

Nutritional value of wild, cultured and frozen prawn *Macrobrachium rosenbergii* (De Man, 1879)**

Ferdose A¹ and Hossain MB^{1*}

¹Department of Fisheries and Marine Science, Noakhali Science and Technology University, Sonapur- 3802, Noakhali, Bangladesh.

[Received: April 9, Accepted: June 22, 2011]

ABSTRACT

This investigation principally entails with the proximate analysis of the constitutional composition of fresh water prawn, *Macrobrachium rosenbergii*. Protein, fat, moisture, ash and carbohydrate content in prawn collected from wild, culture farm and market (frozen form) during April, 2010 were determined dry matter basis by following AOAC method to evaluate the nutritional value of prawn from different sources. The proximate composition of the muscle tissue of wild, cultured and frozen prawn were found to be 68.27 ± 0.23, 74.85 ± 0.65 and 60.8 ± 0.12% protein; 6.99 ± 0.92, 5.61 ± 0.37 and 8.21 ± 0.14 % carbohydrate; 8.44 ± 0.10, 9.15 ± 0.61 and 7.89 ± 0.005% lipid; 16.30 ± 0.65, 10.14 ± 0.55 and 23.09 ± 0.39% ash; 78.3 ± 5.83, 77.1 ± 1.69 and 74.9 ± 0.98% moisture respectively. Prawns collected from all sources showed reasonably good proximate composition although variation occurred. This indicates that the wild has also provided with adequate food. The proportion of total protein and lipid were found to be higher in cultured prawns than in the others. In contrast, the proportions of ash contents were higher in frozen prawns when compared with other two, and moisture contents were higher in wild and cultured prawn. In the present study, nutrition wise, the adult cultured prawn was better compared to the wild and frozen prawn. Since *M. rosenbergii* is a good source of protein, and very low in fat, it can be used as a healthy choice of food for human consumptions.

Key words: Proximate composition, freshwater prawn, *Macrobrachium rosenbergii*, nutritional value.

INTRODUCTION

Bangladesh is considered one of the most suitable countries in the world for giant freshwater prawn (*Macrobrachium rosenbergii*, De Man, 1879) farming, because of its favorable resources and agro-climatic conditions. A sub-tropical climate and a vast area of water bodies provide a unique opportunity for the production of *Macrobrachium rosenbergii* [1]. Now, in Bangladesh prawn (*Macrobrachium rosenbergii*) farming is very important sector for national economy. After readymade garments, prawn and shrimp sectors as a whole is the second largest export industry, generating US\$380 million annually and 5.6% of the total value of exports [2].

Prawns contain good amount of organic and inorganic constituents. The main constituents are protein, carbohydrate and lipid. In addition to that prawns also contain a significant proportion of minerals (Ca, P, Mg, Mn and Cl) and vitamins (A, C and D) [3]. Prawns and shrimps are highly perishable because of their high moisture content, low connective tissue and their high amino acid content [4].

Body constituents (protein, fat, moisture, mineral) are good indicator in evaluating the quality of prawn. The percentage of water is good indicator of its relative contents of energy, proteins and lipids. The lower the percentage of water, the greater the lipids and protein contents and higher the energy density of

the fish [5]. However, these values vary considerably within and between species, size, sexual condition, feeding season and physical activity. Protein content which is an important component tends to vary little in healthy fish [6]. Many works have been conducted on the improvement of growth and nutritional quality of *M. rosenbergii* under different culture conditions [7,8,9,10,11,12]. However, the information on nutritional value wild, cultured and frozen from of *M. rosenbergii* are rare except a few reports [13,14,15]. Therefore, in the present study, an attempt has been made to evaluate the proximate composition of basic biochemical constituents, such as protein, carbohydrate, lipid, moisture and ash in the wild, cultured and frozen prawn.

MATERIALS AND METHODS

Collection of sample

Healthy adult wild prawns of *M. rosenbergii* were collected from Halda river, cultured prawns from an aquaculture farm (Suborno Char, Noakhali) and frozen prawn from market (Riazuddin Bazar, Chittagong). Six prawns (two from each site) of almost equal size were collected and segregated. The adults were identified by the enlarged and sharply up turned rostrum and horizontal lines on the carapace, which increase in number with the increasing size of the prawn. After collection the prawn samples were carried safely by using ice box to the laboratory of Institute of Marine Science and Fisheries, Chittagong and started sample preparation.

*Corresponding author: belalhossain@yahoo.com

**Short Communication

Table 1: Proximate composition (% , dry matter basis) of *Macrobrachium rosenbergii* (Mean \pm SE)

Parameter	Wild	Cultured	Frozen
Protein	68.27 \pm 0.23	74.85 \pm 0.65	60.8 \pm 0.12
Carbohydrate	6.99 \pm 0.92	5.61 \pm 0.37	8.21 \pm 0.14
Lipid	8.44 \pm 0.10	9.15 \pm 0.61	7.89 \pm 0.005
Ash	16.30 \pm 0.65	10.14 \pm 0.55	23.09 \pm 0.39
Moisture	78.3 \pm 5.83	77.1 \pm 1.69	74.9 \pm 0.98

Proximate composition: The proximate composition of prawn was determined by using AOAC [16] method. Moisture content was measured by weighing differences before and after oven drying at 105°C for 10 to 12 hour. Protein content (% N * 6.25) was determined by Kjeldahl method. Ash content was determined using dry ashing procedures. Fat content was measured by drying the samples in 105°C oven and then extracting the fat with petroleum ether in a Soxhlet Extractor for 4 to 5 hour. Then carbohydrate was determined by subtracting protein, lipid and ash from 100.

RESULTS AND DISCUSSION

The proximate composition of *Macrobrachium rosenbergii* (wild, cultured, frozen) is furnished in table 1. The percentage of protein in the cultured prawn was higher (74.85%) than that of wild (68.27%) and frozen (60.8%) prawn. Likewise the lipid content of cultured prawn was higher (9.15%) than the wild (8.44%) and frozen (7.89%). The highest amount of carbohydrate was found in frozen prawn, the value being (8.21%) whereas in the higher level of moisture content was noticed in 78.3% in wild prawn. The higher value of 23.09% of ash was noticed in the frozen than that of wild and cultured (16.30 and 10.14%).

Comparison between the wild, cultured and frozen *Macrobrachium rosenbergii* shows that high level of protein, and lipid content were reported in the cultured prawn. Likewise higher level of carbohydrate and ash content was noticed in frozen prawn and higher moisture was in the wild prawn (Table 1).

The proximate composition of fish varied widely from species to species and even within the same species from one individual to another [17]. These individual variation are normally found to correlate with such factors as sex, reproductive cycle, capture period, food availability, hydrologic level etc [18,19,20]. Because of variation of supplying diet composition in different farm prawns composition varies [12].

Protein is essential for normal function, growth and maintenance of body tissues. Its content is considered to be an important tool for the evaluation of physiological standards [21]. Amino acids are the building blocks of proteins and serve as body builders. They are utilized to form various cell structures, of which they are key components and they serve as source of energy [22]. In the present study, the levels of proteins were found to be increased in cultured (74.85%) prawns in comparison to the other prawns. This suggests that diet differences impact on physiology of prawns highly and because of artificial diet growth of cultured prawn is high and protein content also. In different studies it was seen that protein composition might be up to 90% depend on diet composition [7,12]. Carbohydrates are considered to be the first among the organic nutrients to be utilized to generate required energy [23].

Lipids are the best source of energy producers of the body through metabolism. They provides a source of indispensable nutrients and act as carriers of certain non fat nutrients, notably the fat soluble vitamins like A, D, E and K [24,25]. In the present study, the level of total lipid was found to higher (9.15%) in cultured prawns when compared to the other prawns. In the present study, the contents of moisture were found to be slightly higher in wild prawns and ash in frozen prawns than other prawns. It has been reported that the muscle of male prawns contained higher levels of ash and water, and the females have relatively greater amounts of fat, protein and carbohydrates [26].

In the present study, the variation in muscle constituents between different prawns reflects their energy requirements for maintenance of body physiology during the adult stage. Therefore, the recorded data indicate that diet variation has a role in growth and meat quality of *M. rosenbergii*.

In consistent it is seen that cultured prawn contains higher level of constituents. It might have several causes, and mainly due to variation in diet composition. Another causes are include, physical,

chemical and biological conditions related to the habitat. The recorded data indicates that nutritionally the adult cultured prawns were better than the adult wild and frozen prawns. Since *M. rosenbergii* (wild, cultured and frozen) is a good protein source and other nutrients, this species of prawn can be recommended as a healthy choice for human consumption.

REFERENCES

- Ahmed N, Demaine H and Muir JF (2008). Freshwater prawn farming in Bangladesh: history, present status and future prospects. *Aquacul. Res.* 39:806-819.
- DOF (2006). Fishery Statistical Yearbook of Bangladesh 2004-2005. Fisheries Resources Service System. Department of Fisheries (DOF), Ministry of Fisheries and Livestock, Dhaka, Bangladesh.
- Abulude FO, Lawal LO, Ehikhamen G, Adesanya WO and Ashafa SL (2006). Chemical composition and functional properties of some prawns from the coastal area of Ondo state, Nigeria. *Electron. J. Environ. Agric. Food Chem.* 5:1235-1240.
- Shamasunder BA and Prakash V (1994). Physicochemical and functional properties of proteins from prawns (*Metapenaeus dobsoni*). *J. Agric. Food Chem.* 42: 169-174.
- Gopakumar K (1998). Utilization of by-catches and low-value fish in India. In *proceeding of the APFIC symp. on fish utilization in Asia and the Pacific*, Beijing. People's Republic of China, ed. James DG, 29-47. *RAP publication 1998/24*.
- Hui YH (2001). *Meat Science and Application*. CRC press. USA.
- Gomez GH, Nakagawa and Kasanara S (1988). Effect of dietary protein/ starch ratios and energy level on growth of the giant freshwater prawn, *Macrobrachium rosenbergii*. *Nippon Sui. Gakk.* 54:1401-1407.
- Reed L and D'Abramo LR (1989). A standard reference diet for crustacean nutrition research III. Effects on weight gain and amino acid composition of whole body and tail muscle of juvenile prawns *Macrobrachium rosenbergii*. *J. World. Aqua. Soci.* 20: 107-113.
- Sheen SS and D'Abramo LR (1991). Response of juvenile freshwater prawn, *Macrobrachium rosenbergii* to different levels of cod liver oil/ corn oil mixture in semi purified diet. *Aquacul.* 93: 121-134.
- Hossain MA, Siddique MAL and Miaje, MAH (2006). Development of low cost feed for culture of giant fresh water prawn *Macrobrachium rosenbergii* de Man in ponds. *Bangladesh J. Fish.* 4: 127-134.
- Hossain MA and Paul L (2007). Low-cost diet for monoculture of giant freshwater prawn *Macrobrachium rosenbergii* (de Man) in Bangladesh. *Aqua. Res.* 38: 232-238.
- Habashy MM (2009). Growth and body composition of juvenile freshwater prawn, *Macrobrachium rosenbergii*, fed different dietary protein/starch ratios. National Institute of Oceanography and Fisheries, Fish Research Station, El-Qanatar El-Khairya, Cairo, Egypt.
- Cavalli RO, Tamtin M, Lavens P and Sorgeloos P (2001). Variation in lipid classes and fatty acid content in tissues of wild *Macrobrachium rosenbergii* (De Man) females during maturation. *Aquacul.* 193: 311-324.
- Thompson KR, Muzinic LA, Yancey DH, Webster CD, Rouse DB and Xiong Y (2004). Growth, processing measurements, tail meat yield, and tail meat proximate composition of male and female Australian red claw crayfish, *Cherax quadricarinatus*, stocked into earthen ponds. *J. Appl. Aquacul.* 16: 117-129.
- Bhavan PS, Yuvaraj C, Leena M and Sangeetha M (2008). Concentrations of total protein, lipid, and carbohydrate in juveniles and sub adults of the prawn *Macrobrachium malcolmsonii* collected from the Cauvery River. *Indian J. Fish.* 55: 323-325.
- AOAC (1980). *Association of Analytical Chemists*, Washington DC. 125-39.
- Stansby, ME (1962). Proximate composition of fish. In *Fish in nutrition*. Ed. Heen, E and Kreuzer, R : 55-60, Fishing News (Books) Ltd, London.
- Oliveira ERN, Agostinho AA and Matsushita M (2003). Effect of biological variables and capture period on the proximate composition and fatty acid composition of the dorsal muscle tissue of *Hypophthalmus edentatus* (Spix, 1829). *Brazilian Arch. Biol. Technol.* 46: 105-114.
- May-Ku MA, Ordonez-Lopez U and Defeo O (2006). Morphometric differentiation in small juveniles of the pink spotted shrimp (*Farfantepenaeus brasiliensis*) and the southern pink shrimp (*F. notialis*) in the Yucatan Peninsula, Mexico. *Fish Bulletin.* 104: 306-310.
- Nargis R (2006). Seasonal variation in the chemical composition of body flesh of koi fish *Anabas testudineus* (Block) (Anabantidae, Perciformes). *Bangladesh J. Sci. Ind. Res.* 41: 219-226.
- Diana JS (1982). An experimental analysis of the metabolic rate and food utilization of northern pike. *Comp. Biochem. Toxicol.* 59:989-993.
- Babsky EB, Khodorov BI, Kositsky GI and Zubkov AA (1989). *Human Physiology*, Mir Publishers, Moscow.

23. Heath AG (1987). Water pollution and fish physiology. In *Physiological Energetic*. Ed. Boca Raton, FL: 131-163, CRC Press, USA.
24. New MB (1986). Aquaculture diets of post larval marine fish of the super-family Percoidae, with special reference to sea bass, sea breams, groupers and yellow tail: a review. *Kuwait bull. Mari Sci.* 7: 75-151.
25. Ricardo LS, James TL, Zelionara PB, Bianchini A and Luiz Eduardo Maia NY (2003). Lipids as energy source during salinity acclimation in the euryhaline crab *Chasmagnathus granulata* Dana, 1851 (crustacea-grapsidae). *J. Exp. Zool.* 295 A: 200-20
26. Amer HA, Sedik MF, Khalafalla, FA Amer HA, Sedik MF, Khalafalla, FA, Abd E1-Ghany AH (1991). Results of chemical analysis of prawn muscle as influenced by sex variations. *Mol. Nutri. Food Res.* 35: 133-138.
27. Abd E1-Ghany AH (1991). Results of chemical analysis of prawn muscle as influenced by sex variations. *Mol. Nutri. Food Res.* 35: 133-138.