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Waste Water Treatment by Using Reed Bed System

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Abstract: *The waste water generated from the boys hostel and girls hostel SIT campus were collected and analyzed. Conventional treatment method and the method of purification using Reed bed for the treatment of effluent were compared. The plant used for this purpose was Setaria italica and ornamental plant which is locally known as Foxtail millet (Thinai) and Flax lily. The experiment was conducted with the Primary treated sewage taken from the Sewage Treatment Plant (SIT STP) of our campus. From the experiment it is found that the one with Reed Bed system gives a better quality treated water vis-à-vis the campus STP treated water. Hence, the filter bed of SIT STP is planted with Setaria italica and ornamental plant as a trial run. The project presents the method of construction of root zone bed and the effectiveness of removal of various contaminants using this root zone treatment process. The results for raw water and treated water samples were compared and discussed.*

Keywords*: Wastewater, Foxtail millet, Flax lily, Treated water.*

I. Introduction

Water resources have become scare and also they demand for food is increasing. Under this situation, the agricultural productivity has to be increased with minimum water. Therefore, the need of an alternate for fresh water source is necessary. Grey water is abundantly available waste water resource. Hence recycling grey water can be used as an alternative irrigation source. The treatment adopted in an eco-friendly manner where special equipment and electricity are not required. This method is done using wetland plants adopting the principle of natural wetland and Appling reed bed technology. Reeds are rough coarse grasses having extensive root system that gores in wet areas. they can be treated as a natural and inexpensive method for domestic, agricultural, industrial waste water. This is done through phytoremediation which is the direct use of living green plants for institutor in place, removal, degradation or containment of containments in soils, sludge, sediments, surface water and groundwater. Using this reed, the domestic sewage is treated and let out for reuse. Application of root zone technology (RZT) is finding wider acceptability in developing and developed countries, as it appears to offer more economical and ecologically acceptable solution to water pollution management problems. Root zone system whether natural or constructed, constitute an interface between the aquifer systems and terrestrial system that is the source of the pollutants. These are reported to be most suitable for schools, hospitals, hotels and for smaller communities. The country's reportedly first RZT system was designed by NEERI at sainik school, Bhubaneshwar, Orissa. It has reportedly been giving a very good performance of removing 90% BOD and 63% nitrogen (CPCB, 2000)

Wastewater Treatment

When utilized in wetlands that are either natural in origin or manmade. This type of system can help to remove contaminates like soap and similar agents with relative ease, allowing the water to be reclaimed. However, many forms of waste water today require heavy chemical treatment in order to remove harmful agents from the water and make it safe for further use. In some homes, people sometimes take steps to recycle wastewater themselves. Water used for bathing may be collected and utilized for watering flower or vegetables gardens. Any liquid used to boil pasta, for example may be recycled as water for plants rather than dumping the used water into the sink. The most common example of wastewater is liquid sewage. Discharge from homes and business alike, sewage

usually contains a mixture of human waste, food remnants, water food remnants, water using in washing machines, and other items that may have found their way into the sewage system. Many municipalities operate wastewater treatment plants that help to purify the sewage and recycle the water for other uses, such as watering lawns. The plant may employ many different devices to recycle the wastewater, including filters and chemical treatments

Types Of Reed

The various reeds include aquatic reeds, common reed, and aquatic plants.

Advantages Of Reed Bed

- Operation does not require electricity or fuel supply. No mechanical systems are involved.
- Reed beds do not breakdown. Set up is visually unobtrusive (aesthetical good) and provides growth of microorganisms.
- The plants, especially the species that grow naturally and under harsh environment conditions, offer a simple and economic method of wastewater treatment.
- Root zone plants can also be effectively used for the treatment of small volumes of municipal wastewater, particularly where construction of sewage collection system to an adjacent waste water treatment is needed.

Reed Plant Selection

Reed is the general botanical term used for tall, grass like plants of wet places. We are use foxtail millet and flax lily plants. (Figure 1 & 2)

Figure 1. Foxtail millet

Figure 2. Flax lily

Other Materials

Other materials like coarse aggregate, stone dust and sand are collected from local construction place. Tubs with pipe and tap connection are used.

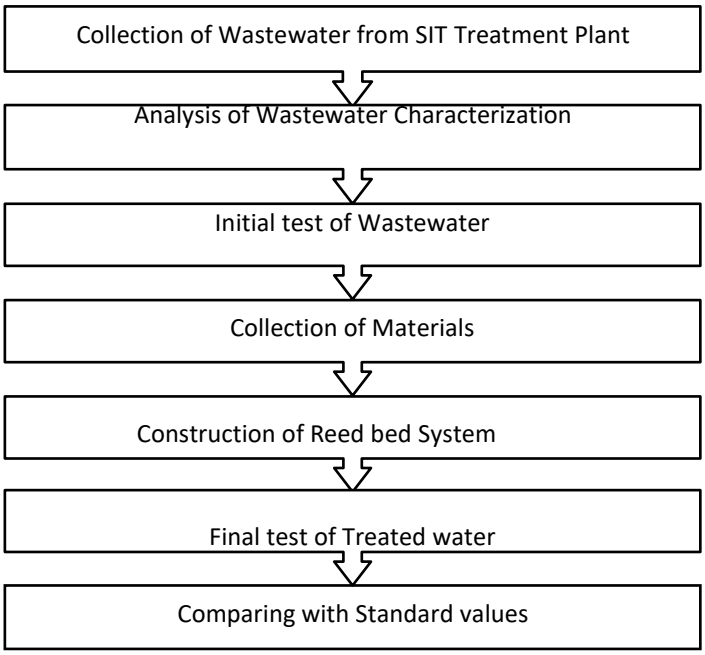
Functions Of Reed Plants

First, the very existence of root zone system creates channels for the water to pass through. Secondly, the roots introduce oxygen down into the body of soil and provide an environment where aerobic bacteria can thrive. These organisms are necessary for the breakdown of many types of compounds in particular in the oxidation of ammonia to nitrate; this is the first step in the biological breakdown of nitro compound. Thirdly, the process of nitrification takes place i.e. the plants themselves take up a certain amount of nutrient from the wastewater. In the spring and summer about 15% of the treatment capacity for sewage effluent occurs through this root zone treatment. Most degradation of nutrients is however undertaken by the microbes. The plants are also capable of accumulating certain heavy metals, an area where there is currently a great deal of research. In essence Reed beds can help to achieve a better standard of water quality through

- High level of bacterial and viral removal
- Decreased biological oxygen demand

II. Methodology

Methodology is a collection of methods, practices, processes, techniques, procedures, and rules. This project processes or procedures, methodologies given below.



Construction and Working of Reed Bed

The unit was constructed by placing separate layers of bricks (bricks or brick bats), stone chips, sand, stone dust. Different layers of beds were arranged and plants were planted in the unit as shown in figure 3. Further the growth of plants was monitored. During the growth period of one month, clean water is sprinkled. After that, sewage water was let into the root zone system and treated samples is collected. The sample before & after treatment is analyzed. The setup of plants flax lily & foxtail millet are shown in figure 4 & 5 respectively

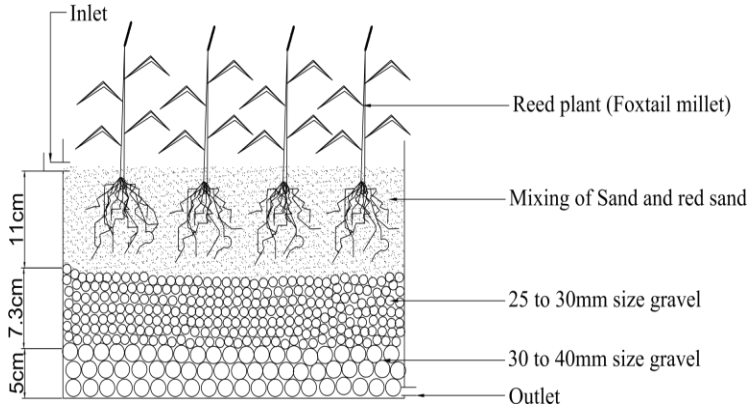


Figure 3. Plan of the project

Figure 4. Reed plant in tub (flax lily)

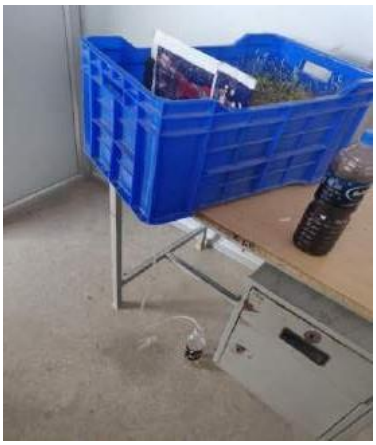


Figure 5. Reed plant in tub (foxtail millet)

III. Results

The sample collected from the college campus are analyzed by the characteristics tests of water. The water is made to pass through the root system of the vegetation's that are planted. Finally, the treated water is also analyzed for their characteristics. The results are in the following Table 1. The before & after treatment samples are shown in figure 6 & 7.

Table 1. Sample initial and final test values

S.NO	PARAMETERS	STANDARD VALUES	INITIAL TEST RESULTS	FINAL TEST RESULTS	
				FOXTAIL MILLET	FLAX LILY
1.	pH	6.5 to 8.5	8.6	7.6	7.9
2.	Chloride	1000 mg/L	2905 mg/L	1256 mg/L	1450 mg/L
3.	Chemical oxygen demand (C.O.D)	250 mg/L	380 mg/L	282 mg/L	310 mg/L
4.	Suspended volatile	100 mg/L	1465 mg/L	450 mg/L	700 mg/L
5.	Fixed solid	2100 mg/L	3125 mg/L	2470 mg/L	2735 mg/L
6.	Biochemical oxygen demand (B.O.D)	30 mg/L	141.87 mg/L	55 mg/L	80 mg/L
7.	Turbidity	5 to 10 NTU	>200 NTU	45 NTU	60 NTU

Figure 6. Sample before & after treatment (foxtail millet)

Figure 7. Sample before & after treatment (flax lily)

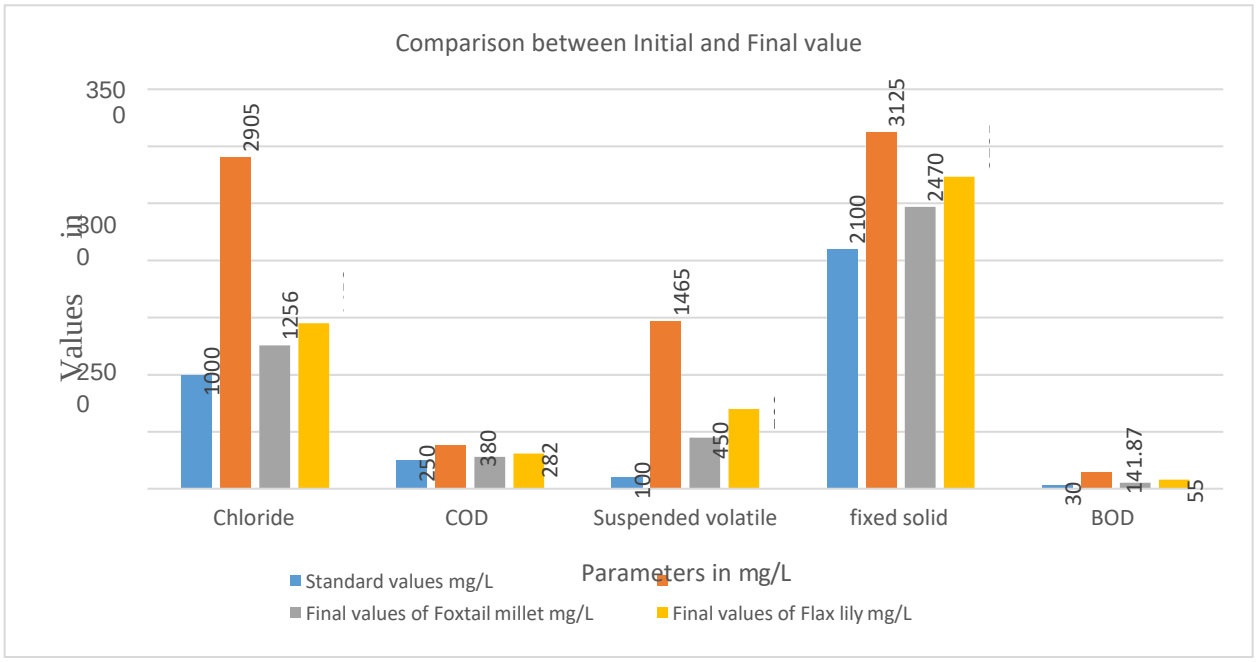


Figure 8. Test values for Chloride, COD, Suspended volatile, Fixed solid, BOD

IV. Discussion

From the graph, (Figure 8) the pH parameter reduces to be than the initial value as 7.6 and 7.9 respectively. The initial value of turbidity is >200 NTU while after treatment with reed plants it is found to be reduced to 45 NTU and 60 NTU. In the same way, the chloride is reduced to 1256 mg/L and 1450 mg/L. BOD removal efficiency of the treatment plant reduce to the value 141.87 mg/L to 55 mg/L and 80 mg/L respectively. COD removal efficiency of the treatment plant reduce to the value 380 mg/L to 282 mg/L and 310 mg/L respectively. Also, the suspended volatile and fixed solid parameters reduce to be than the initial value. Reed bed system achieves standards for treatment with no operating cost. There is no consumption of electricity. Wastewater treatment process reed bed system is best one. Because mechanical process less. So economic wise good.

V. Conclusion

The wastewater discharged into our campus was analysed to determine their characteristics. The reed bed system method was employed on a lab scale to treat the wastewater that is discharged. The initial results were compared with the TNPCB standard values. From the project study, it can be concluded that the use of reed plant receives attention for their effectiveness in wastewater. By comparing, the test results final result is less than the initial test results anddoes not exceeds the permissible limit. And, also among the reed plants foxtail millet (Thinai) and flax lily, it is clear that foxtail millet (Figure 1) effectively removes more amount of pollutants from the collected wastewater. The treated water is used in field of irrigation, aquifer recharge, industrial mixing of water, cooling tower etc.…Also, the foxtail millet (Thinai) is an edible part, human use it for their healthy life and flax lily (Figure 2) gives aesthetic view.

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