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EXPERIMENTAL STUDY ON IMPACT OF LEACHATE

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Abstract - *Leachate emitted by landfill municipal solid waste (MSW) may cause many and cumulative adverse effects ranging from health problem to environmental impacts. Leachate can be defined as a liquid that passes through a landfill and has extracted dissolved and suspended matter from it. This paper presents the results of the analyses of leachate treatment located at Kodungaiyur by using natural coagulant. The main goal of the study is to reduce the effect of leachate water by using natural coagulant- Pine bark. the amount of pH, Conductivity, Bio-chemical oxygen demand(BOD), Chemical oxygen demand(COD), Total Solids(TS), Chlorides, Sulphate, Phosphate, Iron, Nickel, Copper shows 6.65, 40 µs, 295.5 mg/l, 5280 mg/l, 34300 mg/l, 454.76 mg/l, 41.15 mg/l, 1.673 mg/l, 3.76 mg/l, 0.6814 mg/l, 0.2985 mg/l respectively and after treatment depends on dosage optimization, COD is reduced to 520 mg/l in dosage optimization and its value is further reduced to 400 mg/l in time dependent. There is a reduction of 90% in the COD value can be determined.*

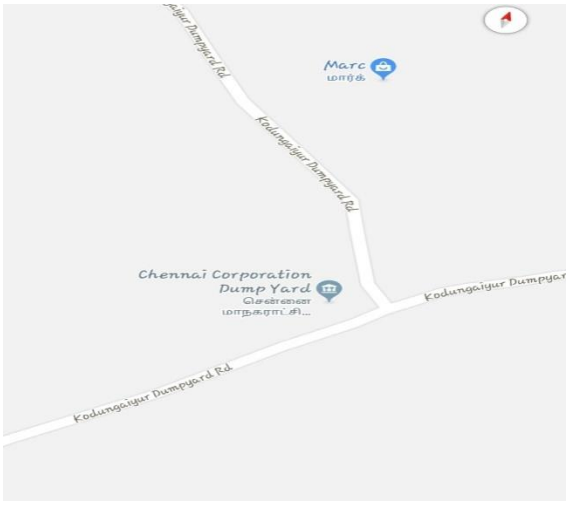
***Key Words*: Leachate, Pine bark, MSW, BOD, COD, TS.**

1. INTRODUCTION

Leachate is a liquid that when it is passed through matter, extracts soluble or suspended solids, or any other component of the material through which it has passed. Leachate is contaminated liquid leaches out from the bottom of the landfill, which constitutes innumerable organic and inorganic compounds. The leachate from Municipal Solid waste landfills is concentrated "chemical soup", so concentrated that small amounts of leachate can pollute large amount of groundwater, leaving it not suitable for domestic water use. Fecal contamination has been detected in leachate samples. Other contaminates, including heavy metals and inorganic compounds such as calcium, magnesium, iron, sulphate and bicarbonate are not so easy to deal with, and in fact they can react with the chlorine used in the disinfection process. Leachate generation is a major problem in municipal solid waste (MSW) landfills and causes significant threat to surface water and groundwater. More than 90% of the municipal solid waste generated in India is directly dumped on land in an unsatisfactory manner. The aim of this paper is to detect how polluted water at Kodungaiyur by various physio-chemical test and finally to treat the water using natural coagulant (Pine bark).

2. STUDY AREA

The site chosen was Kodungaiyur dumpyard site in Chennai city. Kodungaiyur is a residential part in the north most part of city of Chennai, Tamil Nadu, India. It comes under Perambur Taluk of the Chennai District. It covers a vast area bordering. Manali to the north, Korukkupet to the east, Madhavaram Milk Colony and Madhavaram to the west, Perambur to the southwest and MKB Nagar (Vysarpadi)to the south lies in the National Highway 5 touches this area in southwest at Moolakadai. Latitude and longitude of Kodungaiyur will be 13.1362° N and 80.2684° E. Elevation of 7 metre above mean sea level.



Fig–1: Site map

3. TEST RESULTS

The colour of water may normally detected by naked eye and it indicates the freshness of the leachate. Turbidity is the cloudiness of the water caused by a large amount of suspended solids. The turbidity depends upon fitness and concentration of particles present in water. Organic matter is most often assessed in terms of oxygen required to oxidize the organic matter to CO_2, H_20 and other oxidize species. The oxygen require to oxidize the organic matter present in given leachate can be theoretically composed, if the organic presents in given leachate are known. Thus, if the chemical formulae and the concentration of the chemical compounds present in water are known to us. We can easily calculate the theoretical oxygen demand of each if these compounds by writing the balanced reaction for the compound with the

oxygen to produce CO_2, H_20 and oxidized inorganic components. There is no known evidence that chlorides constitutes any human health hazard. For this reason chlorides are generally limited to 250 mg/1 in supplies intended for public use. In many areas of the world where water supplies are scarce, sources containing as much as 2000 ppm are used for domestic purpose without the development of adverse effect, once the human system gets adopted to the water.

Table-1: Test results

EXPERIMENTS	RESULTS OBTAINED
PHYSICAL PARAMETERS	
Colour	Yellowish
Temperature	33.8 °C
Odour	Landfill gas odour
Turbidity	Highly turbid
CHEMICAL PARAMETERS	
pH	6.65
Conductivity	40 µs
BOD	295.5 mg/l
COD	5280 mg/l
TDS	34300 mg/l
Chloride	454.76 mg/l
Sulphate	41.15 mg/l
Phosphate	1.673 mg/l
HEAVY METALS	
Iron	3.76 mg/l
Nickel	0.6814 mg/l
Copper	0.2985 mg/l
TREATMENT	
Dosage optimization	0.5 g
Time dependent	1 hour

The phosphate graph is represented

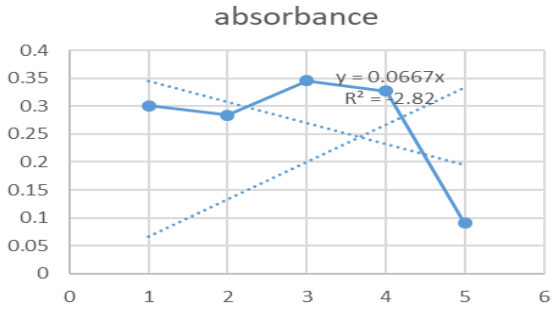


Fig-2: Phosphate

The nickel and copper graphs

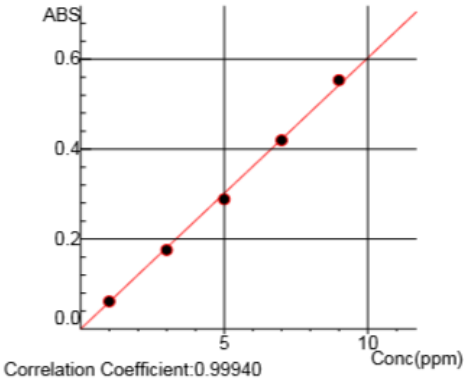


Fig-3: Nickel

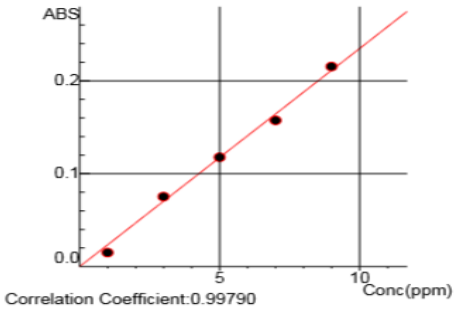


Fig-4: Copper

4. TREATMENT

Pine Bark is widely used as adsorbent material for organic pollutants, and since 1980 investigated as a possible adsorbent for heavy metals. Studies covered all the heavy metals of concern and bark from different sorts of trees. Most papers describe experiments with one metal solutions and changes in pH conditions. Pine bark is one of the most suitable materials and showed good adsorption properties for lead, copper, nickel. Comparison of sorption properties of several coniferous barks has been done. Eucaliptus and Yohimbe bark were also showed to be efficient in adsorption of metal ion. Several studies were carried out chemically pre-treated pine bark, a few studies showed decreasing sorption capacity of pre-treated bark. Adsorption capacity of bark is attributed to its high tannins content. Tannins are group of water-soluble phenolic compounds having molecular weight between 500 and 300 giving usual phenolic reactions, and having special properties such as ability to precipitate alkaloids. Molecular weights as high as 20000 are reported. Approximately empirical formula of tannic acid, or gallotannic acid which is most often referred as “tannin” is $C_{76}H_{52}O_{46}$. The polyhydroxy polyphenol groups are thought to be the active species in the metal sorption process. Ion exchange takes place as metal cations displace phenolic hydroxyl groups, forming chelate. Bark produced for

adsorption of oil spills. This bark consists 90% of pine bark and 10% of wood fibre. It was additionally ground before use in column experiments. Packed in column, bark showed good kinetic characteristics. Low cost absorbents have been widely studied in past years in the search for filter materials that retain contaminants. One promising, economic material is pine bark. Many studies have shown that pine bark has great potential for the treatment of metals and organic substances. However, some potential problems are faced through the use of natural materials and by-products. One such problem that must be addressed is the possibility of leaching of contaminants from the filter material, especially in the initial filtration step or during flushes of lightly contaminated water, e.g. during rainfall for on-site treatment of storm water or landfill leachate. We collected the pine bark from Kanyakumari.

Fig-5: Pine Bark

5. SHAKING INCUBATOR

Shaking incubators integrate both a shaker and an incubator into one space-saving unit. Oxygen and proper nutrients combined along with optimal environment conditions are key factors during cell growth. Our shaking incubators have a platform that oscillates horizontally within the enclosure, which creates a form of agitation or shaking. This occur while samples are incubated at a stable, consistent temperature. Shaking incubators can be used to grow all types of cells including bacterial cultures, microorganisms. A shaker is a piece of laboratory equipment used to mix, blend, or agitate substances in a tube or flask by shaking them. It is mainly used in the fields of science. A shaker contains an oscillating board that is used to place the flasks, beakers, or test tubes. Although the magnetic stirrer has lately come to replace the shaker, it is still the preferred choice of equipment when dealing with large volume substances or when simultaneous agitation is required. Platform shaker is the type of shaker which we adopted, platform shaker has a table board that oscillates horizontally. The liquids to be stirred are held in beakers, that are placed over the table or, sometimes, in test tubes that are nested into holes in the plate. Platform shakers can also be combined with other systems like rotating mixers for small systems and have been designed to be manufactured in laboratories themselves with open source scientific equipment. Laboratory Platform Shakers are used to mix, agitate or process samples within flasks, tubes or blots. This piece of equipment can be found in all major laboratories. The platform of laboratory shaker can vary greatly in size, shape and texture depending on its shaking. Whether a number of large flasks, a few micro tubes in a basket, staining gels or processing blots most vendors are able to customize a laboratory platform shaker for your needs. Some features to be considered when purchasing a platform shaker are platform size, capacity, display options, and type of shaking generated. There are different types of shaking or agitating, including orbital and 3D. One may be better suited to your needs, so be sure to inquire.

Fig-6: Shaking incubator

6. CONCLUSION

The results of the conducted experiments are listed before. Among all the experiments, the value of COD is the highest. Dissolved solids value is also higher because always any form of solids will be higher in liquids. So the treatment is not done particularly for solids but COD is an organic substance so certain treatments are necessary to remove it away. Treatment is done by using a natural coagulant pine bark depending on dosage optimization and time dependent and the results obtained are for a **time period** of **1 hour** with **0.5 g** of **dosage of pine bark**, the value of **COD** had been greatly **reduced to 90%**. So the natural coagulant which we used for our project is an effective and a very economical one. The conclusions were drawn from the present studies of using a natural coagulant, is very effective. From the study, it clearly shows that the natural coagulant (pine bark) are effective in the removal of COD. Therefore, the need for economical, effective and safe method for disposal of pollutant in leachate has resulted in dosage optimization and time dependent.

REFERENCES

[1] A.Idris, B.Inane, M.N.Hassan, (2004) "Overview of waste disposal and landfills/dumps in Asian countries", Material Cycles and Waste Management. Volume 6, Issue 2, pp 104–110.

[2] Awasthi A.K., AmitPandey, Pandey A.K. and Jamaluddin, (2013) "Comparative study on heavy metal characteristics of leachate from municipal solid waste in central India", IJSIT. 2(5), pp. 390-396.

[3] Lovleengupta and Swati rani, (2014) "Leachate characterization and evaluating its impact on ground water quality in vicinity of landfill site area". e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 8, Issue 10 Ver. III, PP 01-07.

[4] Magda M. Abd El-Salam and Gaber I. Abu-Zuid, (2014) "Impact of landfill leachate on the groundwater quality". Volume 6, Issue 4.

[5] Nithya M and Abirami M, (2018) "The Leachate treatment by using natural coagulants (PINE BARK)". Volume: 05 Issue: 04, p-ISSN: 2395-0072, e-ISSN: 2395-0056.

[6] Reyes-Lopez JA, Ramirez-Hernandez J, Lazaro-Manicalla O, Carreon-Diazconti C and Garrido MML, (2008) "Assessment of groundwater contamination by landfill leachate". Waste manage 2008; 28:S33-9.