskenderun bay, northern east Mediterranean sea, Turkey. Food Chem., 91: 167-172.