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DOMESTIC WASTEWATER TREATMENT THROUGH INDIGENOUS PLANTS

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Abstract- Wastewater treatment plants produce wastes that contain many potential contaminants. Reclaimed wastewater is usually clean enough to be used for irrigation, but usually contains higher (~1.5 times) concentrations of dissolved solids than the source water and play a vital role in reducing the microbial load of sewage before the end-products are discharged to surface waters (final effluent) or local environments (bio solids).Wetlands are effective nutrient sinks and absorbers of organic and inorganic pollutants. They require little or no energy to function .Constructed wetlands offer distinct advantages over alternative treatment systems, and this technique can be a cost effective. In this wastewater is treated by using indigenous plats like Hyacinth, SagattariaLatifollia, and Onion Weed and the maximum percentage reduction of various parameters can be observed at 45th days of observation.
Key Words: Wastewater, Hyacinth, SagattariaLatifollia, Onion Weed

I. INTRODUCTION

Domestic wastewater characteristically contains high level of organic matter and nutrients. the release of nutrient-rich wastewater effluents into receiving water bodies results in environmental and human health problems such as eutrophication in water bodies. treatment of domestic wastewater has mainly been done using conventional wastewater treatment systems such as activated sludge and biological nutrient removal technologies. These technologies are expensive and dependent on electrical energy and skilled personnel (kanokporn boonsong and monchai chansiri).

This study was planned to design a floating system for treatment of domestic wastewater. constructed floating system works like natural method in which only a single plant can remove the multi-pollutants from wastewater. many floating plants can be used in the system for removal of contaminants, but plant selection criteria depends on the climate conditions, nature of wastewater and nutrients to be removed (arfan arshad,sikandar ali). in this study plants used are hyacinth, sagattarialatifollia, duck weed.treatment of waste water before its disposal is very important because it adds nutrients, having metals and other contaminates to the fresh water bodies, as waste water includes enough amount of nutrients, therefore waste water after proper treatment can also be used for bio-fustigations of agricultural crops. the use of wastewater for agriculture productions is one of the alternate ways for irrigation

II. OBJECTIVES

This study was aimed to examine

1. The Quality of waste water.
2. To evaluate all environmental work that sustains a treatment system.
3. The Removal efficiency of plants over various parameters Nitrate, Iron, Fluoride, pH, Turbidity, TDS
4. The Removal efficiency of plants over various parameters Acidity, Alkalinity, Chloride, DO,BOD,COD concentration

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III. METHODOLOGY

The process carried out by following steps

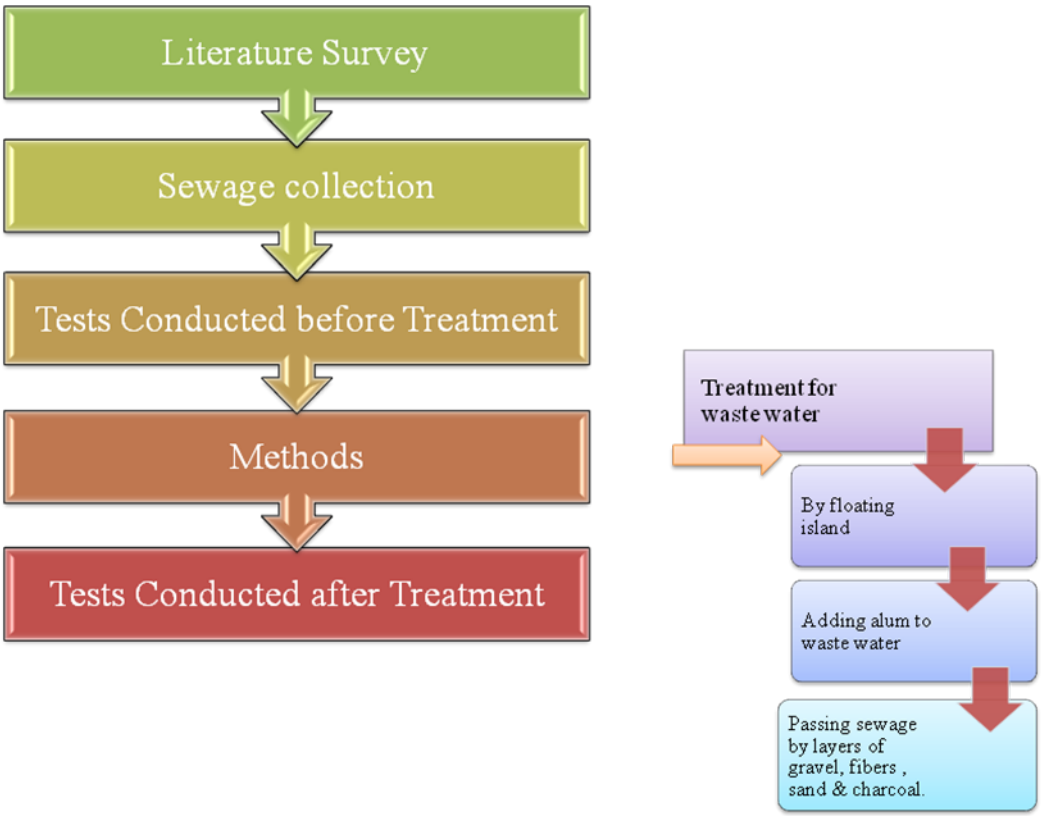

Figure 1. Floating Technique Model

Waste water collected from Gavenahalli Pond where the wastewater (sewerage) enters from household without any treatment. Treatment for this carried out by floating matter. Prototype is constructed by locally available materials and Adding alum to wastewater. Pass the wastewater through the layers of Charcoal, sand, coarse aggregate and coconut fibers. Thereafter treated water is used for agricultural land/ Irrigation purpose.

A. STEP 1: BY FLOATING TECHNIQUE

Floating treatment wetland is an effective & sustainable technology for waste water treatment. These are vegetated on a floating mat while their roots are extended down to the contaminated water acting as biological filters. Organic contaminants which are already taken up by plants are degraded by endophytic bacteria in plants thus BOD gets reduced. These are supported by artificial non decay able mats, for instance variety of construction materials such as polyester sheets, PVC pipes & bamboo containing meshes have been used to construct the floating structures. Mat should allow plant to pass roots sufficiently. Use of plants increases sedimentation, decreases turbulence, increases habit for development of micro organisms. Micro organisms decompose organic matter into simple nutrients & then they are absorbed by plants. Plants roots grow both in horizontal and vertical direction. Plants release various kinds of organic compounds that regulate biological process such as denitrification. This is particularly effective for nutrient rich sewage.

B. STEP 2: ADDING ALUM TO WASTE WATER AFTER TREATING BY FLOATING TECHNIQUE

Alum is known as aluminium sulphate. When added to raw water reacts with bicarbonate alkalinities present in water & forms a gelatinous precipitate. This floc or precipitate attracts other fine particles & suspended material in raw sewage & settles down @ bottom of the container. This allows for removal of unwanted colour & turbidity additionally the process removes the aluminium itself. By adding excess of alum it lowers the pH thus acidity increases. Amount of alum added to waste water is 9.4 mg/L.

C. STEP 3: AFTER TREATED USING ALUM IT IS PASSED THROUGH LAYERS OF COARSE AGGREGATES, COCONUT FIBRES, SAND AND CHARCOAL

Depth of gravel or coarse aggregates used in treatment is 30cm and well graded gravel is used in the treatment. Size of gravel used should be in between 3-40mm.Depth of Coconut fibers are used in treatment is 10cm.Depth of sand used in treatment used in treatment is 40cm & well graded sand is used in the treatment. Size of sand used is less than 2mm, uniform co-efficient is 0.22.Depth of charcoal used in the treatment is 20cm.It may be used in both powdered and in solid form. Grain size of sand & gravel is major factor for proper functioning of sewage treatment .only washed sand, gravel & fibers should be used. A dirty skin which is formed on the surface which further helps in filtering tiny particles. Sand & gravel traps and removes turbidity, small bugs, suspended dirt & flocculated particles formed by coagulation. Coconut fibers biologically treat pollutants & acts as barrier to retain solids, used as micro-organism adhesion & biofilm formation. Fibers are rich in hard organic matter with high specific surface area and wetting ability. Charcoal mainly removes chlorine, sediment, volatile organic compounds, taste & odour from water. Charcoal is good & effective adsorbent because it is highly porous material, provides large surface area & countless bonding sites to which chemicals or contaminates are attached to the surface or adsorbed and are trapped

Figure2. Prototype

Figure3. Roots penetrated

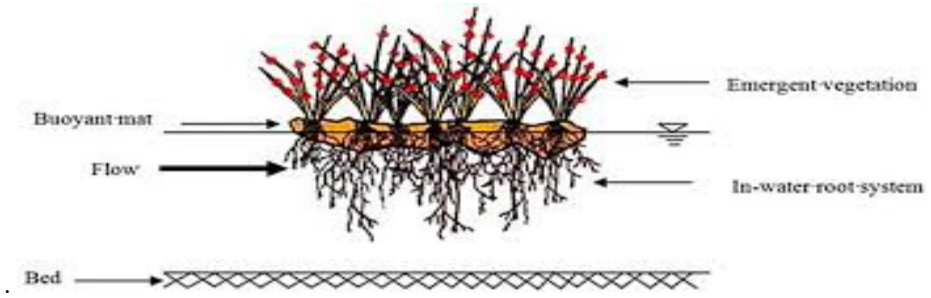

Figure3. Plant penetrating technique

III. Experiment and Result

The mean value of each water quality parameter considered for both influent and effluent wastewater Samples have been computed and tabulated here. pH value increases from 8.39mg/l to 8.5mg/l this is due to low influent pH or low alkalinity water with nitrification. One of the primary pollutants in municipal and food processing wastewaters is ammonia. The nitrification process is used to convert the ammonia in the wastewater to nitrate. Nitrification is a two-step biological process utilizing two species of nitrogen converting bacteria. These species of bacteria are most active in the pH range of 7 to 8. During the nitrification process, hydrogen ions are released and alkalinity is consumed as the acid is neutralized. Alkalinity increases from 79 mg/l asCaCo3 to 88 mg/l asCaCo3 after 45 days. Organic matter is the major pollutant in wastewater. Traditionally organic matter has been measured as BOD and COD. BOD is slow and cumbersome due to the need for dilution series. The COD analysis measures through chemical oxidation by dichromate the majority of the organic matter present in the sample. The COD removal efficiency achieved is 68%.Dissolved Oxygen content achieved is 4mg/l. Amount of Nitrate Iron and Fluoride removal efficiency achieved as 0.9 mg/l, 0.1mg/l, and 0.2mg/l respectively.

Particulars	Before Treatment	After 5 Days	After 10 Days	After 15 Days	After 20 Days	After 45 Days
Nitrate mg/l	12.3	3.22	1.63	1.26	0.99	0.90
Iron mg/l	0.55	0.39	0.11	0.11	0.10	0.10
Fluoride mg/l	0.76	0.42	0.41	0.24	0.20	0.20
PH mg/l	8.39	8.42	8.48	8.44	8.50	8.50
Turbidity NTU	12	5	4.8	4.2	4.0	3.99
TDS mg/l	2246	2072	2000	2112	1999.12	1982.5

Table -1 Experiment Result

Particulars	Before Treatment	After 5 Days	After 10 Days	After 15 Days	After20 Days	After 45 Days
Acidity mg/l asCaCo3	62	60	58	57	56	56
Alkalinity mg/l asCaCo3	79	80	85	86	87.5	88
Chloride mg/l	40	36.5	35	35	35	35

Hardnes s mg/l	390	390	390	390	390	390
DO mg/l	1	3	3.8	4	4.07	4.08
CO D mg/l	124. 8	81. 6	80	70.4	68.0 1	68.0
BO D mg/l	8	4.8	3.4	3.2	2.8	2.8

. Table -2 Experiment Result

IV.CONCLUSION

Treatment of waste water before its disposal is very important because it adds nutrients, having metals and other contaminates to the fresh water bodies, as waste water includes enough. Amount of nutrients, therefore waste water after proper treatment can also be used for bio-fustigations of agricultural crops. Floating system is cost effective and energy efficient. If we use treated wastewater for irrigation purpose then we can save a significant amount of fresh water supplies. The COD removal efficiency achieved is 68% and Dissolved oxygen content achieved is 4 mg/l. The use of waste water for agriculture productions is one of the alternate ways for irrigation. Floating technique seems to be an efficient technique for both wastewater treatment and natural water purification; however, further research is needed in order to better interpret system's behavior and optimize its efficiency

REFERENCES

[1] B. Corona, M. Nakano, H. Pérez, "Adaptive Watermarking Algorithm for Binary Image Watermarks", *Lecture Notes in Computer Science, Springer, pp. 207-215, 2004*.

[2] Borne, K. E. (2014). Floating treatment wetland influences on the fate and removal performance of phosphorus in stormwaterretention ponds. Ecological Engineering, 69, 76–82. https://doi.org/10.1016/j.ecoleng.2014.03.062.

[3] Cao, W., Wang, Y., Sun, L., Jiang, J., & Zhang, Y. (2016). Removal of nitrogenous compounds frompolluted river water by floating constructed wetlands using rice straw and ceramsite as substrates underlow temperature conditions. Ecological Engineering, 88, 77–81.

[4] Ge, Z., Feng, C., Wang, X., & Zhang, J. (2016). Seasonal applicability ofthree vegetation constructed floating treatmentwetlands for nutrientremoval and harvesting strategy in urban stormwaterretention ponds. International Biodeterioration and Biodegradation, 112, 80–87.

[5] Headley, T. R., & Tanner, C. C. (2008). Floating Treatment Wetlands: an Innovative Option for StormwaterQuality Applications. 11th International Conference on Wetland Systems for Water Pollution Control, 1101–1106.

[6] Headley, T., & Tanner, C. (2006). Application of floating wetlands for enhanced stormwatertreatment: A review. Report, (November), 96 p.

[7] Retrieved fromhttp://www.oracwa.org/files/news/592/NIWA-Research---Floating-Wetland-Review-Final.pdf Lynch, J., Fox, L. J., Owen, J. S., & Sample, D. J. (2015). Evaluation of commercialfloating treatment wetland technologies for nutrientremediation of stormwater. Ecological Engineering, 75, 61–69. https://doi.org/10.1016/j.ecoleng.2014.11.001

[8] McAndrew, B., & Ahn, C. (2017). Developing an ecosystemmodel of a floating wetland for water quality improvement on a stormwater pond. Journal of Environmental Management, 202, 198–207. https://doi.org/10.1016/j.jenvman.2017.07.035

[9] Pavlineri, N., Skoulikidis, N. T., & Tsihrintzis, V. A. (2017). Constructed Floating Wetlands: A review of research, design, operation and management aspects, and data meta-analysis. Chemical Engineering Journal, 308, 1120–1132. https://doi.org/10.1016/j.cej.2016.09.140

[10] Saeed, T., Paul, B., Afrin, R., Al-Muyeed, A., & Sun, G. (2016). Floating constructed wetland for the treatment of polluted river water: A pilot scale study on seasonal variation and shock load. Chemical Engineering Journal, 287, 62–73. https://doi.org/10.1016/j.cej.2015.10.118

[11] Wang, C. Y., & Sample, D. J. (2014). Assessment of the nutrient removal effectiveness of floating treatment wetlands applied to urban retention ponds. Journal of Environmental Management, 137, 23–35. https://doi.org/10.1016/j.jenvman.2014.02.008

[12] West, M., Fenner, N., Gough, R., & Freeman, C. (2017). Evaluation of algal bloom mitigation and nutrient removal in floating constructed wetlands with different macrophyte species. Ecological Engineering, 108(November 2016), 581–588. https://doi.org/10.1016/j.ecoleng.2017.07.033