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Proximate composition of less known some processed and fresh fish species for determination of the nutritive values in Iran

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The objectives of the study were comparison of the proximate composition and energy of five fishes species obtained from Iranian Persian Gulf. Proximate composition was carried out accordance AOAC method. The crude protein (24-22%), lipid (14-16%), and ash (3.27-2%) contents of fresh *Euthynnus affinis* and *Orcynopsis unicolor* were observed. Lipid content of fresh *O. unicolor* was found to be significantly ($P<0.05$) higher than in *E. affinis*. A expected, energy content depended on the fat content of the fish and hence, canned *O. unicolor* fish after 6 months of storage which had high fat content exhibited the highest energy values (376.58kcal kg^{-1}), while one monthly canned *E. affinis* had lower fat content (15.2 g kg^{-1}) exhibited lower energy values(276.4 kcal kg^{-1}). Both of these species are good sources of EPA and DHA. Therefore, it was concluded that freshwater mussels, *E. affinis* and *O. unicolor* are suitable as healthy food choice. *E. affinis* nutritional value after four months of storage with energy value (293.4 kcal kg^{-1}) and *Orcynopsis unicolor* nutritional value after six months of storage with energy value (376.58 kcal kg^{-1}) were highest value.

Key words: Processed and Fresh fishes, Proximate composition, Nutritional values

Introduction

The beneficial effects on health by including fish in a diet are well known and have been documented in several studies. Fish is a good source of many important nutrients such as protein, vitamins and minerals. Fish is associated with improved cardiovascular health and other related health conditions (Damsgaard *et al*. 2006; Mayer *et al*. 2006; Dahl *et al*. 2006; Mozaffarian *et al*. 2006). Fish constitutes a very important component of the diet for many people and often provides the much needed nutrient that is not provided in cereal based diets (Clucas and Sutchitte, 1981). It was reported by Olomu (1995) that fish is rich in protein with amino acid composition which very well suited to human dietary requirements comparing favourably with egg, milk and meat in the

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nutritional value of its protein. Body composition is a good indicator of the physiological condition of a fish but it is relatively time consuming to measure. Proximate body composition is the analysis of water, fat, protein and ash contents of fish. Carbohydrates and non-protein compounds are presented in negligible amount and are usually ignored for routine analysis (Cui and Wootton, 1988). The percentage of water is good indicator of its relative contents of energy, proteins and lipids. The lower ~~the~~ percentage of water would be greater the lipids and protein contents and higher the energy density of the fish (Dempson *et al*. 2004). However, these values vary considerably within and between species, size, sexual condition, feeding season and physical activity. Protein content, which is important component, tends to vary little in healthy fish (Weatherly and Gills, 1987). There is a wealth of literature available on body composition of various fish species (Berg, Thronaes, & Bremset (2000); Dempson, Schwarz, Shears & Furey, 2004). The present study was aimed at nutritional values of various fish species using analysis of body composition. The collection of fish species was carried out in Dilam Bandar City in southern Iran, during 2011. Analysis of body composition was done at Chemistry Lab of Behbahan Khatemolanbia Technology University, Iran.

Materials and methods

Samples preparation

All fishes were purchased from the local market in the Dilam city, the capital of Iran. Five species fishes were included in this study. *Euthynnus affinis* and *Orcynopsis unicolor* belong to the family Scombridae. It is a maximum size 100 cm TL with a maximum weight of 7,200 g. *O. unicolor* is a maximum length 130 cm TL with a maximum weight 13.1 kg. Both fishes are excellent food-fish marketed in fresh and cans.

Proximate analysis

The present study was carried out on five fish species cultured in Dilam Bandar City in southern Iran, during 2011. Using heavy anesthetic MS222, these fish were killed, blotted dry and weighed. Water content was determined by placing the whole fish in a pre-weighed aluminum foil tray for drying in an electric oven at 65-80^{o}C till constant weight. Proximate composition analyzes of the samples were done in triplicate for protein, moisture, lipid and ash contents. The crude protein was determined by the Kjeldahl procedure (AOAC, 1990). Ash content was estimated by burning 500 mg of sample in a pre-

weighed heat resistant China clay crucible placed in a Muffle furnace for 7 hours at 500^{o}C and reweighed after cooling. Lipid content was estimated by dry extraction following the method of Bligh and Dyer (1959); Salam and Davies (1994). Powdered dry tissue (3 mg.) was mixed into 10 mL solution of chloroform and methanol (in the ratio 1:2), and stirred with a glass rod. The resultant mixture was left over night and then centrifuged. After centrifugation, the clear supernatant was removed carefully into washed, dried and pre-weighed small bottles. These bottles were then put in an oven at 40 to 50^{o}C to evaporate the solvent leaving the lipid fraction. Carbohydrate was calculated using the standard equation 100%- (%protein+%fat+%ash+%moisture) and the energy evaluation was done by multiplying the protein, carbohydrate and fat with the factors 4, 4 and 9, respectively.

Statistically analysis

Analysis of variance was used to evaluate the analysis data and significant differences among means were determined by independent samples-T Test (P=0.05). Statistical calculation was performed with SPSS 15.0 for windows.

Results and discussions

Proximate content

The proximate composition of fresh and canned fishes consumed in Iran are presented in Tables 1, 2 and 3. As the water content in fish increased the fat content decreased and hence, *Orcynopsis unicolor* was high in moisture contents in canned fish after 2,4 and 6 months from production (50.8 g kg^{-1}, 49.6 g kg^{-1}and 40.3 g kg^{-1}respectively) (Table 2) and low in their fat content (17.6 g kg^{-1}, 18.4 g kg^{-1} and 28.3 g kg^{-1}respectively). As commonly observed in the fish, protein levels were quite high in most species; the highest was in canned *Euthynnus affinis* (24.5 g kg^{-1}) (Table 3) after two months of storage. The canned *Euthynnus affinis* fish contain carbohydrate content after 1, 2 and 4 months from production (9.35 g kg^{-1}, 2.56 g kg^{-1}and 1.3 g kg^{-1}respectively). Maximum ash content was in fresh *Euthynnus affinis* fish (3.27g kg^{-1}) (Table 1). An expectation, energy content depended on the fat content of the fish and hence, canned *Orcynopsis unicolor* fish after 6 months of storage which had high fat content exhibited the highest energy values (376.58kcal kg^{-1}), while one monthly canned *Euthynnus affinis* had lower fat content (15.2 g kg^{-1}) exhibited lower energy values(276.4 kcal kg^{-1}) (Table 3).

Fishes in this study were high in protein and contained considerable levels of fat. This aspect is of dietary advantage to the consumer since it is a known the fact that protein is essential for maintaining and building muscle (Bonjour, 2005). The higher fat content in some species of fish is of nutritional value as that support protective effect against coronary heart disease for fish consumption and intake of marine omega-3 fatty acids (Alonso, Martinez-Gonzalez and Serrano-Martinez (2003). Recent studies suggest that eating fish oil daily reduces the risk of heart disease death. The most efficient way to add these important oils to your diet is to eat two meals per week of fish rich in this fatty acid prepared without additional oil. The British Nutrition Foundation has recommended that for a balanced and healthy diet, we should all consume 0.2 g of EPA+DHA daily or 1.5 g on a weekly basis. In the light of these findings, it may be concluded that these freshwater mussel species are suitable items in the human diet. Comparison of proximate composition between fresh and canned fishes showed fat content has been increased and amounts of protein, ash and carbohydrate has been decreased and overally energy value would be increased after three months of storage. Fat and moisture content for anyone species fluctuates depending on season and location of catch, size, spawning cycles, etc., and variability can be expected in the data. Moisture content may also fluctuate on canned samples depending on drip loss during storage, thus affecting the drip loss and subsequent moisture determination. This loss in moisture content is reflected as a gain in the other constituents of the proximate composition.

Table 1. Proximate analysis of some fresh fishes

Fish species	Fat (%)	Protein (%)	Ash (%)
Orcynopsis unicolor	16 $\pm$0.17^{a}	22 $\pm$0.28^{c}	2 $\pm$0.06 ^{e}
Euthynnus affinis	14$\pm$0.14 ^{b}	24 $\pm$0.19 ^{df}	3.27$\pm$0.09
Sparidae	0.24	13.02	0.71
Lizadussmieri	0.25	10.13	1.36
Sciaenide	0.22	12.84	0.97

Results are means ± standard deviation of triplicates.
Means within the same column that have no common letters are significantly different (P<0.05).

Table 2. Proximate and physicochemical analysis of canned *Orcynopsis unicolor* fish after different months of storage

Storage time value (Months)	Fat (%)	Protein (%)	Ash (%)	Moisture (%)	pH	Carbohydrate (%)	Energy Kcal/100g
Two	17.6	22.8	1.8	50.8	5.5	7	277.6
Four	18.4	19.8	3	49.6	5.5	9.2	281.6
Six	28.3	21	0.93	40.3	5.5	9.47	376.58

Results are means ± standard deviation of triplicates.

Table 3. Proximate and physicochemical analysis of canned *Euthynnus affinis* fish after different months of storage

Storage time (Months)	Fat (%)	Protein (%)	Ash (%)	Moisture (%)	pH	Carbohydrate (%)	Energy value Kcal/100g
One	15.2	23.3	1.65	50.8	5.5	9.35	276.4
Two	18.4	24.5	2.04	52.5	5.5	2.56	273.84
Four	21.4	23.9	2.40	51	5.5	1.3	293.4

Results are means ± standard deviation of triplicates.

Conclusion

This study showed that there was difference between fresh and canned fishes from nutritional values. There was however, reduction in the protein after 3 month of storage indicating that the nutritional level of food particular fish are better consumed fresh. In the light of these findings, it may be concluded that these fishes mussel are suitable items in the human diet. Therefore, it was concluded that *Euthynnus affinis* nutritional value after four months of storage with energy value (293.4 kcal kg^{-1}) and *Orcynopsis unicolor* nutritional value after six months of storage with energy value(376.58 kcal kg^{-1}) were highest.

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