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Comparative analysis of grey water using vermifilter & non-vermifilter

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Abstract : In this paper efforts are made to investigate the potential application of Vermifiltration for the treatment of grey water canteen & hostel of Nandha Engineering College,Erode.Water scarcity is one of the major problems faced by today's world. Vermifiltration is a treatment method that combines the conventional filtration processes with the vermicomposting techniques. Vermifiltration was used for the treatment of domestic wastewater using earthworm species. The main aim of the project was to study the efficiency of the vermifilter & non vermifilter in the removal of various parameters such as COD (Chemical Oxygen Demand), BOD (Biochemical Oxygen Demand), TDS (Total Dissolved Solids), TSS (total suspended solids), Turbidity and Ph from the grey water.

Keywords: Organic solids; Vermifiltration; Grey water; Earthworms

I INTRODUCTION

Nearly 80% of the water supply used by the society returns as domestic wastewater in the sewer system as sewage. Sewage carries hazardous chemicals and high loadings of organic matter referred as BOD & COD, this would seriously affect the survival of all aquatic organisms in the rivers and oceans. In India alone the International Water Management Institute (IWMI) predicts that by 2025, one person in three will live in conditions of absolute water scarcity Grey Water means wastewater generated from bathroom, laundry and kitchen. Need of Grey Water to Reuse for Fresh water requirement & Sewage generation.

Vermifilter:

- Involving the use of earthworm as versatile nature bioreactor for effective recycling of nontoxic organic solid and liquid waste
- Earthworm can effectively employed to maximize the growth of aerobic Bactria for waste processing.
- This can be achieved by providing proper living condition and feeding them organic waste.

Non-Vermifilter:

- Filter without earthworm

II OBJECTIVES

- To compare the vermifilter and non-vermifilter for parameters
- Study the efficiency for grey
  a) COD (Chemical Oxygen Demand),
  b) BOD (Biochemical Oxygen Demand),
  c) TDS(Total Dissolved Solids),
  d) TSS (total suspended solids),
  e) Turbidity and
  f) Ph from the grey water

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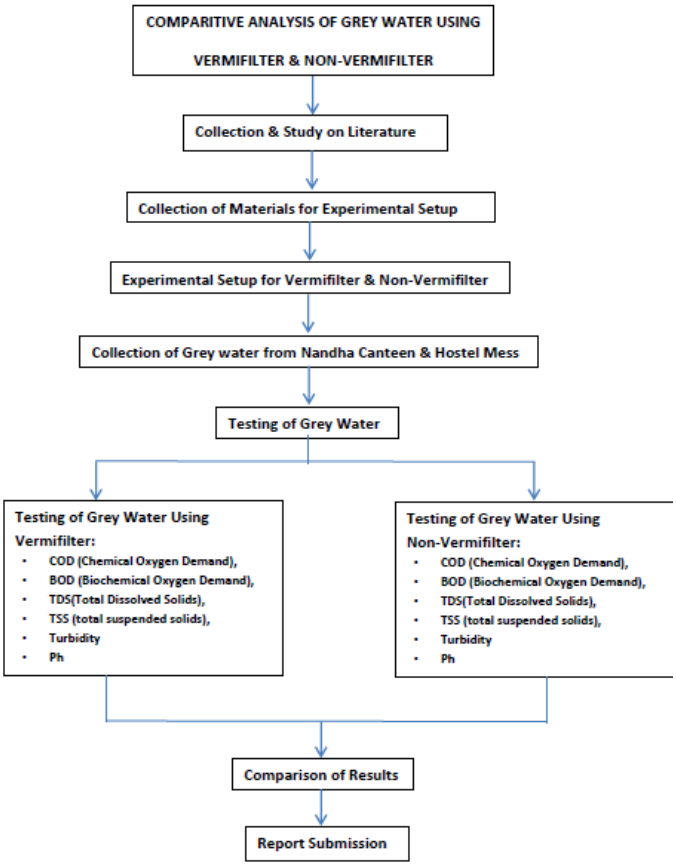
III METHODOLOGY



IV LITERATURE REVIEW

Ministry of Environment and Forest – 2009

In developing countries like India there is scarcity of water due to rapid growing population and pollution of 70% of freshwater river bodies

CPCB, 2009

Multiple sources have been identified to be responsible for this situation. Discharge of untreated sewage in surface and sub-surface water courses is the most important water polluting source in India. Out of about 38000 million liter per day of sewage generated treatment capacity exists for only about 12000 million liters per day

Sinha et al. 2008

Total of 38000 million of sewage generated treatment capacity is only about 12000 million liter per day. Sewage consist of high loading of organic matter refer as biochemical oxygen demand (BOD) and COD (chemical oxygen demand), total dissolved solids, total suspended solids

Victor G. Nganga et al, 2012

Grey water reuse offers various advantages which will help to save money by water authorities on clean water supplies as well as sewage flow and public water demand of potable water. This helps to reduce the load on wastewater disposal systems. According to United States Environmental Protection Agency, grey water can be used untreated or it can be treated to varying degrees to reduce nutrients and disease causing micro-organisms

Ghatnekar et al. 2012

Due to their negative impact on environment, many environment regulations and laws come to exists. Conventional treatment techniques of wastewater are expensive, since they have large requirements of land, high maintenance cost and create significant negative effect on environment. So there is a need of alternative technique which is low cost, high treatment efficiency and lowered operating cost.

Vermi-bio-filtration technology involves use of synergistic activity of the selected microorganisms, enzymes and earthworms for the degradation of toxins from the waste water converting it into “bio-clean” and “bio-safe” crystal clear water. This technology has proved to be the best environment friendly and cost-effective solution for wastewater treatment.

Pathania et al. 2013

Earthworms’ body works as a ‘bio filter’ and they have been found to remove the 5 days’ BOD (BOD5) by over 90%, COD by 80–90%, total dissolved solids (TDS) by 90–92%, and the total suspended solids (TSS) by 90–95% from wastewater by the general mechanism of ‘ingestion’ and biodegradation of organic wastes, heavy metals, and solids from wastewater and also by their ‘absorption’ through body wall

Lakshmi et al. 2014

Earthworm body works as bio-filter which widens the microbial metabolism by increasing their population. Effluent resulted will be extremely rich in nutrition and can be reused as earthworms are versatile waste eaters and decomposers. It also grinds, aerate, crush, degrade the chemicals and act as biological stimulator. Microbial and Vermi processes will simultaneously work by treating the wastewater using earthworms

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V EXPERIMENTAL SETUP

Layers	Vermifilter	Non-Vermifilter
Top layer (1)	Free Board	Free Board
Upper layer (2)	Black Cotton Soil + Cow Dunk + Earthworm (Soil & Cow dunk – 1:3)	-
Upper layer (3)	Sand	Sand
Middle layer (4)	Aggregate (10 mm)	Aggregate (10 mm)
Bottom layer (5)	Aggregate (20 mm)	Aggregate (20 mm)

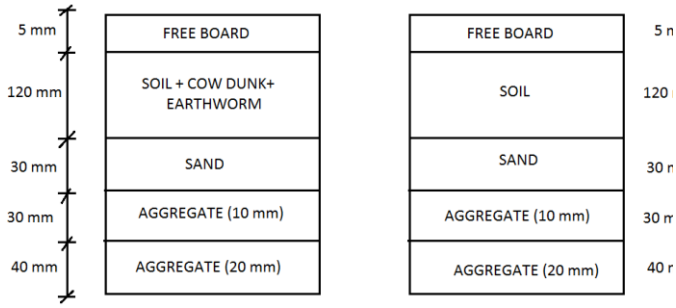

Fig 5.1 Experimental Setup of Vermifilter and Non Vermifilter

VI TEST RESULTS

The analysis of College Canteen & Hostel wastewater was carried out in the Environmental Engineering Laboratory of the Civil Engineering Department, Nandha Engineering College, Erode. Important Wastewater parameters analyzed such as pH, BOD, COD, TDS, TSS & Turbidity of the vermifilter and non vermifilter.

i. PH Test: Initially pH of grey water was little acidic but after passing through vermifilter it reached to neutral.

PH Value		
Sample	**Non-Vermifilter**	**Vermifilter**
Canteen	6.35	7.1
Hostel	6.20	7

ii. Total Suspended Solids in mg/Lit
The TSS of grey water sample showed a reduction of approx.93-95% by vermifilter

TSS Value		
Sample	**Non-Vermifilter**	**Vermifilter**
Canteen	5850	410
Hostel	6100	336

iii. Total Dissolved Solids in mg/Lit
The TDS of grey water sample showed a reduction of approx.82-85% by vermifilter

TDS Value		
Sample	**Non-Vermifilter**	**Vermifilter**
Canteen	4900	882
Hostel	4985	798

iv. Chemical Oxygen Demand in mg/Lit
The COD of grey water sample showed a reduction of approx.90-95% by vermifilter

COD Value		
Sample	**Non-Vermifilter**	**Vermifilter**
Canteen	9960	996
Hostel	10150	508

v. Biochemical Oxygen Demand in mg/Lit
The BOD of grey water sample showed a reduction of approx.94-96% by vermifilter

BOD Value		
Sample	**Non-Vermifilter**	**Vermifilter**
Canteen	15600	858
Hostel	16050	723

vi. Turbidity
The Turbidity of grey water sample showed a reduction of approx.98% by vermifilter

BOD Value		
Sample	**Non-Vermifilter**	**Vermifilter**
Canteen	1090	22
Hostel	1200	24

VII CONCLUSION

From the experimental data it was found that vermifilter is more efficient than non-vermifilter in efficiency of removal of COD (Chemical Oxygen Demand), BOD (Biochemical Oxygen Demand), TDS (Total

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Dissolved Solids), TSS (total suspended solids), Turbidity and Ph.

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