Advance Journal of Food Science and Technology 2(1): 28-30, 2010
ISSN: 2042-4876

Submitted Date: October 19, 2009 Accepted Date: November 20, 2009 Published Date: January 10, 2010

Studies on Quality of Fatty Acids and Properties of Skin and Digestive Fat Content Oils from Some Iranian Fishes

A. Aberoumand
Department of Fisheries, Natural Resources College, Behbahan University, Iran

Abstract: Fatty acids with several double bonds omega -3 and omega- 6 in fish oil decrease heart disease risk. In this research, Iodine, peroxide and acidic indexes of oils obtained from some fishes species of Persian Gulf of South Iran include: *Katus wonus pelamis*, *Cyprinodon Aphanius dispar*, *Hilsa macrura ilisha*, *Chirocenterous dorab*, *Cybium scomberomorus guttatum* and *Pseudosciaena johninus aneus*, were evaluated. Evaluation of For Peer Review quality of fishes oils, showed *Katus wonus pelamis* , *Pseudosciaena johninus aneus* and *Cyprinodon aphanius dispar* oils had high quality respectively. Comparison of fishes oils showed *Cyprinodon aphanius dispar* oil had highest yield (24%) and *Katus wonus pelamis* oil had lowest yield (3.95%). Comparison of peroxide indexes in Fishes oils, showed *Pseudosciaena johninus aneus* and *Cybium scomberomorus guttatum* oils had highest and lowest of peroxide value respectively. Tuna fish oil contains considerable contents of Free Fatty Acids (FFA) and omega--3 and omega--6 fatty acids, furthermore, *Katus wonus pelamis* and *Hilsa Macrura ilisha* oils have high and low quality respectively. *Cyprinodon Aphanius dispar* and *Cybium Scomberomorus guttatum* oils have highest and lowest of yield respectively. It is observed that *Cyprinodon aphanius dispar, Pseudosciaena johninus aneu* , *Katus wonus pelamis* and *Chirocenterous dorab*, were suitable commercially for extraction of oil in industrial scale.

Key words: Extraction, fishes oils, iodine, Iran, peroxide and values of acidic

INTRODUCTION

Apart from its various uses as consumable oils and other beneficial uses, the production of fish oil is necessary in the utilization of those fish species regarded as un-saleable and unpalatable. Fish oil is the lipid fraction extracted from fish and fish by products. samples are regarded as fatty species, having fat content well distributed throughout the body. Generally, fish oils are more complex than land-animal oils or vegetable oils due to long – chain unsaturated fatty acids (Hall, 1992). Fish oil is considered as liquid oil, but, in fact contains triglycerides of intermediate melting point for the oils to be partially solid at 20ºC. Fish oils are unique in the variety of fatty acids of which they composed and their degree of un-saturation (Ackman *et al*., 1998) Refined fish oils are rich in polyunsaturated fatty acids of the linolenic acid family. Current medical research suggests that these fatty acids might have a unique role to play in prevention of coronary artery disease and the growth of different types of cancers. The oil is industrially used in leather tanning, production of soap and glycerol, and other products. Presently, the production of fish oil is becoming more demanding, as there is a sizeable and growing world market demand for high quality fish oils. In other to meet the demand of the society there is the need to locate new oil fish and further research to know their characteristics and usefulness (Eining and Ackman, 1997). The project is aimed at the extraction of the oil from samples, while keeping other parameters (e.g. particle sizes, temperature etc.) constant. It also refines the extracted oil and carries out analytical test of the crude oil to ascertain some of its physical and chemical properties. These include the moisture content, iodine value, acid value, peroxide value(Ackman *et al*., 1998).

Omega-3 fatty acids can be divided into three main categories-EPA, DHA and Alpha-Linolenic Acids; out of which EPA and DHA have the most beneficial effects. EPA and DHA are found mainly in fish oils while Alpha-Linolenic is usually derived from plant sources (Gopakumar, 1996). However, there is an increase of awareness in the role of omega-3 fatty acids. Omega-3 fatty acids aids in the prevention and management of heart diseases. This can help in reducing one's risk of developing an abnormal heartbeat that can lead to heart problems and even sudden death. Omega-3 prevents asthma, hypertension, diabetes, cancer, and kidney dialysis and tends to inhibit the development or metabolism of these diseases in the body (Saglik and Imre, 2001).

Production of Fish Oil: The production of the fish oil deals with the separation of fatty substances (lipids) from other constituents of the fish. Generally, separation starts from the preparation of the raw material up to the purification of the product, which is the final stage of the process (Gopakumar *et al*., 1996). One of the methods

used industrially in obtaining fish oil is the batch hydraulic pressing, a process whereby the oil is obtained or expressed by hydraulic pressing from a mass of moderately cooked oil bearing fish samples. A recent development is in the extraction of oil from oil – bearing material using solvent. Solvent extraction, which is also referred to as leaching is a process whereby a soluble constituents present either as a solid or liquid is removed from a solid or from a liquid by the use of solvents (Richardson and Harker, 1999). In fact solvent extraction techniques are one of the most commonly used methods of isolating lipids from food samples (e.g. fish) and of determining the total lipid content of foods. The principle is based on the fact that lipids are soluble in organic solvents, but insoluble in water hence providing a convenient method of separating the lipids components in the food samples from water-soluble components such as protein, carbohydrates and minerals (McClements, 2003). For a successful extraction of oil the sample need to undergo specific preparations prior to solvent extraction (McClements, 2003; Richardson *et al*., 1999). In practice, the efficiency of solvent extraction depends on the polarity of the lipids present compared to the polarity of the solvent. Polar lipids (such as glycolipids or phospholipids) are more soluble in polar solvents (such as alcohols), than in non- polar solvents (such as hexane). On the other hand non – polar lipids (such as triacylglycerols) are more soluble in non-polar lipid than in polar ones. Soxhlet extraction is one of the most commonly used methods for determination of total lipids in dried samples. This is mainly because, it is fairly simple to use and is the officially recognized method for a wide range of fat content determinations. The main disadvantages of the technique are that: a relatively dry sample is needed (to allow the solvent to penetrate), it is destructive and it is time-consuming (McClements, 2003).

MATERIALS AND METHODS

This work has been done in the laboratory of Department of Food Science and Technology, Ramin Agricultural University at 2007. In this study, the experiments were performed on fresh fishes samples such as *Cyprinodon aphanius dispar, Hilsa macrura ilisha, Katus wonus pelamis, Cybium scomberomorus guttatum, Cyprinodon aphanius dispar* and *Pseudosciaena Johninus*. These fishes species were caught freshly from Persian Gulf in south Iran. The samples were stored in freezer until performing the trials. At the beginning, frozen fishes after thawing , were cut and were heated and cooked in boiling water up to 30 minutes (Gopakumar and Nair, 1996).

After cooking and cooling, fishes oils was removed and poured in jars and after few minutes, oils and impure materials were formed two separate phase. In the next stage, oils phase was transferred to another jar and stored in refrigerator until performing the qualitative experiments(Jauregui and Regenstein, 1991).

In this research, qualitative and quantitative properties of fishes samples were evaluated.

Qualitative parameters include peroxide, iodine, acidic indexes were measured according to AOAC methods. For quantitative evaluation of fishes oils, parameters such as percentage of lipid , moisture were measured. Percentage of moisture and total dry solid were measured with Oven. Fishes oils yield was measured according to standard method (Gopakumar and Nair, 1996).

Statistical Analysis: Statistical method applied in this survey was means comparison and variance analysis in order to SPSS method .

RESULTS AND DISCUSSION

Results has been shown in Table 1 and 2. Evaluation of fishes oils quality, showed *Katus wonus pelamis, Pseudosciaena Johninus aneus* and *CyprinodonAphanius dispar* oils had high quality respectively.

Comparison of fishes oils showed *Cyprinodon aphanius dispar* oil had highest yield (24%) and *Katus wonus pelamis* oil had lowest yield (3.95%).

Comparison of Fishes oils peroxide values, showed *Pseudosciaena Johninus aneus* and *Cybium Scomberomorus guttatum* oils had highest and lowest of peroxide values.

The iodine value directly depends on to number of double bonds unsaturated fatty acids of fishes oils. *Katus wonus pelamis* and *Cyprinodon aphanius dispar* oils had highest and lowest iodine values respectively.

It is observed unsaturated fatty acids with several double bonds and omega-3 and omega-6 fatty acids in *Katus wonus pelamis* oil prevent from heart and brain diseases and Atherosclerosis. we can conclude that *Pseudosciaena Johninus aneus* oil has highest chemical spoilage, so that it may be increase with increasing of concentration of oxygen, metal ions, light intensity and temperature (Firestone, 1989).

Comparison of the acidic values of oils showed that *Katus wonus pelamis* and *Chirocenterous Dorab* oils have highest and lowest of acidic values respectively.

we can suggest that *Chirocenterous dorab*, *Hilsa macrura ilisha*, *Cybium guttatum* and *Cybium scomberomorus guttatum* were satisfactory for extraction of oil because they had good quality values.

Other Researchers showed extraction of oil from the Scombroid and clupeids fishes gave an appreciably yield of 7.31%, 11.635%, at varied extraction time of between 1 to 7 hrs, while the corresponding percentage moisture content removed was 17.18%, 26.00%, at varied evaporation time of between 1-6 hrs, but oil yield of some our samples was more.

Table 1: Average of peroxide, acidic and iodine indexes obtained from Fishes oils

Samples	Peroxide index meqO2 / 1000gr	Acidic index mg KOH / gr	Iodine index gr I / 100 gr
Cyprinodon Aphanius dispar	3.48±12.73 [d]	4.12±92.53 [bc]	94.5±43.29[d]
Chirocenterous Dorab	12.18±12.73[c]	1.21±92.53[d]	141.3±43.29 [b]
Cybium Scomberomorus guttatum	3.26±12.73[d]	3.21±92.53[c]	119.23±43.29[c]
Cyb*ium guttatum*	12.24±12.73[c]	4.28±92.53[bc]	136±43.29 [b]
Hilsa Macrura ilisha	26.1±12.73[b]	6.72±92.53[b]	38.42±43.29 [e]
Pseudosciaena Johninus aneus	38.1±12.73[a]	163.39±92.53[a]	N.D
Katus wonus pelamis	N.D	9.39+92.53[a]	177.08±43.29 [a]

Data expressed as mean values of three independent experiments.
Same letters means that results have not significantly differences.
N.D.: not detected.

Table 2: Percentage of Moisture, Dry Solid and yield of Fishes Oils

Samples	Moisture	Dry solid	Oil
Cybium Scomberomorus Guttatum	66.69	33.31	9.5
Cybium guttatum	72.91	27.09	8.2
Cyprinodon Aphanius dispar	63.09	36.91	24
Chirocenterous Dorab,	66.19	33.81	12.49
Hilsa Macrura Ilisha	55.95	44.65	13.27
Katus wonus Pelamis	60.44	39.56	3.95
Pseudosciaena Johninus aneus	68.15	31.61	5.82

Data expressed as mean values of three independent experiments.

However, the linear relationships between the two values is being supported by the fact that an increase in the lipid content of fish is usually accompanied by a decrease in the moisture content in almost linear proportion or vice versa (Ihekoronye and Ngoddy, 1985).

This considerable high lipid content could be attributed to the season (summer) in which the experiment was conducted and the fish specie, since a higher lipid content is obtainable in mackerel silage in summer than in spring (Ihekoronye and Ngoddy, 1985) in another research, The oil was analyzed by carrying out some physical and chemical tests on it. It was observed that though most of the results obtained were tolerable to the standard values, nevertheless some were outside the normal range. The most of the standard For Peer Review values from the literatures are dependent on geographical locations, seasons and purpose to which the oil will be used for (Ihekoronye and Ngoddy, 1985). In another research, The acid value of the oil was found to be 2.50 mg/KOH, which is within the standard value of less than 5 mg/KOH for fish oil, and our research, four samples contain less than 5 mg/KOH. In another research, The peroxide value was found to be 2.18 meq/kg against the standard value of less than 10 meq/ kg, but our research, two samples peroxide values was less than 10 meq/kg. The appreciably lower value in peroxide value could be attributed to the fact that the oil was left for very few hours prior to the analysis of the oil, which supported the fact that the lesser the period of the oil exposure to the atmosphere, the lesser the rate of the oxidation of the oil and consequently the lesser the peroxide value of the oil. in another research, The iodine value was found to be 108.09 I2/100 g of the sample as against the standard value of between 135 to 190 I2 /100 g of the sample, but our research, the iodine values was less than 190 I2 /100 g (Ihekoronye and Ngoddy, 1985).

CONCLUSION

Studies on fishes oils relative to the omega-3 fatty acids and various parts of the world. As expected, they show enormous variation in the content of both omega-3 fatty acids and antioxidants. In developing new sources of sea foods, the study of the dietary composition of fishes is essential. omega-3 fatty acids in fishes oils and antioxidants, both of which reduce the risk of chronic diseases.

ACKNOWLEDGMENT

This work was funded by Shehid Chamran University, Linkage research grant.

REFERENCES

Ackman, R.G., S.M. Barlow and M.E. Stansby, 1998. Fatty acid composition of fish oils, Nutritional evaluation of long-chain fatty acids in fish oil. Academic Press, pp: 25-80.

Eining, R.G. and R.G. Ackman, 1997. Omega-3-PUFA in marine oil products. J. Am. Oil Chem., 64: 499.

Firestone, D., 1989. Official Methods and Recommended Practices of the AOCS, American Oil Chemist Society. Champaign.

Gopakumar, K. and M. Nair, 1996. Fatty acid composition of eight species of Indian marine fish. J. Sci. Food Agric., 23: 493.

Hall, G.M., 1992. Fish Process Technology. Food Engineering and Biotechnology Group University of Technology, Loughboroug, 4-7: 172-181.

Ihekoronye, A. and P. Ngoddy, 1985. Integrated food Science and Technology in the Tropics, MacMillan Education Limited, pp: 338-339.

Jauregui, C. and J.A. Regenstein, 1991. simple centrifugal method for measuring expressible moisture, A water binding property of muscle foods. J. Food Sci., 46(4): 1271-1271.

McClements, D.J., 2003. Analysis of Food Products, University of Massachusetts, Lecture Note Food Sci., 581: 50.

Richardson, J.F. and J.H. Harker, 1999. Chemical Engineering. Elsevier, Butterworth-Heinemann, 2: 375-379.

Saglik, S. and S. Imre, 2001. Omega -3-fatty acids in some fish species from turkey. J. Food Sci., 66(2).