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ANALYSIS OF NOYYAL RIVER AND ITS POTENTIAL FOR IRRIGATION USING PHYTOREMEDIATION

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ABSTRACT

The Noyyal River, a vital water source in India, faces contamination challenges affecting its suitability for irrigation. This study explores the potential of phytoremediation, specifically using Aloe Vera plants, to purify the river water. Aloe Vera is known for its ability to absorb pollutants and improve water quality. Through a series of laboratory experiments and field observations, the efficiency of Aloe Vera in removing contaminants from Noyyal River water was assessed. Preliminary findings indicate promising results, suggesting that Aloe Vera could be a sustainable and cost-effective solution for enhancing the river's water quality and making it suitable for irrigation. Further research and implementation of phytoremediation strategies using Aloe Vera could play a significant role in restoring and maintaining the ecological balance of the Noyyal River ecosystem.

Keywords: Noyyal River, phytoremediation, Aloe Vera, water quality improvement.

1. INTRODUCTION

The Noyyal River, formerly a vital resource for the populations within its basin, is currently experiencing significant environmental degradation. The Noyyal River, which is situated in southern India, has seen a major reduction in water quality, which has been linked to urbanization, agricultural runoff, and industrial discharges. Inaddition to endangering the river's biological integrity, the uncontrolled discharge of pollutants into its waters has sparked worries about the river's potential effects on human health and nearby ecosystems. This initiative uses phytoremediation, a sustainable and environmentally friendly water treatment method, to address the serious problems the Noyyal River is experiencing. Phytoremediation is an environmentally acceptable substitute for traditional remediation techniques. It is the deliberate

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use of particular plants to remove,stabilize, or decompose.

This effort aims to investigate the effectiveness of phytoremediation in enhancing waterquality and reinstating the health of the river ecosystem by choosing suitable plant species and setting up controlled trial locations along the Noyyal River. By conductinga thorough investigation that includes plant selection, phytoremediation procedures, and water quality analysis, this project aims to provide important information for the preservation and restoration of the Noyyal River. The Noyyal River is an important waterway in Tamil Nadu, in southern India. Despiteits significant environmental issues, the river has cultural and historical significance. The river rises in the Western Ghats and flows through the districts of Erode and Coimbatore for a distance of about 180 kilometers. The Noyyal has historically been essential to the region's agrarian development by supporting crops and encouraging communities along its banks.

The depletion of aquatic species and the deteriorating water quality of the Noyyal highlight the pressing necessity for extensive rehabilitation initiatives. The Noyyal could be brought back to life with the help of this project's phytoremediation approach,which offers a sustainable and environmentally responsible way to lessen the negative effects of human activity and bring the river back to its former, healthy state Because of the Noyyal River's varied significance that transcends physical borders, examination of the river is essential. The Noyyal has historically provided water for irrigation and maintained the agricultural output of the area, acting as a lifeline for ruralinhabitants. Rapid urbanization and industrialization, however, have seriously pollutedthe river, endangering ecosystems and public health in addition to lowering the quality of its water.

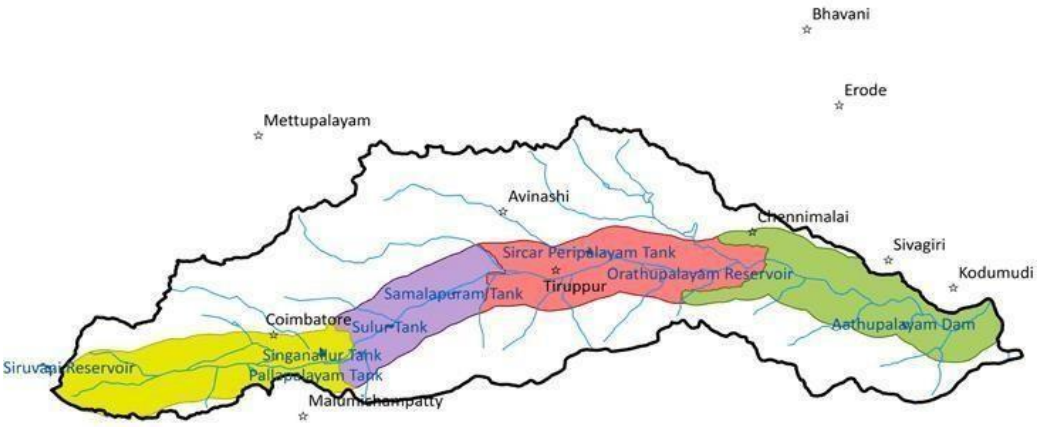

Fig 1.1

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1.2 OBJECTIVES OF PHYTOREMEDIATION:

Water Quality Assessment: Conduct a detailed analysis of the Noyyal River's water quality to identify specific pollutants, including heavy metals, pesticides, and nutrients,contributing to its degradation.

Site Selection: Identify strategic locations along the Noyyal River for implementing phytoremediation interventions based on the severity of pollution and the ecological sensitivity of the areas.

Plant Species Selection: Systematically choose and introduce phytoremediation plantspecies known for their ability to uptake, accumulate, and/or degrade pollutants, considering the specific contaminants in the Noyyal River.

Experimental Design: Develop a robust experimental design to study the efficacy of phytoremediation processes, including phytoextraction, phytostabilization, and hemofiltration, in improving water quality and reducing pollutant concentrations.

STUDY AREA:

In my instance, I have decided to examine the water quality of Coimbatore and Tiruppur, which are located in regions 1 and 2. It is crucial to comprehend the physicochemical characteristics of the water in these areas to evaluate its suitability for different uses. Given its reputation for both industrial and agricultural activity, Coimbatore may havewater quality issues as a result of these causes. Contaminants may be present due to agricultural runoff and industrial discharges, which might impact chemical oxygen demand (COD), pH, and total dissolved solids (TDS). However, the discharge of dyeing and finishing effluents may pose a threat to the waterquality of Tiruppur, a major textile hub. In this context, parameters such as color, turbidity, and amounts of heavy metals can be significant. By keeping an eye on these variables, one can gain insight into the general state of the water, spot possible problems, and put the appropriate measures in place for Tiruppur and Coimbatore's sustainable water management. The maintenance and enhancement of water quality in these areas depend on regular evaluations and cooperative efforts between stakeholders.

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1.3 GEOGRAPHY AND HYDROLOGY OF NOYYAL RIVER:

Originating in Tamil Nadu, India's Western Ghats, the Noyyal River is a noteworthy watercourse that flows for around 180 kilometers. The districts of Coimbatore and Erode are included in the river basin, which is crucial in forming the topography and hydrology of the area.

The Noyyal River basin's topography is made up of a variety of landscapes, from the highlands of the Western Ghats, the river's source, to the plains where it flows throughcities and farmland. The geography affects the river's flow; as it flows eastward, altitudes steadily drop. From a hydrological perspective, the Noyyal River's watershed is essential for surface water body nutrition and groundwater aquifer recharge.

However, the Noyyal River's natural hydrology has been dramatically changed by human activity. The river's flow has been disturbed by unchecked agricultural water extraction, industrial discharges, and urban growth, which has decreased water supply and raised pollution. Developing successful conservation and restoration solutions to solve the issues faced by the Noyyal River requires an understanding of the complex link between the river's hydrology and topography.

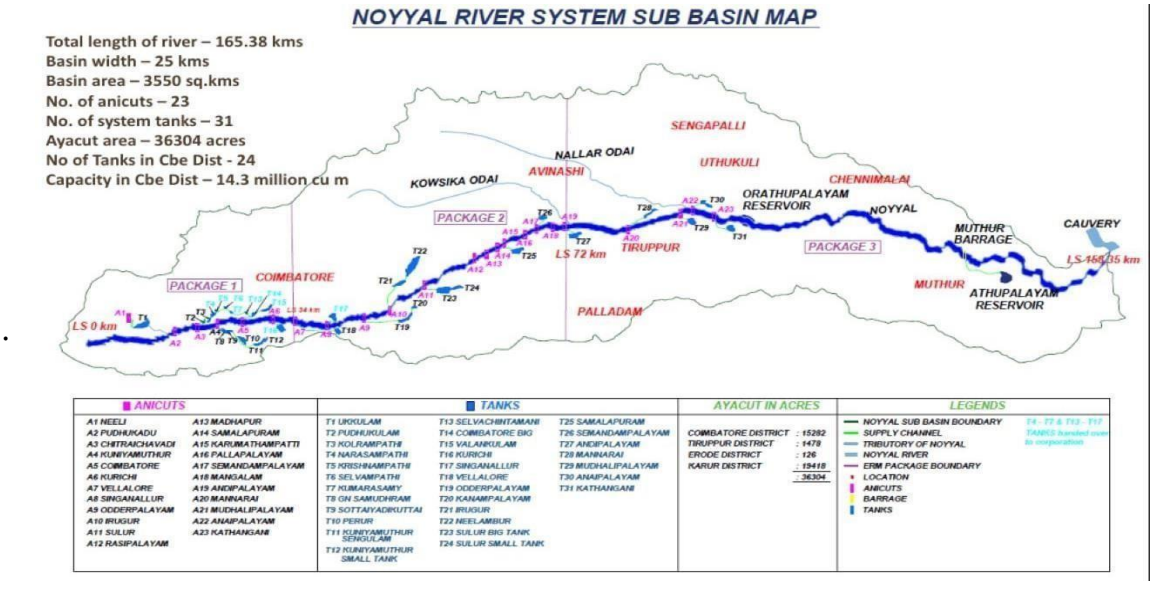

Fig 1.2 Sub Basin Map of Noyyal

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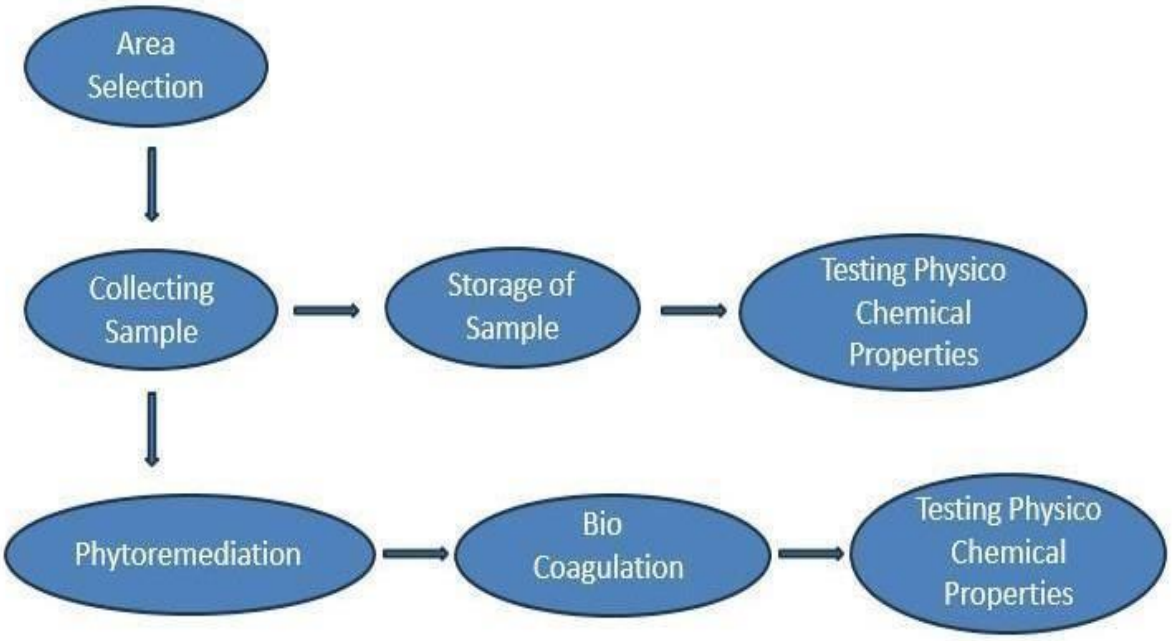
2. METHODOLOGY



3. WATER QUALITY ANALYSIS

Physicochemical parameters: The term "physicochemical parameters" refers to a wide variety of attributes that characterize a substance's chemical and physical properties. These parameters are essential in many scientific and industrial applications. Temperature, pressure, density, viscosity, solubility, conductivity, pH, and other characteristics are some examples of these properties. One of the primary factors affecting molecular mobility, phase transitions, and chemicalreactions is temperature. A substance's physical state is impacted by pressure, which isa force that can also have an impact on the kinetics of a reaction. Density gives information about a substance's compactness by calculating its mass per unit volume. Viscosity affects mixing and transport processes by defining a fluid's resistance to flow. Understanding a substance's solubility—its capacity to dissolve in a particular solvent—is essential to comprehend the behavior of solutions. A material's conductivity indicates how well it conducts electricity

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4. MATERIALS USED

Noyyal River water: The River serves as a sample in our experiment to assess the effectiveness of Aloe Vera in phytoremediation. This river, impacted by industrial pollution, presents a real-world scenario to evaluate the plant's potential to improve water quality through natural filtration and absorption processes.

Aloe Vera: Aloe Veras are short-stemmed plants growing up to a height of 60-100 cm (24-39 inches) which are spread through offsets. The leaves are thick and fleshy, green or greyish-green in color. Aloe Vera is chosen as the most preferred plant species because it is capable of absorbing phosphates, nitrates, cholera, and dysentery-causing bacteria

4.1EXPERIMENTAL SETUP:

It consists of 2 bottles of 2 liters filled with coarse aggregate, fine aggregate, and sand soil. The Aloe Vera plant has been planted in it and connected in series with different pipe fittings. These containers are connected using PVC pipes having controlling valves and different pipe fittings. The containers are 60 cm in height and are connected to a hose having a diameter of 1 inch. The drum has an outlet and an inlet at a depth of 50 cm from the top. Through the roots of the Aloe Vera plant after a detention period of 5 days, the treated water has to be collected from the outlet. The treated water thus obtained from the outlet and raw river waters is to be tested for various parameters.

Fig 4.1

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5. RESULTS AND PERMISSIBLE LIMITS:

PARAMETERS	COIMBATORE SAMPLE	TIRUPPUR SAMPLE	AFTER PHYTOREMEDIATION OF TIRUPPUR SAMPLE	PERMISSIBLE LIMITS (as per BIS Standards)
pH	6.60	7.19	6.05	6.5
EC(dS/m)	0.06	0.64	0.5	-
Ca(mg/L.)	3.26	67.76	3.06	200
Mg(mg/L)	9.94	20.61	11.8	100
Na(mg/L)	4.37	31.05	22.36	200
K(mg/L)	1.95	5.65	3.9	10
CI (mg/L.)	28.30	56.69	26.8	60
SAR	3.06	4.68	2.99	<10
RSC (mg/L)	2.2	84.15	4.32	<1.25
Turbidity (NTU)	18.3	62.60	30.5	40
Phosphorus (mg/L)	0.13	0.22	0.02	0.3

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6. CONCLUSION

After conducting phytoremediation, water samples were collected from Tiruppur for physicochemical parameter testing, as the Coimbatore sample already exhibited minimal pollution. The results revealed significant differences in various parameters post-phytoremediation. Parameters such as pH, Electrical Conductivity (EC), Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Chloride (Cl), Sodium Adsorption Ratio (SAR), Residual Sodium Carbonate (RSC), Turbidity (NTU), and Phosphorus (P) showed notable improvements, reflecting the efficacy of the phytoremediation process in reducing pollutants and enhancing water quality. These findings underscore the potential of phytoremediation as a sustainable and environmentally friendly approach to remediate polluted water sources, particularly in regions with significant contamination like Tiruppur. Further, the experiment needs to be subjected to Bio coagulation for better results, and monitoring is recommended to evaluate the long-term effectiveness and sustainability of phytoremediation in improving water quality in polluted areas.

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