Applied Science & Engineering Journal for Advanced Research
ISSN (Online): 2583-2468
Volume-1 Issue-1 || January 2022 || PP. 14-21 DOI: 10.54741/asejar.1.1.3

Colacasia Plants Used Treat Waste Water from Homes

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Received: 15-12-2021	Revised: 21-01-2022	Accepted: 23-01-2022

ABSTRACT
One of the low-cost wastewater treatment options is Root Zone Technology. We can treat non-point sources effectively, with the help of this method. To achieve this purpose, trailed by the source area bed, we must distinct non-point bases into created channels inside the river bank, or if the non-point bases are natural nulls, we are able to deliver this system through their channel. We set up a channel on which I created a source area bed and conducted a laboratory examination the director's production on a variety the factors. The two parameters for which channels must be built are flow rate and detention time. As a result, I'm adjusting the flow rate to see how the parameter changes over time. When we obtain the best result with the most flow, we say we've optimized. For the three-day, seven-day, and twenty-one-day detention periods, I received satisfactory results. Using this information, I created a root zone bed system for the identified actual domestic sources.

Keywords: *colacasia plants, waste water, homes, technique*

I. INTRODUCTION

One of the most natural and appealing techniques for treating home, industrial, and agricultural pollutants root zone treatment. It's a way of cleaning wastewater by passing it through an artificially produced wetland area. It is regarded the trustworthy tertiary therapy and successful secondary option. The treatment root zone is a low-maintenance device that uses the roots of wetland plants to purify sewage effluent. The root zone technique purifies home and industrial effluents effectively according to natural laws. The approach incorporates an eco-system’s self-regulating dynamics.

Source zone equipment is gaining popularity in both developed and developing countries because it looks to provide a more cost-effective and environmentally friendly reply to the problem of water pollution management. Root zone systems, whether natural or artificial, serve as a link between the aquifer system and the terrestrial system, which is where the contaminants originate. Schools, hospitals, hotels, and smaller villages are said to benefit the most from these.

Root zone systems, also known as built wetlands, are intentionally produced wetlands that have a clay or plastic lined excavation with emergent plants growing on gravel/sand mixtures. For the treatment of wastewater, this approach integrates mechanical filtration, chemical precipitation, and biological degradation into one phase. Root zone systems are an attractive solution for wastewater management due to a variety of features, including low operating costs, minimal energy requirements, and ease of maintenance. The term "root zone" refers to the interactions between diverse bacteria species, wetland plant roots, soil, air, sun, and, of course, water.

II. LITERATURE REVIEW

Nikhil Singh (2017) conducted research on waste water from the Root Zone. When a septic tank overflows, effluent is collected and transported to a treatment facility. A pit of critical size is created at the plant. The Root Zone pit is designed to pass the cleared sewage from the septic tank. The size of the pit is determined by the amount of wastewater to be treated per day. Low-density polypropylene sheets or rolls are used to line the pit. Other forms of civil structures can be used as treatment tanks if necessary. Layers of suitable porosity layered material are used to fill the pit layer by layer.

Mahendra et al. (2017) an introduction to the Root Zone technique for waste water treatment was examined. This study the quality or quantity of water resources are exploited and impacted by increasing urbanization and human activities. The growing output of home trash, sewage, industrial waste, and other waste has led to the pollution of freshwater bodies. This study discusses the Root Zone Treatment System, which consists of soil gravel, sand, and fine aggregate planted filter beds. This technique employs a natural approach to efficiently cleanse home and industrial effluents. RZTS are well-known in

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temperate areas and are simple to operate with cheap installation, maintenance, and operational expenses. They also include the self-regulating dynamics of an artificial soil eco-system.

Naeem et al. (2015) conducted an experimental study on source-to-sequence handling of household trash. He has talked about the handling of grey water and kitchen solid waste. For wastewater management, sand filters with reeds are tested and treated with the simple sand filter bed technique and vice versa. It also advises creating compost from kitchen garbage using PVC pipes. For waste water treatment, reed plants such as Phragmites australis (also known as nanal) and Canna Indica (also known as cannas) were employed. This study discusses the reed bed construction method as well as the efficacy of the root zone treatment process in removing various impurities. Raw water and treated water samples had their quality parameters evaluated and discussed.

Shivam & Dheeraj (2014) investigated the feasibility of non-point low-cost source treatment. He had gone through non-point sources or how to deal with them. Due to the disposal of city waste through which it passes, river water has now become waste water. The sewerage network and treatment facilities are insufficient as a result of haphazard and ill-planned infrastructure development. This results in the growth of unlawful sewage in any location, resulting in non-point sources. The majority of existing wastewater treatment plants are nearing the end of their useful lives. The Root Zone Bed System is a low-cost wastewater treatment technology. We can treat non-point bases successfully, with the help of this method.

Prem Jigar et al. (2016) An experimental investigation was carried out after the purification of dairy spoiled water using hybrid reed bed technique. Its paper provides info about dairy waste then its treatment. He treated dairy waste with a hybrid reed plant. This investigation revealed that the hybrid reed bed system was highly successful at removing COD up to 110 miligram/liter and BOD up to 14 milligram/liter during thirty six hours of detention period, with a BOD removal efficiency of 97 percent and a COD removal efficiency of 92 percent for dairy effluent. The pH of the dairy waste sample stood initially more alkaline, but thanks to the techniques used, it was brought significantly closer to the neutral axis. The TSS and TDS reductions stood not significant.

III. MATERIALS AND TECHNIQUES

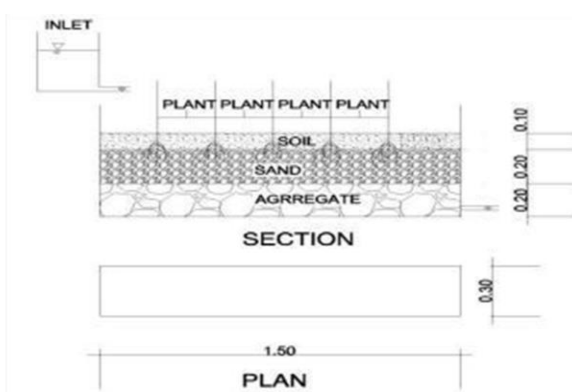
3.1 Constructed Wetland

I built a 1.5 m x 0.5 m x 0.3 m constructed wetland for Colacasia and canna plants. Consider the reactor's length of 1.5 meters, height of 0.5 meters, and thickness of 0.3 meters. The section and plan of the constructed reactor are shown in the diagram above. Consider a 200 mm thick layer with a 20 mm aggregate size at the lower level. Natural sand in the middle layer, 200 mm thick and black cotton soil on the top layer, 100 mm thick.

The aggregate was washed with water before being placed in the reactor and the sand was also cleaned with water before being placed in the reactor. Fill the reactor with all the layers at the same time and leave that one day. Create two parallel systems for Canna and Caucasia plants.

3.2 Reactor Setup

The four-sided drum with a soil feed of a plant was set up to slope 100 and was at a slight elevation on the back side of the tub, and it was retained sloping. Using a bucket and timer, the inlet and output flow rates were regulated. The wastewater inlet and exit flows were modified to keep the hydraulic retention time (HRT) at 3 days, 7 days, and 15 days, respectively.



The units of measurement are meters
Figure 1: Root Zone System Plan and Section

(a) **(b)**

(c) **(d)**

Figure 2: (a) and (b) depth 200mm of bottom coating with collective (c) Trial setup (d) at bottom drainage pipe

3.3 Planting Methods

Rhizomes, seedlings, and planted clumps are all viable options for reeds. Clumps of 2 Nos./m2 can be planted at any time of year. Premonsoon is the optimal time to plant rhizomes, and 4–6 rhizomes per m2 are recommended. Plant 3–5 seedlings per m2 in the pre-monsoon. To avoid compaction of the filter medium, planting should be done from support boards. The plants should be watered often at first, but not inundated. Periodic flooding can be used to keep weeds from growing if the shoots are well-developed. A sufficient quantity of nutrients is needed during the first phase of growth. If wastewater is utilized for initial watering, special precautions must be taken, such as avoiding stagnation, to prevent the production of H2S in the filter bed.

Figure 3: A Colacasia plant is being planted

A graded filter is installed in the blower portion of the reactor to prevent soil from entering the under drain pipe and washing away the soil. A layer of fertile soil 20 cm thick is given over the filter. A 1-2 cm thick layer of organic manure is applied over the soil layer. After these layers have been laid and the plants are watered, planting can begin. The filter is made of crushed stone with a gradient of 40 mm near the drain pipe and 5 mm just below the soil layer on top. Various plant species were evaluated for plantation in RZT system. The elephant ear, or arum, was selected as a plant species in the RZTS based on local availability, its ability to ingest organic and inorganic materials from waste, and the revenue generated by selling the plant.

3.4 Plants used in the System

Colacasia esculenta: It is considered one of the earliest plants to be grown. Which are root vegetables is a tropical plant grown extensively for its edible corms, often referred to as taro. Linnaeus originally named two genera of cultivated plants, now known as Colacasia anticorum and Colacasia esculenta, but several highly variable genera, with modern botanists considering them all to be members of a single, Colacasia esculenta.

Figure 4: Colacasia plant

3.5 The Colacasia Plant a Wide Range of Applications

The edible corm and leaves of the taro are the plant's major purposes. The presence of needle-shaped rap hides and calcium oxalate in the vegetal cells makes the plant poisonous in its raw state. By boiling or steeping the tuber in cold water overnight, the toxicity can be reduced and the tuber made more edible.

Peeled and boiled, these little round corms are marketed frozen, packaged in liquids, or canned. The vitamin and mineral content of the leaves is high. It's also available as an aquatic ornamental. It's also employed in anthocyanin research, particularly with biaxial anthocyanin concentrations.

IV. WORK WITH ROOT ZONE TECHNOLOGY

4.1 Methods of Sampling

I took a sample from the Nasardi River near Bombay. Nashik-Naka because it runs through the city and slum areas, this river has become filthy. A sample has been taken from the sample bottling. All samples, excluding those gathered for bacteriological, oil-based, or solvent analysis, should be collected in one liter or two 12-litre fresh PVC bottles.

At low flow rates, to take the sample deeply, a hand-pump extending with the tube should be used. Then, a depth sample tumbler (250 mL, 500 mL, or 1000 mL) with screw-in extension rods should be used.

Figure 5: Before and after treatment of a sample, and a sample point near the Nasaradi River in Nashik

4.2 Mechanisms in the Root Zone

The experimental protocols used in this study were comparable to those previously defined. Canna and esculent colocasia are two most well-known adaptable marshland plants in India that have been used to remediate wastewater. In the Angular Horizontal Subsurface Flow procedure, the created wetland was transplanted into the intended wetland system.

- Each experimental set-up had two sets of buckets of varying sizes and dimensions. The wastewater was collected in vertical buckets as a holding tank (inlet). Each tank had a 50-liter storage capacity.
- Fill the bottom of the built structure with pounded total up to 200 mm heavy. The middle layer of the reactor was then filled with washed sand up to a depth of 200 mm. At the top, there is soil up to 100 mm deep.
- Plants on the bed were acclimatized for two weeks at a time using appropriate dilutions. Through plant treatment, the concentrations of sewage were gradually increased to 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80, 90%, and 100%. After their pre-treatment characterization, and another set was used as a control (without plant), these trials were treated with Canna colocasia and esculenta using the Phytoremediation approach.
- In each set, an experimental test setup consisting of a rectangular tub with a test plant bed was utilized to produce a root zone bed with a length of 1.5m and a height of 0.5m and an appropriate outlet. For uniform distribution of waste, the perpendicular pipe was put overhead the pot in an upturned "T" figure and connected creek of the every set holding tank in with the rubber pipe. The plastic tube was 40 cm long, with perforations every 5 cm and a manual flow adjustment.
- After running out of the root zone bed through the outlets, the treated water was collected in plastic cans. Tubes and plastic water pipes were used to connect the inlet, root zone tub, and outlet.
  Water samples that had been treated were taken and tested at a lab.

4.3 Parameters of Choice

Test samples were evaluated for selective parameters such as TDS, pH, TSS, BOD, COD, TN, PO4, and DO, with a normal procedure in both circles (control bed and plant bed).

Both beds of CWs had their soils evaluated before and after treatment. Finally, the efficiency of the test plant's pollutant reduction and treatment was determined.

V. FINDINGS & DISCUSSION

Table 1: Shows the pH of the Colacasia plant

S. No.	Details	Colacasia Plant
1	Prior to the treatment	6.7
2	After Three Days	6.8
3	After Seven Days	7.0
4	After 21 Days	7.1

Table 2: Colacasia plants' COD value

S. No.	Details	Colacasia Plant Miligram/Liter
1	Prior to the treatment	442.6
2	After Three Days	211.9
3	After Seven Days	92.1
4	After 21 Days	81.1

Table 3: Colacasia plants' BOD value

S. No.	Details	Colacasia Plant
1	Prior to the treatment	341.5
2	After Three Days	170.9
3	After Seven Days	89.6
4	After 21 Days	70.6

Table 4: Colcassia plants' TDS value

S. No.	Details	Colacasia Plant
1	Prior to the treatment	60.1
2	After Three Days	26.9
3	After Seven Days	14.1
4	After 21 Days	12.1

Table 5: Colacasia & Canna plants have a high nitrogen value

S. No.	Details	Colacasia Plant Miligram/Liter
1	Prior to the treatment	901.1
2	After Three Days	604.2
3	After Seven Days	553.9
4	After 21 Days	481.1

Table 6: Colcassia and Canna plants have different TSS values

S.No.	Details	Colacasia Plant
1	Prior to the treatment	186.2
2	After Three Days	131.9
3	After Seven Days	554.1
4	After 21 Days	482.1

Table 7: Colacasia plant's phosphate value

S.No.	Details	Colacasia Plant
1	Prior to the treatment	33.2
2	After Three Days	23.6
3	After Seven Days	12.1
4	After 21 Days	9.8

VI. CONCLUSION

Domestic, agricultural, and industrial waste, as well as urban and highway runoff, are all treated using construction wetlands in developing countries. The most prevalent method is the root zone system, which is utilized for household trash. From the project above, it can be said that the technique of RZT can decrease the impurity level exposed beneath.

1. Before treatment, the PH level was 6.7. After treatment, the PH level was 7.1.
2. COD in the Colacasia root zone decreases by 52 percent, 78 percent, and 82 percent after 3 days, 7 days, and 21 days.
3. After 3 days, 7 days, and 21 days, the BOD level in the Colacasia root zone drops by 50%, 74%, and 79%, respectively.
4. After 3 days, 7 days, and 21 days, the TDS in the Colacasia root zone has dropped by 33%, 39%, and 47%, respectively.
5. Colacasia root zone reduces nitrogen by 54%, 77%, and 81% after 3 days, 7 days, and 21 days.
6. TSS in the Colacasia root zone decreases by 29% after 3 days, 7 days, and 21 days.
7. After three days, seven days, and 21 days, the amount of phosphate in the Colacasia root zone has dropped by 30%, 64%, and 70%, respectively.

Overall, the study says that CWs should be used to clean household waste water of pathogenic bacteria and other pollutants.

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