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Nutritive profile of seafoods of different regions of Iran

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Abstract Processed seafoods (canned mackerel tuna, frozen Sea-Bream and Pressed caviar) were analyzed. Canned mackerel tuna, frozen sea bream and pressed caviar also contained higher amounts of fat, carbohydrate and energy respectively ($p<0.05$) than raw material. Except canning with water, all processing technologies decreased the moisture content but increased energy values ($p<0.05$) of the fish. It is concluded that processed seafoods are rich in chemical components and very nutritive, but they are generally not suitable for low-calorie diets due to the high amounts of fat and energy value. Canned tuna with salted water may be advised for low-calorie diets.

Key words: Chemical composition, Seafood processing, Canning, Freezing, Pressing.

Introduction

In 2002, the United States per capita consumption of canned fishery products was 2.2 kg/y (NMFS, 2002), with canned tuna (1.4 kg/ y) being the 2nd most popular seafood (NFI, 2001). Fish is a good source of dietary protein, vitamin D, and minerals (Saglik and Imre, 2001; Kris-Etherton *et al*., 2002). Fish consumption has been associated with improved pregnancy outcomes, as well as enhanced fetal growth rate (Burdge *et al.,* 1997; Olsen and Secher, 2002; Horrocks and Yeo, 1999; Allen and Harris, 2001; Rogers *et al.,* 2004). The fetus and the nursing infant obtain longchain omega-3 fatty acids from their mothers through placental exchange or breast milk (Helland *et al*., 2001), and these fats are important for brain and retinal development (Helland *et al.,* 2001). Frozen storage is the only large scale preservation method that facilitates exports and minimizes variations in supply of raw fish (Persson and Londahl, 1993). Frozen storage is, therefore, an important method for processing of fish. However, when seafoods are frozen and stored in frozen state they inevitably

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lose quality (Mackie *et al.*, 2007). Loss in quality of frozen stored fish is mainly due to changes in muscle integrity, proteins and lipids (Shenouda, 1980).

Seafoods are very important for a healthy diet and it is popular to consume these foods as raw, frozen, canned, smoked, marinated, salted, and dried all over the world. Processing presents consumer different tastes, and minimizes the waste of seafoods. It is also very important to increase shelf life of such a perishable food since it leads to decrease economic losses. Therefore; a great demand occurred to the seafood processing technology (Ünlüsayın, 1999). Seafoods represent an excellent option as a major source of nutrients and nutritional factors affecting health, quality of life, general well-being and longevity. It is known that 98% of total mass of seafood flesh consist of water, protein and fat. However ratios of these components change due to the species of fish, and processing technology (Sikorski *et al.*, 1990). Changes of nutrient components in foods occurred due to the processing must be known since they are important for human health (Birkelan *et al.*, 2004). Aim of this study was comparison of proximate analysis of some fresh and processed sea foods.

Materials and methods

Raw materials and canned, frozen and pressed samples obtained from 3 different regions in Iran, were subjected to analysis. The results were presented as mean values. With the exception of canned products; samples were transported to the laboratory in ice-boxes. One type of canned tuna (canned with vegetable oil), and other samples selected for study are popular in the market. Therefore, all of the products were analyzed. Moisture content was determined by drying sample at 105℃ (Nuve FN500, Italy) to constant weight. The difference of weight before and after drying was multiplied with 100 and divided to the initial weight of the sample (AOAC, 1998a). For the estimation of crude protein, Velp UDK 140 distillation unit and DK6 Heating digester (Velp Scientifica, Italy) were used according to Kjeldahl method. Sample was heated with H2SO4 and a catalyst, and then treated with NaOH and boric acid.

The amount of nitrogen was estimated after the titration with HCl. It was multiplied with coefficient 6.25 (AOAC, 1998b). Fat was measured using Soxhelet system (AOAC, 1998c). Crude ash was determined by burning samples at 550℃ (Nuve MF100, Iran) (AOAC, 1998d). All analyses were performed in five repetitions. Carbohydrate proportion was calculated mathematically (% carbohydrate =100–the total of other components) and energy value was calculated according to the method of Merrill and Watt (1973). Data from the different measurements were subjected to t test and statistical differences were determined by the method of Renner (1970). The significance level was chosen as 0.05.

Statistical Analysis

Experiments were performed in triplicate and results were expressed as mean ± SD and were analyzed by SPSS statistical programme.

Results and discussions

Canned tuna, pressed caviar and frozen sea bream were analyzed before and after processing to determine the effect of processing on the nutrient composition. Canned tuna fish are frequently and largely produced and consumed in Iran and also exported. The results of the samples obtained from different firms were presented in Table 1 as mean values. Moisture, protein and fat values of tuna fish were estimated to be 51%, 23.9%, 21.4%, respectively. Sikorski *et al.* presented the main components of *Thunnus thynnus* as 67.7-72.6% moisture, 23.3-27.5% protein, and 1.2-8.0 % fat. similarly Souci *et al*. reported that the moisture, protein, fat and ash contents of tuna fish after heat-sterilization process as 52.5%, 23.8%, 20.9%, and 2.30%, respectively. These results are similar to our results (Table1). Moisture content of the canned tuna with vegetable oil (CVO) was ($p<0.05$) similar to the raw material. Energy and fat values of canned tuna with vegetable oil (CVO) were significantly lower ($p<0.05$) than the raw materials. It is known that, heat-sterilization process affects the food components (Naczk and Artyukhova, 1990), and fat content is different before and after canning procedure (Ackman and McLeod, 1988).

Freezed sea bream are the other popular processed seafoods. Carbohydrate and energy values of sea bream increased significantly ($p<0.05$) after the freezing process. Conversely, moisture content decreased ($p<0.05$) as it expected. The moisture, protein and fat amounts of raw caviar samples were determined as 46%, 26.9%, and 15%, respectively.

In this study moisture content of pressed caviar was 36%, protein content was 34.4%; fat content was 16.7 %,carbohydrate and energy values were 4.9 % and 316 Kcal/100g, respectively, showing that moisture content decreased while the other components and energy value increased ($p<0.05$) after caviar pressing and packaging.

The discrepancy in the lipid content of fresh gilthead seabream fillets between the study by Kyrana *et al.* (1997) and the present one may be related to the differences in samples that were analyzed, that is, white muscle in the present study as opposed to whole muscle in their study. It is known that the white muscle of fish contains less lipids than the red muscle (Shewfelt, 1981).

Table 1. Nutrient composition of sea foods before and after processing.

	Moisture (%)	Protein (%)	Crude Fat (%)	Ash (%)	Carbohydrate (%)	Energy (Kcal/100g)
Tuna Raw	51±2.1	22+1.6	23.3±1.4	3.27±1.2	0.43±0.4	299.42±3.4
Tuna CVO	51±2.3	23.9±1.8	21.4 ±2.0	2.4 ±2.4	1.3 ±0.2	293.4±3.8
Sea Bream Raw	80±1.3	13.02±2.28	0.24±0.03	0.77 ±0.05	5.97±1.8	78.12 ±4.8
Sea Bream Freezed	77.30±1.8	12.74±4.3	0.23 ±0.04	0.81±0.80	8.92±3.03	88.44 ±3.8
Caviar Raw	46+2.11	26.9±1.93	15+3.93	8.8±2.23	3.3+1.2	262±8.33
Caviar pressed	36±2.13	34.4±4.21	16.7±4.03	8 ±2.43	4.9 ±1.63	316 ±7.83

CVO= canned tuna with vegetable oil

Conclusion

Processed seafoods might be very nutritive, but not suitable for low-calorie diets due to the high amounts of fat and energy. Canned tuna with salted water may be advised for low-calorie diets. Caviar pressed was the best seafoods obtained in Iran and in this study, because it contains highest protein value. The reactions of water/oil with food items particularly at high temperature as obtained during processing have been shown to affect some nutrients in the food item as well as causing alteration of the structure of the oil and denaturing of the food nutrients hence the significant difference recorded in moisture content after the different processing method. Since fishes are consumed as a major protein source in food, it is very important that the protein content should not be compromised during table preparation. It is significant to note, therefore that all the tables processing methods reduced the crude protein contents but the reduction did not follow a particular order or fish type.

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