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Biochemical Analysis of some Selected Species of Macrophytes and their Effects on Fish Growth from Kori Lake District Thatta Sindh

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Abstract: Macrophytes constitute important components of many freshwater ecosystems. Macrophytes play fundamental roles in nutrient cycling of water bodies and provide suitable habitats for many other animals. This study was conducted to evaluate the food potential of macrophytes for aquatic fauna; macrophytes were collected for their biochemical composition (total lipids, carbohydrate content and total protein content) from Kori Lake District Thatta. The five of these macrophytes *Typha latifolia L, Bacopa monnieri L, Phragmites australis Adans, Lemna minor L., Valisnaria L., Salvinia molesta D. Mitch* were collected for biochemical analyses. The total moisture percentage in *Typha latifolia* in leaves, stem and rhizoids varied between 62.53, 43.22 and 65.33 respectively during summer June while in case of winter season the values ranged between 42.97, 30.40 and 49.77 respectively. The percentage of lipid of *Nelumbo nucifera*leaves and stem and rhizoids varied between 1.82 and 1.51 during summer while during winter season 1.29 and 1.42

Keywords: Kori Lake; Macrophytes; Biochemical Analysis; Fish.

1. INTRODUCTION

Macrophytes develop abundantly on any diverse aquatic bodies like lentic and lotic environment throughout the globe and are generally known as aquatic plants (Muhammed, *et al.*, 2012). It can play essential roles in nutrient recycling of natural water bodies and deliver appropriate surroundings for many terrestrial and aquatic animals (Tacon, *et al.*, 2009). Since last few decades an extra ordinary importance has been given to discover the potential steps to use these aquatic plants as cheaply available ingredient in animal feeds throughout the globe (Pandit, 1986). Now a day's macrophytes are ranked as worthy basis of nutrition and feed stuff for human beings, water and terrestrial higher and lower vertebrates. It can be used as dung like mulch and manure, ash, fresh manure, nourishment for the assembly of foodstuff crops, flowering beds and besides and act as basis of aquatic food web (Hasan, 2009). Macrophytes could play important role in upholding of hydro ecosystems as to provide propagation ground for many creatures comprising crustaceans, zooplankton fish, water born insects and many more which serve as nourishment for fish is well (Ratusshnyale, 2008).The presence of water/moisture in animal or plant body considered as good indicator of protein, fat and carbohydrates (Khan, *et al.*, 2002). Kori Lake is one of oldest Lake of Sindh, located at Thatta Sujawal road 92 km away from Hyderabad Sindh. (Akmal *et al.*, 2014) elaborate nutritional potential of hydrophytes from Head Baloki of River Ravi and they proposed that the hydrophytes can be assimilated as a decent basis of protein and extra nutrients for the nourishment of land and as well as aquatic animals. Evangelista *et al* (2014) published information regarding the biological importance of macrophytes in relation to freshwater habitat. They determined that the macrophytes such as *Myriophyllum spicatum, Hydrilla verticillata, Phragmites australis* and *Eichhornia crassipes* are common and play vital role in maintaining under threat aquatic ecosystems. (Olele, 2012) described the role of water borne macrophytes in recycling of nutrient in the water bodies. (Thomaz and Cunha 2011) described the importance of aquatic macrophytes and their role for forming populations in aquatic environments. They found that macrophytes not only affect animal assemblages but also promote biodiversity through a series of devices, interrelated to environment complexity, that include the accessibility of shelter and feeding sites. (Henry-Silva and Camargo 2006) they attempt to evaluate the effectiveness of three species of water borne floating macrophytes like *Eichhornia crassipes, Pistia stratiotes* and *Salvinia molesta* to treat effluents from Nile tilapia culture ponds. (Khan *et al.*, 2002), they assess the nutritional prospective of diverse water borne macrophytes like *Lemna trisulca, Lemna perpusilla, Azolla pinnata* and *Eichhornia crassipes*. They observed extensive in consistency in the concentrations of minerals, protein, gas production; ability to synthesis microbial protein; rumen degradable nitrogen and *in situ* dry matter and crude protein

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degradability were recorded with in the plant species. The objective of this study is to identify aquatic macrophytes and analyze the seasonal variations in biochemical composition of each species from Kori Lake.

2. MATERIAL AND METHODS

2.1 Collection of sample

Macrophytes was procured monthly by hand picking from Kori Lake, Thatta, Sindh after that these were cleaned with the help of lake water to eliminate dust and other waste material and brought them into laboratory University of Sindh Jamshoro in polythene bag.

2.2 Identification of samples

The collected macrophytes were identified; specimen washed first with tap water to remove crustation, dirt and dust and washed again with distilled water and then weight. Available parts root, stem and rhizoids weight separately for moisture. Samples were dried for about 15 days at room temperature. The dried material was grind make them into fine powdered form for proximate composition.

2.3 Biochemical analysis

Plant material was weight on electronic balance raped in aluminum foil and reserved for one hour in furnace at 80℃. Weight again and preserved for one hour more in furnace and continual the procedure till there was no fluctuations amongst weighing. The percentage of moisture was enumerated by using under equation.

Moisture% = Loss in the sample weight × 100/ Sample weight.

For determination of total percentage of Ash 5gram of plant powder was weighed with crucible after that it can be stored in hot oven at 450℃ with the weight of crucible observed. The whole process could be continual until and unless became carbon free.

For protein analysis

For protein analysis following reagent were prepared

A. Reagent:Na_2CO_3 (2%).

B. Reagent: $CuSO_4.\ 5H_2O$ (1%)

C. Reagent: Sodium potassium tartrate (2%)

D. Reagent: Mix reagent A, B and C in the ratio of 100:1:1.E. Reagent: 2 N NaOH

F. Reagent: Phosphate buffer with pH 7.6

Standard stock solution: 2mg/ml Bovine Serum Albumin in D.D H_2O).

The Total Carbohydrates were analyzed by preparing following reagent

Enthrone: 0.2g enthrone dissolved in 100 ml, of cold concentrated hydrochloric acid. Standard Glucose: For this, 100mg of D-Glucose standard was liquefied with 10 ml purified water and diluted in the 100 ml of purified water. The 10 ml solution was poured and thinned with 100 ml purified water. Lipid was estimated by the method of (Folch *et al.*, 1957).

3. RESULTS

The following macrophytes species were collected randomly from study area during winter and summer season.

3.1. *Typha latifolia*

It belongs to Family Typhaceae and Order Poales. These are aquatic, herbaceous perennial plant. The leaves are glabrous, linear, alternate and mostly basal on a simple, joint less stem, Stem bears the flowering spikes.

3.2.Bacopa monierri

It is a perennial, creeping and a non-aromatic herb. The leaves of this plant are succulent, which arranged oppositely on the stem. The flowers are small and white, with four to five petals. Its ability to grow in water makes it a popular aquarium plant.

3.3. Phragmites australis

It belongs to family Poaceae and Order Poales. The cosmopolitan common reed has the generally accepted botanical name *Phragmites australis.* It is a perennial grass. The erect stems grow to 2–6 meters. Where conditions are suitable it can also spread at 5 metres or more per year by horizontal runners, which put down roots at regular intervals.

3.4. Valisnaria australis

It belongs to family Hydrocharitaceae and order Alismatales. Vallisneriais a submerged plant that spreads by runners and sometimes forms tall underwater meadows. The Leaves arise in clusters from their roots. The leaves have rounded tips, and definite raised veins. Single white female flowers grow to the water surface on very long stalks. Male flowers grow on short stalks, become detached, and float to the surface.

3.5.Lemna minor

Duckweeds, or water lenses, are flowering aquatic plant which floats on or just beneath the surface of still or slow-moving bodies of fresh water and wetland. Also known as "bayroot", they belong to family Araceae and sub family Lemnoideae. The end of the 20^{th} century, place them as a separate family, Lemnaceae.

Table 1 Season wise total moisture % in selected macrophytes.

Season	*Typha latifolia*	*Phragmites australis*	*Nelumbo nuciffea*	*Valisnaria australis*	*Lemna minor*
Winter					
Leaves	42.97	36.59	31.79	53.22	55.07
Stem	30.40	27.59	31.23		
Rhizoids	49.77	28.49		48.97	
Summer					
Leaves	62.53	57.66	59.59	72.29	422.47
Stem	43.22	48.61	50.96		
Rhizoids	65.33	53.89		76.40	

Table 1 shows the total moisture percentage in *Typha latifolia* in leaves, stem and rhizoids varied between 62.53, 43.22 and 65.33 respectively during summer while in case of winter season the values ranged between 42.97, 30.40 and 49.77 respectively. In *Phragmites australis* highest moisture was recorded in leaves (36.59) during winetr and summer (57.66).

Table 2 Season wise total ash % in selected macrophytes

Season	*Typha latifolia*	*Phragmites australis*	*Nelumbo nucifera*	*Valisnaria australis*	*Lemna minor*
Winter					
Leaves	18.79	17.12	20.48	22.31	15.47
Stem	19.83	`14.37	11.11		
Rhizoids	22.15	9.67		18.84	
Summer					
Leaves	26.77	25.57	27.15	26.37	17.58
Stem	22.43	19.23	13.57		
Rhizoids	23.43	14.91		23.27	

Table 2 shows the total Ash percentage in *Typha latifolia* .in rhizoids found highest 22.15 during winter while lowest was observed 18.79 in leaves

Table 3 Season wise total protein % in selected macrophytes

Season	*Typha latifolia*	*Phragmites australis*	*Nelumbo nucifera*	*Valisnaria australis*	*Lemna minor*
Winter					
Leaves	1.80	1.36	1.71	1.21±0.31	1.54
Stem	1.09	1.24	1.27		
Rhizoids	1.09	1.27		1.01±0.15	
Summer					
Leaves	2.85	2.48	2.05	2.18±0.31	1.95
Stem	1.84	1.95	1.64		
Rhizoids	1.72	2.12		1.59±0.31	

Table 3 shows the total protein percentage in *Typha latifolia* leaves have highest 1.80 during summer while lowest in stem and rhizoids 1.09 .

Table 4 Season wise total carbohydrate % in selected macrophytes

Season	*Typha latifolia*	*Phragmites australis*	*Nelumbo nucifeera*	*Valisnaria australis*	*Lemna minor*
Winter					
Leaves	4.77	9.92	3.31	3.93	4.50
Stem	3.74	3.92	2.03		
Rhizoids	3.37	2.61		2.23	
Summer					
Leaves	10.66	11.58	4.46	5.39	7.02
Stem	8.62	5.79	3.40		
Rhizoids	8,83	3.85		3.57	

Table 4 shows the percentage of carbohydrate in different parts of *Typha latifolia*. In leaves highest value 4.77 was found in summer and 10.66 in winter.

Table 5 Season wise total lipid % in selected macrophytes

Season	*Typha latifolia*	*Phragmites australis*	*Nelumbo nucifera*	*Valisnaria australis*	*Lemna minor*
Winter					
Leaves	0.37	0.13	1.29	0.38	0.40
Stem	0.42	0.14	1.42		
Rhizoids	0.61	0.21		0.29	
Summer					
Leaves	0.92	0.35	1.83	0.52	0.80
Stem	0.92	0.29	1.51		
Rhizoids	1.19	0.30		0.33	

Table 5 shows that percentage of lipid in different parts of *Typha latifolia*. In leaves highest value 0.92 during summer.

4. DISCUSSION

The current research on the bio-chemical composition of selected macrophytes and their effect on fish growth were investigated from Kori Lake, District Thatta, Sindh. During current studies moisture found between (28.49-82.06%) the values were high because they inhabited in aquatic environment. This affirmation was described by (Boyd and Blackburn 1970; Banerjee and Matai, 1990; Shah *et al.*, 2010). Previous work showed that the values of moisture in macrophytes diverse between from 48.6 -54.80%. The 54.80% was observed from *Pistia stratiotes* and low from water lily and spinach 8.78 and 6.25% respectively (Olele, 2012; Adelakun *et al.*, 2016).Present studies demonstrates that in studied macrophytes the Ash was in between (9.67-29.95%). The previous work showed that total ash (13.5%) Ashalatha (2015) was (12.68%). During current investigation it was noticed that the protein was in studied macrophytes around (0.98- 3.06%). The previous work showed that total proteins concentration was in disparate macrophytes describe highest in *Nelumbo nucifera* and *Potamogeton natans* 2.41 and 1.44% respectively (Zahoor, *et al.*, 2015). The protein values of various macrophytes were Vallisneria (31.2%), water primrose (6.88%), water lilly (25.60%), phragmites (19.67%), cuttail (24.70%), cod grass 17.50% and in water hyacinth was (12.12%) (Shah, *et al.*, 2010; Akmal *et al* 2014) were of the view that the percentage of protein in various macrophytes could be diverse during various seasons, environmental conditions, different kinds and biological nature of the water body. Their discovery indicated that the macrophytes possess great potential land rich source of protein not only for human consumption also for the feed of fish and livestock. Similar results have also been reported by (Pandit, 1986; Jayasankar, 1999; Banerjee, 1990; Shah, 2010; Prasannakumari, 2012).

Recent work shows that in studied macrophytes the total carbohydrate was observed in between (2.23-22.01%) while previous work showed that total carbohydrate concentration of dissimilar macrophytes present to be highest in *Potamogeton natans* (17.4± 1.33%) and *Nelumbo nucifera* (19.13 ± 0.69%) (Zahoor *et al* 2015). Findings of the present investigations support that of (Pandit, 1986; Gatenby, *et al*., 2003; Shah, 2010; Prasannakumari, 2012). The Recent work shows that in studied macrophytes lipid was noted in between (0.13- 1.83%) in different parts of these plants. The previous work the highest value of total lipids *Typha angustata* (5.87 ± 1.94%) and (5.47 ± 1.90%) in case of *Phragmites australis* and the lowest value of lipid was observed in *Nelumbo nucifera* (1.30 ± 0.71%) *and Potamogeton natans* (1.40 ± 1.23%) (Akmal *et al.,* 2014) and (Dar *et al.* 2013) showed similar results of total lipid. Diverse worker like (Boyd, 1968; Annon 1984; Pandit 1984; Pandit 1986; Banerjee 1990; Dar, 2013) reported that water borne macrophytes possess lipid concentration around 1.18 to 5.42%. Our results are in consonance with the findings of (Boyd, 1968; Pandit 1984; Pandit 1986; Banerjee 1990; Dar, 2013). Earlier it was suggested by Henry-Silva and Camargo (2006) that the effectiveness of three species of water borne floating macrophytes like *Eichhornia crassipes*, *Pistia stratiotes* and *Salvinia molesta* to treat effluents from Nile tilapia culture ponds. They suggested that the effluents from fish farming can be utilized to increase the quantity of suspended solids which will stimulate the enhancement of nitrogen and phosphorus in aquatic ecosystems. (Akmal *et al.,* 2014) also elaborate the nutritional potential of hydrophytes from Head Baloki of River Ravi and they proposed that the hydrophytes can be assimilated as a decent basis of protein and extra nutrients for the nourishment of land and as well as aquatic animals. The misuse of these hydrophytes will not only of economic loss but a step toward improved consumption and production of feed in this will be helpful to eradicate the weed problem. The observation of aforesaid authors accords with the present investigations.

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