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The Effect of Different Cooking Methods on Nutrient Content of Selected Bangladeshi Fish

M. A. Rashid*, M. Saifullah, M. A. Habib, Md. Iqbal Hussain, M. A. Sattar

Department of Applied Chemistry and Chemical Technology, Islamic University, Kushtia, Bangladesh

Abstract: *Microwave cooking has gained considerable importance as an energy-saving, convenient and time-saving cooking method. This study was performed to compare the effects of microwave cooking and conventional cooking method on proximate nutrient and health promoting contents of fresh Bata Fish (Labeo bata) and Taki Fish (Channa Punetata) grown in Bangladesh. The moisture and ash content in raw Bata fish were 75.00% and 5.00%, respectively, for Taki fish they were 75.00% and 6.00%, respectively. After conventional cooking moisture and ash content were 80.00% and 4.00%, respectively, for Bata fish whereas 79% and 5.5%, respectively, for Taki fish. On the other hand, microwave cooking food showed the values were 76.00% and 6.00%, respectively, for Bata fish, whereas 76.00% and 5.5%, respectively, for Taki fish. The protein content in raw Bata fish was 13.50%, for Taki fish it was 15.30%. After conventional cooking protein content of Bata fish and Taki fish were 11.56% and 12.08%, respectively, whereas 13.50% and 15.16%, respectively, for microwave cooking. This study also showed fat and carbohydrate content were significantly changed by both cooking methods.*

Keywords: *Microwave cooking, Nutritional value, Fish, Labeo bata, Channa Punetata.*

1. INTRODUCTION

Fish has long been recognized as an excellent source of animal 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 [1]. In recent years, fish lipids have also assumed great nutritional significance, because of their high polyunsaturated fatty acid levels. Fishes are also considered very rich source of minerals and vitamins. The total content of minerals in the raw flesh of fish and invertebrates is in the range of 0.6–1.5% of wet weight. Mineral components such as sodium, potassium, magnesium, calcium, iron, phosphorus and iodine are important for human nutrition [2].

Bata fish is available throughout Bangladesh. Ponds, rivers, rivulets are its main habitats. Its food comprises crustaceans and insect larvae in early stages [3]. Its body is elongate. Its dorsal profile is more convex than the ventral. Snout slightly projecting beyond mouth, often studded with pores. A pair of small maxillary barbells is hidden inside the labial fold. No Cartilaginous support to lips. Dorsal originates midway between snout tip and anterior base of anal. Pelvics originate slightly nearer to snout tip than to caudal base [4]. Bluish or darkish on upper half, silvery below, opercle light orange. It is well known as a testy and good fish in the market. This is the most important and available fish of the landed fish from culture media such as ponds, beels etc. whereas it is listed as a threatened species by IUCN Bangladesh [5].

In Bangladesh Taki fish is also known as Lata, Chaitan and Sati fish. Its body color varies with its habitats, generally yellowish to brown on back and lighter below. A series of about 8-9 vertical bands above lateral line, alternating with a similar series below it [6]. In some specimens, numerous black spots on body, dorsal fin, anal fin and caudal fin. Dorsal, anal and caudal fins are dark gray [7]. It is found in ponds, ditches, beels and swamps of Bangladesh. It is also found in oxbow lakes and rivers [8].

The various cooking methods invariably affect the nutritive value of fish and especially vitamins, flavour compounds and polyunsaturated fatty acids. Early developments in the field of nutrition predicted that certain substances, important for the proper functioning of the human body, are lost

during cooking of foods. It is imperative to conserve nutrients of food products and also is a major consumer concern related to food preparation. Therefore, it is important to determine the retention of nutrients in fish cooked using several common domestic practices. In these studies, boiling and microwave cooking methods were used to investigate the effects of different cooking methods on the proximate nutrient content of different fishes of Bangladesh. The microwave cooking process presents controversial results in the literature due to the different conditions that are employed (time, power, and added water).

2. MATERIALS AND METHODS

2.1. Preparation of Sample

Fresh vegetables Bata Fish (*Labeo bata* L.) and Taki Fish (*Channa Punetata* L.) were collected from local market (Sheikh Para, Kushtia, Bangladesh). Samples were washed properly and cut into small pieces from the edible part of the green vegetables.

2.2. Conventional Cooking

Among various methods of conventional cooking, boiling method was applied in the study for the cooking of the selected sample. In this case, the sample to be cooked was just immersed in water at 100 °C and the water was maintained at that temperature till the sample was tendered.

2.3. Microwave Cooking

A weighed, chopped sample was placed in a 250-ml beaker. The sample in the microwave oven was cooked until it is tender (about 45 s in a 700W oven). Remove the sample from the oven and the nutrition values were estimated.

2.4. Determination of Moisture Content [9]

Moisture was determined by oven drying method. A clean crucible was dried to a constant weight in air oven at 110°C, cooled in a desiccator and weighed (W1). Two grams of finely ground sample was accurately weighed into the previously labeled crucible and reweighed (W2). The crucible containing the sample was dried in an oven to constant weight (W3). The percentage moisture content was calculated as follows:

$$\text{Moisture content (\%)} = \frac{(W2 - W3) \times 100}{W2 - W1}$$

2.5. Determination of Ash Content [9]

For the determination of ash, a clean porcelain crucible was dried in an oven at 100°C for 10 min, cooled in a desiccator and weighed (W1). Two grams of the finely ground sample was placed into a previously weighed porcelain crucible and reweighed (W2), it was first ignited and then transferred into a furnace which was set at 550°C. The sample was left in the furnace for eight hours to ensure proper ashing. The crucible containing the ash was then removed; cooled in a desiccator and weighed (W3). The percentage ash content was calculated as follows:

$$\text{Ash content (\%)} = \frac{(W3 - W1) \times 100}{W2 - W1}$$

2.6. Determination of Crude Protein Content

Protein in the sample was determined by Kjeldahl method [10]. 2 g of dried samples was taken in digestion flask. Add 10-15 ml of concentrated H_2SO_4 and 8 g of digestion mixture i.e. K_2SO_4:$CuSO_4$ (8:1). The flask was swirled in order to mix the contents thoroughly then placed on heater to start digestion till the mixture become clear (blue green in color). It needs 2 hrs to complete. The digest was cooled and transferred to 100 ml volumetric flask and volume was made up to mark by the addition of distilled water. Distillation of the digest was performed in Markam Still Distillation Apparatus [11]. Ten milliliters of digest was introduced in the distillation tube then 10 ml of 0.5 N NaOH was gradually added through the same way. Distillation was continued for at least 10 min and NH_3 produced was collected as NH_4OH in a conical flask containing 20 ml of 4% boric acid solution with few drops of modified methyl red indicator. During distillation yellowish color appears due to NH_4OH. The distillate was then titrated against standard 0.1 N HCl solution till the appearance of pink color. A blank was also run through all steps as above. Percent crude protein content of the sample was calculated by using the following formula:

$$\text{Protein (\%)} = 6.25X \frac{\text{(Sample Titration – Blank Titration) X Strength of HCl X 0.014 X Volume of digest Sample X 100}}{\text{Wt. of the sample X Volume taken for Distillation}}$$

2.7. Determination of Crude Fat [12]

The fat content was determined by ether extract method using Soxhlet apparatus. Since all the fat materials e.g. fats, phospholipids, sterols, fatty acids, carotenoids, pigments, chlorophyll etc. are extracted together therefore, the results are frequently referred to as crude fat. Approximately 1 g of moisture free sample was wrapped in filter paper, placed in fat free thimble and then introduced in the extraction tube. Weighed, cleaned and dried the receiving beaker was filled with petroleum ether and fitted into the apparatus. Turned on water and heater to start extraction. After 4-6 siphoning allow ether to evaporate and disconnect beaker before last siphoning. Transferred extract into clean glass dish with ether washing and evaporated ether on water bath. Then placed the dish in an oven at 105^{o}C for 2 hrs and cooled it in a desiccator. The percent c

$$\text{\% Fat content} = \frac{\text{Wt. of Ether Extract X 100}}{\text{Wt. of Sample}}$$

rude fat was determined by using the following formula:

2.8. Determination of Carbohydrate [12]

The total carbohydrate was determined by difference. The sum of the percentage moisture, ash, crude protein and crude fat was subtracted from 100.

Calculation:

$$\text{\% Total carbohydrate} = 100 - (\text{\% moisture} + \text{\% ash} + \text{\% Protein} + \text{\% fat})$$

3. RESULT AND DISCUSSIONS

Food preparation is an important step in meeting the nutritional needs of the family. Food has to be pleasing in appearance and taste in order to be consumed. Cooking as a conventional processing method has a great impact on food nutrients. Most foods are mainly consumed after being cooked and cooking considerably affects their health-promoting compounds, minerals and vitamins. In this study tried to picture the changes brought by cooking (microwave and conventional method) in the nutrient content of two fresh vegetables collected from local market named as Bata fish and Taki fish.

Previous studies showed that raw samples of Bata fish contained 74.80% moisture, 0.90% fat, 16.10% protein, 6.90% carbohydrate and Taki fish contained 75.10% moisture, 6.01% fat, 12.30% protein, 2.20% carbohydrate [13]. In this study, the moisture content in raw Bata fish and Taki fish were 75.00% and 75.00%, respectively. After conventional cooking moisture content in Bata fish and Taki fish were 80% and 79%, respectively, whereas after microwaving, 76% and 76%, respectively, were found for Bata fish and Taki fish (Figure 1). Ash content in raw Bata fish was 5.00%, but after conventional and microwave cooking it was found 4.00% and 6.00%, respectively. On the other hand, ash content in raw Taki fish was 6.00%, but after conventional and microwave cooking it was found 5.5% and 5.5%, respectively (Figure 2).

Total crude protein of raw Bata fish was 13.50%. After conventional and microwave cooking it was found 11.56% and 13.5%, respectively. On the other hand, crude protein content in raw Taki fish was 15.30%, but after conventional and microwave cooking it was found 12.08% and 15.16%, respectively (Figure 3). As shown in Figure 4, crude fat in raw Bata fish was 2.50%. After conventional and microwave cooking it was found 2.50% and 2.25%, respectively. On the other hand, crude fat content in raw Taki fish was 1.25%, but after conventional and microwave cooking it was found 1.16% and 1.12%, respectively.

The cabohydrate content in raw Bata fish and Taki fish was 4.00% and 2.45%, respectively. 1.19% carbohydrate was found in Bata fish after conventional cooking while 2.25% carbohydrate was found after microwave cooking. On the otherhand, 1.76% carbohydrate was found in Taki fish after conventional cooking while 2.22% carbohydrate was found after microwave cooking (Figure 5).

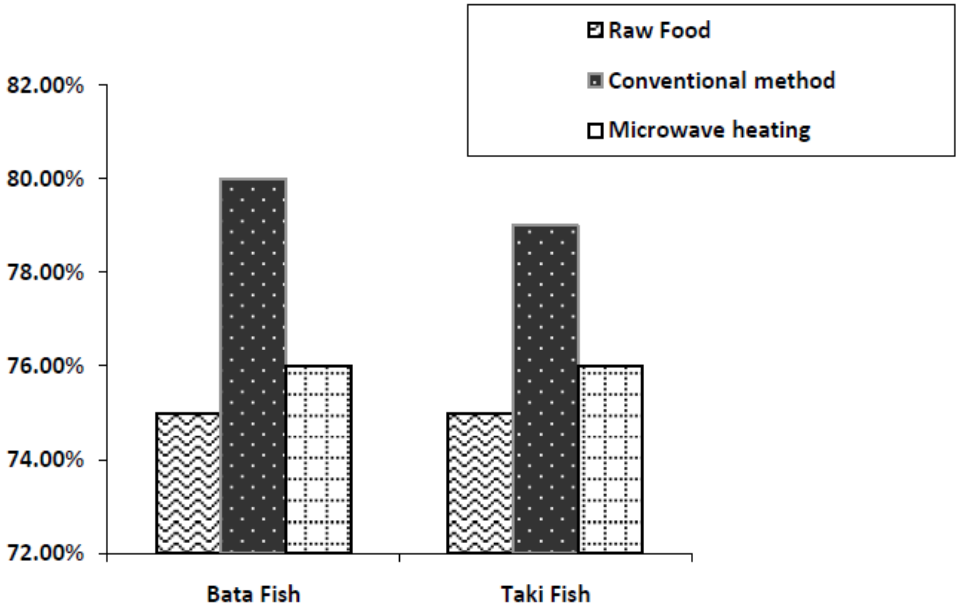

Figure1. *The moisture content in Bata Fish and Taki Fish cooked by different methods*

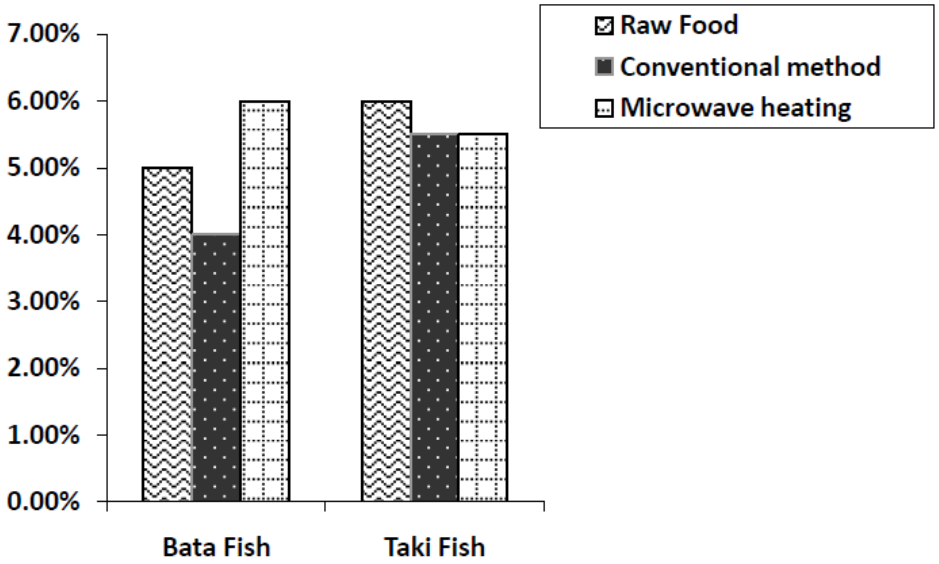

Figure2. *The ash content in Bata Fish and Taki Fish cooked by different methods*

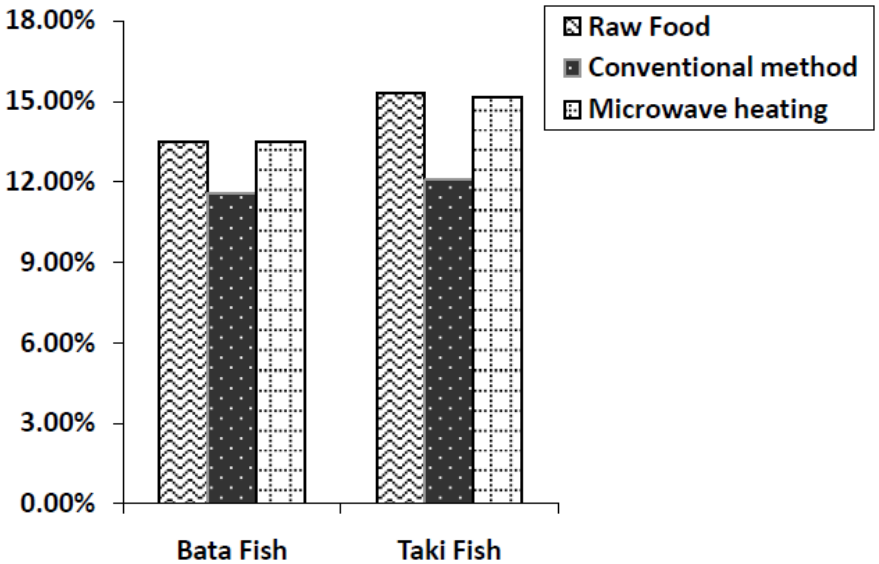

Figure3. *The protein content in Bata Fish and Taki Fish cooked by different methods*

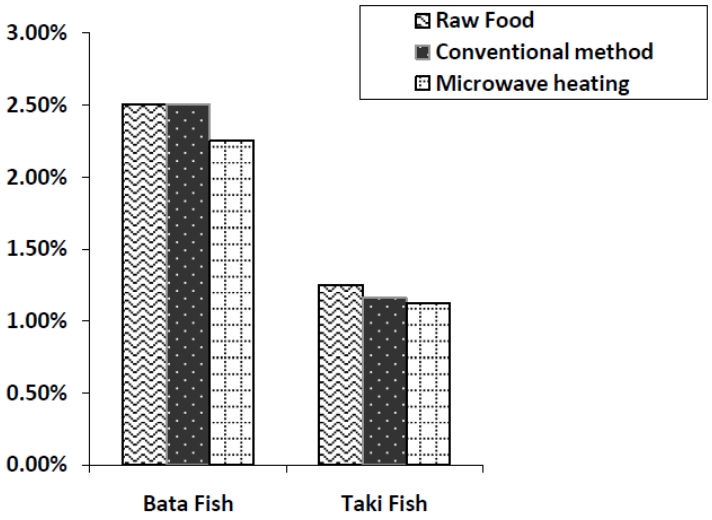

Figure4. *The fat content in Bata Fish and Taki Fish cooked by different methods*

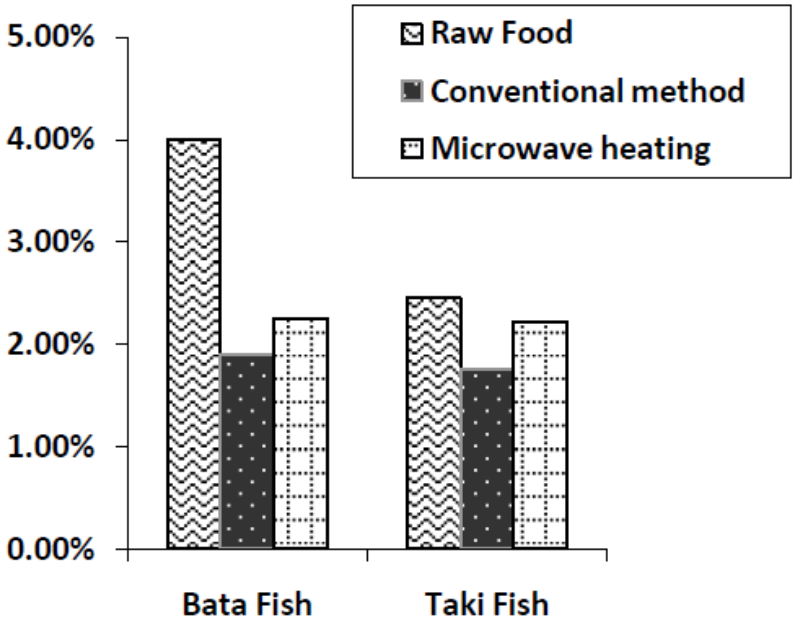

Figure5. The *carbohydrate* content in *Bata Fish and Taki Fish cooked by different methods*

4. CONCLUSION

Bangladesh is an under developing country and many people of this country are suffering from nutritional problem. For this reason people should choose the best method of cooking by which nutrient content are present in high amount. Results of this study suggested that microwave cooking method is better than other methods because microwave cooked food contains high amount of nutrients.

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