



## Nutritional assessment of semi-fermented fish product (Chepa Shutki) from three different regions of Bangladesh

Mohajira Begum<sup>\*1</sup>, Humaira Afroz<sup>1</sup>, Md. Nazmul Hossain<sup>1,3</sup>, Fouzia Akter<sup>4</sup>,  
Md. Nur Hossain<sup>2</sup>

<sup>1</sup>*Fish Technology Research Section, IFST, BCSIR, Dhaka, Bangladesh*

<sup>2</sup>*Industrial Microbiology Division, IFST, BCSIR, Dhaka, Bangladesh*

<sup>3</sup>*Department of Microbial Biotechnology, Sylhet Agricultural University, Bangladesh*

<sup>4</sup>*Department of Nutrition and Food Engineering, Daffodil International University, Dhaka, Bangladesh*

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### Abstract

“Chepa shutki” is one of the major traditional semi-fermented fishery products of Bangladesh. We herein, analyzed the nutritional quality of *Chepa shutki* samples from three different district of Bangladesh (Rangpur, Mymensingh and Jamalpur) followed by sensory and biochemical composition analysis. The result of sensory evaluation exhibited highest ( $6.92 \pm 0.74$ ) overall acceptability of “Chepa shutki” from Rangpur Region compared with Mymensingh and Jamalpur. Biochemical analysis revealed that “Chepa shutki” of Rangpur contained the highest amount of protein ( $59.4 \pm 0.15\%$ ), Fat ( $15.9 \pm 0.38\%$ ), Ash ( $21.9 \pm 0.85\%$ ), Carbohydrate ( $2.7 \pm 0.81\%$ ), Energy ( $391.83 \pm 2.54$  Kcal) and Magnesium ( $0.71 \pm 76$  mg/100g) among the three different samples. On the other hand, “Chepa shutki” of Jamalpur consisted the lowest amount of protein ( $35.9 \pm 0.98\%$ ), Fat ( $15.7 \pm 0.16\%$ ), Carbohydrate ( $2.7 \pm 0.81\%$ ) and Energy ( $290.58 \pm 1.89$  Kcal) but highest amount of Calcium ( $494.92 \pm 5.33$  mg/100g) and Iron ( $204.08 \pm 2.90$  mg/100g). The highest total volatile basic nitrogen TVB-N found in the samples of Jamalpur ( $2.1 \pm 0.51$ ) but the lowest ( $1.3 \pm 0.84$ ) was found in the samples of Rangpur. Overall results indicated that “Chepa sutki” from Rangpur region was much more acceptable among the three regions. Hence, their production method can be followed for the industrial production of “Chepa shutki” in Bangladesh.

\* **Corresponding Author:** Mohajira Begum ✉ [mohajira10@yahoo.com](mailto:mohajira10@yahoo.com)

## Introduction

“Chepa shutki” is one of the major traditional fishery products of Bangladesh where a large part of Bangladeshi people use chepa shutkias various food items. “Chepa shutki” also contributes as indigenous fermented foods in large portion of north-eastern states of India (Muzaddadi and Basu, 2003). It is a sticky, solid, semi-fermented, salt free product prepared from small carps (*Puntius* spp.) normally in dried form by fermenting in mutka (earthen pot specifically designed and made for shidal preparation). People prefer chepa shutki owing to its special taste and low cost compared with larger commercially important fish (Khanum *et al.*, 1999; Mansur *et al.*, 2000; Muzaddadi and Mahanta, 2013). Among the fermentation procedure, semi-fermentation is one of the most important methods of preserving fish in Bangladesh. Due to cheap sources of nutrition, low cost processing method semi fermented foods are very important for a developing country like Bangladesh. A large number of people from Mymensingh, Netrokona, Kishorgonj, Bhrannonbaria, Jamalpur, Tangail regions are frequently involved with this semi fermented product production and marketing and it plays a significant role by enhancing their socio economic condition (Mansur, 2007).

The procedure of preparing semi-fermented fish (Chepa shutki) varies from region to region so the nutritional qualities such as protein, fat, carbohydrates, minerals etc is likely to be different. As the scientific information on the nutritional qualities of (Chepa shutki) is very limited, therefore, studying on the nutritional quality of semi-fermented fish in different regions of Bangladesh to get concerned on their availability and safety aspect are very important. Moreover, as this semi-fermented fish product is still only popular in some certain regions in Bangladesh there is a scope to explore this tradition to whole country and can be selected as a medium of export to other countries, if it's nutritional quality and hygienic condition is properly maintained. Considering the above facts an attempt was taken to evaluate the nutritional status of semi-fermented fish (Chepa shutki) from three different regions of Bangladesh.

## Materials and methods

### *Collection of samples*

The experimental fishes were collected from the local producers of “Chepa shutki” of three districts (Rangpur, Mymensingh and Jamalpur) of Bangladesh. The samples were tightly packed in separate pre-sterile polyethylene bags following the aseptic collection of samples. Then the samples were placed in ice-box and were transported to the Fish Technology Research Section of the Institute of Food Science and Technology (IFST) of Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhanmondi, Dhaka where the whole experiment were carried out. Finally, Each sample from each district were divided into three parts to determine the mean value of the experiment.

### *Sensory evaluation of collected samples*

The sensory evaluation of experimental samples consisting appearance, color, texture, flavor intensity and overall acceptability were done using 9 point hedonic scale by a trained taste panel. The color was judged on the basis of visual examination and texture was evaluated by applying fingertips.

### *Biochemical analysis*

Determination of moisture and mineral content (Calcium, Magnesium and Iron) of the raw fish was conducted by AOAC method (AOAC, 2000). The crude protein of the fish was determined by Micro-Kjeldhal method (Pearson, 1999). The estimation of fat content of fish was accomplished by Bligh and Dyer method (Bligh and Dryer, 1999). The ash content of the Chepa shutki samples were determined as the inorganic residues such as oxides, sulphates, silicates and chlorides left behind, in the dry muscle. The samples heated to the temperatures of 500-600 °C in a muffle furnace. Finally the percentage of ash content was calculated. TVB-N were determined according to procedure of Conway manual (Siang and Kim, 1947). The pH of the samples were measured by using digital pH meter.

### Statistical analysis

All the analyses were performed in three independent experiments for three samples each collected from different regions.

The standard deviations as well as arithmetic mean of the triplicate samples were estimated. Data were analyzed and compared by analysis of variance (two factorial ANOVA) and probability level was fixed at  $p < 0.05$ .

### Result and discussion

Nutritional assessment of “Chepa shutki” samples from three district of Bangladesh were conducted initially by sensory evaluation and followed by biochemical composition analysis. The result of sensory evaluation was shown in table 1.

**Table 1.** Sensory scores of “Chepa shutki” on 9 point hedonic scale (mean  $\pm$  SD, n = 9) after fermentation period.

Name of district	Appearance	Color	Taste	Texture	Flavor intensity	Overall Acceptability
Rangpur	7.3 $\pm$ 0.87	6.8 $\pm$ 0.43	7.1 $\pm$ 0.32	6.3 $\pm$ 0.65	7.1 $\pm$ 0.67	6.92 $\pm$ 0.74
Mymensingh	6.9 $\pm$ 0.38	6.5 $\pm$ 0.62	6.3 $\pm$ 0.56	7.1 $\pm$ 0.27	6.9 $\pm$ 0.46	6.74 $\pm$ 0.32
Jamalpur	6.4 $\pm$ 0.45	6.1 $\pm$ 0.43	6.8 $\pm$ 0.48	6.7 $\pm$ 0.46	6.3 $\pm$ 0.53	6.46 $\pm$ 0.45

The above values are the means of three replicates  $\pm$  SD.

It is apparent from the table 1 that the “Chepa shutki” was much more acceptable containing 6.92 $\pm$ 0.74 score in terms of overall acceptability compared with the samples of Mymensingh and Jamalpur. It has been observed that the fermented fish from three replica contained different chemical content (table-2). “Chepa shutki” of Rangpur contained

the highest amount of protein (59.4  $\pm$  0.15%) , Fat (15.9  $\pm$  0.38%) , Ash (21.9  $\pm$  0.85%), Carbohydrate (2.7 $\pm$  0.81%) and Energy (391.83 $\pm$  2.54 Kcal) among the three different samples (table-2). On the other hand, the highest moisture (29.9  $\pm$  0.56% ) and fat (16.71 $\pm$  0.73%) obtained in the samples of Mymensingh (Table 2).

**Table 2.** Biochemical composition of three types of “Chepa shutki” of three distinct regions.

Test parameters	Rangpur	Mymensingh	Jamalpur
Moisture (%)	14.2 $\pm$ 0.34	29.9 $\pm$ 0.56	25.1 $\pm$ 0.64
Protein (%)	59.4 $\pm$ 0.15	42.0 $\pm$ 0.47	35.9 $\pm$ 0.98
Fat (%)	15.9 $\pm$ 0.38	16.71 $\pm$ 0.73	15.7 $\pm$ 0.16
Ash (%)	21.9 $\pm$ 0.85	9.50 $\pm$ 0.17	21.9 $\pm$ 0.34
Carbohydrate (%)	2.7 $\pm$ 0.81	1.8 $\pm$ 0.29	1.2 $\pm$ 0.45
TVB-N measurement (mg/100g)	1.3 $\pm$ 0.84	1.7 $\pm$ 0.54	2.1 $\pm$ 0.51
pH	6.1 $\pm$ 0.45	6.5 $\pm$ 0.65	6.4 $\pm$ 0.34
Energy (Kcal)	391.83 $\pm$ 2.54	325.95 $\pm$ 3.90	290.58 $\pm$ 1.89

The above values are the means of three replicates  $\pm$  SD.

However, The samples of Jamalpur consisted the lowest amount of protein (35.9  $\pm$  0.98%), Fat (15.7  $\pm$  0.16%), Carbohydrate (2.7 $\pm$  0.81%) and Energy (290.58  $\pm$  1.89 Kcal). The differences in moisture content maybe due to duration of the fermentation, quality of salt used and the amount of salt etc. Here, we have found a greater degree of variation in protein content in the experimental samples.

Hence, it can be said that the duration of fermentation might be responsible behind this variation and two steps (salting and drying) are interrelated to reduce the moisture sufficiently (Itou and Akahane, 2000; Anihouvi *et al.*, 2012). However, although the “Chepa shutki” of Rangpur (21.9  $\pm$  0.85) and Jamalpur (21.9  $\pm$  0.34) contained almost similar ash content but the samples of Mymensingh exhibited very little amount (9.50  $\pm$  0.17) of ash.

The quality of “Cheapa shutki” was also analyzed by TVB-N measurement where the samples Jamalpur exhibited highest TVB-N ( $2.1 \pm 0.51$ ) but for Rangpur and Mymensingh it was lower than 2.00 (table-2). Increasing TVB-N may be responsible for deamination by autolytic enzymes of protein responsible in the formation of volatile bases (Hernandez-Herrero *et al.*, 1999; Karacam *et al.*, 2002; Nayeem *et al.* 2010). The “Cheapa shutki” of Rangpur consisted

highest energy value ( $391.83 \pm 2.54$  Kcal) which was an important indication to regard them as best among others (table-2). In addition, a greater degree of variation was observed in mineral contents of the experimental samples (table-3). Here, we found that the samples of Jamalpur was found to be highest in Calcium ( $494.92 \pm 5.33$  mg/100g) and Iron content ( $204.08 \pm 2.90$  mg/100g) whereas samples of Rangpur contained highest amount of Magnesium ( $0.71 \pm 76$  mg/100g).

**Table 3.** Composition of Calcium, Iron, and Magnesium of “Chepa shutki” from three different districts.

Test parameters	Rangpur	Mymensingh	Jamalpur
Calcium (mg/100g)	$490.68 \pm 4.88$	$236.22 \pm 2.56$	$494.92 \pm 5.33$
Iron (mg/100g)	$106.62 \pm 3.98$	$15.68 \pm 99$	$204.08 \pm 2.90$
Magnesium (mg/100g)	$0.71 \pm 76$	$0.52 \pm 71$	$0.67 \pm 54$

The above values are the means of three replicates  $\pm$  SD.

The “Chepa shutki” of Mymensingh consisted a significantly lower amount of Iron ( $15.68 \pm 99$ ) than the Rangpur and Jamalpur region. Similar type of experiment was conducted by Udomthawee *et al.*, (2012) but was limited in determination of Calcium and Phosphorus content of fermented fish collected from three regions.

From the above discussion, it is clear that, the quality of “Chepa shutki” of Rangpur region was much more acceptable than the Mymensingh and Jamalpur in terms of sensory and nutritional evaluation. Although the mineral content of the samples of Jamalpur seems better but the “Chepa shutki” of Rangpur exhibited as best due to the overall acceptability and other nutritional contents. However, we herein estimated all the samples produced by the traditional production process which were lack of proper production, handling and packaging systems.

### Conclusion

As the nutritional analysis showed that “Chepa shutki” of Rangpur region is the best among three districts, hence, the production method of that region can be followed for the industrial production of “Chepa shutki” in Bangladesh.

However, all of them are produced locally with less hygienic practices. Therefore, more hygienic practice are to be ensured during the method of sun-drying in order to increase the shelf life and quality of the product. This study will provide valuable nutritional information to the consumers, commercial producers and exporters of semi-fermented fish products.

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