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The pilot study of COD Removal in Industrial complex effluent by wetland plants *Cyperus rotundus Linn.*

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Abstract:

Present study was carried out to determine the high COD of GIDC (Gujarat Industrial Development Corporation) areas. One of the burning problems of Industrial society is the high consumption of water and the high demand for clean drinking water. Numerous approaches have been taken to reduce water consumption, but in the long run it seems only possible to recycle wastewater into high quality water. In this study, an attempt was made to compare the efficiency of grass lend plants like *Cyperus rotundus Linn.* To treat the effluents from GIDC Common treatment plant (NEPL-Naroda Enviro Projects Ltd.) in constructed wetlands DF system beds. The chemical oxygen demand of Complex effluent was reduced significantly after treatment. The *Cyperus Rotundus.* based treatment system was the most efficient in removing the pollutants from the effluent. So in conclusion, *Cyperus species* were more efficient than the constructed wetland technology.

Keywords: COD, GIDC, Cyperus, effluents.

1.0 Introduction:

Wetlands have evolved during the last three decades of the century in a viable treatment Technology used for various types of wastewater around the world. There are several types of Wetlands which could be distinguished according to several criteria such as presence/absence of free water surface, macrophytes used or direction of flow (Table 1). Constructed wetlands are primarily used to treat domestic and municipal wastewaters but their use for other types of wastewater such as agricultural and industrial wastewaters, various runoff waters and landfill leachate have become more frequent, recently (Kadlec and Knight, 1996).

Constructed wetlands have been used widely for the treatment of municipal, industrial and agricultural wastewater, as well as for urban storm water. This is owing to their high nutrient absorption capacity, simplicity, low construction, operation and maintenance costs, low energy demand, process stability, low excess sludge production and potential for creating biodiversity (Korkusuz et al., 2005). They are designed to take advantage of many of the processes that occur in natural wetlands, but do so within a more controlled manner. These systems can be used in almost in any environment for treatment of wastewater. Properly designed and constructed man-made wetland ecosystems are extremely efficient at utilizing and cleaning nutrient-rich waters (Mitsch and Gosselink, 1993). Special concern in constructed wetland designing process is given to appropriate plant selection and pools and canals arrangement (Nicolic, 2010). The constructed wetlands for water pollutioncontrol are becoming an accepted technology world wide. It is being used in some countries have either arid or semiarid climates such as England, in some states in U.S., Canada and Australia (Kandlec and Knight, 1996).

At present, area of GIDC divided by four Phases having units of Dyes, Chemicals, Food Processing, Pharmaceuticals, Dairy products, Textiles, Oil mills and Engineering units in Naroda GIDC at Ahmedabad. An average wastewater generation from production of found to be about 30 lacs lit/day of product. The wastewater is collected and treated in Common Effluent Treatment Plant (CETP). They are treted this water with primory, secondory and aerobic system and very good work in this plant. The

objective of this study was to find out the possibility to apply to treat wastewater from GIDC Naroda.

2.0 Materials and Methods:

***2.1 Media preparation*:**

Soil used in this study was collected from GIDC Canal side Areas in Naroda, Ahmedabad. The soil was air-dried and grinded into a uniform particle size. The sand was air-dried and removed gravel and other contaminated materials. The mixtures of soil and sand were prepared by weight basis at the ratio of 50:50 and 25:75. Soil sample was analyzed for particle size distribution by pipette method (Walsh and Beaton, 1973). Sand particle was measured by sieving method (Metcalf and Eddy, 1991).

***2.2 Wetland bed preparation*:**

The wetland bed size was 80x80x60mm. and Coras, fine send then the media was filled in the middle of the bed. Sets of constructed wetland systems were set up as shown in Figure 1. Each constructed wetland set consisted of one Downflow (DF) system to complete a system were used as the wastewater top inlet and bottom side in outlet.

2.3 Chemical analysis:

Chemical measurements were made the influent and every day on the effluent from each of the wetland bed for 19 days. Influent and effluents samples were collected in sterile 500-mL HDPE Plastics bottles and stored on ice for transport to laboratory. Then the samples were transferred to a Refrigerator for storage at 4 to 5^{o}C until processing. Samples were analyzed for chemical oxygen demand (COD (Table-1) following standard methods (APHA).

***2.4 Plantation in wetland beads*:**

The fresh plant collect from farmhouse and plant showing in bed before one week treatment , and started were first time of fresh water and after one week in using by dilution 10:90 to 100 percentage effluent using in wetland beds.

3.0 Results and Discussion:

The process of acclimatization is the process of adjustment to the experimental plant of the new Environmental conditions, namely the reactor. The process of acclimatization in this study performed a total of two stages, namely One and acclimatization two. Conditioned on the acclimatization of a Plant to adjust to the new planting medium is gravel and soil. Water used for watering the plants are used to clean water is not wastewater. Observations during the study showed that at One week of the beginning of planting, this condition indicates that *Cyperus* plant more difficult to adapt to the new environment. After one week of planting, *Cyperus spp.* blossomed again beginning to look as well. In the second Week, Plant watered with waste water from a mixture of GIDC Naroda water effluent with dilution retio system 10:90, 15:85, 20:80, 25:75, 30:70, 35:65, 40:60, 45:55, 50:50, 55:45, 60:40, 65:35, 70:30, 75:25, 80:20, 85:15, 90:10, 95:05, 100% using by weatland DF bad tratment . The results of the pH and COD degradation performance of the reactor with the plant In decreased these parameters can be shown in the following table 1.

Cyperus spp. plant reactor shown to neutralize the pH of the wastewater, as shown by Table1. When the Inlet pH value is lowered by 7.7 to 7.0 and outlet pH value recorded at the 7.5 to 7.0 during period. pH level greatly affects the fertility of soil and quality of plant growth. Soil pH is an important factor to know; it measures the degree of acidity or alkalinity of your soil, both of which are vital to the health of your plants. Each influences the availability of essential nutrients in the soil. The highest concentration of inlet water COD recorded at 8228 mg/l in dilution 95:05% and lowest concentration 800 mg/l in dilution 10:90 and 15:85%. After treatment outlet water highest COD recorded at 4088mg/l in dilution 95:05 % and lowest concentration 320mg/l in dilution 30:70% (effluent: fresh water).The COD under the action of *Cyperus spp.* is 49.68 to 80% in respectively. The growth of *Cyperus rotundus Linn.* from minimum height 385mm and after watering maximum highest recorded at the 393mm during period of 19 days.

Table 1: Provision for pollutant materials in the reactor with plant growth

Date	Dilution % (Effluent : Fresh water)	Inlet COD	Outlet COD	Inlet pH	Outlet pH	*Cyperus* spp. Growth mm
4/9/2012	0	Plantation	0	7.2	7.0	385mm
5/9/2012	10:90	800	400	7.0	7.0	-
6/9/2012	15:85	800	400	7.1	7.0	-
7/9/2012	20:80	3600	1800	7.1	7.0	-
8/9/2012	25:75	1200	534	7.5	7.1	-
9/9/2012	30:70	1600	320	7.4	7.1	-
10/9/2012	35:65	2600	1120	7.2	7.4	388mm
11/9/2012	40:60	1600	480	7.5	7.2	-
12/9/2012	45:55	2800	1600	7.4	7.1	-
13/9/2012	50:50	1600	533	7.4	7.1	-
14/9/2012	55:45	2400	1066	7.3	7.5	-
15/9/2012	60:40	3200	1200	7.4	7.1	-
16/9/2012	65:35	3200	1866	7.0	7.1	-
17/9/2012	70:30	7200	4000	7.6	7.1	390mm
18/9/2012	75:25	4000	2400	7.4	7.2	-
19/9/2012	80:20	3200	2600	7.3	7.3	-
20/9/2012	85:15	4000	3200	7.4	7.1	-
21/9/2012	90:10	6696	3720	7.0	7.4	-
22/9/2012	95:05	8228	4088	7.2	7.0	-
23/9/2012	100	7200	3200	7.7	7.5	393mm

Fig-1 Plantation of *Cyperus Rotundus Linn*.

Fig -2 Outlet water collection

Fig-3 Comparison of Inlet and Outlet Water minimum dilutions (10:90 %)

Fig-4 Comparison of Inlet and Outlet Water Maximum dilutions (100%)

4.0 Conclusion:

The pilot-scale constructed wetland experiment, DF followed by grass (*Cyperus rotundus Linn.*) recorded high removal of COD and pH Control (Table-1) meet the effluent standard. Results from the study should be COD degradation further implemented at the selected cooperatives. Very good performance achieved by this experiment and also can be used for any type of industrial effluents by no chemical use and very less maintenance.

5.0 Acknowledgement:

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