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Effect of salinity on proximate composition of *Pangasianodon hypophthalmus* reared in inland saline water

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Abstract
A study was conducted to find the effect of salinity on proximate composition of *Pangasianodon hypophthalmus* reared in Inland saline water, results of the study indicates that, the proximate composition of the *P. hypophthalmus* varied significantly ($P<0.05$) among the various treatment groups, showing declining trend in the moisture and ash content with the increase in the salinity and increase in the protein, fat content with the raise in the salinity.

Keywords: salinity, proximate composition, saline water, Pangasianodon *hypophthalmus*

Introduction

The fast growing population raise the question about future food and nutrition for prevailing food scarcity. It is important to develop such methods or technology that accomplishes the need of food. Fish is a very famous and easily accessible protein rich food source. Freshwater aquaculture is the major contributor in inland fish production so it is urgent need to proper use of all inland water resources for food production. Inland saline water resources are not properly used resources in the world so as it is current need to development a technology for using these resources in food production. Increasing inland salinity due to human activity has major economic, social and environmental consequences, threatening the viability of numerous rural communities (Chand et al. 2015) [4]. Secondary salinity affects over 380 million hectares of land in over 20 countries worldwide (Lambers, 2003) [8]. In India, nearly 8.62 million ha of land area is affected by soil salinity. Salt affected soils occur in states like Gujarat, Rajasthan, Haryana, Punjab, Orissa, Uttar Pradesh, Delhi, West Bengal, Kerala and Tamil Nadu about 2.8 million hectares of salt-affected soils are present with in Indo-Gangetic alluvial plain occupying parts of the states of Rajasthan, Haryana, Punjab, Uttar Pradesh, Delhi, Bihar (Abrol *et al*. 1971) [1]. The development of the immersing field for culture of *Pangasianodon hypophthalmus* (Sauvage, 1878) in Inland saline water is the new scope for aquaculture as well as to increasing the overall aquaculture production. *Pangasianodon hypophthalmus* is the most popular and cultured species in Asian countries. Hence, there is a crucial need to know the actual physiological changes of salinity on an aquatic animal and also to establish whether some of the freshwater species can be farmed in the inland saline areas. Hence, the present study was commenced to study the effect of inland water salinity on survival rate and changes in proximate composition of survive animal at different salinity exposure for a period of 60 days.

Material and Methods

Experimental design and Acclimatization

The experiment was conducted in the catfish research unit located at CIFE Rohtak Centre, Haryana, India. The experimental fishes with an initial weight of 0.40±0.04 gms (mean±SE) were procured from a private fish hatchery located in Kolkata (West bangal, India). The fishes were transported in 20 L oxygenated Polyethylene packing (1000 fish per pack) and after the arrival, the fishes were acclimatized to the local conditions and carefully transferred to an aerated circular tank (1000 L). The fishes were acclimatized to the local conditions for a period of 15 days in the same tank with the water exchange at every 24 hours and fed with commercial grade fish feed ad libi tum. Completely Randomized Design (CRD) was followed in the experiment, with one control and five treatments and three replicates of each treatment. The treatments were indicated as T_1, T2, T3, T4 and T_5 at inland saline water of salinity 5 ppt, 10 ppt, 15 ppt, 20 ppt and 25 ppt were designated as the treatments T_1, T2, T3, T4 and T_5 respectively with the fresh water as the control (C). Inland saline water used in the experiment, have been obtained from various bore wells located in the high saline and low saline zones of the CIFE Rohtak Centre. Saline water of salinity 5 ppt had been obtained from the bore well located in low saline region, whereas 10, 15, 20 and 25 ppt water had been obtained from the high saline zone, The experimental animals have been acclimatized to different salinities for around 20 days. The fishes were exposed to progressively increasing salinities by adding the appropriate amount of inland saline water at equal intervals. The salinity was increased by 1 ppt every 18 hrs until each treatment has reached around 5ppt, after that the salinity had been increased by 1ppt in every 24 hrs interval.

Proximate analysis of the carcass tissues

Proximate analysis of the carcass tissue of survive animal of different treatment and control groups was done by standard methods (AOAC, 1995) [2] at post-harvest Laboratory, CIFE Mumbai**.** The moisture content of fish was determined by drying the meat in an oven at 105^c until a constant weight was obtained, crude protein content was calculated by converting the nitrogen content determined by Kjeldahl's method as Crude protein (%) = N_2 (%) × 6.25, Fat was determined using the Soxhlet system, Ash content was determined by dry ashing in a muffle furnace at 525 ^{O}C for 24 h., Organic matter of the fish

carcass tissue was calculated by subtracting the ash (%) from 100.The total carbohydrate (TC) of the fish carcass tissue were calculated by subtracting the percentage of other nutrients from 100 (Hasting 1969).Digestible energy of the fish carcass tissue was calculated as per standard physiological values (Halver, 1976) according to the formula the Digestible energy (kcal/100g) = Protein (%) x 4 + Lipid (%) x 9 + Carbohydrate(%) x 4.

Statistical Analysis

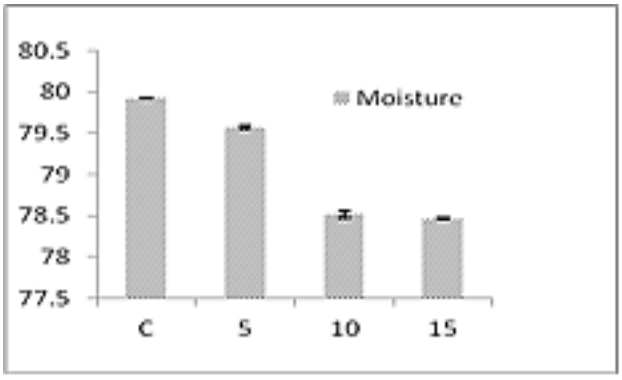
The statistical analysis was conducted using statistical package SPSS version 16.0.Separate ANOVAs were conducted for each sampling time point. A significance level of $P<0.05$ was used for mean separation. The results are expressed as mean± standard error. Significant differences among means ($P<0.05$) in the different treatments were determined by the Duncan's multiple range test (Duncan, 1955).

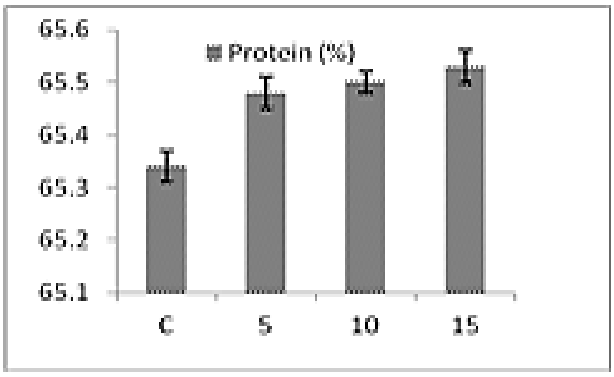
Result

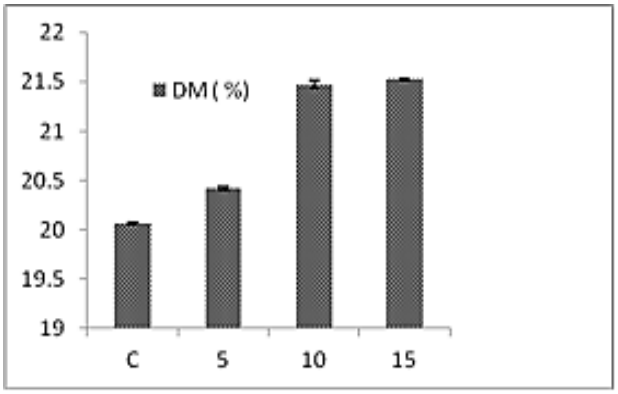
This study was carried out to find out the effect of inland water salinity on survival animal proximate composition of the carcass tissue of survive animal up to 15ppt salinity of different treatment and control groups. The biochemical composition of all the experimental animals in terms of moisture, protein, lipid and ash at the end of the experiment are given in Table-1 and Fig.1.The proximate composition was found to be significantly different ($P<0.05$) among the various treatment groups. The moisture content of the experimental fishes varied significantly different ($P<0.05$) among the various treatment groups. The highest moisture content was found in control group (79.93±0.01), which followed by T_1, T_2 and T_3 groups respectively. The Dry matter of the experimental fishes varied significantly ($P<0.05$) among the various treatment groups. The highest dry matter was observed in T_3 (21.52±0.01) groups and followed by T_2, T_1 and control group simultaneously. The Crude protein (% DM basis) of the experimental fishes varied significantly ($P<0.05$) among the various treatment groups. The highest crude protein was recorded in T_3 group (65.53±0.04) and shown gradual declining trend in control group. The ether extract of the experimental fishes varied significantly ($P<0.05$) among the various treatment groups. The highest ether extract was found in T_3 (19.55±0.04) and followed by T_2, control and T_1 groups (19.01±0.30). The ash content of the experimental fishes varied significantly ($P<0.05$) among the various treatment groups. The highest ash content was found in control group (8.84±0.02) and lowest in T_3 (8.41±0.05).It has shown descending trend from control group to T_3 groups. The Total carbohydrate of the experimental fishes varied significantly ($P<0.05$) among the various treatment groups. The highest Total carbohydrate was recorded in T_1 (6.49±0.15) and followed by control, T_2 and T_3 groups and lowest in T_3 group (6.13±0.01).The calculated digestible energy (Kcal/ 100g) of the experimental groups were varied significantly ($P<0.05$) are recorded in the range of 458.04±1.44 to 462.69±0.30.It was highest in T_3 group (458.04±1.44) and followed by T_2, control and T_1 groups.

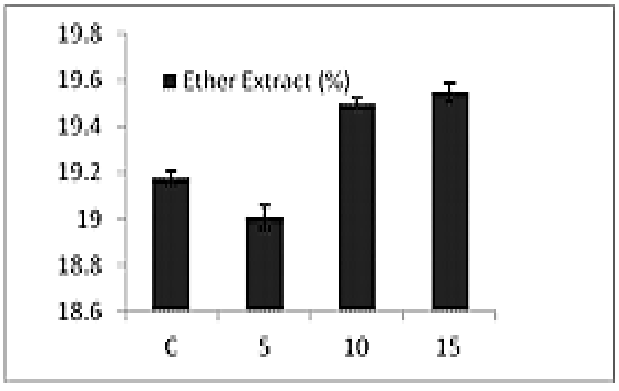
Table 1: Proximate composition of the whole body of *P. hypophthalmus*in different treatment groups (%DM basis ± SE).

Treatments	Moisture	DM	Protein	EE	Ash	TC	Energy*
C	79.93^{a}±0.01	20.07^{b}±0.01	65.34^{b}±0.03	19.18^{bc}±0.03	8.84^{a}±0.02	6.29^{a}±0.05	459.18^{b}±0.30
T_1	79.57^{a}±0.02	20.42^{b}±0.02	65.48^{a}±0.03	19.01^{b}±0.05	8.69^{b}±0.02	6.49^{a}±0.03	458.04^{b}±0.70
T_2	78.52^{b}±0.04	21.47^{a}±0.04	65.50^{a}±0.02	19.50^{a}±0.02	8.62^{b}±0.03	6.16^{b}±0.01	462.21^{a}±0.04
T_3	78.47^{b}±0.01	21.52^{a}±0.01	65.53^{a}±0.03	19.55^{a}±0.04	8.41^{c}±0.05	6.13^{b}±0.01	462.69^{a}±0.30









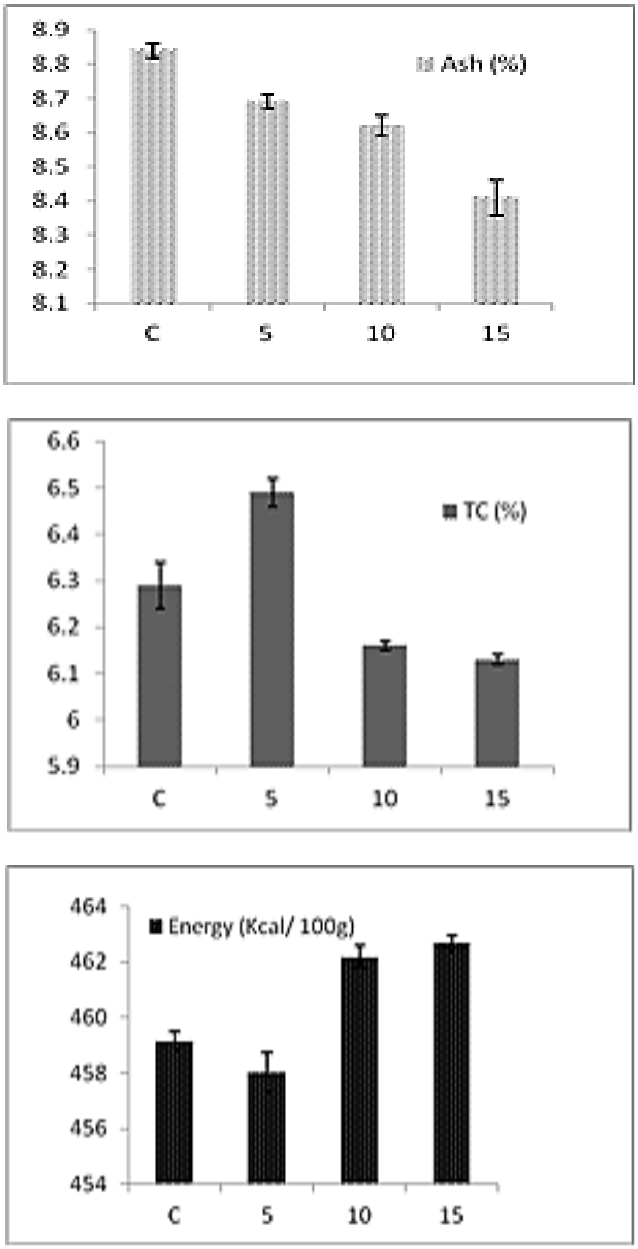


Fig 1: Proximate composition of the whole body of *P. hypophthalmus*in different treatment groups (%DM basis ± SE).

Discussion

The biochemical constituents of the fishes are affected to some extent by the medium in which they are reared and the salinity maintained. The results obtained in the proximate analysis clearly shows that, there is significant difference in biochemical composition among the treatments. Highest moisture content is seen in the control group (79.93±0.01), which gradually reduced with the increase in the salinity (78.47±0.01) in T_3 group. Similarly in a study conducted by Barman, (2012) on milk fish body composition, shows that there is significant reduction in the level of moisture (%) from 79.93±0.01 to 78.47±0.01 with the increase in salinity from 0 ppt to 15 ppt. Significantly ($P<0.05$) higher values were obtained for protein, fat, energy and phosphorus in the milk fish reared at 15 ppt in comparison to the animals maintained at 0 ppt. In the same way the findings obtained in the present study clearly shows that, protein, fat and energy contents of the tissue gradually increased with the increase in the salinity, showing significantly higher values at T_3 (15 ppt). Parry (1960) reported a reduction in moisture content in the muscle fiber of atlantic salmon (*Salmosalar*) from 78- 68 % when the fish migrate from freshwater to sea water. Maceina and Shireman (1979) reported that, grass carp fingerlings experienced a comparable reduction from 80 to 76.6 % in moisture content when they were transferred from freshwater to 12 ppt salinity. Considerable variation in muscle protein were observed in *M. cephalus* at tested salinity by De Silva, andperera (1976) who recorded the highest protein level in 20 ppt salinity follow by 15 ppt and 30 ppt salinities. Dendrinos and Thrope (1985) reported that in case of europianseabass, *Dicentrachuslabrax*, there was a marked decrease in the percentage of ash and increase in the percentage of total protein and total lipid when reared at different salinities. This information can be helpful to the overall techniques and knowledge of aquaculture in country (Dempson *et al.*, 2004) [6]. The body composition can be used as an indicator to assess the nutritional status and condition of fish.

Conclusion

Thus the baseline information generated in this study clearly indicates that the body composition of *P. hypophthalamus* also varies with the increase in salinity in inland saline water.

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