International Journal of Engineering Research and Technology. ISSN 0974-3154 Volume 10, Number 1 (2017)

Community Wastewater Treatment By Using Vermifiltration Technique

Author 1
Nandini Misal
Assistant Professor,Department of Civil Engineering,D.Y .Patil College of Engineering and Technology, KasabaBawada,Kolhapur

Author 2
Mr.NitishA.Mohite
Assistant Professor,Department of Civil Engineering,D.Y .Patil College of Engineering and Technology, KasabaBawada,Kolhapur

Abstract
Now-a-days many developing countries cannot afford the wastewater treatment processes as they are costly,need more space to construct the treatment plant and in addition use of chemicals for the treatment.They need some more options at low cost,space saving and ecofriendly techniques.Vermifiltration is one of the simple,low cost,ecofriendly,chemical free technique used to treat the canteen wastewater using the Eisenia fetida earthworm species.The earthworms are potentially capable of digesting the waste organic material and reduce it through ingestion.It is considered to be an innovative ecofriendly technology that provides a sustainable solution for the treatment of wastewater with no sludge generation and treatment.

Key Words: Earthworms,Eisenia fetida,Biochemical Oxygen Demand(BOD),Chemical Oxygen Demand(COD),Total Solids(TS),Total Suspended Solids(TSS),Total Dissolved Solids(TDS),Waste Water(WW).

Introduction

Wastewater is any water that has been adversely affected in the physical,chemical and biological characteristics.It may get generated from a combination of domestic,industrial,commercial or agricultural activities,surface runoff or storm water and from sewer inflow or infiltration.Large quantity of the water about 85-90% used by the society flows as a wastewater in the sewerage system as sewage.Their are various treatment processes used to treat the wastewater but are expensive,time consuming,space consuming and include usuage of chemicals.To overcome this,a new low cost,ecofriendly technique has been introduced in the developing countries.

Vermifiltration technique is a new approach towards wastewater treatment to save cost,energy and eliminate chemical usuage.Unlike conventional water treatment amenity,vermifilter uses no chemicals,the system is all natural.We have tried to develop a sustainable and environmental friendly technology for the treatment of College Canteen wastewater at low cost.

The vermifilter is made up of simple filtering system made up of plastic container.The bottom layer is made up of gravels with space for aeration and water percolation,covered with a layer of aggregate then sand and sand boulders,covered with cowdung,clay and loaded with vermis-Eisenia fetida earthworms.

The wastewater is allowed to pass through the filter,the earthworms consume and metabolise oils,fats and other compounds.The water percolating through is collected in another container.Earlier report of Sinha et.al(2008) have proved that the body of earthworms works as a “biofilter”and the body walls absorbs the solids from wastewater.It has been observed that the earthworms are potentially capable of digesting the waste organic material and remove the 5days BOD_5 near about 90%,COD by 85-90%, TS by 90-95%,TDS by 95%,TSS by 95-98%.

The results have proved that earthworms appear promising to provide cheaper solutions to environmental problems as their boby works as biofilter and hence can reduce BOD,COD,TS,TDS,TSS,Oil and grease of wastewater significantly.

Materials And Methodology

The Wastewater sample was collected from our College canteen.Eisenia fetida earthworm species were used in the study.The study was carried out in a vermifiltration kit made up of plastic having 20lit capacity.The kit contains a layer of aggregates of 20mm size of 7cms with layer of 10-16mm size of 7cms and 5mm size of 7cms aggregates above which 5cms layer of sand and sand boulders with layer of cowdung,clay of 10cms with vermis on the top.The WW was allowed to pass through beds of Vermifilter at a maintained velocity.

Fig 1- Earthworms used in vermifilter

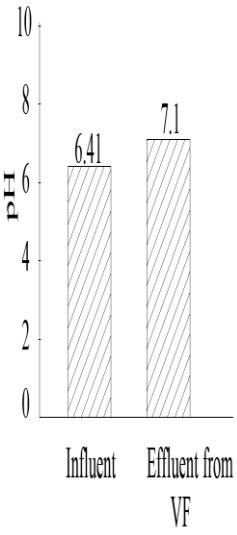
Fig 2-Schematic diagram of vermifiltration kit

Analytical Methods Used In The Laboratory

The analysis of College Canteen wastewater was carried out in the Environmental Engineering Laboratory of the Civil Engineering Department, DYPCET, Kasaba Bawada, Kolhapur.Important Wastewater parameters analyzed such as $_{p}$H,BOD,COD,TS,TDS,TSS,oil and grease of the influent and the effluent.

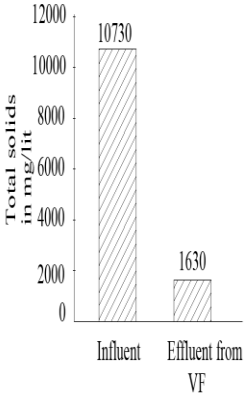
Experimental Results

(i) p^H



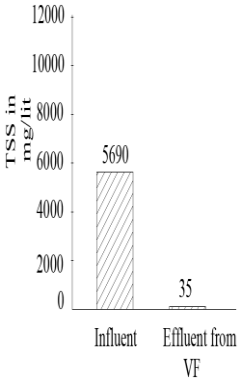
Initially p^H of WW was little acidic about 6.41,but after passing through VF it reached to neutral 7.1.

(ii) Total Solids in mg/Lit



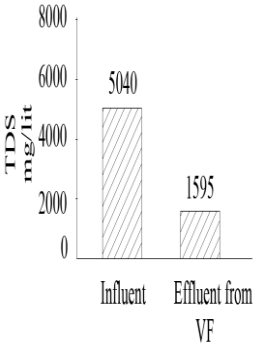
The reduction of TS of WW by VF ranges approx. between 85-90%.

(iii)Total Suspended Solids in mg/Lit



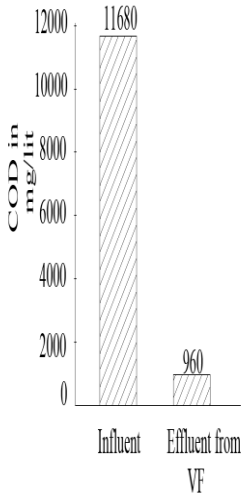
The TSS of WW sample showed a reduction of approx.90-95% by VF.

(iv) Total Dissolved Solids in mg/Lit



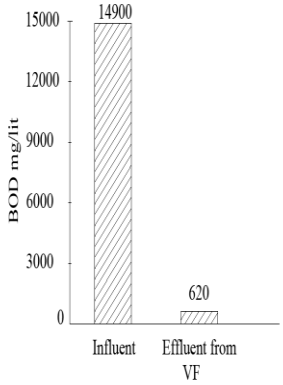
The TDS of WW sample showed a reduction of approx.80-85% by VF.

(v) Chemical Oxygen Demand in mg/Lit



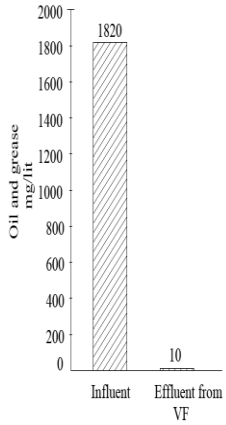
The COD of WW sample showed reduction of approx.90-95% by VF.

(vi) Biochemical Oxygen Demand in mg/Lit



The BOD of WW sample showed reduction of approx. 93-95% by VF

(vii) Oil and Grease in mg/Lit



Oil and Grease of WW sample showed reduction of 99% by VF.

Conclusion

Vermifiltration is an ecofriendly,low cost,space saving,chemical free technique to treat the Community Wastewater.The working of Vermifilter by using Eisenia fetida earthworms for College canteen wastewater was studied for important parameters such as pH,BOD,COD,TS,TSS,TDS,Oil and Grease.The Vermifilter showed a significant reduction in the parameters.The overall results indicate that the Earthworms significantly degrade the waste material without generation of the sludge.The results obtained are remarkably satisfactory.Hence, it can be concluded that the Vermifiltration is affordable,safe,conventional,ecofriendly,space saving with no sludge generation technique can be implemented by a common society.

References

[1] Pali Sahu,Swapnali Raut,Sagar Mane(2015)"Treatment of Grey and Small Scale Industry Wastewater with the help of Vermifilter",Civil Engineering and Urban Planning:An International Journal (CiVEJ)Vol.2,No1,29-35.

[2] Anusha V,KM Sham Sundar(2015)"Applications of Vermifiltration in Domestic Wastewater Treatment",International Journal of Innovative Research in Science,Engineering and Technology Vol.4 Issue 8,7301-7304.

[3] Musaida Mercy Manyuchi,Anthony Phiri(2013)"Application of the Vermifiltration Technology in Sewage Wastewater Treatment,"Asian Journal of Engineering and Technology(ISSN:2321-2462)Vol1-Issue 04,110-113.

[4] Tomar and Suthar,S.2011:Urban Wastewater Treatment using Vermi biofiltration System.Desalination Vol28 no.2, 95-103.

[5] Rohit Pathania et.al 2012:A Review of Vermifiltration and related low cost alternatives for wastewater management.

[6] Ghatnekar et.al.2010:Zero discharge of wastewater from Juice making industry by Vermifiltration technology.

[7] Sinha RK,Bharambe G.Chaudhari U(2008)"Sewage Treatment by Vermifiltration with Synchorous Treatment of Sludge by Earthworms: A low cost Sustainable Technology over Conventional systems with Potential for Decentralization" ,Springer Science 28:409-420.