Identification and Quantification of Some Iranian Fishes Oils Properties

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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 Reviewquality 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 22 g kg^{-1}) and *Katus wonus pelamis* oil had lowest yield (3.95 g kg^{-1}). Comparison of peroxide indexes in Fishes oils, showed *Pseudosciaena Johninus aneus* and *Cybium Scomberomorus guttatum* oils had highest and lowest of peroxide indexes 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 *Cybiu Scomberomorus guttatum* oils have highest and lowest of yield respectively. Thus, it is observed that fishes such as *Cyprinodon Aphanius dispar, Pseudosciaena Johninus aneus, Katus wonus pelamis and Chirocenterous Dorab,* were suitable for extraction of oil in industrial scale from point of view of commercially and nutritional.

Key words: Fishes oils · Extraction · Indexes of acidic · Peroxide · Iodine

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. Fish oil is considered as liquid oil, but, in fact contains triglycerides of intermediate melting point for the oils to be partially solid at 20°C. Fish oils are unique in the variety of fatty acids of which they composed and their degree of un-saturation [1,2]. 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 47 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. 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 [3].

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 [4]. However, there is an increase of awareness in the role of

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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 [5].

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 [4]. One of the methods used industrially in obtaining fish oil is the batch 74 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 I 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 [6]. 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. For a successful extraction of oil the sample need to undergo specific preparations prior to solvent extraction [5,6].

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 non90 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 [6].

MATERIALS AND METHODS

This research has been done in the laboratory of Department of Food Science and Technology, Ramin Agricultural University. 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 [7].

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 [8].

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 [8]. 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. Percentage of lipid of fishes oils was calculated according to standard method [8].

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

RESULTS

Results has been shown in Tables 1 and 2. Totally, evaluation of fishes oils quality 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 (g kg^{-1}) and *Katus wonus pelamis* oil had lowest yield (3.95 g kg^{-1}). Comparison of Fishes oils peroxide indexes, showed *Pseudosciaena Johninus aneus* and *Cybium Scomberomorus guttatum* oils had highest and lowest of peroxide indexes.

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

Samples	Peroxide index (meq 1000 gr^{-1} O2)	Acidic index (mg gr^{-1} KOH)	Iodine index (gr 100 gr^{-1} I)
Cyprinodon	3.48 +12.73d	4.12+92.53bc	94.5+43.29d
Aphanius dispar Chirocenterous	12.18 +12.73c	1.21+92.53d	141.3+43.29b
Dorab Cybium	3.26 +12.73d	3.21+92.53c	119.23 +43.29c
Scomberomorus guttatum Cybium guttatum	12.24+12.73c	4.28+92.53bc	136+43.29b
Hilsa Macrura ilisha	26.1+12.73b	6.72 +92.53b	38.42+43.29e
Pseudosciaena	38.1+12.73a	163.39 +92.53a	N.D
Johninus aneus Katus wonus pelamis	N.D	9.39+92.53a	177.08+43.29a

Same letters means that results have not significantly differences

N.D.: Not detected

Data expressed as mean values of three independent experiments

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

Samples	Moisture (g kg^{-1})	Dry solid (g kg^{-1})	Oil (g kg^{-1})
Cybium	66.69	33.31	9.50
Scomberomorus Guttatum Cybium guttatum	72.91	27.09	8.20
Cyprinodon	63.09	36.91	24.00
Aphanius dispar Chirocenterous	66.19	33.81	12.49
Dorab, Hilsa Macrura	55.95	44.65	13.27
Ilisha Katus wonus	60.44	39.56	3.95
Pelamis Pseudosciaena	68.15	31.61	5.82

Data expressed as mean values of three independent experiments

DISCUSSION

The iodine index directly depends on to number of double bonds in unsaturated fatty acids in fishes oils. *Katus wonus pelamis* and *Cyprinodon Aphanius dispar* oils had highest and lowest iodine indexes respectively.

Therefore it is observed that unsaturated fatty acids with For Peer Reviewseveral 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 [8]. Comparison of the acidic indexes of oils showed that *Katus wonus pelamis* an *Chirocenterous Dorab* oils have highest and lowest of acidic indexes respectively. Totally, we can suggest that Fishes of *Chirocenterous Dorab, Hilsa Macrura ilisha Cybium guttatum, Cybium Scomberomorus guttatum* were satisfactory for extraction of oil because they have good quality indexes.

Other Researchers showed extraction of oil from the Scombroid and clupeids fishes gave an appreciably yield of 7.31 g kg^{-1}, 11.635 g kg^{-1}, at varied extraction time of between 1 to 7 hrs while the corresponding percentage moisture content removed was 17.18 g kg^{-1}, 26.00 g kg^{-1}, at varied evaporation time of between 1-6 hrs, but oil yield of some our samples was more. 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 [9]. 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 [10].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. 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 I2/100g of the sample as against the standard value of between 135 to 190 I2 /100g of the sample, but our research, the iodine values was less than 190 I2 /100g. It is observed that there is not any relationships between nutrition of fishes and product quality. Oil quality of the fishes depends on fishes species.

Concluding Remarks: 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.

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