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Studies on the fat content and fatty acid composition of Fish waste

by

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Declaration

"I carried out the work described in this thesis under the supervision of Professor A.Bamunuarchchi (Department of Food Science and Technology, University of Sri Jayawardenapura, Nugegoda, Sri Lanka). This report has not been submitted to any university for another degree."

Date: 2006-08-26

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DECLARATION OF THE SUPERVISOR

"I certify that above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation"

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ABSTRACT

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ABSTRACT

There is considerable attention for seafood and fish in recent years due to their nutritional and medicinal benefits to humans. Recently fish oils has been studied and confirmed that it is rich in omega 3 polyunsaturated fatty acids have a beneficial effect on the vascular systems and in the lowering of plasma levels of cholesterol. This was presented the results of a series of experiments carried out on fish waste with regard to extraction of oil and fatty acid composition.

Tilapia (*Oreochromis mossambicus*), Salaya (*Sardinella melanura*), Shark (*Carcharhinus falciformis*), Hurulla (*Amblygaster sirm*), Linna (*Decapterus russelli*), and Kumbalawa (*Rastrelliger kanagurta*) were subjected for proximate analysis. Waste samples of the above fish were also analyzed for proximate composition. As Tilapia and Shark waste show high content of fat, they were subjected for fatty acid composition.

Out of the five extraction methods namely steam rendering, wet rendering, acid silage, microbial silage and Bligh & Dyer method used for fat extraction steam rendering and acid silage methods were found to be suitable for small-scale fat extraction.

Fatty acid composition of Tilapia waste and Shark waste were carried out. Tilapia oil contained high content of C: 18 unsaturated fatty acids. Shark oil contained higher amounts of C: 20 and C: 22 unsaturated fatty acids than the fresh water fish oil.

CHAPTER 1

INTRODUCTION

Fish undoubtedly is one of the most nutrious of foods available for human consumption Fish flesh on an average contains 15-20 per cent protein. The fish has been a well-known source of protein in the human diet for a long time. Fish and fishery products provide nearly 15% of the total protein intake. Due to cultural and religious reasons people do not like to eat meat, and also meat is relatively more expensive than fish. Consumer prefers fish, since it is tender than the meat. Therefore, fish is the best solution of the problem of protein deficiency and the fulfillment of essential amino acids such as methionine and lysine.

Fish are also rich in nutrients such as lipids, vitamins and minerals but low in carbohydrates. The carbohydrate percentage of fish is less than 1%. Fish also is an excellent source of minerals such as sodium, potassium, calcium, zinc, and iron. Fish liver lipids are rich in vitamins A and D.

Fish lipids have become valuable for human as a food material as well as a medicine. Fish lipids used as a raw material for many industries like paint and leather industry for many purposes. Generally fish contains 0.5-10% lipids and it may increase up to 15% in some species due to various reasons. The fish lipid content and its composition vary due to factors such as species, season, diet, physiological factors, geographical condition and age.

The degree of unsaturation in fish lipids is higher than any other lipids. The most abundant fatty acids consists 5 or 6 double bonds in their fatty acid chain.

Recently fish oils has attracted many scientists as studies confirmed that fish oils rich in omega 3 polyunsaturated fatty acids have a beneficial effect on the vascular systems and in the lowering of plasma levels of cholesterol, triglycerides and very low density lipoproteins. As a result more people move into fish consumption nowadays. Food grade fish oils are used in preparing margarine, shortenings, salad oils and dressings and many other foods.

Production of edible fish oil would be of interest to the developing countries because they can save foreign exchange by producing fish oil from available raw material. It will help to reduce the loss of foreign exchange when such oils have to be imported.

However even the best quality table fish has even at the highest level, only 50% edible flesh, the rest consisting of frame, head and viscera which are inedible. There is a large quantity of very small fish landed as by catch which do not find a ready market as fresh fish. Fish processing and filleting industries turn out large quantities of fishery waste. All these are good sources of high quality protein, fat, minerals etc.

Due to large consumption of fish and fishery products the accumulation of waste becomes high. This is a huge load of organic pollutant. So it is essential to find out a proper management system for this waste.

Fish waste includes heads, fins, skin, intestines, liver and other organs. There is no proper management of this waste accumulate in St John market daily. Everyday it is disposed. There are possibilities of extraction oil from this waste. Fish waste is vital raw material for the extraction of fish oil. The remaining after extraction the oil is a good source of protein. This can be used as a protein supplement for animal food

To achieve this goal a preliminary study was carried out at suitable sampling site in St. John Fish market in Sri Lanka where is the major fish distributing and wholesale center in the country. Freshness of the raw material is important as it affects the quality of the oil. So sample must be preserved or oil must be extracted immediately. Delay will cause the increase the free fatty acid content of the oil.

The extraction of lipids for commercial purpose is based on cooking and steaming. At present many methods are being applied for extracting fish oil and yield and quality may differ with the extraction method. Therefore it is very important to introduce a convenient and low cost oil extraction method, which produces high quality fish oil for industrial use.

This study was designed to extracted fish oil from waste of one fresh water fish (Tilapia) (*Oreochromis mossambica*) and waste of few marine fish such as Shark (*Carcharhinus falciformis*), Salaya (*Sardinella melanura*), Linna (*Decapterus russelli*), Kumbalawa (*Rastrelliger kanagurta*) and Hurulla (*Amblygaster sirm*). Also determine the fatty acid composition of fish oil those are extracted from each waste