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IMPACT OF RETTING ON HYDROLOGICAL AND BIOCHEMICAL QUALITY OF *ARIUS SUBROSTRATUS* FISH IN KOLPADAM KADAVU, KOLLAM DISTRICT, KERALA.

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***Abstract*:** Retting is a traditional process of soaking green coconut husk in water for making coir fibre. The waste disposal from the coconut husk retting causes increases of toxic ingredients such as acids, alkalis, suspended solids, polyphenols, pectin, tannin etc. make threatening effect on aquatic organisms. Kolpadam kadavu is a part of Ashtamudi Lake and it is the region having intense retting activity and traditional coir manufacturing unit for many years. The present investigation was carried out to analyse the haematological and biochemical changes in the impact of retting on fish population at Kolpadam Kadavu. The physico-chemical parameters such as water temperature, pH, salinity, dissolved oxygen, carbon dioxide, biological oxygen demand, turbidity, nitrate, hydrogen sulfide, total phenol, etc. were analysed seasonally during 2018-2019. Fish Arius subrostratus collected from Kolpadam kadavu was subjected to analysis of biochemical parameters such as total protein, glycogen and total amino acids to find out the impact of retting activity.

***Index terms*: *Arius subrostratus*, biochemical, coconut husk, Kolpadam kadavu, retting.**

I. INTRODUCTION

Retting of coconut husk has been one of the important sources of pollution in the Kolpadam kadavu. Retting affects the physico-chemical parameters of water and cause serious health problems in humans. The retting of coconut husks adversely affects the productivity of the backwaters and is harmful to marine fisheries (K.N Remany et al, 1990). The pectinolytic activities of bacteria and fungi from the retting process liberates more organic substances including pectin, tannin and polyphenolic compounds into the ambient water (Suja.S, 2014).The oxidation of phenolic compounds formed during the coir fermentation releases foul smell and depletion of oxygen causes decrease in the aquatic life (Suma S. et al, 1989).The Kolpadam kadavu, part of Ashtamudi Lake is considered as the major retting site for several years. Fishes are useful bioindicators and integrators of contaminants due to their wide distribution in the fresh water environment, the fact of being free swimmers, their ability to respond to environmental pollution, and their importance as a food source for human beings (Gupta et al, 2009).

Fishes are vital sources for many nutrients especially vitamins such as Vit. A, D and E as well as minerals including calcium, iodine, selenium etc., and the protein containing all essential amino acids in the exact proportions (Sankar et al., 2013). Fish is a key source of an essential amino acid lysine which is low in cereals, hence giving a nutritional balance in the overall quality of a mixed diet (FAO, 2005). Fish and fishery products are excessively utilized as animal feeds. Knowing biochemical composition denotes the quality of meat and help to find out the nutritional value of a specific fish (Ambily. V et al, 2018).

The present study was carried out to analyse the changes in biochemical parameters of *Arius subrostratus* fish in retting area of Kolpadam kadavu.

II.MATERIALS AND METHODS

Kolpadam kadavu of Ashtamudi Lake was selected for the study. It is one of the major retting yards in Ashtamudi Lake for many years. There is intense retting activity and traditional coir manufacturing unit. Water samples were collected in sample collection bottles for analysis of various physico-chemical parameters such as water temperature, pH, salinity, dissolved oxygen, carbon dioxide, turbidity, nitrate, hydrogen sulfide, total phenol etc. for a period of 2018-2019. Sampling and analysis of water samples for the above mentioned parameters were done by standard methods of APHA (1998)[Table.1].

Fish samples were collected using gill nets and cast nets for biochemical analysis. Fish samples were cleaned with distilled water and transported to the laboratory in iced condition in insulated boxes. The fresh fish muscle tissues of *Arius subrostratus* were used for estimating biochemical parameters such as total protein, glycogen and total amino acids. Protein levels were estimated according to the method of Lowry et al (1951) using standard solution of bovine serum albumin. Homogenates (10 mg/ml, w/v) were prepared in 10% TCA. Glycogen content in fish samples were estimated by Anthrone method of van Der Vies (1954). In the present experiment 50 mg of tissue were homogenates with 5 ml of cold 5% TCA. The homogenate was filtered and 1.0 ml of filtrate was used for assay. Estimation of total amino acids was performed by Ninhydrin method of Yemm and Cocking (1955). 50mg of tissue sample was homogenized in 1mL phosphate buffer (pH 7.0). Centrifuged and 1mL of Ninhydrin reagent was added to the sample and the concentration of amino acid was calculated using the standard curve of proline.

Table 1: Summary of methods adopted for estimating hydrological parameters

Parameters	Methods/Instruments	References
Temperature	Celsius thermometer (≠0.1°C)	Welch (1948)
pH	pH meter (Model, pH, Testr1, 2 Eutech, UK	APHA (2012)
Salinity	Refractometer (ERMA, Inc, Tokyo)	APHA (2012)
DO	Winkler method	APHA (1998)
CO_2	Titration method	APHA (2005)
BOD	Winkler's method (5 day incubation)	APHA (1998)
Turbidity	Turbidimetric method, Nephelometer (Systronics-132)	APHA (1998)
H_2S	Titration method	Chathapathay (1998)
NO_3	Spectro photometry UV-Vis spectrophoto meter (Model UV-100, UNICAM, UK)	Morris and Reley (1963)
Phenol	Spectrophotometry visible spectrophotometer (Systronics-104)	APHA(1998)

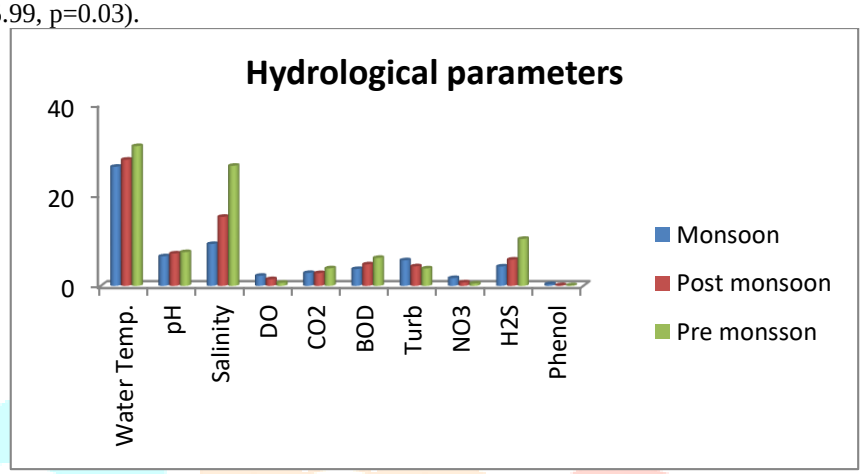
2.1.Data Analysis

Statistical analysis of hydrological, haematological and biochemical data were performed by one way ANOVA, using statistical package for social sciences (SPSS version 16).

IV.RESULTS AND DISCUSSION

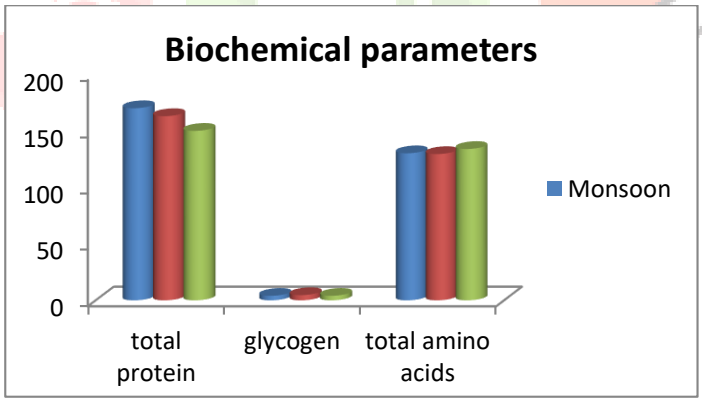
The results of the hydrological quality of retting water during the study period were showed in Graph.1. In the present study seasonal values of water temperature ranged from 26.28ºC (monsoon season) to 30.83ºC (pre monsoon season). ANOVA of water temperature showed 1% level of significance ($p<.01$) between seasons($r=46.73$, $p=0.001$). The pH of water samples during the study period recorded from 6.53(monsoon season) to 7.45(pre monsoon season). ANOVA of pH showed 1% level of significance ($p<.01$) between seasons($r=19.68$, $p=0.000$). Salinity of water samples was ranged from 9.25 ppt (monsoon) to 26.5 ppt (pre monsoon). ANOVA of salinity water samples showed 1% level of significance ($p<.01$) between seasons($r=104.18$, $p=0.003$). Dissolved oxygen content in the water samples during the study period showed 0.68 mg/L(pre monsoon) to 2.23 mg/L(monsoon). ANOVA of dissolved oxygen showed 1% level of significance ($p<.01$) between seasons($r=11.49$, $p=0.000$). Carbon dioxide content in the water samples was ranged from 2.82 mg/L (post monsoon) to 3.88 mg/ L (pre monsoon). ANOVA of CO_2 showed

that it was 1% level of significance (p<.01) between seasons(r=25.41, p=0.003). In the present study seasonal values of biological oxygen demand in the water samples recorded from 3.72 mg/L (monsoon) to 6.18 mg/L (pre monsoon). ANOVA of BOD showed that it was 1% level of significance (p<.01) between seasons(r=46.73, p=0.001). Seasonal turbidity values in the water samples ranged from 3.85 mg/L (pre monsoon) to 5.65 mg/L (monsoon). ANOVA of turbidity of water samples showed that 1% level of significance (p<.01) between seasons(r=27.79, p=0.000). Nitrate content in the water during the study period recorded from 0.52 mg/L (pre monsoon) to 1.72 mg/L (monsoon). ANOVA of nitrate content in water samples showed that 1% level of significance (p<.01) between seasons(r=16.35, p=0.005). Seasonal values of Hydrogen sulphide content present in the water samples ranged from 4.28 mg/L (monsoon) to 10.38 mg/L (pre monsoon). ANOVA of H_2S content in water showed 1% level of significance (p<.01) between seasons(r=65.31, p=0.001). Total phenol content of the water samples ranged from 0.13 mg/L (pre monsoon) to 0.38 mg/L (monsoon). ANOVA of phenolic content in water samples showed that it was showed 5% level of significance (p<.05) between seasons(r=5.99, p=0.03).



Graph:1. Hydrological parameters of Kolpadam Kadavu during 2018-2019

Graph.2 summarizes the biochemical changes observed in *Arius subrostratus* fish during the study period in the Kolpadam kadavu area. In the present study seasonal values of total protein content of *Arius subrostratus* fishes in Kolpadam kadavu was recorded from 150.04 mg/g (pre monsoon) to 169.99 mg/g (monsoon). ANOVA of total protein content of *Arius subrostratus* fish showed that it was 1% level of significance (p<.01) between seasons(r=15.66, p=0.003). Glycogen content of *Arius* fishes in Kolpadam kadavu during the study period was ranged from 4.02mg/g(monsoon) to 4.63 mg/g(post monsoon) and total amino acids content of *Arius* fishes in Kolpadam kadavu was ranged from 129.06 mg/g (post monsoon) to 134.07 mg/g(pre monsoon). ANOVA results of glycogen showed that it was significant at 5% level of significance (p<.05) between seasons(r=5.97, p=0.03) and ANOVA of total amino acids showed that it was significant at 5% level of significance (p<.05) between seasons (r=7.34, p=0.02).



Graph:2.Biochemical parameters of Arius subrostratus fishes in Kolpadam kadavu

The hydrological conditions of lake water influenced by various environmental pollutants and industrial effluents. Retting of coconut husk affect various water quality parameters such as pH, salinity, DO, CO_2, BOD, H_2S and phenolic contents (Jasmi A et al, 2020).The retting of coconut husk in the lake has influence on the pH of surrounding area and optimum pH hasten the activity of microorganisms in the process of retting of coconut husk (Kataria H. C, 2000 and Balusamy, 1988). The low pH of the water could be due to the pectinolytic hydrolysis of the organic matter present in the husk. The lake water show low dissolved oxygen value, this may be due to the low solubility of oxygen in saline water (Suma. S et al, 2012).The level of oxygen in the retting water may be used up by oxidation of organic matter and associated phenomenon of retting process of coconut husk. Depletion of DO was reported by earlier studies (Sunilkumar , 2004) .The carbon dioxide concentration was remarkably high in the retting zones because the intense retting activity enhances the decomposition of organic matter like pectin, phenol, tannin etc, leading to a rise in the temperature of the medium and favouring production of the gas (Somanathan pillai, 2008). BOD determines the measure of

Pollution in the water body. In the retting zones huge quantities of coconut husks underwent greater microbial decomposition, leading to depletion of oxygen and high biochemical oxygen demand values (Somanathan pillai, 2008). Retting of coconut husk contributed to the increased nitrate content in the water. Similar observation was made by Balusamy (1988), and Santhanam et al (2013). According to Prabhu and Pandalai et al (1957) the production of hydrogen sulphide associated with the retting of coconut husk. Phenolic concentration of retting water decreases from initial stage of retting to final stage. Similar observation was done by J.K Reshma in Kadinamkulam backwater.

Biochemical parameters determines the quality and nutritional value of fish as dietary supplement. Water quality of surrounding water and environmental pollutants affected the values of biochemical parameters like total protein, glycogen and total aminoacid content in Arius subrostratus fishes in Kolpadam kadavu. The depletion in total protein in fishes in the retting water might be due to low rate of protein synthesis under stress and also use of degraded products for metabolic process. Similar observations were found by Oikari et al (1985), Virk S et al (2003).Increase in free amino acid level was the result of breakdown of protein for energy requirement and impaired incorporation of amino acid in protein synthesis. Decrease in the Glycogen content in tissue of fishes in retting water as a consequence of toxic stress developed during retting process. Similar observations were found by Singh et al (1996), Kumari Mamta et al (2017).

V.CONCLUSION

In the present study, it can be concluded that the retting area in Kolpadam kadavu is highly polluted and it caused various biochemical changes in the fishes. Considering the impact of retting on the aquatic ecosystem, we would faclilitate the implementation of remedial measures to control retting activities without damaging livelihood.

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