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Proximate nutritional studies of *Clarias batrachus* Linn fish of different agro-climatic zone's water bodies with reference to Madhya Pradesh

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Abstract

Madhya Pradesh is divided into eleven agro-climatic zones and has special cropping patterns, soil types and varying degrees of rainfall. Mangur is a local name of freshwater air breathing catfish species. *Clarius batracus* has been reported good source of unsaturated fatty acid as compare to other fresh water fishes. Proximate nutrition and biochemical status of *Clarius batracus* was carried out in this study and reported Glycogen % 4.9, 5.03, 4.95; Total lipids (mg/dL) 190, 196, 189; Crude Protein (g/100g) 15.69, 16.01, 17.2; Total Fat (g/100g) 1.19, 1.21, 1.16; Cholesterol (g/100g) 1.33, 1.39, 1.32; Total Ash (g/100g) 1.1, 1.095, 1.01; Moisture content (g/100g) 72, 77, 78 in Upper Lake (Vindhya Plateau), Halali Reservoir (Vindhya Plateau), Narmada River (Central Narmada Valley) respectively were reported.

Key words: Proximate nutrition, *Clarias batrachus* Linn, Agroclimatic zone, Upper Lake Bhopal, Halai Reservoir Raisen, Narmada River Hoshangabad.

Introduction:

Madhya Pradesh is divided into eleven agro-climatic zones and has special cropping patterns, soil types and varying degrees of rainfall (Mall *et al.*, 2016). There were two different agro-climatic zones taken for this study comprising Central Narmada Valley and Vindhya Plateau. Central Narmada Valley having deep black soil, rainfall 1200 to 1600mm comparising Narsinghpur, Hoshangabad, Harda Sehore (Budhni tehsil), Raisen(Bareli Tehsil) districts. Vindhya Plateau having medium black and deep black (medium/heavy soil, 1200 to 1400 mm

rainfall comprising Bhopal, Sagar, Damoh, Vidisha, Raisen (except Bareli Teh.), Sehore (except Budni Teh.), Guna (Chanchoda, Raghogarh & Aron Tehsils) districts (Department of Farmer Welfare & Agriculture Development, MP). Mangur is a local name of freshwater air breathing catfish species *Clarias batrachus* Linn. This fish has different names in many areas including walking catfish. This name for this fish is due to walk and wiggle on dry land (Catfish, 2019; Masterson, 2007; Fish Base, 2003). Habitat of this fish is wide spread from Southeast Asia, Africa, North America. This is found in muddy water in pond, streams, rivers, paddies field, and nearly dry pools. Sometimes researchers confuse this species with some close relatives of this species (Ng and Kottelat, 2008). Biochemical parameter tests are widely used to know the physiological and pathological status of fish (Adeyemo *et al.,* 2009). Glycogen %, Total lipids (mg/dL), Crude Protein (g/100g), Total Fat (g/100g), Cholesterol (g/100g), Total Ash (g/100g), Moisture content (g/100g)parameters for Proximate nutrition and biochemical studies of Upper Lake,Halali Reservoir and Narmada River was done in this study.

Materials and Methods:

10g of fresh wetted muscle was taken and homogenized in a clean glass beaker. Digested it with 20 ml of 1:1 concentrated HNO_3 and H_2O_2 on a hot plate maintained at 100^oC inside a fume hood until white fume emanated from the solution. The resulting digest was cooled, filtered and made up to the mark in 25 ml standard flask with de-ionized water. The liver and muscle glycogen was estimated using the anthrone reagent method (Seifter *et al.,* 1950). Estimation of total lipid was carried out by Barnes and Blackstock (1973) method. For determining the moisture content of fishes, the body of each fish was divided into two horizontal regions along the lateral line i.e. dorsal and ventral parts and samples was taken. The wet samples was put in pre-weight dry petri dishes and then weighted again. The petri dishes with wet samples were kept in digital hot air oven for drying at 105^oC for about 24 hours or until the constant weight was obtained. Then dry samples were taken out from oven and put in desiccators, after 30 minutes the weight was taken, the difference in weight (wet and dry sample) was calculated and expressed as percentage moisture content of the sample.Crude protein content was based on slightly modifying micro-Kjeldahl's method (Jafri *et al.*, 1964) 0.1-0.5gram of sample was digested with 1:1 sulphuric acid in presence of potassium persulphate as an oxidizing agent. After complete digestion the sample was betransferred in 50 ml volumetric flask and raised the volume upto 50 ml byadding double distilled water. 0.5 ml of aliquot was then taken in a test tube with Nesseler's reagent, after 10 minutes the colour developed was read on spectrophotometer at 480nm. The optical density

(OD) obtained is used for estimating the crude protein (N×6.25) content of the sample. Crude fat content of sample was determined by using solvent extraction technique with petroleum ether (B.P=40-60 0C) by using Soxlet assembly. 1-5 gm of dried fined powdered sample was placed in Whatman Thimble and defatted cotton is plugged on the top of the thimbles. These thimbles then put into the thimble holder and fit it to the soxlet assembly. The extraction containing fat content was removed from the extraction unit and placed in digital oven for about 60 minutes at 50-60^{o}C for the complete evaporation of petroleum ether.

Weight of fat= Weight of extraction cup with fat- Weight of empty extraction cup. Cholesterol contents of fishes were estimated as per method of Zlatkis *et al*. (1953). Extracted lipids were treated with ferric chloride, acetic acid mixture and sulphuric acid and the colour developed was observed. After 20 min absorbance was read at 560 nm in a spectrophotometer. The ash content of the sample is the residue left after complete ashing. The fine powdered moisture free samples was taken in clean pre-weighted silica crucibles and weighted again along with samples. The crucibles containing samples was then placed in a muffle furnace at 650^{o}C for about 4-6 hours or till the residue became completely white. The samples were then allowed to cool in desiccators for about 20-30 minutes, reweighted and the amount of ash was calculated as the difference in weight. Weight of ash= weight of crucible with ashed sample -weight of empty crucible.

Results and Discussion:

Fish is a rich source of poly unsaturated fatty acids namely n-3 and n-6 PUFAs. Fish oils as well as meat are good sources of unsaturated Omega - 3 fatty acids, eicosapentacenoic acid and docasahexaenoic acid and even its ancestor alpha linolenic acid. Fish meat contains higher n-3 PUFAs than animal and bird meat (Calder, 2004). This is highly beneficial for human health (Dhanpal, *et al.* 2011). This has cardio protective, anti atherosclerotic, anti thrombotic and anti arrythmitic properties and also assist in reducing blood cholesterol level. Consumption of fish may regulate prostaglandin synthesis and helps in wound healing (Bowman and Rand, 1980). This may also helps in stabilizing the electrical activity of heart cells (Dallongeville *et al.* 1991). PUFA composition may vary in fish to fish species, their life stage and environment. Freshwater fishes are reported lower PUFAs than marine fishes (Vlieg and Body, 1988). But fresh water fishes have higher quantity of omega-6 fatty acid than marine fish (Muhamad and Mohamad, 2012). *Clarius batracus* has been reported good source of unsaturated fatty acid as compare to other fresh water fishes. Proximate nutrition and biochemical status of *Clarius batracus* was carried out in this study and reported Glycogen % 4.9, 5.03, 4.95; Total lipids (mg/dL) 190, 196, 189; Crude Protein (g/100g) 15.69, 16.01, 17.2;

Total Fat (g/100g) 1.19, 1.21, 1.16; Cholesterol (g/100g) 1.33, 1.39, 1.32; Total Ash (g/100g) 1.1, 1.095, 1.01; Moisture content (g/100g) 72, 77, 78 in Upper Lake, Halali Reservoir, Narmada River respectively (classified in graphs fig. 01 to 07). A study conducted by Jakhar., *et al.*, 2012 revealed highest value in lipid content, mono and poly unsaturated fatty acid, EPA and Linolenic Acid in Clarias magur. Magur was reported richest in PUFA content 25.56% followed by Pangas - 23.37%, Rohu - 15.84% and Catla - 12.5% (Jakhar, 2012). Paul *et al.*, 2015 was recorded 1.34 gm of Poly unsaturated fatty acid out of 5.24 gm total fat content per 100 gm of fish muscle whereas Omega 3 is 0.42mg and Omega 6 is 0.92mg in total PUFA content (Paul, 2015). Presence of PUFA in good quantity in muscle of Magur can play significant role in providing essential nutrition to the ethnic population belonging to the land locked states like the North East region of India (Chetia, 2019; Borah, 2020).

Glycogen %: Mean glycogen % was recorded 4.9 in sample of Upper Lake, 5.03 in sample of Halali Reservoir and 4.95 in sample of Narmada River. Graphical presentation of observed values is shown in Fig. 01.

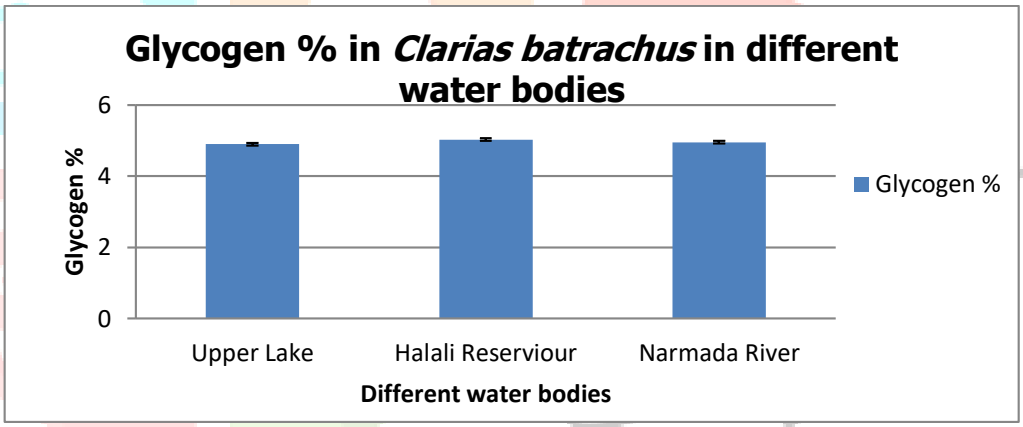

Fig. 01 Mean glycogen % in samples of different water bodies

Total lipids (mg/dL): Mean total lipids (mg/dL) was recorded 190 in sample of Upper Lake, 196 in sample of Halali Reservoir and 189 in sample of Narmada River. Graphical presentation of observed values is shown in Fig. 02.

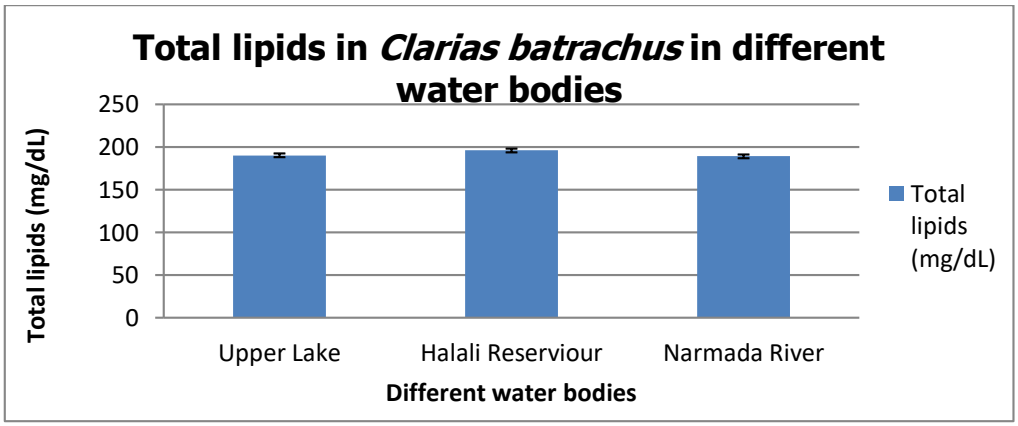

Fig. 02 Mean total lipids (mg/dL) in samples of different water bodies

Crude Protein (g/100g): Mean crude Protein (g/100g) was recorded 15.69 in sample of Upper Lake, 16.01 in sample of Halali Reservoir and 17.2 in sample of Narmada River. Graphical presentation of observed values is shown in Fig. 03.

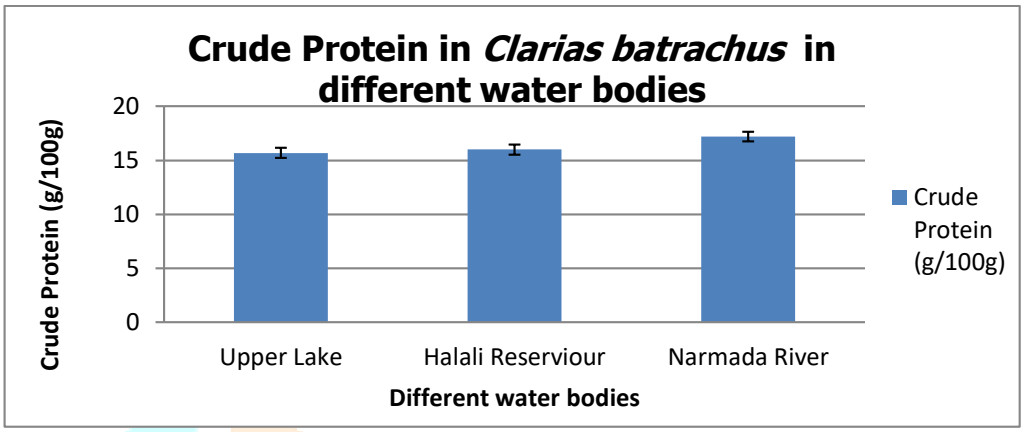

Fig. 03 Mean crude Protein (g/100g) in samples of different water bodies

Total Fat (g/100g): Mean total Fat (g/100g) was recorded 1.19 in sample of Upper Lake, 1.211 in sample of Halali Reservoir and 1.62 in sample of Narmada River. Graphical presentation of observed values is shown in Fig. 04.

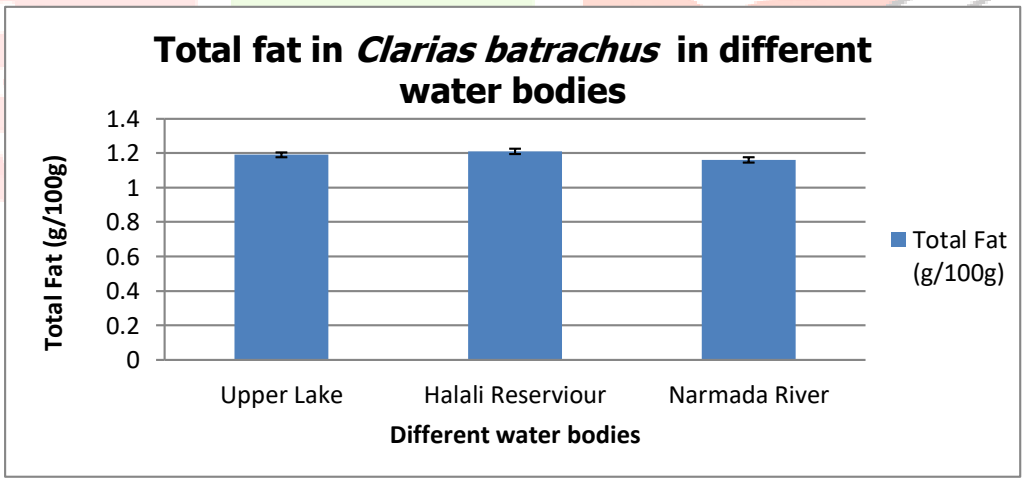

Fig. 04 Mean total Fat (g/100g) in samples of different water bodies

Cholesterol (g/100g): Mean cholesterol (g/100g) was recorded 1.33 in sample of Upper Lake, 1.39 in sample of Halali Reservoir and 1.32 in sample of Narmada River**.** Graphical presentation of observed values is shown in Fig. 05.

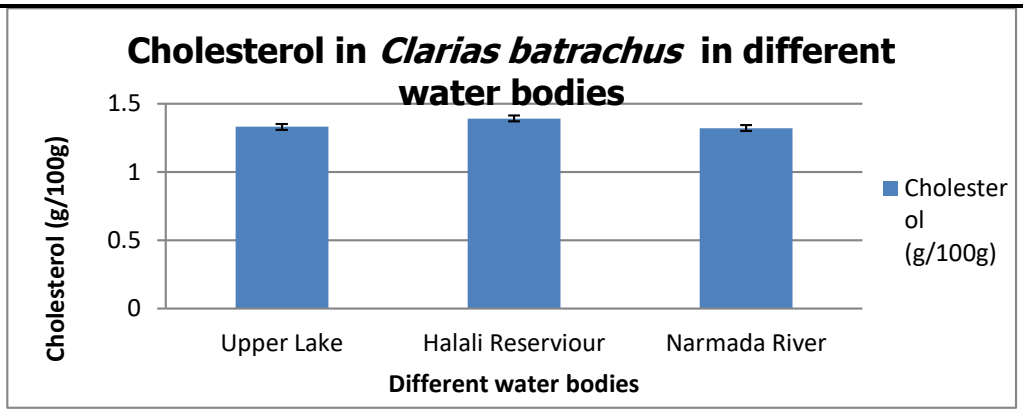

Fig. 05 Mean cholesterol (g/100g) in samples of different water bodies

Total Ash (g/100g): Mean total Ash (g/100g) was recorded 1.1 in sample of Upper Lake, 1.095 in sample of Halali Reservoir and 1.01 in sample of Narmada River**.** Graphical presentation of observed values is shown in Fig. 06.

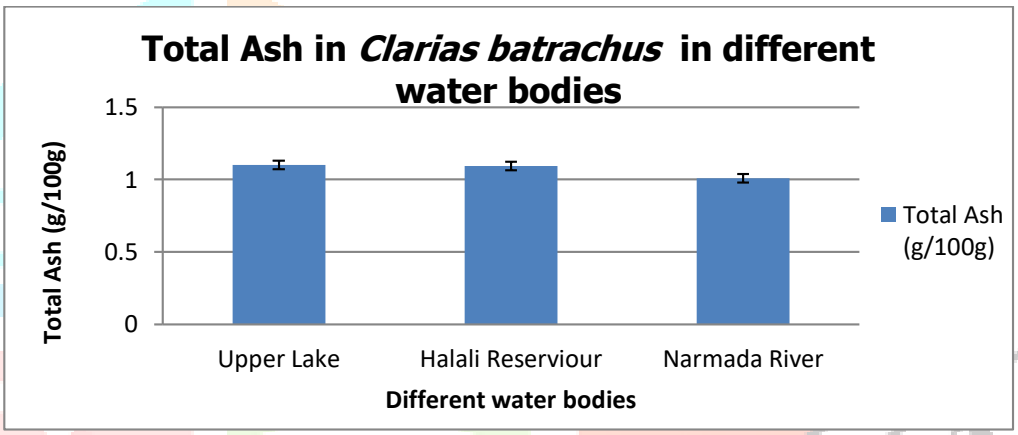

Fig. 06 Mean total Ash (g/100g) in samples of different water bodies

Moisture content (g/100g): Mean moisture content (g/100g) was recorded 72 in sample of Upper Lake, 77 in sample of Halali Reservoir and 78 in sample of Narmada River**.** Graphical presentation of observed values is shown in Fig. 07.

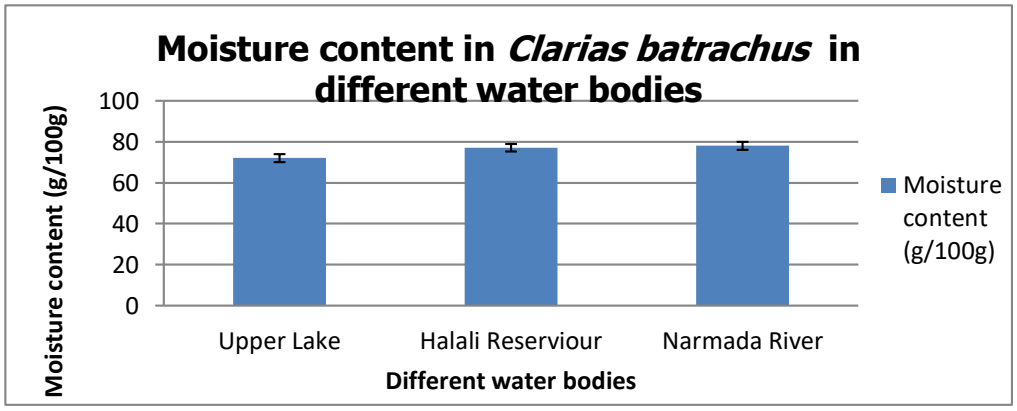

Fig. 07 Mean moisture content (g/100g) in samples of different water bodies

Conclusion:

Proximate nutritional values in *Clarious batrachous* fish sample collected from Upper Lake (Vindhya Plateau), Halali Reservoir (Vindhya Plateau), Narmada River (Central Narmada Valley) were indexed.

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