

PHYTOREMEDIATION OF DOMESTIC WASTEWATER USING CATTAIL PLANTS

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Abstract – This paper presents the Phytoremediation is one of the remediation technology for treatment of water, wastewater and soil, which utilizes the different plants for removal of contamination or management of nutrients in water. It is a low cost technique compared to conventional treatment methods. In this study the Cattail plants (*Typha latifolia*) are used for the removal of nutrients such as Nitrogen and Phosphate from wastewater (sewage). The sample is collected from the inlet of 20MLD treatment plant located at B.kallappana halli of Davanagere city. The Cattail plants are kept in the sewage water for nutrients absorption for 15 days. For each 5days readings are taken and observed that nutrients (Nitrogen and Phosphate) removal efficiency of Cattail plants from the sewage water up to between 45 to 50%.

Key Words: Phytoremediation, nutrient Cattail plants (*Typha latifolia*), Phosphate, Nitrogen.

1. INTRODUCTION

Plants are the valuable resources that are recognized throughout the human history. Purification of water from plants has been recognized long time back. The plants naturally improve the water quality after passing through them. When water is passing through them many processes are carried out such as physical purification, chemical purification and biological purifications that removes the pollutants from water and filters the water. They act as the natural filter Phytoremediation is a new technology that uses the wetland plants to remove the pollutants from the water and wastewater processes are carried out such as physical purification, chemical purification and biological purifications that removes the pollutants from water and filters the water. They act as the natural filters. Phytoremediation is a new technology that uses the and wetland plants to remove the pollutants from the water.

wastewater. Types of Phytoremediations [From Environmental science and technology]

1. Rhizodegradation
2. Phytohydraulics
3. Phytoextraction
4. Phytovolatilization
5. Phytodegradation

Phosphate is a nutrient that excess can cause the eutrophication or contamination. The contamination increases the cost of treatment, also toxic to the drinking water. Hence it is necessary to remove the excess phosphate.

Nitrogen is also a major nutrient but in excess quantity can results in growth of algae and other weeds. Excess of nitrate in drinking water can leads to health problems particularly in children's that is "Methenoglobinemia" or Blue baby disease.

Davangere is a city, placed at the central part of Karnataka. It is one among the 25 cities of the Karnataka state where urban sector investment program have been proposed. Sewage is a major carrier of diseases (from human wastes) and toxins (from industrial wastes). The safe treatment of sewage is necessary to the health of any community. The sewage treatment plant focuses on the all physical chemical and biological treatments used to make the sewage biologically and chemically harmless.

The 20MLD plant in Davanagere city has primary and secondary treatment units. Primary treatment includes screenings, grit chamber. Then divided into two and goes to secondary treatment that is technology. Then for tertiary treatment and out let.

1.1 OBJECTIVES

Specific Objectives of this project

- Sample is collected from the inlet of 20MLD treatment plant located at B.Kallappana halli of Davanagere city.
- Analysis of physical and chemical parameters in the laboratory.
- Identifying the nutrient removal efficiency of Cattail plants.

1.2 METHODOLOGY

COLLECTION OF SAMPLE

- Samples are collected from the inlet of 20MLD treatment plant located at B. Kallappana halli of Davanagere city.
- There are three methods of sampling
- In this study samples are collected by using grab sampling method.

4 liters of sample is collected at the inlet of 20MLD treatment plant in plastic bottles. Figure 1 show the inlet of 20MLD STP of Davanagere city where the sample is collected.



Figure 1: Inlet of 20MLD STP in Davanagere

1.3 INITIAL PARAMETERS ANALYSIS

1. BOD (Biochemical oxygen demand)
2. COD (Chemical oxygen demand)
3. DO (Dissolved oxygen)
4. Conductivity
5. TDS
6. Nitrate
7. pH
8. Temperature
9. Phosphate
10. Turbidity

1.4 Cattail plant (*Typha latifolia*)

This plant comes under monocotyledonous flowering plants in the family of Typhaceae. These are tall sturdy plants that can grow to almost 10 feet tall. It has long flat leaves and long cylindrical flower spikes. It will grow anywhere that supplies a constant source of water. It has ability to absorb the nutrients. Plants are help in treating or cleaning the water. Nutrients (Nitrate and Phosphate) are absorbed by roots of the plants where detoxifying mechanisms are taking place.

These stored nutrients are supplied to the stem, leaves and turned it into harmless chemicals or into gases. Absorbed nutrients are leads to the growth of the plants.

1.5 EXPERIMENTAL SETUP AT LABORATORY

- Experiments were conducted in laboratory scale systems consisting of one sprayer, three trays, one mesh, one collecting tray, and one bucket as shown in figure 10.
- Collected sewage water is sprayed uniformly on the first tray.
- Then the water is move down to second tray where it passes through the filter media (the middle tray there is a mesh of opening of size 1mmx1mm and containing the aggregates of size more than 4.75mm and less than 4.25mm as lower layer and upper layer respectively so as to filter the sewage water) then collected at the bottom.
- Then the water is tested initial parameters which are listed below(table1).then the water is send to bucket using pipe of diameter 0.5cm.then the plant is placed in the water for 15 days.
- For each 5 days readings are taken to know how much a plant can absorb the nitrate and phosphate.



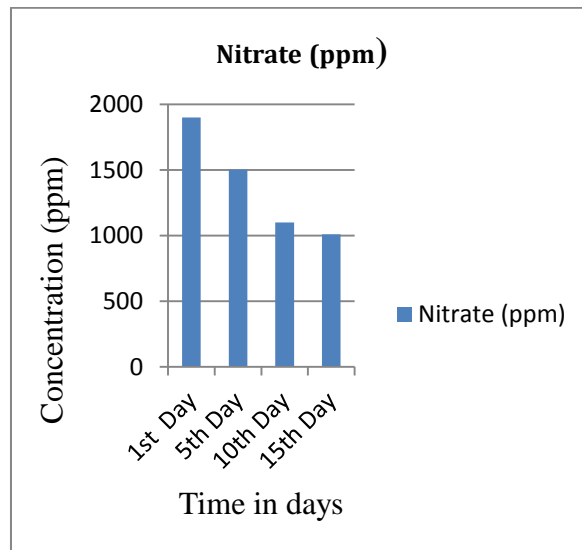
Experimental setup at laboratory

2 RESULTS AND DISCUSSIONS

Three samples are collected from the inlet of 20MLD treatment plant at B.Kallappana halli of Davanagere city. Samples are collected, analyzed and treated and results are discussed.

Table 1: Results of sample 1 (nitrate concentration) during experiment

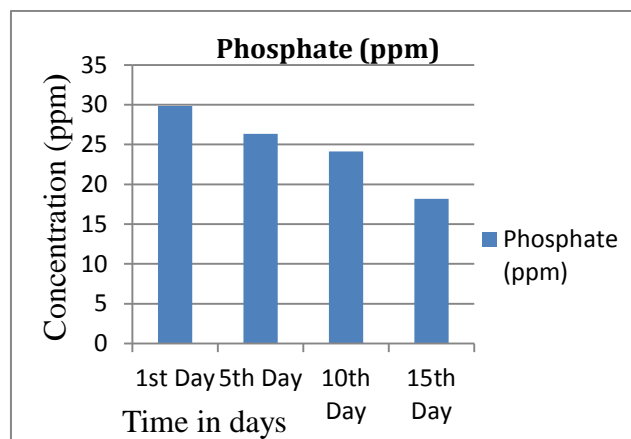
Time in days	1 st Day	5 th Day	10 th Day	15 th Day	Removal (%)
Nitrate (ppm)	1900.40	1501.087	1100.88	1010.540	46.803%



Concentration of nitrate in sample 1 during experiment

Table 2: Results of sample 1 (phosphate concentration) during experiment

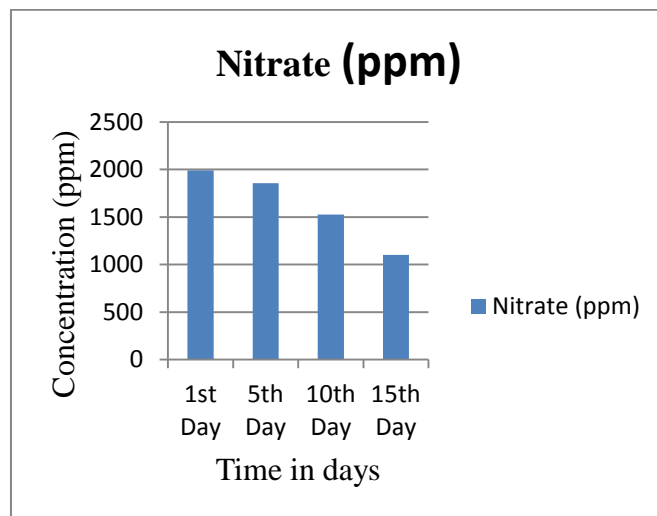
Time in days	1 st Day	5 th Day	10 th Day	15 th Day	Removal (%)
Phosphate (ppm)	29.850	26.321	24.147	18.166	40.423%



Concentration of Phosphate in sample 1 during experiment

Table 3: Results of sample 2 (nitrate concentration) during experiment

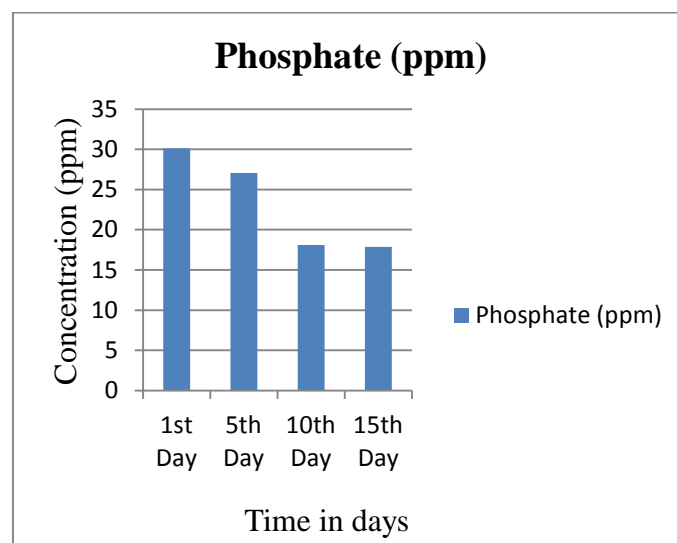
Time in days	1 st Day	5 th Day	10 th Day	15 th Day	Removal (%)
Nitrate (ppm)	1991.560	1854.34	1524.35	1100.11	44.761%



Concentration of Nitrate in sample 2 during experiment

Table 4: Results of sample 2 (phosphate concentration) during experiment

Time in days	1 st Day	5 th Day	10 th Day	15 th Day	Removal (%)
Phosphate (ppm)	30.148	27.055	18.123	17.880	40.692%



Concentration of Phosphate in sample 3 during experiment

From the results of three samples, the sample 3 is treated more efficiently within the same period of treatment. We can say that the Cattail plant (*Typha latifolia*) can remove the nitrate and phosphate effectively. The removal efficiency of cattail plants is about 48.922% for nitrate and about 47.614% for phosphate within 15 days of treatment.

3. CONCLUSIONS

- The results from this study seem to show the removal efficiency of nitrate and phosphate from the cattail plants.
- This study shows the using of wetland plants is a feasible way to treat the nutrient contaminated water. By these types of project we can find the natural plants which can remove more concentration of nutrients.

- By the results of this experiment we can conclude that the cattail plants are more efficient to nutrient removal process.
- Cattail plants can be planted in the wetland systems or others areas where the nutrient rich water flows. Then we can treat the water by placing water or allowing water to flow through by the plants. And harvesting the plants regular intervals we can permanently remove the nutrients. Harvested matter can be used as fertilizers in the agricultural field [1].
- Using of these types of technique we can potentially decrease the amount of nitrate or phosphates reaching the lake that is leads to eutrication and other problems. And also it can be used to limit the point and non point source of pollutions entering the rivers and lakes [15].
- Lastly phytoremediation is the natural method of remove the nutrients from environment. Especially in case of lake water rivers and wastewater [9].
- It is a cost effective, simple applicability.
- Hence based on all these factors, the conclusion of this project is Phyto remediation is the one of the best eco friendly method to treat water with large number of benefits.

REFERENCES

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