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Preliminarily Comparison of Nutritional Composition of Some Fresh and Processed Seafood

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Abstract: Processing made fish less susceptible to spoilage. Fish are rich in protein content but the protein content is reduced with processing gave a better result when long-time preservation was carried out. Aim of this study was comparison of proximate analysis of some fresh and processed seafoods. Raw materials and processed seafoods (canned mackerel tuna, frozen Sea-Bream and Pressed caviar) were obtained from different firms and analyzed. Analysis carried out according AOAC methods. Moisture, protein and fat values of tuna fish were estimated to be 51, 23.9 and 21.4%, respectively. In this study, moisture content of pressed caviar was 36%, protein content was 34.4% and fat content was 16.7%, carbohydrate and energy values were 4.9% and 316 kcal/100 g, respectively. Pressed and smoked seafoods contained lower amount of moisture but higher amounts of the other components than raw materials ($p<0.05$). 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. Canned tuna with salted water may be advised for low-calorie diets. Caviar pressed was one the best sea foods that was produced in Iran. 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.

Key words: Chemical composition, seafood processing, canning, freezing, pressing

INTRODUCTION

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. 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 (Birkeland *et al*., 2004). The aim of this study was to determine the effect of processing on the nutrient composition of seafoods. The most popular processed seafoods (canned tuna, pressed caviar and frozen sea bream,) were analyzed before and after processing. Aim of this study was comparison of proximate analysis of some fresh and processed seafoods.

MATERIALS AND METHODS

Samples preparation: Selected fishes obtained from Persian gulf and Caspian sea from southern and northern of Iran. Raw materials and canned, frozen and pressed samples obtained in southern Iran, were subjected to analysis. 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.

Techniques: All of the products were analyzed. Moisture content was determined by drying sample at 105°C (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 H_2SO_4 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°C (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. 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 DISCUSSION

Canned tuna, pressed caviar and frozen sea bream were analyzed before and after processing. 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 and 21.4%, respectively. Sikorski *et al.* (1990) 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 (Table 1). In this study, moisture content of pressed caviar was 36%, protein content was 34.4% (Fig. 1); fat content was 16.7%, carbohydrate and energy values were 4.9% and 316 kcal/100 g, respectively, showing that moisture content decreased while the other components and energy value increased ($p<0.05$) after caviar pressing and packaging. 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 (Fig. 2, 3). It is known that,

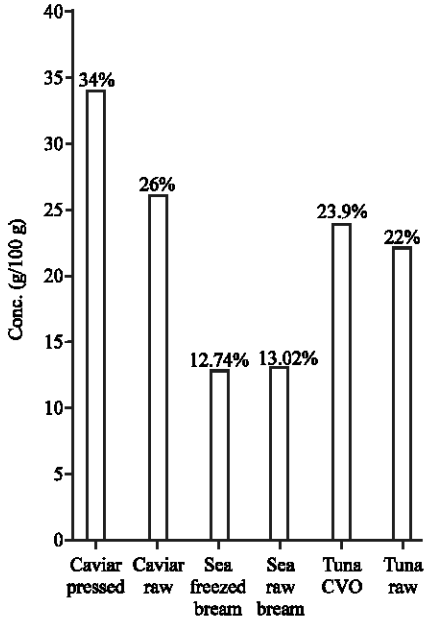

Fig. 1: Protein contents of some selected seafoods

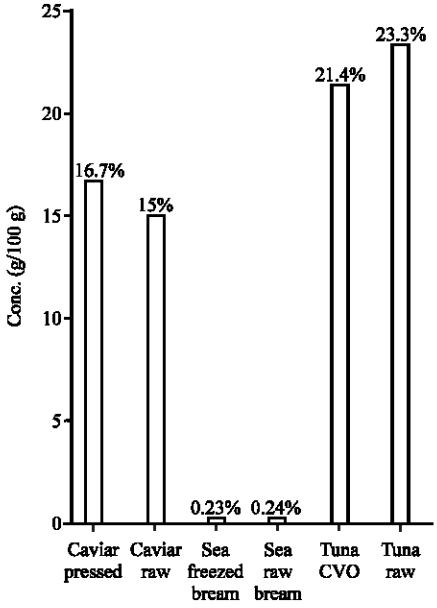

Fig. 2: Fat contents of some selected seafoods

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

Samples	Moisture (%)	Protein (%)	Crude fat (%)	Ash (%)	Carbohydrate (%)	Energy (kcal/100 g)
Tuna raw	51.0±2.10	22.00±1.60	23.30±1.40	3.27±1.20	0.43±0.40	299.42±3.4
Tuna CVO	51.0±2.30	23.90±1.80	21.40±2.00	2.40±2.40	1.30±0.20	93.40±23.8
Sea raw bream	80.0±1.30	13.02±2.28	0.24±0.03	0.77±0.05	5.97±1.80	78.12±4.8
Sea freezed bream	77.3±1.80	12.74±4.30	0.23±0.04	0.81±0.80	8.92±3.03	88.44±3.8
Caviar raw	46.0±2.11	26.90±1.93	15.00±3.93	8.80±2.23	3.30±1.20	262.00±8.33
Caviar pressed	36.0±2.13	34.40±4.21	16.70±4.03	8.00±2.43	4.90±1.63	316.00±7.83

CVO: Canned tuna with vegetable oil, Values are mean of three independent experiments

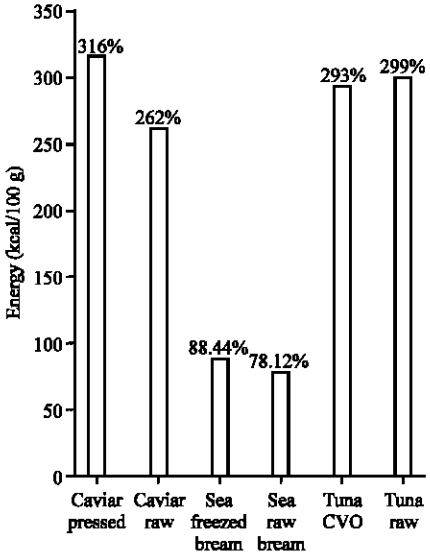

Fig. 3: Energitic values of some selected seafoods

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.

Protein and ash contents were highest in caviar. High ash content in caviar shows high minerals contents contain it, therefore, caviar contains high nutritive value in comparison others seafoods. Caviar is one of rare and nutritious seafoods in Iran.

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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