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Body composition of Edible portion of wild Bighead carp *Aristichthys nobilis* in relation to Body size and Condition factor from Indus River, Pakistan

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Abstract: The experimental fish bighead carp, *Aristichthys nobilis* were procured from River Indus near Ghazi Ghat, for the determination of condition factor, body composition and body size from the edible portions by rising analysis of regressing. It was observed that average parentage fat, protein and water content in edible portion of *A. nobilis* was found to be 1.97, 14.21and 81.79 respectively. The composition study of edible parts of the wild bighead *A. nobilis* reported highly significant between protein content and percentage of water (r = 0.768). Water contents also showed highly positive correlation with that of organic contents (r = 0.854). Protein and fat content (r = 0.010) showed non significant relation to the water content. Ash content of wet weight was found to be non significant relationship to the content of water. Content of ash (dry and wet weight) and fat (dry and wet weight) has reported non significant relation with body weight. Total length has shown highly positive effect ($p<0.001$) with Water contents. Highly significant relation existed between water content and Organic Contents (wet weight). Condition factor have shown Positive correlation with % water (r = 0.422) and least Significant Relation with % organic contents (r = 0.270) and non significant correlation with % Ash, % protein (r =0.230) and % Fat (r =0.159).

Keywords: Body Composition, Body Size, Condition Factor, Fish.

1. INTRODUCTION

Pakistan is an agricultural land but it facing deficiency of valuable proteins. In intensive and polyculture fish culturing is the key to get through scarcity of cheap protein source in the form of white meat (fish). Culture and rearing of aquatic animals is called aquaculture (Barnabe, 1994). Fish is the only source of animal protein and exhibits high production capacity in a small unit (Pillay, 1993). Flesh of fish is also considered very useful for the control of eye and cardiovascular diseases (Kulikov, 1978). Body composition analysis is the measure of physiological conditions of a fish which provide an idea about the percentage of fats, proteins and minerals and their relation to size and condition factor (Shammi and Bhatnagar, 2002). The water percentage in fish body is good indicator for relative content of energy, proteins and lipids. Water contents are inversely proportional to relative lipids, proteins and energy contents (Gopakumar, 1998). As lower the water percentage in the fish, greater will be the percentage of lipids and proteins, so higher the energy contents in fish (Talwar and Jhingran, 1991). Fish body mainly composed of Fats, Proteins, water and inorganic contents while carbohydrates and some other non protein parts are usually in negligible quantities. For assessing the nutritional value of fish food, biochemical analysis of fat, ash and protein is very important (Kamal *et al*., 2007) which ensures the eating quality as well as fish nutritional values (Azam *et al*., 2004). Bighead (*Aristichthys nobilis)* is originates from river plains of vitamin deficiencies. The major objectives of the present study on edible parts of wild bighead is to collect data about the water quantity, fats, protein and ash contents and to study their variations with different body parts in relation with condition factor and body size.

2. MATERIALS AND METHODS

The experimental fish *Aristichthys nobilis* fifty two specimen were procured from Indus River near Ghazi Ghat and brought to the laboratory in polythene bags. The collected samples weighed on electronic balance; length measurement was recorded with the help of measuring tape graduated with 0.1 cm. The edible parts of the body was separated for proximate analysis, non edible parts were also detached. To estimate the water contents of edible parts from every sample, the dead fish was measured was kept in foil to make them dried until constant weight to be reached in an electric oven at temperature of 60-65°C. For more analysis, every dried fish sample was ground in a powder form with the help of grinder, after proper crushing the sample was conserved in air-tight labeled plastic bottles for subsequent studies. Content of ash was analyzed replicated twice for every sample by using 0.5 to 1 gram in crucibles and were made to be in a furnace for one day at a temperature 450-500°C and was weighed again. The calculation of fat content of 0.5 -1 g dried tissues, the tissue powder was mixed in the mixture of Chloroform and Methanol (1: 2) by following the methodology of Bligh and Dyer (1959) and placed in proper tagged test tubes with aluminum foil covers to protect solution from evaporation for one day. After that, the contents of fat

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were detached the solution was kept in oven. The contents of protein of wild *Aristichthys nobilis* were projected through the analysis of other constituent like water content, fat and ash as made by Caulton and Bursell (1977). Co-efficient of condition (condition factor) was described through the equation $K = W/L^3 \times 100$ given by Weatherly and Gill (1987). Statistical analysis, including regression analysis and standard error were conceded as reported by Zar (1996).

3. RESULTS

Highly significant relationship was reported between % water contents and percent protein (wet weight = 0.768) and same result was shown with organic contents wet weight as represented in **(Table 1).**

However dry weights of fats, % protein and ash contents showed non significant relation to Water content ($p > 0.05$) as in **(Table 2)**.

Fat (wet and Dry weight), % Protein (Dry weight), percent ash (Wet and dry weight) and Organic contents (Dry weight, r = 0.130) had shown Non significant relation with Body weight as represent in table 2. Water contents (Log of Water contents), Protein content, ash contents and Organic content (r = 0.994) have represented Highly Significant Correlation with body weight as in **(Table 3)**.

It was reported that with the increase of body weight per total length it showed highly significant effect on % water content and organic contents wet weight ($p<0.001$). Total length has showed highly significant correlation to fat content, protein and Organic contents as in **(Table 4)**.

Condition factor (K) showed significant relation to %water (r = 0.422) and represented least significant influence on %organic contents (r = 0.270) as evident in table 6 and has been reported non significant correlation with % Ash, percent protein (r=0.230) and % fats (r=0.159).).

4. DISCUSSION

Several investigators had made equations to relate water content with Fat content and contents of protein and has been resulted that Body composition can be predict from water contents by use of the regression equations as made by Salam and Davies (1994). Highly positive correlation was observed in between % water contents and % Protein contents (Craig *et al.,* 1989; Naeem *et al.,* 2010). These variations which had been made observed can be because of many factors like feeding habits of fishes, maturity status, sex and also the quality of water.

In present research, Condition factor represented least significant effects on percent organic contents and reported non significant correlation with percent protein and fat percentages.

These effects of condition factor on body composition of a fish has also been worked out by many of other researchers as well as made by Naeem and Salam (2010).These may be due to change in feeding habitats during processes of its growth.

Table-1. Regression Analysis And Statistical Parameters Of Water Contents Versus Body Constituents Of *Aristichthys nobilis*

Relationships	r	a	b	S. E. (b)	t value when b=0
%Water (x) %Ash wet weight (y)	0.059 $^{n.s}$	4.864	-0.034	0.082	-0.034
% Water (x) %Ash dry weight (y)	0.130 $^{n.s}$	-23.448	0.423	0.455	0.423
% Water (x) %Fat wet weight (y)	0.411 **	16.336	-0.175	0.054	-0.175
% Water (x) %Fat dry weight (y)	0.176 $^{n.s}$	42.197	-0.384	0.303	-0.384
% Water (x) %Protein wet weight (y)	0.768 ***	78.799	-0.789	0.093	-0.789
% Water (x) %Protein dry weight(y)	0.010 $^{n.s}$	81.251	-0.039	0.519	-0.039

correlation coefficient (r), intercept (a), regression coefficient (b), standard error of b (S.E.) and probabilities (p), n = 46 in each case, *** $p < 0.001$, * $p < 0.05$, $^{n.s}$ $p > 0.05$

Table-2. Regression analysis and statistical parameters of body weight versus weight specific body constituents of *aristichthys nobilis*

Relationships	r	a	B	S. E. (b)	t value when b=0
Body weight, g (x) % Water (y)	0.398 **	82.760	-0.078	0.025	-0.078
Body weight, g (x) % Ash wet wt (y)	0.036 $^{n.s}$	2.074	-0.004	0.016	-0.004
Body weight, g (x) %Ash dry wt (y)	0.130 $^{n.s}$	12.196	-0.083	0.089	-0.083
Body weight, g (x) %Fat wet wt (y)	0.151 $^{n.s}$	1.815	0.012	0.011	0.012
Body weight, g (x) %Fat dry wt (y)	0.055 $^{n.s}$	10.486	0.023	0.060	0.023
Body weight, g (x) %Protein wet wt (y)	0.345 *	13.348	0.069	0.026	0.069
Body weight, g (x) %Protein dry wt (y)	0.082 $^{n.s}$	77.317	0.059	0.101	0.059

correlation coefficient (r), intercept (a), regression coefficient (b), standard error of b (S.E.) and probabilities (p), n = 46 in each case, *** $p < 0.001$, * $p < 0.05$, $^{n.s}$ $p > 0.05$

Table-3. Regression analysis and statistical parameters of total length versus weight specific body constituents of *aristichthys nobilis*

Relationships	r	a	B	S. E. (b)	t value when b=0
Total length, cm (x) % Water (y)	0.485 ***	85.795	-0.331	0.084	-0.331
Total length, cm (x) % Ash wet wt (y)	0.078 $^{n.s}$	2.404	-0.031	0.056	-0.031
Total length, cm (x) %Ash dry wt (y)	0.189 $^{n.s}$	16.236	-0.419	0.307	-0.419
Total length, cm (x) %Fat wet wt (y)	0.205 $^{n.s}$	1.250	0.059	0.040	0.059
Total length, cm (x) %Fat dry wt (y)	0.091 $^{n.s}$	9.138	0.135	0.209	0.135
Total length, cm (x) %Protein wet wt (y)	0.432 **	10.549	0.303	0.089	0.303
Total length, cm (x) %Protein dry wt (y)	0.113 $^{n.s}$	74.623	0.283	0.352	0.283

correlation coefficient (r), intercept (a), regression coefficient (b), standard error of b (S.E.) and probabilities (p), n = 46 in each case, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, $^{n.s}p > 0.05$.

Table-4. Regression analysis and statistical parameters of log total weight versus log total body constituents of *aristichthys nobilis*

Relationships	r	a	b	S. E. (b)	t value when b=1
Log body weight, g (x) Log water contents, g (y)	0.999 ***	-0.075	0.988	0.0041	-242.914
Log body weight, g (x) Log ash contents, g (y)	0.838 ***	-1.675	0.945	0.0870	-10.549
Log body weight, g (x) Log fat contents, g (y)	0.869 ***	-1.856	1.119	0.0899	-10.004
Log body weight, g (x) Log protein contents, g (y)	0.985 ***	-0.927	1.076	0.0261	-37.238

correlation coefficient (r), intercept (a), regression coefficient (b), standard error of b (S.E.) and probabilities (p), n = 52 in each case, *** $p < 0.001$, $^{n.s}p > 0.05$

Table-5. Regression analysis and statistical parameters of log total length versus log total body constituents of of *aristichthys nobilis*

Relationships	r	a	b	S. E. (b)	t value when b=3
Log total length, cm (x) Log water contents, g (y)	0.976 ***	-2.431	3.199	0.1007	-26.592
Log total length, cm (x)s Log ash contents, g (y)	0.837 ***	-4.053	3.098	0.2856	-7.406
Log total length, cm (x) Log fat contents, g (y)	0.874 ***	-4.694	3.690	0.2895	-6.673
Log total length, cm (x) Log protein contents, g (y)	0.978 ***	-3.610	3.505	0.1033	-25.537

correlation coefficient (r), intercept (a), regression coefficient (b), standard error of b (S.E.) and probabilities (p), n = 52 in each case, *** $p < 0.001$, $^{n.s}p > 0.05$

Table-6. Regression Analysis And Statistical Parameters Of Condition Factor Versus Body Constituent Of *Aristichthys Nobilis*

Relationships	r	a	b	S. E. (b)	t value when b=0
Condition factor (x) % Water (y)	0.422 **	77.768	6.558	1.9918	6.558
Condition factor (x) % Ash wet wt, g (y)	0.199 $^{n.s}$	3.138	-1.817	1.2643	-1.817
Condition factor (x) % Fat wet wt, g (y)	0.159 $^{n.s}$	2.620	-1.055	0.9252	-1.055
Condition factor (x) % Protein wet wt, g (y)	0.230 $^{n.s}$	16.472	-3.685	2.1973	-3.685

correlation coefficient (r), intercept (a), regression coefficient (b), standard error of b (S.E.) and probabilities (p), n = 52 in each case, ** $p < 0.01$, * $p < 0.01$, $^{n.s}p > 0.05$,

Highly positive correlation had been reported in this research relationship between percent Water content and percent Protein Wet weight. However Fats (Dry weight), percent protein, and Ash contents has been reported non significant relation to water contents.

Water contents, log of water contents, protein contents, Ash content and organic contents has been studied represented highly significant influence with, Body Weight.

5. CONCLUSION

It may be concluded that Body composition of edible potion of fish can be anticipated with much more accuracy from water content or size of the fishes.

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