ROOT ZONE TECHNOLGY USED FOR TREATMENT OF CAMPUS WASTE WATER

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Abstract

Our Indian country faces many Environmental Related problems day by day. Water scarcity, waste water safely disposal is the major problems. Due to urbanization and increase in population the Earth natural resources are getting reduced slowly. prevailing situations the demand for water is increasing day by day in our life, In this situation the waste water can be treated by using a cost economic way by using Root zone Technology by using plants like azolla and the parameters are have to analyze for the our Indian standard. In our campus nearly 0.5 acres of garden area maintained daily.water consumption for the garden ,trees quantity is nearly 10000 litres per day so I take this project ,we are using treated waste water for garden and agricultural purpose. The raw waste water and treated waste water were collected periodically and tested for quality. It is seen that this pilot unit is reducing the concentrations of TSS, TDS, TN, TP, BOD, COD

Keywords :- Root zone , sedimentation ,Gravel filter bed, Azolla .

Introduction

The Waste water will be Treated, Recycling, and producing Azolla. Economically, Sanitation, Sewage Treatment Systems and Technology by Ministry of Environment, Forests & Climate Change, Across the world, there continues to be huge volumes of wastewater pumped directly into rivers, streams and the ocean itself. The impact of this is severe – aside from the damage to the marine environment and to fisheries it can cause, it does little to preserve water at a time when many are predicting that a global shortage is just around the corner.

Azolla

Effect of Increasing No of vehicle due to Global warming and Green house gas effect there are many changes in Climate. The Change in climate plays an important role in rainfall. Sudden heavy rainfall in one place of Earth is making more droughts in another place. Water is important for our day to day life we have to analysis more practices to save water. To develop the agriculture based azolla as live stock feed

Root zone

The term root zone encompasses the life interactions of various species of bacteria, the root of the wetland plants, soil, air, sun and of course, water. Root zone treatment is one of the natural and attractive methods of treating domestic, industrial and agricultural wastes. It is an engineered method of purifying wastewater as it passes through artificially constructed wetland area. It is considered as an effective and reliable secondary and tertiary treatment method.

The root zone treatment is a natural maintenance free system where the sewage wastewater is purified by the roots of wetland plants. The root zone process functions according to the law of nature, to effectively purify domestic and industrial effluents. The process incorporates the self-regulating dynamics of an eco system.

Application of root zone technology 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.

We know the 3R principles- Reduce, Reuse and Recycle. After long investigations 135 liters per head per day is essential for a human .In this 135 liters we can reuse and recycle nearly 80 liters from one persons usage of water by proper way. It is nearly 60% of per capita requirement of water.

Necessity for the Experiment Analysis

The Waste water will be Treated, Recycling, and producing Azolla. Economically, Sanitation, Sewage Treatment Systems and Technology by Ministry of Environment, Forests & Climate Change, Across the world, there continues to be huge volumes of wastewater pumped directly into rivers, streams and the ocean itself. The impact of this is severe – aside from the damage to the marine environment and to fisheries it can cause, it does little to preserve water at a time when many are predicting that a global shortage is just around the corner. Govt of India reports the National status of waste water generation & treatment during 2015.In 2015 the estimated sewage generation in the country was 61754 MLD as against the developed sewage treatment capacity of 22963 MLD. Because of the hiatus in sewage treatment capacity, about 38791 MLD of untreated sewage (62% of the total sewage) is discharged directly into nearby water bodies

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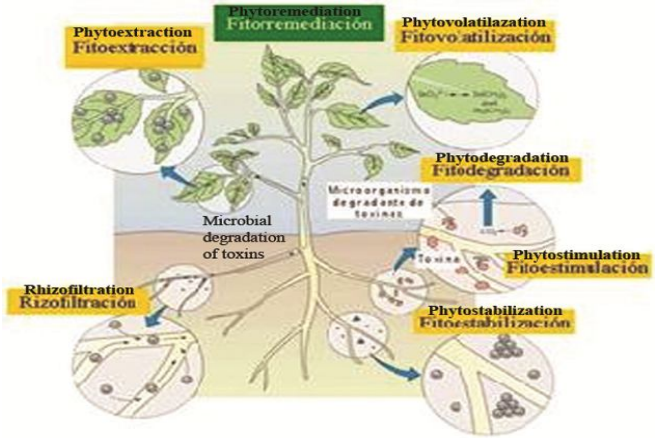


Objective of the Experimental Analysis

- To collect the all kinds of campus waste water at 2 points in our campus
- To examine the sewage waste water contaminants
- To collect plants like Azolla,Reeds
- To analyses the parameters like pH, TSS mg/l, COD mg/l, BOD mg/l, Ammonia, Nitrogen mg/l before and after Root zone treatment
- To compare the reports with standard Limits.
- To Monitor the plant growth rate

Materials and Method

Study Site

A field scale unit of Root zone system was established at Pandian Saraswathi Yadav Engg. College, Sivagangai in the state of Tamil Nadu, South India. The climate of the area is characterized with summer ,monsoon, post-monsoon and winter seasons/ About 95% of the rainfall occurs during monsoon (mid June to mid September) and normal annual average rainfall ranges between 637mm to 1673 mm. The average minimum temperature during winter varies between 18º C to25º C . During summer season (March to mid June) the maximum temperature goes upto 80 º C.

Waste Water Parameters

Wastewater contains a variety of inorganic and organic substances from domestic sources. The wastewater parameters namely BOD, COD, TDS, TSS and pH were analyzed. The procedure followed for calculating the parameters are the STANDARDISED methods (APHA, 1992)

Pretreatment

The wastewater flowing through the root zone bed contains silt/sediments, floating suspended materials (polythene pouches, leaves wood pieces etc.) To remove the floating material and other debris. Gabion structures (3 No.) were constructed in the upstream across the nalla. Prior to entry in the root zone system the wastewater is pretreated in settling tank of 35.0 m3 capacity with retention time of eight hours.

This chamber provides settling of settleable solids presents in the wastewater. The overflow wastewater is then passed through filter medium consisting of brick pieces and boulder stones (5-12 cm diameter). This pretreatment help in removing the floating materials and sediments to large extent from the wastewater before entering the root zone system.

Significance of root zone treatment

Significance of RZT are it is odourless, there is no frequent maintenance required, it has high treatment efficiency and it does not need any mechanical, electrical or chemical equipment.

Functions of Azolla

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.

Azolla is an aquatic floating fern, found in temperate climate suitable for paddy cultivation. The fern appears as a green mat over water. The Blue Green Algae cyanobacteria (Anabaena azollae) present as a symbiont with this fern in the lower cavities actually fixes atmospheric nitrogen. The rate of nitrogen fixed is around 25 kg/ha.

As green manure, Azolla is grown alone for two to three weeks in flooded fields. Afterwards, water is drained out and Azolla fern is incorporated in the field before transplanting of paddy. Otherwise, 4-5 q of fresh Azolla is applied in standing water one week after planting of paddy. Dry Azolla flakes can be used as poultry feed and green Azolla is also a good feed for fish. It can be used as a bio-fertilizer, a mosquito repellent, in the preparation of salads and above all as a bio-scavenger as it takes away all heavy Metals

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 (Babbit and Baumann, 1960). In essence Reed beds can help to achieve a better standard of water quality through

Advantages of Azolla

1. It easily grows in wild and can grow under controlled condition also.
2. It can easily be produced in large quantity required as green manure in both the seasons – Kharif and Rabi.
3. It can fix atmospheric CO2 and nitrogen to form carbohydrates and ammonia respectively and after decomposition it adds available nitrogen for crop uptake and organic carbon content to the soil.

4. The oxygen released due to oxygenic photosynthesis, helps the respiration of root system of the crops as well as other soil microorganisms.

5. It solubilises Zn, Fe and Mn and make them available to the rice.

6. Azolla suppresses tender weeds such as Chara and Nitella in a paddy field.

7. Azolla releases plant growth regulators and vitamins which enhance the growth of the rice plant.

8. Azolla can be a substitute for chemical nitrogenous fertilizers to a certain extent (20 kg/ha) and it increases the crop yield and quality.

9. It increases the utilisation efficiency of chemical fertilizers.

10. It reduces evaporation rate from the irrigated rice field.

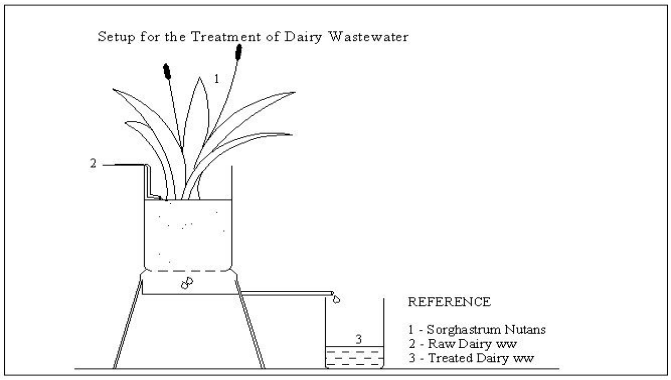
11. High level of bacterial and viral removal

12. Decreased biological oxygen demand and reduction of suspended solids

13. Reduction of nitrogen concentrations and removal of metal

Construction and Working of Root Zone

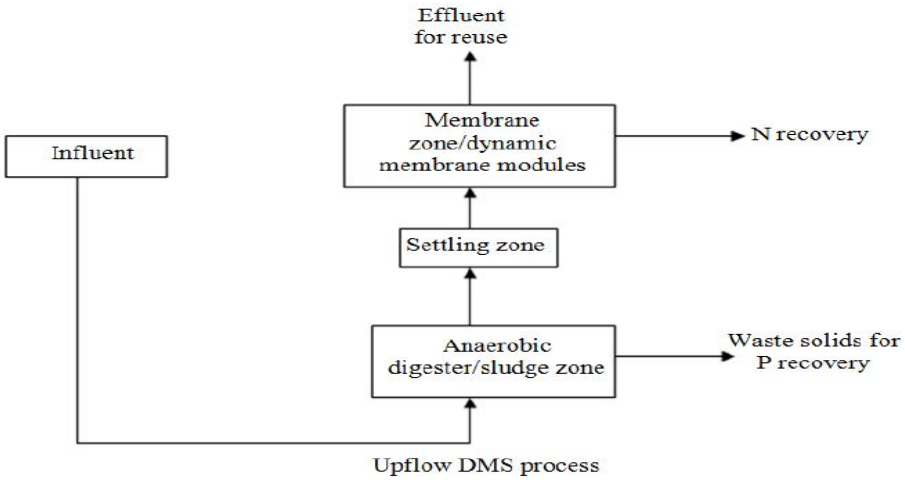
The unit was constructed by placing separate layers of bricks (bricks or brick bats) stone chips, sand, stone dust, after arranging the layers the plants were planted in the unit. Further the growth of plants was monitored. During the growth period of one month, only plain water was sprinkled. Then sewage water was let into the root zone system and the samples were collected.



Species and Distribution

The genus *Azolla* was placed in the family Salviniaceae in the order Salviniales. However, *Azolla* has been placed in the monotypic family *Azollaceae* [7]. There are seven extinct and twenty five fossil species of *Azolla* [8]. The most commonly found forms of *Azolla* are *A. pinnata, A. filiculoides, A. rubra, A. microphylla, A. imbricata* and *A. caroliniana. Azolla pinnata* is the most widely distributed species in India and throughout the world in both tropical and temperate regions. It is generally found to inhabit in paddy fields, canals, ditches and rivers. In India *A. pinnata* has been found to be distributed widely in stagnant and shallow waters. The growth is luxuriant during the months of August to March and it dies in summer due to increase in the temperature.

Flow Chart



Sewage Flow

The sewage from the collection tank is passed continuously to the filter. It filters through the graded stone layer and enters the prepared bed where the treatment takes place. After passing through the bed the treated sewage is allowed to filter through the down end filter. It rises up to the initial level maintained. It is collected in a tank by using a pump and discarded to the farmlands. The particles present above the stone layers are scraped and disposed. The reed grows quickly; it produces large clumps of thick rhizomes, oxygen transfers through the roots may be sufficient. Due to thick and sturdy rhizomes it is planted to help control soil.

Table 1: Concentration of various parameters collected (Before Treatment)

PARAMETERS					
SAMPLES	**1**	**2**	**3**	**4**	**5**
pH	7.27	**7.35**	**7.15**	**7.22**	**7.44**
TSS in mg/L	**134**	**560**	**468**	**162**	**197**
TDS in mg/L	**972**	**734**	**820**	**835**	**760**
BOD in mg/L	**130**	**396**	**619**	**140**	**101**
COD in mg/L	**392**	**895**	**1250**	**515**	**336**

Table 2: General characteristics of Sewage Wastewater

PARAMETERS	High	Medium	Low
pH	8.0	7.2	7.0
BOD in mg/L	350	200	50
COD in mg/L	1000	500	250
TS in mg/L	1300	700	200
TDS in mg/L	1000	500	250
TSS in mg/L	350	220	100

Result

The waste water discharged in our campus setting will be analyzed to determine characteristics . The wastewater from campus shows variation in concentration according to student's strength. TSS, BOD and COD particularly show a large temporal variation. The root zone method will be employ on a lab scale to treat the waste water. The root zone treatment can be utilized independently for a small scale unit or as an additional unit to conventional treatment system for complete treatment of waste water by using the plant Azolla.

Conclusion

The waste water discharged in our campus setting will be analyzed to determine characteristics in phase II. The wastewater from campus shows variation in concentration according to student's strength. TSS, BOD and COD particularly show a large temporal variation. The root zone method will be employ on a lab scale to treat the waste water. I expect in phase II result the root zone treatment can be utilized independently for a small scale unit or as an additional unit to conventional treatment system for complete treatment of waste water by using the plant Azolla.

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