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PROXIMATE COMPOSITION AND CALORIFIC VALUE OF SALMOSTOMA BACAILA (HAM.) IN DAH WATER RESERVOIR AT MAKHPA, MAKHDUMPUR, JEHANABAD, INDIA

F. Y. Peyami*

Department of Zoology, ICLES' M.J. College, Vashi, Navi mumbai, Maharashtra, India 400703.

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***Corresponding Author**
Dr. F. Y. Peyami
Department of Zoology,
ICLES' M.J. College, Vashi,
Navi mumbai, Maharashtra,
India 400703.

ABSTRACT

The present study deals with proximate composition and calorific value of *Salmostoma bacaila* (Ham.) with respect to body length, weight and season in Dah water reservoir. The mean percentage of moisture, Proteins, lipids, carbohydrates and ash content were observed 75.86 ± 0.225%, 16.32 ± 0.218%, 4.98 ±0.186%, 0.708 ± 0.155% and 2.12 ± 0.148 % respectively. The moisture content showed inverse relationship with respect to body size and body weight which were 83.85±0.156 % in small size fishes (body weight 1.00 ± 0.250 g and standard length 3.0 ± 0.110 cm) and 70.0±0.280 % in large size fishes (body weight 11.50 ± 0.210 g and standard length11.0 ± 0.210 cm). The lipid content were directly proportional to body size and weight which showed maxima 7.75± 0.190 % and minima 1.46± 0.210 % in large and small size fish specimens respectively. The proteins, carbohydrates and ash content were varied 13.0± 0.156 % to 18.52 ± 0.365 %, 0.45±0.112 % to 0.92±0.83 % and 1.24±0.106 % to2.81 ± 0.160 % in small and large size fish specimens respectively. The calorific value showed slight seasonal variations which showed maxima in winter season (5.4 Kcal/g) and minima during monsoon (5.26 Kcal/g). The more amount of calorific value during winter was noticed due to more accumulation of fat at the expenditure of moisture.

KEYWORDS: *Salmostoma bacaila*; Dah water; Calorific value; Proteins.

1. INTRODUCTION

Salmostoma bacaila (Ham.) is a fresh water fast swimmer surface feeder teleostean fish which generally live in a shoals of 10 -15 individuals. It has great demand among local people due to its delicacy and high nutritive value.

The fish provides cheap and chief source of proteins, omega fatty acids, minerals and vitamins as well. Such macro ad micronutrients are essential for proper growth, development and maintenance for healthy human life.

The prime proximate composition of fishes containing moisture, proteins, lipids and ashes. Carbohydrates and vitamins also form minor constituents of the body of the fishes (Cui & Wootton, 1986; Love, 1980 and Wootton, 1990). Generally the fish's body components are comprised of 70-80 % water, 15-25 % proteins and 1- 12% lipids (Love, 1980).

Although the proximate components of fishes are varied in accord with body size and weight, feeding nature, spawning season, onset of maturity, physical condition of the environment, degree of robustness and so on (Afser and Ali, 1981). Even though the body constituents are also varied with respect to tissue and organ of the body (Weatherley and Gill, 1987 & Jafri, 1973). The content of the moisture is an effective indicator to show the energy, proteins, and lipid contents of the fishes (Dempson et al. 2004). The change in amount of lipids may be reflected by change in the calorific value of the organic fractions (Gerking, 1955 and Schindler et.al., 1971).

In present study an attempt have been made to find out the proximate composition and calorific value of *Salmostoma bacaila* (Ham.) with respect to body size, weight and season in Dah water reservoir.

2. MATERIALS AND METHODS

Fish samples were collected with the help of local tribal people called Bhuhiyan by using different modus operandi such as mosquito net, Drag net, Reed stick screen and by manually hand picking. The specimens were washed properly to remove all the debris and mucous. The length and weight were taken in cm and gram respectively.

The moisture content was estimated by placing the whole specimens in oven at 70 °C temperature until constant weight was obtained. The difference in initial weight to final weight was calculated in terms of percentage.

Proteins were estimated by Micro Kjeldahl method. Initially the percentage nitrogen was calculated and finally the value was converted into percentage total protein multiplying by factor 6.25.

Lipids were estimated by Soxhlet extraction method. Lipid extraction was done for 2-3 days by using petroleum ether as a solvent. The extracted residue was dried in oven for 2-3 days at 70 °C temperature. The difference in initial to final weight was determined and finally it was converted into percentage.

Carbohydrates were estimated by following the methodology of Carroll et.al. (1956) by using anthrone reagent.

Minerals were estimated by taking 5 g sample in a crucible and burnt in muffle furnace at 550-600 °C temperature for 6 hours. The Weight was taken again after cooling and calculated their percentage.

Calorific value was estimated by Leith methodology (1970) through burning of 1.0 g complete dried weighed pellet in a crucible in an atmospheric pure oxygen gas. 10 cm platinum fused wire was used for ignition of pellet.

Statistical analysis

The mean value, Standard deviation (SD.), standard error (SE) were estimated from which paired student t- test were calculated and finally the 5% level of significance were made. The correlation coefficient (r) were also calculated for length and weight with body moisture, proteins, lipids, carbohydrates and with ash content.

3. RESULS AND DISCUSSION

The proximate composition in terms of body moisture, proteins, lipids, carbohydrates and ash content were estimated during the study period. The proximate components showed variation with respect to body size and body weight more effectively than variation with season. To some extent seasonal variation were noticed in caloric value, lipids, proteins, carbohydrates and ash content.

3.1 Moisture

Moisture contributed maximum percentage of proximate composition of fish that varied from 83.85±0.156% to 70.0±0.280% in small (standard length 3.0 cm and body weight

1.00±0.250g) and large size fishes (standard length 11.0±0.210 cm and body weight 11.50±0.584g) respectively (Table -1 & Fig.1a).

Seasonal variation in % moisture content was noticed during the study period. It showed minima in the month of December (70.0 ± 0.280%) at low water temperature 22.1 °C and maxima in the month of July (75.20 ± 0.226%) at high water temperature 31.5 °C (Table-2). The moisture content showed positive relationship with temperature of the medium. By taking an average season wise the value were noticed 71.25 ± 0.417, 73.04 ± 0.258 and 73.95± 0.309% in winter, summer and monsoon season respectively (Fig.1b).

3.2 Proteins

The highest and lowest protein content were recorded 13.0 ± 0.156% and 18.52± 0.365% in small and large size fishes respectively during study period (Table-1 & Fig.1a). Season wise it showed minimum value in the month of August (16.41 ± 0.128 %) and maximum in December (18.52±0.365%) (Table-2). Its value was recorded 17.93 ± 0.254%, 17.24±0.174% and 16.79± 0.218% in winter, summer and monsoon respectively (Fig.1b).

3.3 Lipids

The lipid content showed maxima and minima 7.75±0.190 % and 1.46±0.210 % in large and small size fishes respectively (Table-1 & Fig.1a). It showed little bit fluctuation with month wise which was minimum 5.06± 0.130% in the month of July and maximum 7.75± 0.190% in the month of December (Table-2). Its value was recorded highest 7.36±0.187% in winter followed by summer 6.44± 0.170 % and least 6.04±0.187% during monsoon. (Fig. 1b).

3.4 Carbohydrates

Carbohydrates were present in very less quantity as a proximate component in their body which showed variation 0.45± 0.112% to 0.92±0.183% in small and large size fishes respectively (Table-1 & Fig.1a). It was recorded maximum 0.92±0.183% in the month of December and minimum 0.74±0.128 in the month of June (Table-2). Season wise it showed variation 0.87±0.152%, 0.82± 0.418% & 0.78±0.152% in winter, monsoon and summer respectively (Fig.1b).

3.5 Ash

Ash content was recorded 1.24 ±0.106 % and 2.81 ± 0.160% in small and large size fish specimens (Table-1 & Fig.1a). The maximum ash content were recorded 2.81 ± 0.120% in

the month of December and 2.21± 0.145% in the month of July (Table-2). A slight seasonal variation was noticed from 2.36± 0.130% to 2.55±0.121% in monsoon to summer respectively (Fig.1b).

3.6 Calorific value

Calorific value showed very little seasonal variation. Although the highest caloric value were recorded 5.42 Kcal/g in the month of December & January and lowest 5.28Kcal/g in the month of June (Table-2).

Table 1: Proximate composition of *Salmostoma bacaila* (Ham.) of different length and weight group in Dah water reservoir, Makhpa, Makhdumpur (2017).

Standard Length (cm)	Body Weight (g)	Moisture (%)	Protein (%)	Lipid (%)	Carbohydrate (%)	Ash (%)
3.0±0.110	1.00± 0.250	83.85± 0.156	13.00± 0.156	1.46± 0.120	0.45± 0.112	1.24± 0.106
5.0±0.125	2.30± 0.280	78.50± 0.121	15.35± 0.182	3.82± 0.142	0.60± 0.140	1.73± 0.142
7.0±0.170	6.90± 0.310	74.95± 0.250	16.85± 0.240	5.10± 0.256	0.72± 0.165	2.38± 0.152
9.0±0.187	9.50± 0.452	72.00± 0.321	17.90± 0.149	6.80± 0.135	0.85± 0.175	2.45± 0.184
11.0±0.210	11.50± 0.584	70.00± 0.280	18.52± 0.365	7.75± 0.190	0.92± 0.183	2.81± 0.160
Mean = 7 ±0.16	6.24 ± 0.38	75.86± 0.225	16.32± 0.218	4.98± 0.186	0.708± 0.155	2.12± 0.148
S.D. = 2.828	4.0626	4.9168	1.9789	2.224	0.1694	0.562

Table 2: Monthly variation in proximate composition, calorific Value and Water temperature of *Salmostoma bacaila* (Ham.) in Dah water reservoir, Makhpa, Makhdumpur (JAN 2017 – Dec 2017).

Month	Standard length (cm)	BW (g)	Moisture (%)	Protein (%)	Lipid (%)	Carbohydrates (%)	Ash (%)	°C	Calorific value (Kcal/g)
JAN	10.95 ±0.140	11.20 ±0.345	71.30 ±0.221	18.00 ±0.245	7.53 ±0.165	0.90 ±0.115	2.27 ±0.125	22.9	5.42
FEB	10.90 ±0.136	10.83 ±0.260	71.90 ±0.350	17.83 ±0.142	7.12 ±0.175	0.80 ±0.110	2.35 ±0.110	23.5	5.36
MAR	10.93 ±0.155	10.95 ±0.340	72.50 ±0.410	17.52±0. 149	6.80 ±0.200	0.84 ±0.105	2.34 ±0.130	25.5	5.30
APR	10.80 ±0.126	10.62 ±0.451	72.90 ±0.320	17.40 ±0.120	6.50 ±0.185	0.79 ±0.180	2.41 ±0.128	28.0	5.29
MAY	10.65 ±0.225	10.56 ±0.351	73.10 ±0.126	17.00 ±0.250	6.33 ±0.155	0.75 ±0.120	2.62 ±0.112	30.5	5.30

JUN	10.50 ±0.210	10.53 ±0.460	73.80 ±0.176	16.84 ±0.180	6.15 ±0.140	0.74 ±0.128	2.37 ±0.134	31.3	5.28
JUL	10.68 ±0.240	10.62 ±0.185	75.20 ±0.226	16.72 ±0.170	5.06 ±0.130	0.81 ±0.150	2.21 ±0.145	31.5	5.14
AUG	10.72 ±0.260	10.74 ±0.253	74.85 ±0.341	16.41 ±0.178	5.56 ±0.230	0.84± 0.145	2.34 ±0.125	29.5	5.26
SEP	10.85 ±0.135	10.87 ±0.210	73.12 ±0.420	17.10 ±0.210	6.74 ±0.268	0.82 ±0.140	2.32 ±0.136	29.3	5.28
OCT	10.78 ±0.120	10.55 ±0.275	72.66 ±0.250	17.05 ±0.316	6.88 ±0.150	0.84 ±0.130	2.57 ±0.118	28.0	5.37
NOV	10.93 ±0.110	11.00 ±0.415	71.08 ±0.356	17.40 ±0.265	7.05 ±0.220	0.87 ±0.205	2.78 ±0.130	23.4	5.37
DEC	11.00 ±0.210	11.50 ±0.584	70.00 ±0.280	18.52 ±0.365	7.75 ±0.190	0.92 ±0.183	2.81 ±0.120	22.1	5.42

Table 3: Statistical analysis of Length and Weight with different parameters.

Body Length					Body Weight				
	SD	**r**	**t**	**P**		**SD**	**r**	**t**	**P**
BL Vs. Moisture	2.828 4.916	-0.983 68	-24.27	P: 0	BW Vs. Moisture	4.042 4.916	-0.968 7	-21.87	P: 0
BL Vs. Proteins	1.978	0.971 19	-5.40	P:0.00 6	BW Vs. Proteins	1.978	0.957 2	-4.48	P:0.0 021
BL Vs. Lipids	2.224	0.989 34	1.119	P:0.29 54	BW Vs. Lipids	2.224	0.969 7	0.543	P:0.0 6016
BL Vs. CHO	0.169	0.993 4	4.441	P:0.00 22	BW Vs. CHO	0.169	0.982 2	2.734	P:0.0 257
BL Vs. Ash	0.562	0.971 37	3.383	P:0.00 96	BW Vs. Ash	0.562	0.970 5	-2.017	0.078 3

BL = Body length, BW = Body weight, CHO = Carbohydrates, WT= Water temperature

% Weight (g)

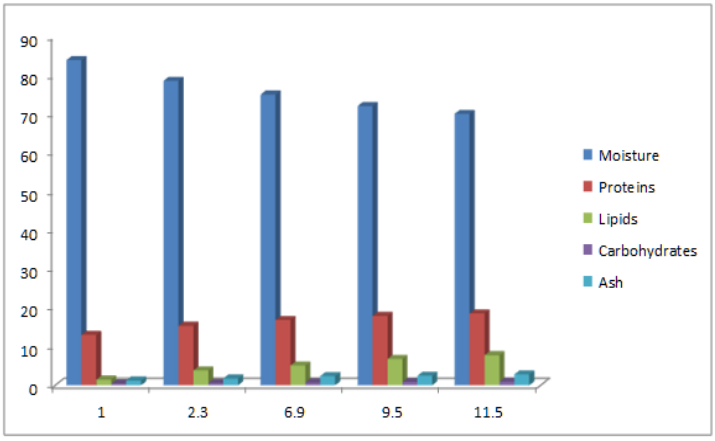

Fig. 1a: Proximate composition of Salmostoma bacaila (Ham.) in different weight group in Dah water reservoir.

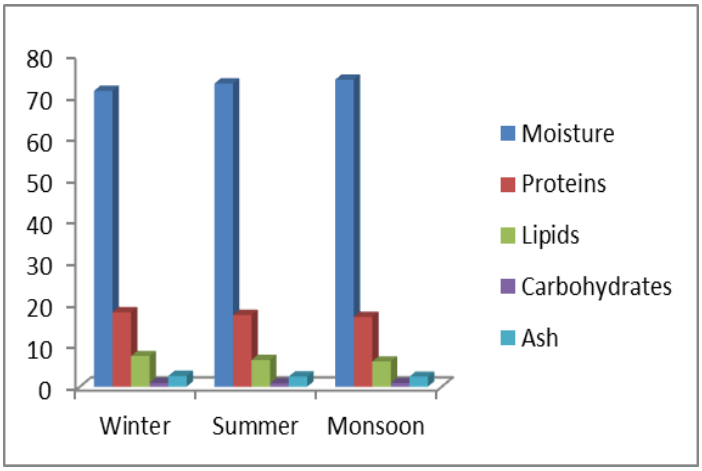

Fig. 1b: Seasonal variations in proximate composition of *Salmostoma bacaila* (Ham.) in Dah water reservoir.

In present study an inverse relationship were existed between moisture content and standard length and also with body weight of Salmostoma bacaila (Ham.) which is an accord to finding of Afser & Ali (1981) and Afser (1993). Moisture content also displayed cyclic changes with season which is similar to finding of Pandey et.al. (1976), Afser (1982) and Mitra et.al. (1978).

The protein is a macromolecule which forms the principal constituent of non-lipid of the fish and showed direct relationship with length and weight of the fish and showed little bit variation with season. Afser and Ali (1981) also made similar observation in air breathing fishes.

The lipid content showed positive relationship with body size and weight of the fish and also showed highest fraction during winter season as suggested by Jafri and Khwaja ((1978).The species could accumulate fat during winter season due to metabolic activities goes down at low water temperature and the fish become inactive. In summer and breeding season the fishes showed less lipid content due to high metabolic activities at high water temperature and their activeness which is an accord to finding of Pandey et.al. (1976) and Mitra et.al. (1978).

The macromolecule carbohydrates contributed very less percentage of body composition of *Salmostoma bacaila* (Ham.) and showed slight fluctuation with size, weight and season as it has been observed by Jayasree et.al. (1994) in marine fishes.

The ash content was produced by the production of oxide after burning in oxygen bomb calorimeter. In the present investigation a negative relationship with the moisture content and positive relationship with proteins and lipids were noticed which are akin to finding of Afser and Ali (1981).

The calorific value on an average it showed maximum 5.4Kcal/g in winter followed by 5.30 Kcal/g in summer and 5.26 Kcal/g in monsoon (Fig.1b) which is akin to finding of Gerking (1955) and Schindler et.al (1971). The variation of energy content might be reason of more accumulation of fat during winter.

In present study the correlation coefficient (r) was calculated for length and weight with different parameters by taking the mean value. The correlation coefficient (r) between length with moisture showed negative correlation (r = - 0.98368) where as it showed positive correlation with proteins (r =0.97119), lipids (r = 0.98934), carbohydrates (r = 0.99346) and with ash content. (r = 0.97137). Similar relation were existed between body weight with moisture (r =-0.96874), proteins (r= 0.95729), lipids (r = 0.969753), carbohydrates (r = 0.98229) and with ash content (r = 0.97054).(Table -3)

There was a significant difference in t- test between length with moisture, proteins, carbohydrates and with ash content but not much more significant difference were noticed with lipids (a = 0,05). Similar finding was also observed for body weight with different biochemical parameters.

4. CONCLUSION

In conclusion, this study provides the basic information about body composition and calorific value of a fresh water teleostean fish Salmostoma bacaila (Ham.). Their body size, body weight and season determine in variation of their body components.

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