Fishery Technology 55 (2018) : 226 - 228

Research Note

Impact of Prolonged Salinity Exposure on Body composition of Freshwater Catfish *Pangasionodon hypophthalmus* (Sauvage, 1878)

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The edible portion of fish body consist of four major constituents *viz.,* water, protein, fat and minerals. This composition will be affected by a number of biological variables (species, size, age and sex), diet (feeding habit), environmental conditions (temperature, salinity, pH, etc.) and seasonal changes (Salam et al., 1995; Orban et al., 2003). Body composition is an important index to estimate the nutritional condition and growth of the cultured fish (Hevroy et al., 2005). Earlier studies have proven that salinity had a major impact on carcass composition like, water (Arunachalam & Reddy, 1979), fat (Haliloglu et al., 2004; Xu et al., 2010) and protein (Jalali et al., 2013; Chowdhury et al., 2014).

In India, *P. hypophthalmus* (Sauvage, 1878) culture is highly popular in fresh waters (Tripathi, 2012). *Pangasius* sp. is reared in lower saline brackish waters especially in Andhra Pradesh. Previously the possibility of culturing *Pangasius* sp. in brackish water has been proved (Castaneda et al., 2010). But there is a lack of information on its body composition when it is reared in brackish waters. The present study was designed to evaluate the effect of varying salinities on proximate composition of *P. hypophthalmus* fingerlings.

The present experiment was conducted at the brackish-water fish farm, Central Institute of Fisheries Education, Kakinada Centre, Kakinada, East Godavari District, Andhra Pradesh, India. Fingerlings with an average body weight of 8.47±0.46 g each were stocked (40 animals/tank) in twelve rectangular tanks (1000 L tank^{-1}) and reared for 90 days. Fish were gradually acclimatized to saline waters (5, 10 and 15 ppt) prepared by mixing freshwater collected from bore-well with brackish water (salinity 17 ppt) collected from a brackish water fish farm. Fishes were reared for an experimental period of 90 days by feeding commercial feed at 3% of body weight (30% of crude protein) twice a day. Continuous aeration, daily cleaning and partial water exchange (20-30% /day) were provided throughout the experiment.

Proximate analysis of the carcass tissue was done at the end of experiment (n=3) by following standard methods of Association of Official Analytical Chemists (AOAC, 1995). Moisture content was estimated by drying the pre-weighed fish sample from each replicate in the hot air oven at 70°C for 48 h and weight was estimated (AOAC, 1995). After moisture estimation, the dried samples were ground and stored in muffle furnace for further analysis. Protein, lipid and ash contents were estimated employing Kjeldahl, Soxhlet and muffle furnace methods, respectively. Nitrogen content was determined by the Micro-Kjeldahl method (Pearson, 1976) and crude protein level was calculated by multiplying the percentage nitrogen with a factor of 6.25. Lipid was determined by acid hydrolysis (Neilsen, 2010). Carbohydrate content was determined by calculating the difference between 100% and the sum of values of moisture, protein, fibre, lipid and ash.

Statistical analysis was carried out using SAS version 9.3 (SAS Institute, USA). Duncan's multiple

Received 11 January 2017; Revised 27 July 2017; Accpeted 02 July 2018

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Table 1. Proximate composition of *P. hypophthalmus* fingerlings reared in different salinities (% wet weight basis ± SE)

Treatments	Moisture	DM	Protein	EE	Ash	TC	Digestible Energy (Kcal/100g)
0 ppt	$70.07^{b}\pm0.94$	$29.93^{a}\pm0.94$	$71.17^{a}\pm1.53$	$17.53^{a}\pm0.84$	$10.37^{a} \pm 0.64$	$0.93^{a}\pm0.08$	$483.94^{a}\pm0.90$
5 ppt	$69.90^{b}\pm0.95$	$30.10^{a}\pm0.95$	$71.75^{a}\pm1.01$	$16.53^{a}\pm0.75$	$11.01^{a} \pm 0.25$	$0.71^{a}\pm0.24$	$479.81^{a}\pm0.70$
10 ppt	$73.67^{a}\pm0.86$	$26.33^{b}\pm0.86$	$69.42^{a}\pm0.58$	$17.68^{a}\pm0.23$	$11.72^{a} \pm 0.65$	$1.19^{a}\pm0.10$	$483.61^{a}\pm0.34$
15 ppt	$73.16^{a}\pm0.74$	$26.84^{b}\pm0.14$	$67.67^{a}\pm1.51$	$17.90^{a}\pm0.32$	$12.00^{a} \pm 0.67$	$2.43^{a}\pm0.12$	$479.78^{a}\pm0.56$

DM-Dry matter **EE-**ether extract **TC-**Total carbohydrate

Values (mean±SE) in the same column with different superscripts differ significantly ($p<0.05$) for each parameter. One way ANOVA was used following Duncan multiple range test. Values in percentage were arcsine transformed and analyzed.

range test was used for post hoc comparison of means ($p<0.05$). All the data presented in the text, and tables are expressed as mean ± standard error and statistical significance for the test was set at ($p<0.05$).

The study did not find any significant difference in the whole body composition of fishes reared in different salinities, except in the moisture content (Table 1). Increase in salinity increased the moisture, fat and ash content and decreased the protein content of the fishes reared in different salinities. Significantly higher moisture content and lower dry matter content were found in 10 and 15 ppt reared fishes (Table 1). Excess dehydration of fishes in higher salinity causes the fish to take more water which ultimately increases the body moisture content (Kaushik & Oliva, 1989). The highest crude protein was recorded in 5 ppt followed by fish reared in 0 ppt reared fishes. Even though, *H. molitrix* has been proven to grow well in salinity level up to 13 ppt (Castaneda et al., 2010), the physiological adaptation to mild stress in higher salinity (15 ppt) could lower the protein content of the fish (Bhanu & Deepak, 2015).

Many authors stated that increase in salinity decreases the fat content in tissues. But the present study did not find any significant difference in fat content with increase in salinity. Similar results were observed in catfish (*Mystus vittatus*) (Arunachalam & Reddy, 1979), rainbow trout (*Oncorhynchus mykiss*) (Ashild et al., 2004) and Japanese sea bass (*Lateolabrax japonicus*) (Xu et al., 2010). Huang et al. (2006) reported that fish need more energy under salinity stress which is compensated by the increased blood glucose and stored lipids in tissues. In the present study, the osmotic energy demand of 15 ppt reared fishes was compensated may be by raised blood glucose level so the fishes did not use stored lipid energy. It may be the reason for similar fat content in the 15 ppt and 0 ppt reared fishes. But fishes reared in 0 ppt exhibited better body composition in terms of high protein content and low water, fat and ash content.

Body composition of fish is affected by number of physical, biotic and abiotic factors (Jalali et al., 2013). So, it has been postulated that physiological adaptation to different salinity (rearing environment) may be the reason for altered body composition of the fishes. The present study concludes that freshwater fish *P. hypophthalmus* can survive higher salinities (up to 15 ppt) for prolonged duration (90 days). It further reveals that *P. hypophthalmus* fingerlings body composition is not significantly altered by salinity, except for the moisture and dry matter content.

Acknowledgement

The authors are thankful to the Director, ICAR – Central Institute of Fisheries Education Mumbai for the necessary support and encouragement.

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