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Pollution Of Ashtamudi Estuary Due To Retting Of Coconut Husk And Its Environmental Impacts

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Abstract— Coir industry in Kerala brings sizeable income and sustains a large number of people. It also causes serious threat to the environment affecting water bodies, air and land causing severe health impacts. Natural retting of coconut husk, which is done in the initial stage of coir production has always had harmful effects. This study is focused on the variation of physicochemical parameters in water samples taken from different sites of the Ashtamudi estuary where intense retting is going on. The physicochemical parameters like Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Total Hardness, etc. showed much deviation from the standard values.

Index Terms— Retting, Ashtamudi estuary, coconut husk,coid industry, health impact, TDS, DO

1 INTRODUCTION

In the classification of lakes in India, Ashtamudi lake in Kollam district, Kerala has been classified as coastal estuarine lake of brackish water. The lake has been included as one of the RAMSAR sites since it is a good representative of a wetland that plays substantial hydrological, biological and ecological roles in the natural functioning of a major river basin or coastal system. Moreover it supports endangered species of Indian plants, certain species of mangroves and marshy plants and remains as a habitat for variety of fishes and aquatic fauna[1]. Retting is a traditional process and is practiced by soaking green coconut husk in water. Thousands of coconut husks are filled in big coir nets known as 'malis' and they are buried in the shallow brackish water for a period of six to ten months. The period of retting depends on the age of husks and the nature of ambient water[2]. During this period, the husks are subjected to microbiological action involving degradation of the non-fibrous components of the husk, facilitating the loosening of coir fiber in the husk. Retting of large quantity of husk has converted the backwater tract into virtual cesspools of foul smelling stagnant waters.

2. LITERATURE REVIEW

Kerala the land of backwater systems has retting as one of the traditional cottage industries. Retting activity is practiced throughout the banks of all backwaters. Retting process causes serious environmental problems and ecosystem damage. It affects the physicochemical characteristics of water, air and land and causes serious health impacts. Retting zone is ecologically an unfavorable environment except for a few tolerant species of organisms and that polluted area supports no life except the anaerobic microorganism[3]. During the initial phase of retting large quantity of polyphenol liberated into the water causes acute toxicity to the biological community.

3. MATERIALS AND METHODS

The retting sites selected for the study were Kandachira, Kuppana, Vettuvila and Olikkara in Kollam district, Kerala State, India. Thevally, another site in Ashtamudi estuary where there is no retting activitiy is selected for comparison.Studies were conducted to assess water pollution by collecting samples for analysis in the laboratory. Water samples were collected in plastic bottles for the analysis. Samples for BOD analysis were taken in separate bottles. Analysis of various physical and chemical parameters were carried out by standard methods[4]. Samples were collected from the sites at three different periods related to monsoon, pre-monsoon and post monsoon seasons. Coir workers health aspects were assessed at the sites of traditional coir retting by conducting surveys.

As demonstrated in this document, the numbering for sections upper case Arabic numerals, then upper case Arabic numerals, separated by periods. Initial paragraphs after the section title are not indented. Only the initial, introductory paragraph has a drop cap.

4. DETAILS OF WATER SAMPLE ANALYSIS

Table 1. Physico Chemical Analysis of Water from retting area

Station 1. KANDACHIRA

Sl No	Parameters	Pre monsoon	Monsoon	Post monsoon
Physical Examination				
1	Appearance	Brownish	Light brown	Brownish

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2	Odour	Foul Smell	-	-
3	Turbidity (NTU)	170	11	36
4	Total dissolved solids (mg/L)	28200	15700	17000
5	Conductivity (mics/cm)	5667	2905	832
	Chemical Examination			
6	PH	7.67	6.82	7.18
7	Alkalinity (mg/L)	136	71	128
8	Total Hardness (mg/L)	3860	2872	3350
9	Nitrate (mg/L)	12	3	12
10	Chloride (mg/L)	4050	3280	292
11	Sulphate (mg/L)	58	130	31
12	Dissolved oxygen (mg/L)	0.1	4.10	2.1
13	BOD (mg/L)	38	12	24
14	COD (mg/L)	110	42	81

Table 2. Physico Chemical Analysis of Water from retting area.
Station 2. KUPPANA

Sl No	**Parameters**	**Pre monsoon**	**Monsoon**	**Post monsoon**
Physical Examination				
1	Appearance	Brownish	Clear	Clear
2	Odour	-	-	-
3	Turbidity (NTU)	120	14	100
4	Total dissolved solids(mg/L)	12100	10200	14200
5	Conductivity (mics/cm)	4862	2905	752
Chemical Examination				
6	PH	7.02	6.52	7.01
7	Alkalinity	128	92	121
8	Total Hardness (mg/L)	2960	1810	2410
9	Nitrate (mg/L)	13	4	10
10	Chloride (mg/L)	9510	8850	10520
11	Sulphate (mg/L)	32	186	36
12	Dissolved oxygen (mg/L)	1.2	5.0	3.6
13	BOD (mg/L)	44	9	30
14	COD (mg/L)	90	31	64

Table 3. Physico Chemical Analysis of Water from retting area
Station 3. VETTUVILA

Sl No	**Parameters**	**Pre monsoon**	**Monsoon**	**Post monsoon**
Physical Examination				
1	Appearance	Light brown	Light brown	Light brown
2	Odour	Foul smell	-	Foul smell
3	Turbidity (NTU)	120	15	110
4	Total dissolved solids(mg/L)	32120	22810	34405
5	Conductivity (mics/cm)	1215	3120	3910

Chemical Examination				
6	PH	7.08	7.03	6092
7	Alkalinity (mg/L)	110	84	114
8	Total Hardness (mg/L)	3100	2200	2940
9	Nitrate (mg/L)	16	8	12
10	Chloride (mg/L)	8200	7950	9160
11	Sulphate (mg/L)	372	325	412
12	Dissolved oxygen(mg/L)	0.3	4.0	3.2
13	BOD (mg/L)	9	12	3
14	COD (mg/L)	98	38	79

Table 4. Physico Chemical Analysis of Water from retting area

Station 4. OLIKKARA

Sl No.	**Parameters**	**Pre monsoon**	**Monsoon**	**Post monsoon**
Physical Examination				
1.	Appearance	Dark brown	Dark brown	Dark brown
2.	Odour	Foul smell	Foul smell	Foul smell
3.	Turbidity	160	120	132
4.	Total dissolved solids (mg/L)	24120	22030	22930
5.	Conductivity (mics/cm)	5237	2705	730
Chemical Examination				
6.	PH	6.93	7.01	7.21
7.	Alkalinity (mg/L)	123	168	213
8.	Total Hardness (mg/L)	4220	3612	3820
9.	Nitrate (mg/L)	14	4	12
10.	Chloride (mg/L)	5120	3010	522
11.	Sulphate (mg/L)	420	140	198
12.	Dissolved oxygen(mg/L)	0.3	2.20	2.1
13.	BOD (mg/L)	42	10	33
14.	COD (mg/L)	112	38	73

Table 5 Physico Chemical Analysis of Water from retting free area

Station5. THEVALLY

Sl No	**Parameters**	**Pre monsoon**	**Monsoon**	**Post monsoon**
Physical Examination				
1	Apperance	Clear	Clear	Clear
2	Odour	_	_	_
3	Turbidity	12	8	12
4	Total dissolved solids(mg/L)	625	520	510
Chemical Examination				
6	PH	7.1	7.0	7.2
7	Alkalinity	52	48	46
8	Total Hardness	320	290	380
9	Nitrate	8	6	12
10	Chloride	625	700	710
11	Sulphate	210	162	230
12	Dissolved oxygen(mg/L)	5.2	8	7
13	BOD (mg/L)	4	3	2
14	COD (mg/L)	-	-	-

5. RESULTS AND DISCUSSION

pH is considered as an important ecological factor and provides important information of the hydrogen ion concentration. The limit for pH value for drinking water is specified as 6.5 to 8.5. According to the present study the pH of all the samples come within the standards approved by the Bureau of Indian Standards[5]. Alkalinity is a measure of buffering capacity of water and is important for aquatic life in marine water systems. The values of alkalinity of the samples are within the limits. Total hardness is the sum of temporary hardness and permanent hardness. The samples collected from all the sites except Thevally showed very high values irrespective of the season. According to Indian Standards the total hardness of domestic water can be 300 mg/L of $CaCO_3$.

Dissolved oxygen is an important parameter which affects the chemical and biological aspects of the ecosystem. At levels of 4 ppm or less some fish or micro vertebrate population will begin to decline. Dissolved oxygen content of the samples collected from the retting area in the pre monsoon season showed very low values. Total solids is the sum of total suspended solids and dissolved solids Total dissolved solids of all the samples from the retting sites showed very high values compared with the acceptable limit of 500 mg /L as per Indian Standards. The BOD and COD values are high in the retting areas compared to non-retting areas. The presence of chloride and sulphate in water in excess amounts is not desirable. In the present study the concentrations of chloride and sulphate in the retting area are much higher than the concentrations in non-retting area. The desirable limit of chloride is 250 mg/L and for sulphate it is 200 mg/L respectively.

6. OCCUPATIONAL HEALTH SURVEY.

The survey conducted among coir retting workers reveals that many have skin problems including irritations, peeling and cracks in hands and legs. The people exposed to retting have nausea and vomiting when they stand close to retting pits for long time. Some of them were affected with asthma due to constant contact with this unhealthy atmosphere.

7. CONCLUSION

On the basis of the above discussion it is concluded that the retting areas in Ashtamudi estuary are highly polluted. Environmental pollution from coir extraction is heavily felt in the coastal areas of South India, especially in the State of Kerala. Ashtamudi estuary is an extensive estuarine system, second largest in Kerala. It is important for its hydrologic functions, biodiversity, support for fish and tourism. Even though there is considerable recognition of the roles that wetlands play, loss of wetlands continue at the global level. The main reason for such loss is lack of awareness among the community about the ecological functions of the estuaries. Low level of dissolved oxygen in the backwaters due to retting activity has adverse role in the fish population and fishery. The impact of fish scarcity becomes an important social problem among the fishermen community. Apart from this, noxious smell of hydrogen sulphide emission from retting area results in air pollution and related health hazards. Flooding during monsoon disperses these pollutants to surrounding areas ultimately damaging the entire water body. Considering all the above serious problems, necessity to develop a green technology is realized for retting without damaging livelihood and industry.

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