



Effect of Cooking on Quality Commonly Consumed Marine Fish *Platycephalidae (Platycephalus indicus)* in Iran

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ABSTRACT

Fish *Platycephalus indicus* usually are consumed by southern people in Iran. The present study assessed the effect of processing on proximate compositions in the fillets of *P.indicus*. The fish samples were prepared by boiling, baking and frying, while proximate analysis was done by standard methods. Boiling processing method significantly reduced ash content in the fillet whereas fat content was significantly increased in frying. Baking method recorded highest ash content of 10.64%. The highest protein concentration was obtained for boiled fillet (82.73%). Lipid content was recorded highest in fried fillet (17.27%). *P. indicus* was, rich in fat, protein, and ash, thus its consumption should be encouraged.

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Introduction

In general fish well known as an excellent source of high biological level protein in the human diet. Fish is widely consumed in many parts of the world by humans not only for its high quality protein content but also for the low saturated fat. It contains important n-3 polyunsaturated fatty acids that are likely to lower the risk of heart diseases in adults and are important for neuro-development in infants and young, and are known to support good health (Uauy et al. 2003).

Fish is always cooked in different methods before consumption. Cooking (boiling, baking, roasting, frying and grilling) improves hygienic quality of the fish by inactivation of pathogenic microorganisms and enhances digestibility of nutrients in the digestive tract. Frying is one of the oldest way of food preparation. It improves the sensory quality of food by formation of aroma compounds, attractive color and texture. Cooking can be both beneficial and detrimental to nutrient content of fish. During cooking, chemical and physical reactions take place which either improve or impair the fish nutritional value (e.g. digestibility is increased because of protein denaturation in fish) but the content of thermo labile compounds, fat-soluble vitamins or polyunsaturated fatty acids is often reduced (Bognár, 1998).

Since fish is not normally consumed raw, different processing methods are employed in preparing them for consumption and some of these processes, which could have varying effects on their nutrient contents, texture and flavor (Eriksson, 1987).

In Iran, species *P. indicus* usually processed by various cooking methods, before consumption. Heating process (boiling, baking and frying) is applied to enhance texture and taste of fishes and inactivate pathogenic microorganisms (Bognár, 1998). The use of the microwave oven grilling method of cooking has increased greatly during the recent decades (Garcia-Aria et al. 2003a). The different cooking methods invariably affect the nutritive value of fish and especially vitamins, flavor compounds and polyunsaturated fatty acids. The effects of various cooking methods on proximate composition of several fish species have been reported (Ersoy et al. 2006; Gokoglu et al. 2004; Kucukgulmez et al. 2006; Rosa et al. 2007; Stephen et al. 2010; Weber et al. 2008). Up to now there is no information available in the literature on the nutritive values of raw and cooked selected fish species. Hence the present study was aimed to investigate the effects of various cooking methods on the proximate and mineral composition of *P.indicus*. The possible effects of

various cooking methods on the nutritive value of this species were evaluated; the values obtained in the cooked samples were compared with the values found in raw fish.

Materials and Methods

Samples Preparation and Cooking

A eight of pieces fish species *Platycephalidae* (*P. indicus*), with a length (44.5–48.5 cm) and weight of (1kg) were obtained from the local fish market in Behbahan, Khuzestan, Iran. They were kept in a plastic container and transported to the laboratory. In the laboratory, the fish was washed with tap water three times to remove wastes. The fish was then placed in ice-cold water for six minutes prior to eviscerating and beheading. Two pieces fish used for each processing. Subsequently the fish samples were filleted and fillets were divided into four groups and each group consisted of four fillets. The first group was uncooked while the other three groups were cooked in the following methods; boiling, baking, and frying. Boiling was performed at 99–101°C for 12 min. Baking of fillets was performed in a conventional oven with the temperature set at 200°C for 20 min. The frying of fillets was performed in a domestic frying pan of 2 L capacity at temperature approximately of 180°C for 15 min. Sunflower oil was used for frying. The fresh and cooked fishes were ground in a kitchen blender to ensure homogeneity and representative samples taken for analysis. Samples were packed in a polythene bags and kept under frozen conditions (–20 °C) until analysis.

Proximate Analyses

The moisture, ash, crude fat, crude protein ($N \times 6.25$) and carbohydrate (by difference) were determined in accordance with AOAC methods (AOAC. 2000). All proximate analyses of the fish samples were carried out in triplicate.

Statistical Analysis

The effect of different cooking methods on the proximate composition of selected fish species was analyzed using one-way analysis of variance (ANOVA) and the significant differences between means were

determined by post hoc Duncan's multiple range test. Differences were considered to be significant when $P < 0.05$. Data were analyzed using SPSS package (Version 11).

Results

The proximate composition of raw fish and the fillets after various cooking methods of, *Platycephalidae* (*P. indicus*) are presented in Table 1. Comparison of processed fillets weight (g/100) after doing all processing methods with raw fish fillets are presented in Table 2.

Discussion

The proximate composition of raw fillets is similar to earlier reports in *Platycephalidae* fish (Zuraini et al. 2006). Proximate composition of protein, fat and ash of *P. indicus* was varied in all the cooking methods. Significantly higher protein content (82.73%) was recorded in boiled fillets followed by (70.96%) in frying than the rest of the cooking methods and raw fish fillets ($P < 0.05$). Significantly higher fat content (17.27%) was observed in fried fillets ($P < 0.05$). There was no significant difference observed in fat content among boiled, baked and fried fish fillets except raw fish fillet ($P > 0.05$). The increase in fat content of the fried fish fillets is related to oil absorption during the cooking process. Further the increase of fat content can be attributed to the oil penetration on the food after water is partially lost by evaporation (Saguy and Dana, 2003). Similar results were reported for sardine and African catfish fried in vegetable oil (Candela et al. 1996). Table 2 showed that loss of moisture in fried fish fillets was more than boiled and baked fish fillets respectively. Therefore, nutritive values of baked and boiled fish fillets can be higher than fried fish fillets, but obtained results in Table 1 showed that energetic value of boiled fish fillets (407.34±1.26 kcal/100g) was more than baked fish fillets (337.56±1.67kcal/100g), but highest value (445.43±1.89 kcal/100) found for fried fillets, because absorption of fat by fillet in frying process.

Table 1 Proximate (%) composition (in DM powder) of raw and cooked fillets samples of *P. indicus*

Items	Raw	Boiled	Baked	Fried
Protein	78.82±1.56 ^a	82.73±0.98 ^b	70.28±1.62 ^c	70.96±0.88 ^c
Lipid	9.74±0.66 ^a	7.74±0.71 ^a	5.52±0.22 ^a	17.27±0.31 ^b
Ash	9.59±0.34 ^a	7.84±0.21 ^b	10.64±0.56 ^a	10.11±0.22 ^a
Carbohydrate	1.85±0.01 ^a	1.69±0.23 ^a	1.45±0.11 ^a	1.54±0.23 ^a
Energetic value(Kcal/100g)	410.34±1.23 ^a	407.34±1.26 ^a	337.56±1.67 ^b	445.43±1.89 ^c

Values are shown as mean±standard deviation of triplicates. Values within the same row have different superscripts are significantly different ($P < 0.05$).

Table 2 Comparison of processed fillets weight (g/100) after doing all processing methods with raw fish fillets

Sample	Raw	Boiled	Baked	Fried
<i>Platycephalus indicus</i>	100	90.72	93.44	84.90

Values are shown as mean of triplicates

The increase in dry matter content was observed in boiled fillets. Increased ash content were found in all the cooked fillets except for the boiled fillet. Moisture loss was found in boiled fillets. However, dehydration rate was low during frying and baking. These changes were similar to those reported by Gokoglu et al. (2004) in rainbow trout and Garcia-Arias et al. (2003b) in sardines. Water losses, occurring during frying and baking resulted in higher protein content in fried and baked fish as compared to the raw fish fillets (Garcia-Arias, et al. 2003b). Accordingly, the increase in ash, protein and fat content found in cooked silver catfish fillets is explained by the reduction in moisture. Differences in water contents between fresh and smoked rainbow trout were found to be significant (Unlusayin, et al. 2001). This findings also supported by Gall et al.(1983), that deep fried fish fillet had significantly higher protein content than raw fillet.

Conclusion

It is concluded all the processing methods examined for preparation of fish for human consumption that frying is the best when preservation of the fish is of priority but when nutrient conservation and safety diet is the focus, boiling is a better option.

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