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Seasonal Variations in Biochemical Composition of *Salmophasia Untrahi* (Day) from Bhadra Reservoir, Karnataka

B.R.Kiran

Research & Teaching Assistant in Environmental Science, DDE, Kuvempu University, Shankaraghatta-577451, Karnataka, India.

Corresponding Author:** ***B.R.Kiran, *Research & Teaching Assistant in Environmental Science, DDE, Kuvempu University, Shankaraghatta-577451, Karnataka, India.*

Abstract: *Biochemical constituents of raw and dried specimens of the freshwater fish Salmophasia untrahi was studied from Bhadra reservoir, Karnataka. The proximate composition of raw male Salmophasia untrahi revealed 71.18% moisture, 26.12% protein, 0.20% fat/lipid, 0.48% carbohydrate and 2.02% ash. In females, the level of moisture, protein, fat/lipid, carbohydrate and ash was 69.20%, 28.21%, 0.30%, 0.50% and 1.79% respectively. Females had relatively higher protein and fat content as compared males. The proximate composition of dried fish showed maximum and minimum occurrence of moisture, protein, fat/lipid, carbohydrate and ash contents during different seasons is attributed to variations in feed intake, water quality, stage of gonads , spawning and were greatly influenced by the breeding activity.*

Keywords: *Bhadra Reservoir, Biochemical composition, Salmophasia untrahi, Seasonal changes*

1. INTRODUCTION

Fishes are the natural source of protein and provide certain other useful products as well as economic substance to many countries. The alteration of the habitat and over-exploitation leads to erosion of the fish species. It is a well known fact that the knowledge on fish biology especially on biochemical composition is a utmost importance in increasing the technology for evolving judicious pisciculture management.

Biochemical compositions of fish tissue are of considerable interest for their specificity in relation to food values of fish and for evaluating their physiological needs at different periods of life. A number of workers have studied the depletive effects of maturation and spawning in the chemical composition of fish (Appa Rao, 1967; Pandy et al., 1976; Piska & Prasad, 1991; Kiran & Puttaiah, 2005; Ashashree etal.,2013).The seasonal variations in biochemical variations of Cyprinid fish have not been given much attention of *Salmophasia untrahi* of Bhadra reservoir. Hence, keeping in view of the importance of fish, an attempt has been made to study the above aspect.

2. MATERIALS AND METHODS

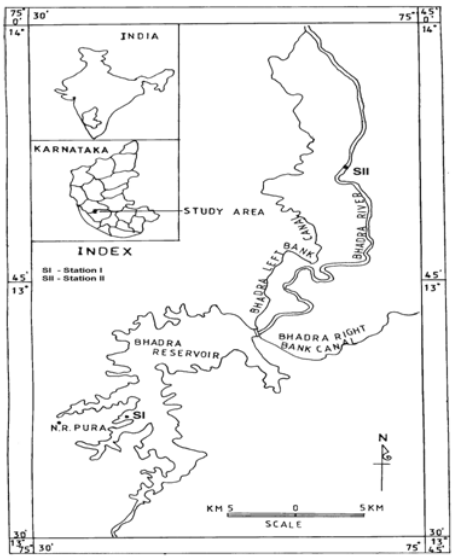

Figure1. *A sketch map showing the Fish sampling site of Bhadra reservoir, Karnataka*

In the present study, the samples of Salmophasia untrahi were obtained from backwaters of Bhadra reservoir at Narasimharajapura near Kalgudda (Fig.1) Chikmagalur district.Karnataka.

Proximate Composition of Raw Fish

Fresh specimens of *Salmophasia untrahi* obtained from backwaters of Bhadra reservoir were brought to the laboratory in iced condition. Later, washed and then their total length and weight were recorded. Further, muscle tissue was removed and utilised for the estimation of protein (Raymont et al., 1964), lipid (Bligh and Dyer, 1959) and carbohydrate (Dubois et al., 1956).

Moisture

The moisture content was estimated by AOAC (1975) method. About 5.0 gm of sample taken in moisture bottle was dried in a hot air oven maintained at 100º ± 1ºc, for about 16-18 hr till two successive weighings gave a constant weight. The weight loss during the drying process was expressed as the moisture content for 100 gm of sample.

Protein

For the estimation of protein, the biuret method as given by Raymont et al. (1964) was followed. For this, 30 mg of fresh tissue samples were removed and homogenised with 1 ml of distilled water. Later, 4 ml of biuret reagent was added to it in two installments of 2 ml each. They were then centrifuged for 30 minutes at 3000 rpm for 15 minutes. The clear supernatant fluid was read at 540 nm using UV-VIS spectrophotometer and the protein was estimated using the values of optical density as follows:

$$\text{Protein (\%)} = 18.44 \times \text{optical density} / \text{Weight of tissue (mg)} \times 100$$

Total Lipid

To estimate lipid, the method given by Bligh and Dyer (1959) was followed. In this method, a mixture of chloroform and methanol (2: 1 V/V) was used. About 1 gm of tissue was first ground using a pestle and mortar with about 10 ml of distilled water. The pulp was then transferred to a conical flask (250 ml capacity) and 30 ml of chloroform – methanal mixture was added to it and mixed well. This was kept overnight at room temperature in dark condition for complete extraction of lipid. At the end of this period, 20 ml of chloroform and 20 ml of water were added. The top methanol layer was discarded and the lower layer was collected free of thick pasty interphase by sucking out with a fine capillary tube. The collected layer, after the extraction, was taken in a pre-weighed beaker and carefully evaporated. The beaker with sample was kept covered with a dark paper to protect from light to avoid lipid polymerisation and decomposition. When the residue was free from solvent mixture, the weight was determined again. The difference in weight gave the weight of lipid. The results were expressed in terms of weight in milligrams of total lipid per 100 mg of fresh tissue.

Carbohydrate

Carbohydrate was estimated by phenol-sulfuric acid method as given by Dubois et al. (1956). To 20 mg of fresh tissue sample, 1 ml of distilled water was added, followed by the addition of 1 ml of 5% phenol and 5 ml concentrated sulphuric acid. After 30 minutes, the sample was read at 490 nm in UV-VIS spectrophotometer. The value of optical density was utilised to estimate the carbohydrate as:

$$\textit{Carbohydrate (\%)} = 0.1 \times \text{optical density} / \text{Weight of tissue (mg)} \times 100$$

Ash

The ash content of the sample was determined by heating, the incinerated sample in porcelain crucibles in a muffle furnace maintained at 5500C ±100C, for 5 hrs (AOAC, 1975).

Proximate Composition of Dried Fish

The proximate composition of fish sample was estimated by following AOAC (1975) method. The moisture content was estimated by heating the samples to 1050C for 30 minutes and then dried at 650C till a constant weight was obtained. Nitrogen content was estimated using the Kjeltec method (Tecator 1002). The nitrogen value obtained was multiplied by the factor 6.25 to get the crude protein

value. Fat content was determined by extracting the sample in petroleum ether (40-600C B.P) in soxtec system (Tecator 1043). Crude fibre was estimated by digesting the samples in acid and alkali in Fibretec (Tecator 1017) apparatus. Ash content was determined by burning the sample in a muffle furnace at 5500C for 6 hour. Nitrogen free extract was calculated by the difference method of Hastings, 1976.

3. Results and Discussion

Raw Fish Composition

Table1. *Proximate composition of raw specimen of Salmophasia untrahi*

BIOCHEMICAL CONSTITUENT	MALE	FEMALE
Moisture (%)	71.18	69.20
Protein (%)	26.12	28.21
Lipid (%)	0.20	0.30
Carbohydrate (%)	0.48	0.50
Ash (%)	2.02	1.79

The biochemical composition of male Salmophasia untrahi revealed 71.18% moisture, 26.12% protein, 0.20% lipid/fat, 0.48% carbohydrate and 2.02% ash. In females, the level of moisture, protein, lipid/fat, carbohydrate and ash was 69.20%, 28.21%, 0.30%, 0.50% and 1.79% respectively (Table 1). Females had relatively higher protein and fat content as compared to males.

Proximate Composition of Dried Fish

Males

Table2. *Proximate composition of Dried specimen of Salmophasia untrahi*

SEASON	SEX	BIOCHEMICAL CONSTITUENT				
		MOISTURE	PROTEIN	LIPID	CARBOHYDRATE	ASH
RAINY	*MALE*	4.67 (± 2.15)	59.89 (± 1.48)	1.71 (± 0.14)	15.63 (± 3.07)	18.10 (± 0.42)
	FEMALE	7.42 (± 3.42)	59.88 (± 7.43)	9.95 (± 0.35)	6.54 (± 4.63)	16.20 (± 0.28)
WINTER	MALE	9.15 (± 0.14)	66.20 (± 1.51)	1.31 (± 0.14)	5.54 (± 2.07)	17.80 (± 0.56)
	FEMALE	6.9 (± 0.14)	64.09 (± 1.48)	7.20 (± 0.56)	6.81 (± 0.77)	15.00 (± 0)
SUMMER	MALE	6.55 (± 1.69)	59.89 (± 1.48)	1.50 (± 0.42)	13.96 (± 2.33)	18.10 (± 0.42)
	FEMALE	5.45 (± 0.35)	61.46 (± 0.74)	13.4 (± 1.54)	6.58 (± 1.38)	13.11 (± 0.14)

The moisture content ranged from 4.67 to 9.15% in males with a maximum in winter season (9.15%). While, protein content was in the range of 59.89 to 66.20%. The highest protein was recorded during winter season (Table 2). Nevertheless, lipid level varied from 1.30 to 1.70% with a maximum percentage was observed during rainy season (1.70%) and lower during winter. The carbohydrate ranged from 5.54 to 15.63%. The lower carbohydrate was recorded during winter (5.54%) and higher in rainy season (15.63%). However, the ash content was ranged from 17.80 to 18.10% with a maximum in rainy and summer season and minimum during winter season (17.80%).

Females

In the present study, the moisture content varied from 5.45 to 7.42% with a maximum in rainy season (7.42%). The protein content was ranged from 59.88 to 64.09%. The lower value recorded during rainy season and highest protein was found during winter. However, lipid content showed variation with minimum of 7.20% during winter and maximum during summer season (13.4%). While, the carbohydrate ranged from 6.54 to 6.81% respectively. The highest carbohydrate was recorded during winter season. The ash content of the sample varied from 13.10 to 16.20% with a maximum recorded during rainy season and minimum in summer season.

The body composition of fish is known to be influenced by the chemical content of the diet (Zeitler et al. 1984). Variations in the chemical constituents of muscular tissues from different regions of fish body have been reported earlier (Jafri, 1973; Sherni and Jafri, 1978; Mustafa and Jafri, 1978). Iqbal and Choudhary (1977) recorded higher moisture content in Puntius sophore i.e., 70.9% and minimum in Tor tor i.e., 68.6%. Whereas in other fresh water fishes it may be as high as 82% (Lates calcarifer) or as low as 53.7% in Hilsa ilisha, (Saha and Guha, 1939). In the present study maximum moisture content was recorded in males and lower in female Salmophasia untrahi.

The biochemical composition of adult Oreochromis mossambicus populations from 9 reservoirs of Sri Lanka were evaluated by De Silva et al. (1984a) when they found that the mean percentage of protein, total lipid and carbohydrate content were 24.18%, 7.91 % and 22.34% respectively. However, in the present study highest protein contents were estimated in female Salmophasia untrahi i.e., 28.21%. Earlier report of highest protein value is 23.9% in shark Carcharias laticaudus (Chari, 1948). It shows that carnivorous fishes whether marine or freshwater species have high protein contents than others. The lipid/fat content of fish basically determines its quality and because of its high energy value, is also important in the evaluation of nutrient utilization.

Nair and Radha Krishnan (1988) reported that the middle part had low lipid content in Tor khudree muscle. Similarly, Braekkan (1959) observed the lower lipid content in the ordinary muscle of coal fish Gadus virens. While, Kondo Hisashi (1976) recorded lower lipid percentage in the flesh of Wakkanai Spring herring as compared the other Herring species. The lipid/fat content ranges from 0.20-0.30% in Salmophasia untrahi. Similar observation has been made by Saha and Guha (1939) where fat content is lower in Ophiocephalus punctatus, Sacchobranchus fossilis and Glossogobius giuris. Hence, the observations made in the present investigation are in essential agreement with the above researchers. Khawaja (1966) recorded the highest carbohydrate level in the muscle of those fish with low protein and fat contents. It has been reported earlier, that fish flesh contains negligible quantity of carbohydrates (Chari, 1948), thus, having no concurrence with the present studies where carbohydrates range from 0.48 to 0.50%. Ash content of fish muscle varies from 1.0% to 1.5% (Saha and Guha, 1939; Natarajan and Srinivasan, 1961).

The percentage of ash was found lowest (1.79 – 2.02%) in Salmophasia untrahi. Similarly, Iqbal and Choudhary (1977) recorded lowest ash content in Cyprinus carpio var communis i.e. 1.1% and highest in Labeo dero (2.5%). While Saha and Guha (1939) reported 2.6% ash in Ophiocephalus punctatus. Therefore, the observations made in the present study are in confirmity with the above researchers. Moreover, female Salmophasia untrahi had relatively higher protein and fat content as compared to males may be the gonads and other environmental factors play a great role in the biochemical composition of a fish. Norman (1962) reported that stage of gonads may play a great role in the biochemical composition of a fish. Hence, the observations made is in partial agreement with Norman (1962).

The maximum and minimum occurrence of moisture, protein, lipid/fat, carbohydrate and ash contents during different seasons may be attributed to variations in feed intake (Plankton), water quality, stage of gonads and spawning. Observations on the depletive effects of maturation and spawning on the chemical composition of fish include those by Robertson et al. (1961), Bachan Lal (1963), Appa Rao (1967), Chaturvedi et al. (1976), Pandey et al.(1976) and Sivakami (1981).

REFERENCES

[1] A.O.A.C. 1975. Official methods of analysis, 12th edn. Association of official analytical chemists. Washington. D.C.

[2] Appa Rao, T. (1967). Fat and Water Contents of the Muscle and Ovary During the Maturation Cycle of pseudosciaena Aneus (Block) and Johnius Carutta (Bloch) Indian J. Fish. 14: 293-297

[3] Ashashree,H.M., M.Venkateshwarlu and H.A.Sayeswara.2013. Seasonal changes of protein in the tissues of male catfish *Mystus cavasius* (ham) in Bhadra reservoir, Karnataka, India. International Journal of Applied Biology and Pharmaceutical Technology Vol 4(4) ;264-267.

[4] Bachan Lal. 1963. Biochemical studies in the ovary of *Cirrhina mrigala* during different maturity stages. *Sci. cult.,* 29 : 305-306.

[5] Bligh, E.G. and Dyer, W.J. 1959. A rapid method of total lipid extraction and purification. *Can. J. Biochem. Physiol.,* 37(8) : 911-917.

[6] Braekkan, O.R. 1959. Report on Technological Research concerning Norwegian Fish Industries 3 : 1.

[7] Chari, S.T. 1948. Nutritive value of some of the West Coast marine food fishes of the Madras provinces. *Indian J. Med. Res.,* 36 : 253-259.

[8] Chaturvedi, L.D., Joshi, B.D. and Gupta, D.K. 1976. Biochemical composition of some tissues in *Heteropneustes fossilis* during pre-spawning period. *Matsya* 2 : 16-18.

[9] De Silva, S.S., Perera, M.K. and Maitipe, P. 1984a. The composition, nutritional status and digestibility of *Sarotherodon mossambicus* from nine man-made lakes in Sri Lanka. *Environ. Biol. Fish.,* 113 : 205-219.

[10] Dubois, M., Gilles, K.A., Hamilton, J.K., Rebers, P.A. and Smith. 1956. Colorimetric method for determination of sugars and related substances. *Analy. Chem.,* 28 : 350-356.

[11] Hastings, W.H. 1976. Fish nutrition and fish feed manufacture. *FAO Technical conference on Aquaculture, Kycto, Japan, FIR: Aq/Conf/76/R.* 23, 13.

[12] Iqbal, S.E. and Chowdhary, S.K. 1977. Biochemical composition of few cyprinid fishes from Jammu. *Matsya* 3 : 90-92.

[13] Jafri, A.K. 1973. Fat and water distribution patterns in the flesh of the common catfish *Wallago attu* (Bl. And Schn.) *Fish. Technol.,* 10 : 138-141.

[14] Khawaja, D.K. 1966. Biochemical composition of the muslcle of some freshwater fishes during prematurity phase. *Fish. Technol.,* 3(10) : 94-102.

[15] Kiran, B.R. and E.T. Puttaiah. (2005). Biochemical composition of Chela untrahi from Bhadra reservoir, India, Geobios, 32: 93-95

[16] Kondo Hisashi. 1976. Studies on the lipids of Herring III. The lipids of the *Rumoi herring. Bull. Facul. Fish.* Hokkaido University. 27(1) : 37-49.

[17] Mustafa, S. and Jafri, A.K. 1978. Some biochemical constituents and the calorific values of different regions of the body musculature of pond murrel *Channa punctatus* Bloch. *Fish. Technol.,* 15 : 57-59.

[18] Nair, V.M. and Radha Krishnan, K.V. 1988. Regional variations in lipid and moisture content of *Tor khudree muscle.* In : *The First Indian Fisheries Forum, Proceedings.* (Ed. Mohan Joseph, M.). *Asian Fisheries Society, Indian Branch, Mangalore* : 89-90.

[19] Natarajan, M.V. and Sreenivasan, A. 1961. Proximate and mineral composition of freshwater fishes. *Indian J. Fish.,* 8 : 422-429.

[20] Normen, J. R. (1962). A History of Fishes. Ernest Bern Ltd., London, 2nd edition.

[21] Pandey, B.N, Datta Munshi, J.S., Choubey, B.J. and P.K. Pandey. (1976). J. Inland Fish. Soc. India, 8: 91-95.

[22] Pandey, B.N., Datta Munshi, J.S., Choubey, B.J. and Pandey, P.K. 1976. Seasonal variation in body composition in relation to breeding cycle of an Air-breathing *fish, Heteropneustes fossilis* (Bloch).*J. Inland Fish. Soc. India* 8: 91-95.

[23] Piska, R.S. and R.M. Prasad. (1991). Seasonal variation in biochemical composition of reproductive tissue in relation to breeding cycle of the carp minnow. Salmostoma bacaila (Ham) from Himayathsagar, Hyderabad. Comp. Physiol. Ecol., 16(2): 69-71.

[24] Raymont,T.E.C, Austin, J. and Linford, E. 1964. Biochemical studies on Marine zooplankton. The biochemical composition of *Neomysis integer. J. Cons. Perm. Int. Explore Sci.,* 28: 354-363.

[25] Robertson, O.H., Krupp, M.A., Favour, C.B., Hane, S. and Thomas, S.F. 1961. Physiological changes occuring in the blood of the pacific salmon (*Onchorhynchus tschawytscha)* accompanying sexual maturation and spawning. *Endo crinol.,* 68: 733-746.

[26] Saha, K.C. and Guha, B.C. 1939. Nutritional investigations on Bengal fishes *Indian J. Med. Res.,* 26: 921-927.

[27] Sherni, K. D. and Jafri, A. K. 1978. Distribution pattern of some biochemical constituents in muscle of the common catfish *Heteropneustes fossilis* (Bloch). *Fish Technol.,* 15: 121-123.

[28] Sivakami, S. 1981. Studies on the cyprinid fishes of the genus *Rasbora* Bleeker of Kerala. *Ph.D. Thesis,* Kerala University.

[29] Zeitler, M.H., Kirchgessner, M. and Schwarz, F.J. 1984. Effect of different protein and energy supplies on carcass composition of carp (Cyprinus carpio L.). *Aquaculture* 36 : 37-48.

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