International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Study of Different Biomaterials for Reducing Textile Industry Waste Water Pollution

Chonde Sachin G[1], Chonde Sonal G[2]

[1]Department of Applied Sciences and Humanities, AMGOI, Vathar, Kolhapur, Mahrashtra, India
[2]Department of Environmental Science & Technology, Department of Technology, Shivaji University, Kolhapur

Abstract:
Textile industry is distributed throughout the country. The manufacturing process of textile industry involve the use of various chemicals and after these processing textile effluent is mix in natural water bodies like river, lakes etc, which shows the impact on water quality changes i.e. cause of water pollution. In this research focus on to change the effluent quality using different biomaterials like saw dust, parthenium, Typha, Maize cob. In textile effluent high content of TSS, COD, Chloride and heavy metals are present. By using these biomaterials the contents of TSS, COD, and Chloride decreases. After treatment of biomaterials change the quality of textile effluent than the before treatment and it becomes pollutant free effluent which does not harm the environment.

Keywords: textile waste water, Biomaterials, pollution control, Maize cob as biomaterial.

1. Introduction:

Today most of the rivers of world receive millions of litres of sewage, domestic waste, industrial waste and agriculture. Effluents containing substances varying in characteristics from simple nutrients to highly toxic substances. Biomaterials are used as adsorbent because it has got very good capacity for the adsorption of pollutants. Biometrical is quite expensive and regeneration cost is also not economical.

The use of fly ash in wastewater treatment has been studied in recent years and experimental results have shown fly ash to be quite suitable adsorbent for the removal of heavy metals (Grover and Narayanswamy 1982, Yadav et al. 1987), Phenols (Deepak et al. 1988), Colour (Coelho, 1989; Gupta et al. 1990) and COD caused by various dyestuffs in aqueous medium.

Removal at wide ranging contaminants such as dissolved solids, heavy metals and colour activated carbon is widely used as an adsorbent, though it is quite expensive. The necessitates to explore low cost adsorbents. Study by using cashew nut hull carbon as an adsorbent for the removal of mixture of reactive dyes (Taupe). Cashew nut hull is available in large quantities as a waste from the production of 3.5 lakh metric tonnes of cashew nut per year (Bhaskara Rao et al. 1994).

The pollution problem caused by these textile industries to our fresh waters in India is well documented (Pande and Shrivastay, 1980; Agarwal et al. 1982; Mahajan, 1986). The present studies are made on the effluents produced by dyeing of cotton fabric with Direct orange 26 and Direct Blue 1 dyes.

The direct dyes are water soluble, cost effective, easily applied on fabrics and find extensive use for dyeing, cellulosic. During dyeing operation, a substantial amount of dye (Sharma and Arora 2001) remains unfixed and lost to the wastewater, which is of great concern for environment Dyes in the wastewater also raise COD level of effluents affecting the survival of aquatic organisms.

Water with colour is not suitable for domestic agriculture as well as industrial use due to it's severe interference with the concerned systems. Some dyes are highly toxic in nature and may result in serious consequences. Coloured effluent also shows a negative impact on the photosynthetic activity of aquatic plants due to reduction in penetration of sunlight.

Removal of dyes is difficult by conventional treatment methods as they resist biodegradation owing to their complex molecular structure along with a fair stability from heat and light. However, adsorption finds a suitable, cost effective and practical method for decolourization of dyes effluents (EL-Geundi, 1991).

Different adsorbents like maize Cob (El-Geundi 1991 and saw dust (Sumanjit et al. 2001) etc. Generally, all these adsorbents are the discarded wastes of some processes, but can come out with an effective role in minimizing the colour of effluents.

Decolourization of effluent with such adsorbents will provide an amicable economically viable trouble shooting approach to this problem. (Ref. Nature Environment and Pollution Technology, Vol. 4 No. 2 pp. 163-160, 2005).

2. Materials and Methods:

2.1 Biomaterials collection:

For selecting the best biomaterial, different biomaterials were collected and scrutinized, which are easily and cheaply available in surrounding area of Kolhapur city. Following are the biomaterial selected for the present study:

1. Typha
2. Parthenium
3. Saw Dust
4. Maize Cob

2.2 Preparation of Biomaterial as Adsorbent:

Easily available biomaterial was used as adsorbents. All the biomaterials collected initially in the natural form. Various impurities were present over them like dust, soil, bacteria, fungi, etc. Therefore, these materials were cleaned up twice with distilled water and dried at 40°C. These dried materials were crushed and sieved to selected proper adsorbent grain size of 2-3 mm. Again these materials were then soaked overnight in 0.1N NaOH solution to remove the lignin content and then again washed with distilled water. Treatment of 0.1 N CH_3COOH for a period of 2-3 hrs to remove the traces NaOH was given to biomaterials. Again washed with distilled water and dried. This material was stored separated in vacuum dedicator to prevent the atmospheric moisture.

2.3 Adsorption Studies

Adsorption is a surface phenomenon by which gas or liquid molecules are captured and adhere to surface of solid adsorbent. The rate of adsorption of molecules depends on concentration of liquid, the surface area of adsorbent the pore volume of adsorbent, pH of the solution and chemical nature of the adsorbent.

2.4 Textile waste water Collection:

The textile waste water was collected from textile industry of Ichalkaranji, Kolhapur.

2.5 Sample Preservation and Analysis:

After the collection of sample, sample preserve in the Refrigerator then analysis of sample. Primary analysis of these samples parameter analyzed pH, Electrical conductivity, TSS, TS, TDS, Chloride, COD.

The second analysis of sample by using different biomaterial i.e. saw dust, parthenium, Typha, Maize Cob at different time interval 2 hrs., 4 hrs., 6 hrs. and 8 hrs.

2.5.1 Parameters Selected:

Following parameters are selected for study:

1. pH
2. Electrical Conductivity μmhos
3. Total Solid (TS) mg/lit
4. Total Dissolved Solid (TDS) mg/lit
5. Total Suspended Solids (TSS) mg/lit
6. Chloride mg/lit.
7. Chemical Oxygen Demand (COD) mg/lit

3. Result and Discussion:

Table 1 Effect of pH before and after treatment of biomaterials on textile effluent.

Sr. No.	Before treatment = 10.9 / Biomaterial	Time in Hrs. and pH			
		2	4	6	8
1.	Parthenium	10	9.1	8.7	8
2.	Saw Dust	9.5	9.8	9.4	7.5
3.	Typha	10.5	10.3	9.6	8.2
4.	Maize cob.	8.4	8.1	7.9	7.5

Graph 1 Effect of pH before and after treatment of biomaterials on textile effluent.

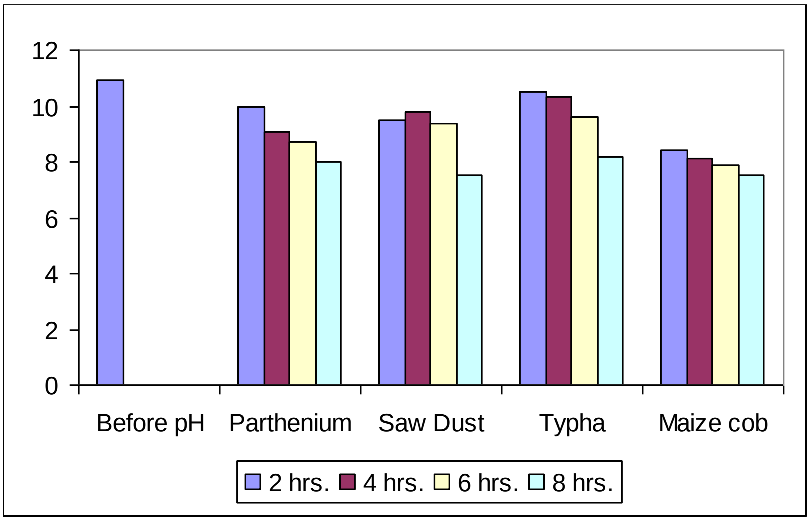


Table 2Effect of conductivity before and after treatment of biomaterials on textile effluent

Sr. No.	Before treatment = 4.16 μhmos / Biomaterial	Time in Hrs. and Conductivity			
		2	4	6	8
1.	Parthenium	3.20	2.00	1.15	0.80
2.	Saw Dust	3.80	3.00	2.15	1.80
3.	Typha	4.10	3.30	2.50	1.60
4.	Maize cob.	3.10	2.70	1.30	0.70

Graph 2 Effect of conductivity before and after treatment of biomaterials on textile effluent

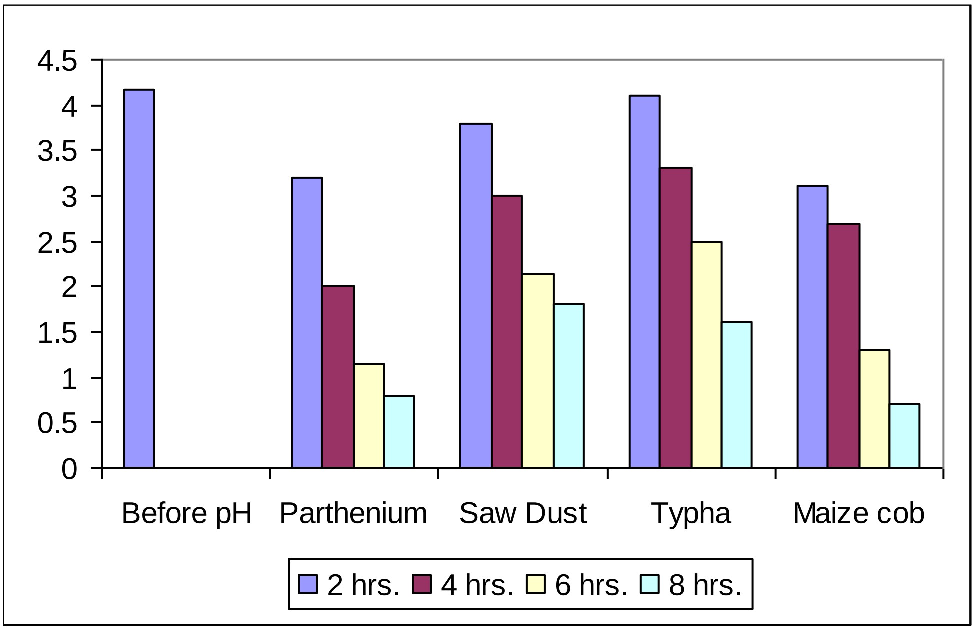


Table 3 Effect of TDS before and after treatment of biomateric on textile effluent

Sr. No.	Before treatment = 2850 mg/lit. / Biomaterial	Time in Hrs. and TDS			
		2	4	6	8
1.	Parthenium	3480	3560	3590	3840
2.	Saw Dust	3240	3364	3420	3500
3.	Typha	2920	3220	3480	3520
4.	Maize cob.	3024	3285	3460	3580

Graph 3 Effect of TDS before and after treatment of biomateric on textile effluent

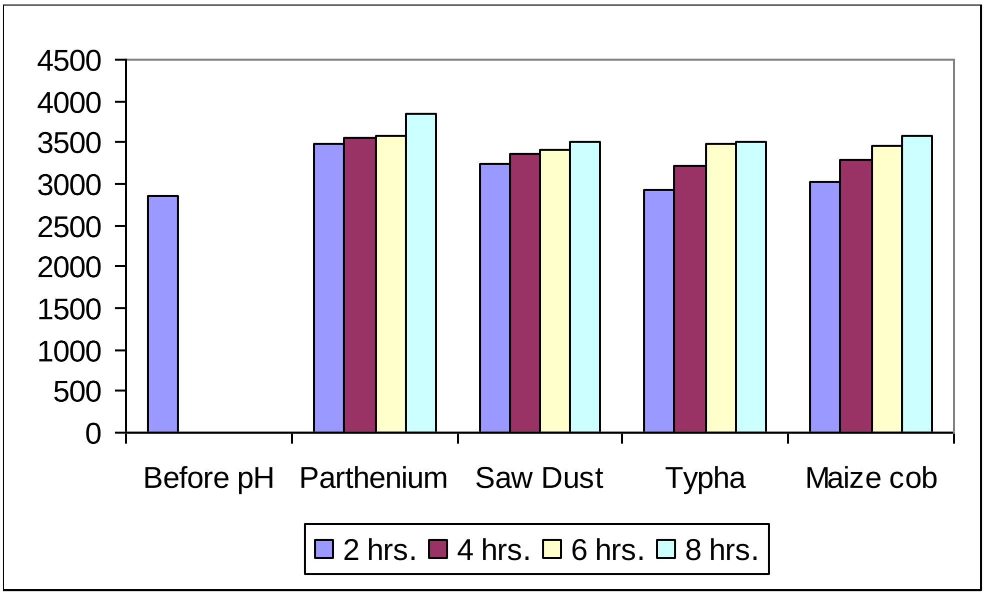


Table 4 Effect of TSS before and after treatment of biomaterials on textile effluent

Sr. No.	Before treatment = 1000 mg/lit / Biomaterial	Time in Hrs. and TSS			
		2	4	6	8
1.	Parthenium	839	760	390	104
2.	Saw Dust	916	846	570	240
3.	Typha	882	744	398	120
4.	Maize cob.	900	868	540	180

Graph 4 Effect of TSS before and after treatment of biomaterials on textile effluent

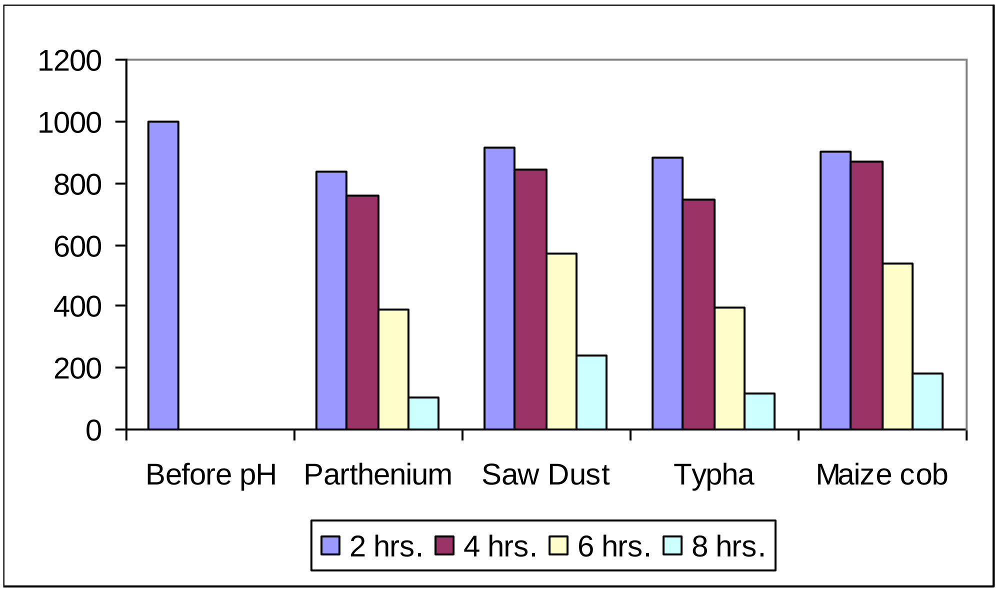


Table 5 Effect of TS before and after treatment of biomaterials on textile effluent

Sr. No.	Before treatment = 3850 mg/lit Biomaterial	Time in Hrs. and TS			
		2	4	6	8
1.	Parthenium	4319	4320	3980	3944
2.	Saw Dust	4156	4210	3990	3740
3.	Typha	3802	3964	3878	3640
4.	Maize cob.	3924	4153	4000	3760

Graph 5 Effect of TS before and after treatment of biomaterials on textile effluent

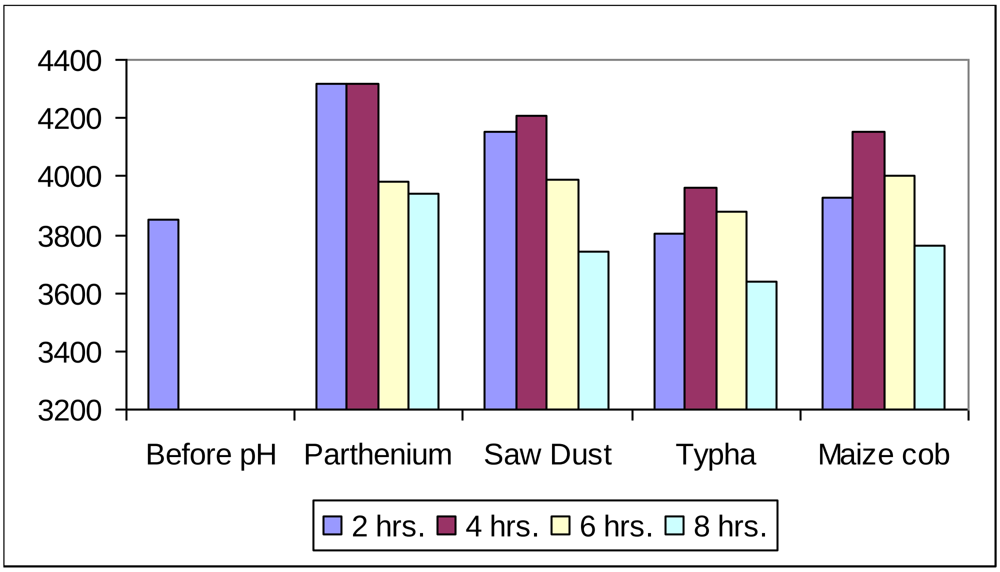


Table 6 Effect of Chloride before and after treatment of biomaterials on textile effluent

Sr. No.	Before treatment = 2130 mg/lit Biomaterial	Time in Hrs. and Chloride			
		2	4	6	8
1.	Parthenium	1988	1150.2	1136	1015.3
2.	Saw Dust	1668.5	1505.2	1107.6	994
3.	Typha	1850	1043	979.8	85.2
4.	Maize cob.	1491	1157.3	937.2	816.5

Graph 6 Effect of Chloride before and after treatment of biomaterials on textile effluent

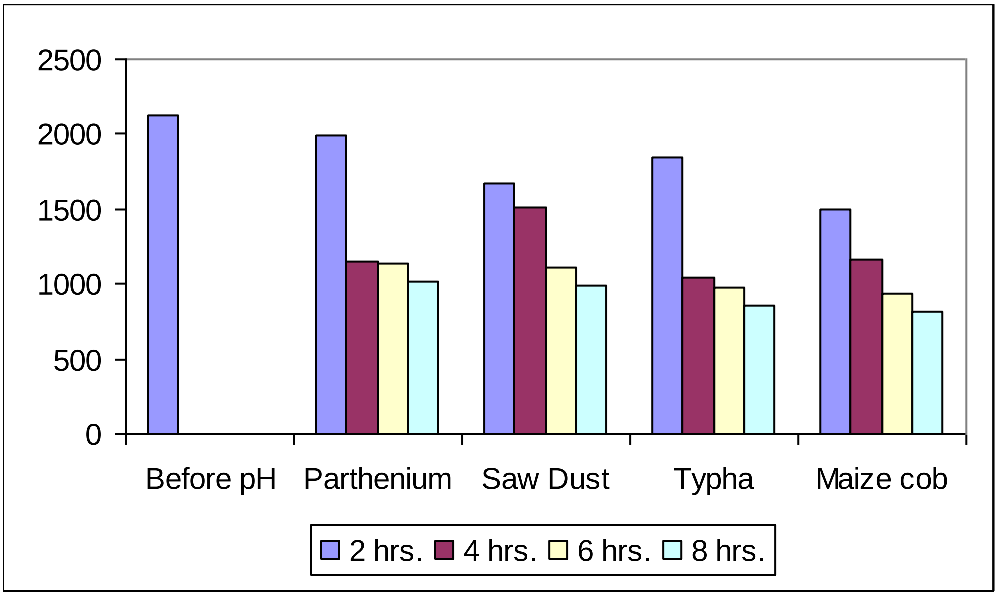
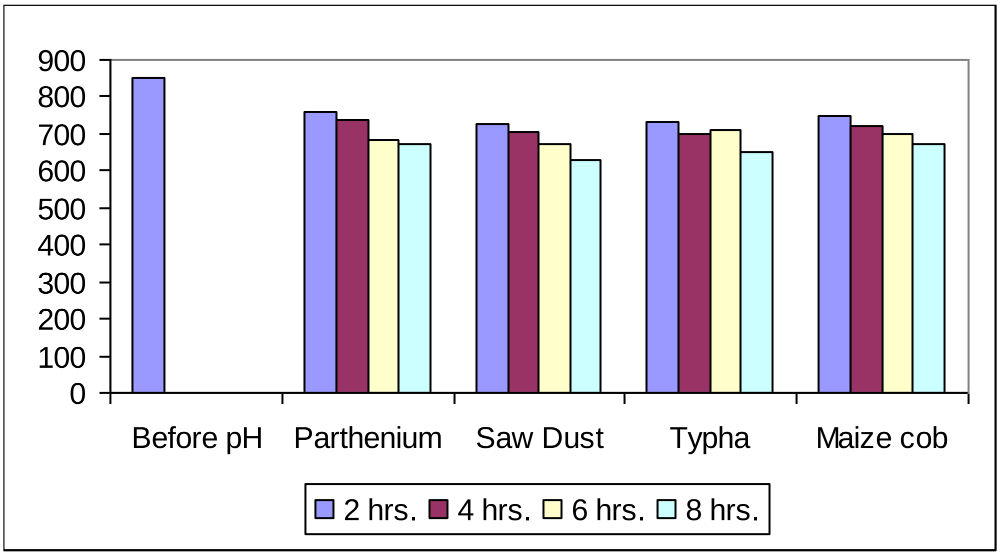


Table 7 Effect of COD before and after treatment of biomaterials on textile effluent

Sr. No.	Before treatment = 850 mg/lit / Biomaterial	Time in Hrs. and COD			
		2	4	6	8
1.	Parthenium	757	739	685	672
2.	Saw Dust	727	703	672	630
3.	Typha	732	699	712	648
4.	Maize cob.	748	721	702	670

Graph 7 Effect of COD before and after treatment of biomaterials on textile effluent



Effluent content strong colour, large amount of suspended solids, high variations in pH, temperature, COD. All these characteristics of the wastewater effluent causes serious environmental problems. These high value of total solids are because of high ion composition of cations (Na, Ca, Mg) and anions as (Cl, SO_4) during the process.

Bioadsorption studies were carried out by treatment of biomaterials like saw dust, parthenium, typha, maize cob. Concentration of pollutants like pH, TSS, TDS, BOD, Chloride reduced by using different biomaterials. Efficiency of biomaterial increases as hours increases. Maximum efficiency is obtained at 8 hrs. Maize cobs are very useful for the pH at alkaline level.

The pH of the parthenium at 2 hrs. At 2 hrs. Saw dust have pH 9.5 and it decreases up to 7.5 at 8 hrs. So that saw dusts are very useful for the pH at alkaline level for 8 hrs. The pH of the typha at 2 hrs are 10.5 and these decreases up to 8.2 at 8 hrs. At the 2 hrs. Maize cob have pH 8.4 and these decreases up to 7.5 at 8 hrs. For 8 hrs. Contact time saw dust and maize cob are very useful for th pH at alkaline level.

Before treatment of biomaterial the conductivity of textile effluent is 4.16 ohms but by using biomaterials the conductivity decreases. The conductivity of parthenium at 2 hrs. is 3.20 ohms and these decreases up to 0.80 at 8 hrs., Conductivity of saw dust at 2 hrs is 3.80 while at 8 hrs. The conductivity is 1.80. Typha have conductivity 4.10 ohms at 2 hrs and these decreases up to 1.60 ohms.

Conductivity of maize cob at 2 hrs. is 3.10 μmhos and these decreases up to 0.70 μmhos at 8 hrs. due to maize cob at this contact, time high efficiency is observed.

Before treatment of biomaterial the TDS of textile effluent is 2850 mg/lit and then by using parthenium at 2 hrs. TDS is 3480 mg/lit and these increases up to 3840 mg/lit. at 8 hrs. Saw dust have TDS 3240 mg/lit. at 2 hrs and at 8 hrs it is increases up to 3500 mg/lit. Typha have TDS 2920 mg/lit. at 2 hrs. While, it increases up to 3520 mg/lit at 8 hrs.

TDS of maize cob is 3024 mg/lit at 2 hrs and it increases up to 3508 mg/lit at 8 hrs. From these it is observed that TDS value of effluent before treatment is less than the after treatment of biomaterials like parthenium, saw dust, Typha and Maize cob. Parthenium is highly increases the TDS.

TS of effluent before treatment is 3850 mg/lit and by using parthenium at 2 hrs. the TS is 4319 mg/lit and it decreases up to 3944 mg/lit at 8 hrs. Maize cob having TS 3924 mg/lit. at 2 hrs. and at 8 hrs. contact time the TS of Maize cob is 3760 mg/lit. TS of parthenium also increase after treatment than the before treatment of effluent.

TSS of effluent at 2 hrs is 839 mg/lit. and it decreases up to 104 mg/lit. at 8 hrs. contact time. Saw dust having TSS 916 mg/lit. at 2 hrs. and these decreases up to 240 mg/lit. at 8 hrs. contact time. Typha have TSS 882 mg/lit. at 2 hrs. and it decreases up to 120 mg/lit. at 8 hrs. TSS of Maize cob at 2 hrs. 900 mg/lit. and these decreases up to 180 mg/lit. at 8 hrs. contact time. Parthenium is more reduces the TSS at 8 hrs.

The Chloride of effluent before treatment is 2130 mg/lit. Chloride of effluent at 2 hrs. is 1988 mg/lit and these decreases up to 1015.3 mg/lit. at 8 hrs contact time. Typha have chloride 1850 mg/lit. at 2 hrs. and these are decreases up to 852 mg/lit. at 8 hrs contact time.

Chloride of Maize cob at 2 hrs 1491 mg/lit and these decreases up to 816.5 mg/lit. at 8 hrs.

Chloride is present in large quantity in textile effluent. Typha at 8 hrs. reduces chloride in more concentration.

The COD of effluent before treatment is 850 mg/lit. then by using parthenium at 2 hrs. 157 mg/lit and these decreases up to 672 mg/lit. at 8 hrs. COD of the saw dust at 2 hrs. is 727 mg/lit. and these decreases up to 630 mg/lit. at 8 hrs. Typha have COD 732 mg/lit. at 2 hrs. and these decreases up to 648 mg/lit at 8 hrs. COD of the Maize cob at 2 hrs. is 748 mg/lit. and these decreases up to 670 mg/lit. at 8 hrs contact time. Saw dust have the efficiency increases at 8 hrs.

Textile effluent content, large amount of suspended solids, high value of COD. Aster using biomaterials for treatment of textile effluents, TSS reduction from effluent by biomaterial parthenium, COD reduction through saw dust chloride reduction due to use biomaterial like parthenium.

4. Conclusion:

From this project it is concluded that, change the effluent quality using different biomaterials like saw dust, pathenium, Typha, Maize cob is very effective. By using these biomaterial the content of TSS, pH, COD, Chloride decreases after treatment of biomaterial change the quality of textile effluent than the before treatment. Parthenium and Typha were found to be best bioadsorbant for textile effluent and others are also good absorbent.

5. References:

1. Anil kumar, 1984, procceding seminar on pollution in textile mills and process,items national productivity council Ahmadabad.
2. APHA 1992, Standard method for examination of water and waste water.
3. Aqueous solution using cashewnut Hull carbon as an adsorbent. Journal of Environment and Pollution 5(1),1988,pp49-58 Technoscience publications.
4. Innocent OBOH Emmanuel ALUYOR,And Thomas AUDU. Biosorption of heavy Metal Ions from aqueous solutions using a biomaterial.Leonardo Journal of sciences Issue14,January-June 2009 p-58-65.
5. Kaur, Sumanjit and Manpreet Kaur,Adsorption of Dyes on Unconventional adsorbents.
6. Maiti, S.K. 2001,ABD publisher,Hand book of methods in environmental studies vol-1 water and waste water analysis.
7. Malathy, R. and N. Rajkumar, Treatment of Textile Effluent using fly ash as an adsorbent nature environment and pollution technology technoscience publications, Vol. 6, NO. 4, pp. 649-652, 2007.
8. Sumanjit kaur,B.S.Lark***and parveen kumar** Chemical Oxygen Demand (COD) Reduction of Some Dyes Using Fly Ash as an adsorbent.
9. Thorat, P.R. and G.R.Pathade.Treatment of Textile Industry Wastewater by chemical coagulation process.Nature Environment and Pollution technology,Technoscience publications vol-4 no-2 pp-233-236 2005.
10. Trivedi R.K., Journal of Industrial Pollution Control.
11. Trivedi R.K., Treatment of Textile Industrial Effluent.
12. Vasanthy, M. and Lakshmanaperumalsamy P. Removal of Reactive Dyes from