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Biochemical Composition of Farmed Thai Pangus (*Pangasianodon hypophthalmus*) Collected from Mymensingh District in Bangladesh

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Abstract: Present study was conducted to determine biochemical composition of fresh Thai pangus (*Pangasianodon hypophthalmus*) cultured at Mymensingh district in Bangladesh. Total percentage of proximate composition of the ten fishes was 98.00±0.68%. Average moisture, protein, lipid, ash, TVB-N, TMA-N and pH of the fishes were 79.21±1.43%, 13.17±0.91%, 4.00±0.45%, 1.60±0.24%, 5.61±0.19 mg/100g, 1.52±0.14 mg/100g and 6.41±0.10, respectively. The trend of proximate composition of Thai pangus was Moisture> Protein>Lipid>Ash. The study indicates that Thai pangus contains low protein and medium fatty fish. The study also indicates that biochemical composition of the fish vary a little bit within the same species.

Key words: Thai Pangus · Proximate Composition · Chemical Composition

INTRODUCTION

The Striped Catfish, *Pangasianodon hypophthalmus* is an indigenous species of Thailand [1] imported by Bangladesh government in 1990 [2]. Thus, the fish is exotic in Bangladesh and locally known as Thai pangus. In recent years, culture of this fish is rapidly increasing in Bangladesh because of simple culture method, high growth rate, high adaptability under stressed condition and high market demand. In addition, the fish can be stocked at a much higher density in culture ponds compared to other species [3]. It was proved that the climate, water and soil conditions of Bangladesh are suitable for Thai pangus production [4]. The fish is mostly cultured as a monoculture species but recently polyculture is practiced in the country [5, 6]. The fish can easily be marketed at live condition which favoured by the consumers as they can buy fresh fish. However, Thai pangus is a low-cost available fish in Bangladesh.

Proximate composition analysis is the estimation of moisture, protein, lipid and ash content of the sample. The assessment of the proximate composition is important to know the nutritive value of fish and for better utilization during processing and preservation [7]. Knowledge on proximate composition is also important to process fish (dried, smoked, salted products etc.) and byproducts (fish protein concentrate, fish protein hydrolyzates, fish meal, fish oil etc.). Among the chemical composition of fish body Total Volatile Basic Nitrogen (TVB-N) value is used as a practical index of freshness of fish [8]. Degradation of Trimethylamine oxide (TMAO) by bacteria produce trimethylamine nitrogen (TMA-N) has been used as an index of bacterial spoilage [9]. pH measurement is a rapid test for detection of spoilage of fish [10, 11].

So far in Bangladesh there is little information on the biochemical composition of freshly collected Thai pangus. Considering the facts, present study is conducted to assess the biochemical composition of Thai pangus cultured in Bangladesh.

MATERIALS AND METHODS

Sample Collection and Preparation: Fresh Thai pangus (average weight of 1000-1200g) was collected from five different farms located in Mymensingh in July, 2013. A total of ten fishes were collected in the morning and transported to the Fish Processing and Quality Control Laboratory in Bangladesh Agricultural University (BAU). The fishes were kept at ambient temperature (22-25°C) in trays and marked with different sample number. Muscle samples were taken from different location of the body. The samples were mixed homogenously using homogenizer and triplicate sample used to carry out the experiment.

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Determination of Proximate Composition: Moisture content was determined by oven drying the muscle samples at 105°C (about 12hr) until reached into constant weight. The protein content was determined using the Kjeldhal method, lipid (Soxhlet acetone extractives) and ash content (residual after heating at 550°C for 6hr) were determined using standard methods described by AOAC [12].

Determination of Chemical Composition: TVB-N, TMA-N and pH were determined by the AOAC [12] method. pH was measured by an electronic pH meter (HANNA pH 211 Microprocessor pH Meter) with a glass electrode using expandable scale.

Data Analysis: Data were recorded carefully in the score sheet. Mean and standard deviation (SD) of each fish was calculated from triplicate by Microsoft Office Excel 2007 version. Mean and SD of the fish was calculated from thirty replication of the ten fishes.

RESULTS AND DISCUSSION

Average percentage of total proximate composition was 98.00±0.68% which ranged from 97.50±0.39 to 98.68±0.08% (Table 1). Nowsad [11] accounts proximate composition in fish tissue about 96-98% where summation of lipid and moisture ranges from 78 to 85%.

Moisture was the most abundant composition in the present study. Moisture content of Thai pangus was 79.21±1.43% and varied between 77.51±0.95% and 80.87±0.58% (Table 1). Result of the present study was in the range given by Davies and Davies [13] who peg fish to be made up of 70-84% water. Edible portion of fish contain 74.8% moisture but muscle contain 80% water on an average [14]. Nowsad [11] reported that moisture content in fish varies widely between 70-80%. Moisture content of Thai pangus is 78.29±0.22% [15] and 82.76% [16]. Orban *et al.* [17] determines high moisture level (80-85%) in Thai pangus fillets.

Protein was the second abundant composition in fish muscle. In the present study average protein percentage of Thai pangus was 13.17±0.91% and varied from 12.29±0.29% to 14.45±1.12% (Table 1). In the present study protein content of the fish was below 15%. So it is a low protein content fish according to the classification of Nowsad [11]. Protein content in fish ranges from 6-28% but average is 18% [14]. Protein in Thai pangus is 12.78 ± 0.16% [15] and 14.71% [16]. These results are similar to the present study. Protein content in Thai pangus fillets ranges 12.6–15.6% [17].

Lipid content makes Thai pangus delicious and tasty [4]. According to Mansur [14] Thai pangus is a medium fatty fish. In the present study lipid content of Thai pangus was 4.00±0.45% and varied between 3.57±0.61% and 4.56±0.35% (Table 1). Begum *et al.* [15] determined lipid content in Thai pangus 16.55 ± 1.52% which is much higher than the present finding. In another study Ahmed *et al.* [16] reported that Thai pangus have a lipid content of 1.40% which is lower than the present study. Nowsad [11] stated that lipid content in fish muscle varies widely from 0.5% to 20%. However, lipid content varies from species to species and even within the same species due to geographical distribution, age, sex, size, fishing season, pH of the fish [14, 18]. The variation may also due to food availability, feeding method, feeding regime, feed types, feeding performance within the area and struggle during fishing etc. Thai pangus fillets contain lower lipid 1.1-3.0% [17].

Table 1: Proximate composition (mean±SD) of Thai pangus

Fish No.	Moisture (%)	Protein (%)	Lipid (%)	Ash (%)	Total (%)
1	78.87±0.45	13.13±0.86	4.04±0.19	1.74±0.15	97.79±0.59
2	79.19±0.84	13.17±0.79	4.16±0.24	1.47±0.34	98.33±0.59
3	80.28±2.08	12.73±1.34	3.64±0.30	1.52±0.22	98.17±0.26
4	79.48±1.16	13.40±0.73	4.04±0.58	1.50±0.20	98.43±0.55
5	80.36±0.20	12.29±0.29	3.57±0.61	1.75±0.41	97.97±0.72
6	78.10±1.49	13.75±0.95	4.56±0.35	1.45±0.12	97.86±0.72
7	77.51±0.95	14.45±1.12	3.93±0.67	1.61±0.16	97.50±0.39
8	78.05±1.33	13.53±0.28	4.21±0.24	1.89±0.17	97.68±1.23
9	80.87±0.58	12.50±0.32	3.67±0.26	1.64±0.62	98.68±0.08
10	79.75±1.09	12.71±0.59	4.06±0.56	1.44±0.06	97.63±0.91
Total (N=10)	79.21±1.43	13.17±0.91	4.00±0.45	1.60±0.24	98.00±0.68

*N= Total number of fishes

Table 2: Chemical composition of different individuals of *P. hypophthalmus*

Fish No.	TVB-N (mg/100g)	TMA-N (mg/100g)	pH
1	5.55±0.09	1.39±0.09	6.42±0.18
2	5.54±0.28	1.57±0.14	6.42±0.10
3	5.68±0.24	1.55±0.11	6.40±0.07
4	5.63±0.19	1.40±0.05	6.44±0.08
5	5.55±0.11	1.46±0.11	6.41±0.11
6	5.68±0.20	1.48±0.16	6.48±0.09
7	5.49±0.23	1.72±0.04	6.33±0.07
8	5.58±0.25	1.57±0.23	6.34±0.06
9	5.61±0.10	1.55±0.09	6.49±0.05
10	5.82±0.13	1.53±0.05	6.35±0.04
Total (N=10)	5.61±0.19	1.52±0.14	6.41±0.10

* N= Total number of fishes

Ash content refers to the mineral content in fish muscle. Ash content of fresh Thai pangus was 1.60±0.24 and ranged from 1.44±0.06% to 1.89±0.17% (Table 1). In Thai pangus it is 1.78±0.19% [15] and 1.12% [16]. The results are more or less similar to the present study. Nowsad [11] recommended that ash content in fish ranges from 0.5 to 5% which supports present study. But ash content in the present study is higher than the range 0.4-1.5% [14].

Fresh fish contain TVB-N levels of 10 mg/100g or less [19]. In the present study TVB-N value in fresh Thai pangus muscle was 5.61±0.19 mg/100g and ranged from 5.49±0.23 to 5.82±0.13 mg/100g (Table 2). Azam *et al.* [10] determined TVB-N in large (750-850g), medium (550-650g) and small (350-450g) Thai pangus and the scores were 4.25±1.05, 5.15±0.89 and 3.35±1.05 mg/100g, respectively in summer season and 4.05±0.25, 5.64±1.06 and 4.21±0.96 mg/100g, respectively in winter season. TVB-N level in Thai pangus was determined 1.37 mg/100g [20] which is much lower than the present study. This variation might be due to a variety of causes such as sex, age, season, feeding habit, spawning cycle etc. [21].

Fish contains TMAO as an osmolyte and its quantity varies from species to species and the environment [22, 23]. Generally, TMAO is absent in freshwater fish muscle [24]. But Stansby and Olcott [25] stated that freshwater fishes generally contain 5-20 mg/100g of TMAO. The amount of TMAO in freshwater fish is insignificant [9, 22]. After death, TMAO converts to TMA-N by spoilage bacteria and fish enzymes [22, 23, 26]. Fresh fish contain low amount of TMA-N [23]. TMA-N contents of Thai pangus ranged between 1.39±0.09 and 1.72±0.04 mg/100g and the average was 1.52±0.14 mg/100g (Table 2). Present study is more or less similar to other study except Bremner [24]. Azam *et al.* [10] determined TMA-N contents in large, medium and small Thai pangus 1.13±0.86, 0.95±0.05 and 1.04±0.25 mg/100g, respectively in summer season and 1.58±0.69, 0.88±0.64 and 1.21±0.05 mg/100g, respectively in winter season.

The typical pH of fresh fish muscle ≈ 7.0 [10, 20, 27]. In the present study average pH of Thai pangus muscle was 6.41±0.10 and ranged from 6.33±0.07 to 6.49±0.05 (Table 2). Azam *et al.* [10] determined pH in large, medium and small Thai pangus 6.75±0.05, 6.90±0.01 and 6.65±0.08, respectively in summer season and 6.62±0.05, 6.06±0.05 and 6.60±0.06, respectively in winter season. Akter *et al.* [28] determined muscle pH of Thai pangus 7.07 immediately after death. Fan *et al.* [29] and Ersoy *et al.* [30] referred that most frequently fresh fish muscle pH is in the 6.0 to 6.5 range which coincides with the present study.

CONCLUSION

Present study has immense importance to the consumers and processors about the nutritive value of Thai pangus. The study would help the processors during processing and preservation of the fish for the purpose of producing diversified value added products. It is recommended to determine biochemical composition of Thai pangus cultured in other districts of Bangladesh.

REFERENCES

1. Robart, T.R. and C. Vidthayanon, 1991. Systemic revision of the Asian catfish family Pangusiidae, with biological observations and descriptions of three new species. Proceedings of the Academy of National Sciences of Philadelphia, 143: 97-144.

2. Sarker, M.T., 2000. *Pangus Chas Babosthapona* (In English: Management of Pangus Culture). Department of Fisheries, Bangladesh, pp: 25.
3. Ali, M.Z., M.A. Hossain and M.A. Mazid, 2005. Effect of mixed feeding schedules with varying dietary protein levels on the growth of sutchi catfish, *Pangasius hypophthalmus* (Sauvage) with silver carp, *Hypophthalmichthys molitrix* (Valenciennes) in ponds. Aquaculture Research, 36: 627-634.
4. Ahmed, N. and M.R. Hasan, 2007. Sustainable Livelihoods of Pangus Farming in Rural Bangladesh. Aquaculture Asia Magazine, 12(4): 5-11.
5. Islam, M.S., K.A. Huq and M.A. Rahman, 2008. Polyculture of Thai pangus (*Pangasius hypophthalmus*, Sauvage 1878) with carps and prawn: A new approach in polyculture technology regarding growth performance and economic return. Aquaculture Research, 39: 1620-1627.
6. Sayeed, M.A.B., G.S. Hossain, S.K. Mistry and K.A. Huq, 2008. Growth performance of Thai Pangus (*Pangasius hypophthalmus*) in polyculture system using different supplementary feeds. University Journal of Zoology Rajshahi University, 27: 59-62.
7. Mridha, M.A., S.Y. Lipi, N.T. Narejo, M.S. Uddin, M.S. Kabir and M. Karim, 2005. Determination of biochemical composition of *Cirrhinus reba* (Hamilton, 1822) from Jessore, Bangladesh. Journal of Science and Technology University Peshawar, 29(1): 1-5.
8. Conway, E.J., 1977. An absorption apparatus for the micro-determination of certain volatile substances. Biochemical Journal, 2: 419-429.
9. Parab, S.N. and S.B. Rao, 1984. Distribution of trimethylamine oxide in some marine and freshwater fish. Current Science, 56(6): 307-309.
10. Azam, K., S. Pervin, S.S. Naher, Y. Ali, M.I. Alam, K.M.B. Haque and B. Ahmed, 2005. Quality changes in Pangus (*Pangasius hypopthalamus*) in relation to size and season during storage in ice. Pakistan Journal of Biological Sciences, 8(4): 636-640.
11. Nowsad, A.K.M.A., 2007. Participatory Training of Trainers: A New Approach Applied in Fish Processing. Bangladesh Fisheries Research Forum, Mymensingh, Bangladesh, pp: 42-45.
12. AOAC (Association of Official Analytical Chemists) 2005. Official Methods of Analysis. International, 18th edition, Washington (D.C.).
13. Davies, R.M. and O.A. Davies, 2009. Traditional and improved fish processing technologies in values of fish. Tropical Science, 33: 183-189.
14. Mansur, M.A., 2012. Fisheries Study (Part-II). Lima Printing Press, Mymensingh, pp: 31-43.
15. Begum, M., T. Akter and M.H. Minar, 2012. Analysis of the proximate composition of domesticated stock of Pangas (*Pangasianodon hypophthalmus*) in laboratory condition. Environmental Science and Natural Resources, 5(1): 69-74.
16. Ahmed, S., A.F.M.A. Rahman, M.G. Mustafa, M.B. Hossain and N. Nahar, 2012. Nutrient composition of indigenous and exotic fishes of rainfed waterlogged paddy fields in Lakshmipur, Bangladesh. World Journal of Zoology, 7(2): 135-140.
17. Orban, E., T. Nevigato, G. Di Lena, M. Masci, I. Casini, L. Gambelli and R. Caproni, 2008. New trends in the seafood market Sutchi Catfish (*Pangasius hypophthalmus*) fillets from Vietnam: Nutritional quality and safety aspects. Food Chemistry, 110(2): 383-389.
18. Stansby, M.E., 2006. Composition of certain species of fresh-water fish. Journal of Food Science, 19(1-6): 231-234.
19. Kimura, K. and S. Kiamukura, 1934. Detection of the onset of decomposition in fish meat as shown by the content of ammonia. Proceedings of the Pacific Science Congress, 5: 3709.
20. Hossain, M.I., M.S. Islam, F.H. Shikha, M. Kamal and M.N. Islam, 2005. Physicochemical changes in Thai Pangus (*Pangasius sutchi*) muscle during ice-storage in an insulated box. Pakistan journal of Biological Sciences, 8(6): 798-804.
21. Begum, M., A.A. Pollen, A.W. Newaz and M. Kamal, 2011. Shelf life of giant freshwater prawn (*Macrobrachium rosenbergii*) under different storage conditions. Journal of Bangladesh Agricultural University, 9(1): 159-168.
22. Bystedt, J., L. Swenne and H.W. Aas, 2006. Determination of trimethylamine oxide in fish muscle. Journal of the Science Food and Agriculture, 10(6): 301-304.
23. Inbasekar, P., A. Sivaraj, K. Sathiyaraj, S. Sundaresan and B.S. Kumar, 2011. A preliminary investigation of freeze storage on the production trimethylamine nitrogen in *Leiognathus splendens* (Family: Leiognathidae). International Journal of Pharmaceutical and Biological Archives, 2(5): 1493-1496.
24. Bremner, H.A., 2002. Safety and Quality Issues in Fish Processing. Woodhead Publishing. Swaston, Cambridge, UK. pp: 395.

25. Stansby, M.E. and H.S. Olcott, 1963. Composition of fish. In: Industrial Fishery Technology. Rrinbold Publication, New York.
26. Ann, L., 2011. Is fish smelly? American Society for Nutrition. Posted on 24th August, 2011. http://www.nutrition.org/asn-blog/2011/08/is-fish-smelly/ accessed on 28th November, 2014.
27. Abbas, K.A., A. Mohamed, B. Jamilah and M. Ebrahimian, 2008. A review on correlations between fish freshness and pH during cold storage. American Journal of Biochemistry and Biotechnology, 4(4): 416-421.
28. Akter, M., M.J. Islam, S. Mian, F.H. Shikha, M.H. Rahman and M. Kamal, 2014. Changes in fillet quality of Pangus Catfish (*Pangasianodon hypohthalmus*) during frozen storage. World Journal of Fish and Marine Sciences, 6(2): 146-155.
29. Fan, W., J. Sun, Y. Chen, J. Qiu, Y. Zhang and Y. Chi, 2009. Effect of chitosan coating on quality and shelf life of silver carp during frozen storage. Food Chemistry, 115: 66-70.
30. Ersoy, B., E. Aksan and A. Ozeren, 2008. The effect of thawing methods on the quality of eels (*Anguilla anguilla*). Food Chemistry, 111: 377-380.