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Bushra A Giadh and basim Y Al-khafaji



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RESEARCH ARTICLE

THE POSSIBILITY OF WASTEWATER TREATMENT BY SOME SELECTIVE FILTRATIONS

Bushra A Giadh* and Basim Y Al-khafaji

College since – Thi-Qar University

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ABSTRACT

The present study deal with wastewater treatment by four selective filtrations (Sand Filter, Sawdust Filter, Coal Filter, *Ceratophyllum demersum* l. Filter) to reduce some physical ,chemical and bacteriological properties of wastewater such as (TS, COD, BOD, pH ,EC,TN, TP, Cd, Cu, Ni, Pb, Zn Fecal coli bacteria) . Samples collected from wastewater treatment station near Al-Nassyria city center - south Iraq .The result showed that selective filtrations specialized Sand Filter reduced these properties above and decrease of pollutant in this study.

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INTRODUCTION

favorite techniques for the production of Re-safe sanitation water from wastewater in developing countries are using techniques require minimal power and skills of operation and maintenance and the production of water treatment good quality and the level of protection against pathogens and bacteria, as it is a low-cost technologies, have been used in this study Filters for sewage treatment of locally available materials and water yielding good environmental and economic feasibility of these filters are.

Sawdust Filter

Filtration process is the separation of solid particles from liquid process through a porous separator or barrier, as it prevents the passage of solid particles and allows the passage of the filtrate, has evolved barrier to the unity of very porous borders (0.02) μ which prevents the passage of even bacteria, process sand filtration although presented but it is the best way and the least expensive in the world of water filtration, has pointed out Metcalf (2003) to the mechanism basic works sandy filter statement removal of materials process, namely, (mechanical filtration process ,the process of concentration remaining material on the minutes candidate and overlapping with it and the process of chemical adsorption which in turn depends on the chemical reaction between the minutes flowing and the characteristics of the surface of the filter and the size and depth

of the filter and the process of biological growth (microbial growth) may lead to a lack of pore size and influence in the removal of minutes. Efficiency sandy filter in the removal of 86% of the total nitrogen, as well as 96% of the COD and 100% of TSS (Healy *et al.*, 2006) and referring results of the study carried out by the Al-amiri (2006) about the possibility of using sewage water treatment plant Sanitation in the Hamdan industrial area in the province of Basra for irrigation after passing on the sandy candidate transaction elementary to the ability of sandy candidate to remove 100% of the organic material easily degradable (BOD) and Article difficult organic decomposition (COD), consider Akporhonor and Asia (2007) to efficiency sandy filter to remove all of the BOD reached between (40-50%) and COD between (30-35%) and TSS between (90-98)%.

Sawdust Filter

The benefit of using agricultural crops and organic matter plant products such as sawdust in sewage treatment confirmed by many researchers have said (That sawdust is the active material to remove contaminants and effective and economic adsorbent material in the removal of heavy metals, dyes, salts, oils and other (Eljamal *et al.*, 2006).

Coal Filter

The coal of the materials used good filter to remove

*Corresponding author: **Bushra A Giadh**

College since – Thi-Qar University

contaminants from the water, particularly sewage and industrial discharges and groundwater for its ability high adsorption widespread availability and low cost, it is a low-cost option in the nomination Simonovic *et al.*, (2009) and the researcher that the material hard coal power, to remove oils from the wastewater that mechanical work begins after the adsorption of oil molecules on the surface of the filter composed unilateral layer on the surface, this first step of the process followed by the oil unilaterally biplane suffered two surface oil molecules and the surface of the hard coal

Ceratophyllum demersum l. Filter

demersum l. is one of the herbs water that are dark green, ranging in length between (20 to 100 cm) with complex leaves once or twice a length of 1 to 2.5 cm thick leaves stack up at the end of branches to earn a scene more like the tip of guilt, which is a perennial plant with a modern and side branches This plant configuration frequently in most of the southern region of Iraq, in particular the marshes, Although there are many methods used in the removal of heavy metals from water, such as ion exchange and reverse osmosis filtration and sedimentation, but some of these methods need to maintain and costly treatment with the use of large volumes of water, and that some people resort to the use of aquatic plants to remove heavy elements in Water and sediment both (Cardwell *et al.*, 2002).

It has shown Statistics issued by the sewage / Directorate sewage treatment plant Dhi Qar 2014 about (8000-10000) cubic meters per hour, and for the purpose the most of this water utilization for agricultural purposes rather than leaked to the neighboring station of land left and then to the Euphrates River, has become This water treatment is an urgent need because of winning in the waters of the rivers shortage and the deterioration of their quality.

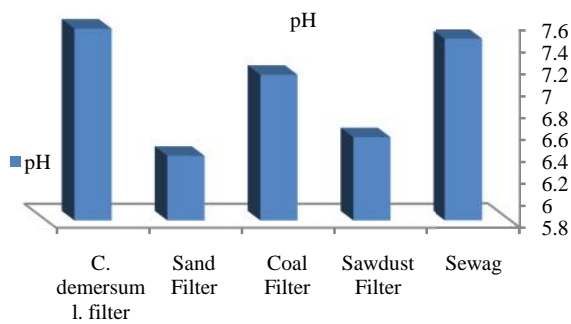


Figure1 variations mean pH for all filters of the study

The present study aims to

1 –Notice the efficiency filters (*Ceratophyllum demersum l.* Filter, the sawdust Filter, Coal Filter filter, sand filter) in the reclamation of wastewater characteristics and improve its quality.

2. Reduce the pollution the launch of wastewater directly into the Euphrates River.

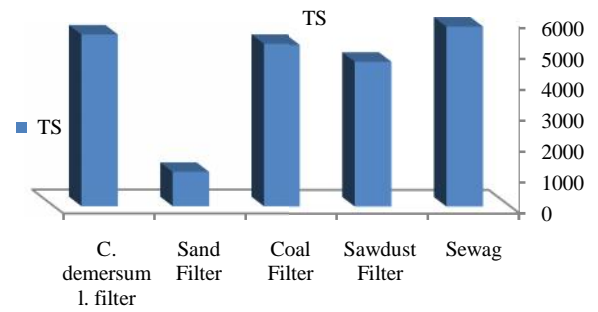


Figure 2 variations mean total suspended solids (TS) mg/l for all filters of the study

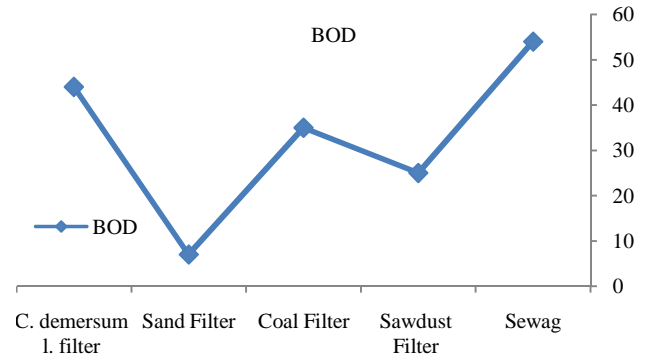


Figure 3 values of biological oxygen demand (mg/l) variations for all filters of the study

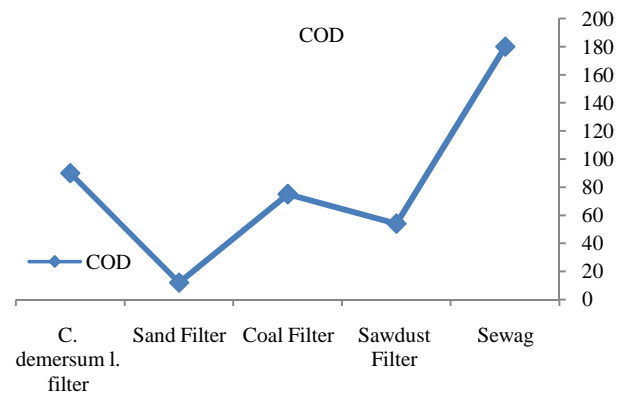


Figure 4 values of chemical oxygen demand (mg/l) variations for all filters of the study

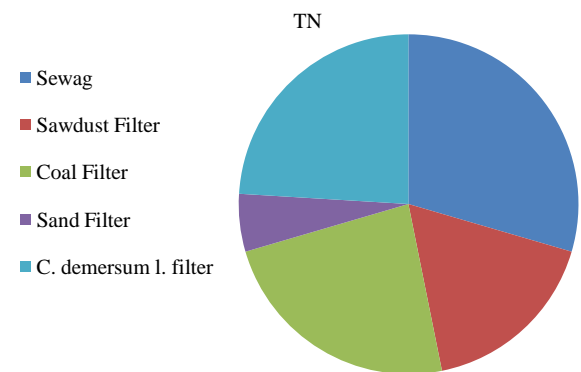


Figure 5 values of total nitrat (TN) µg/L variations for all filters of the study

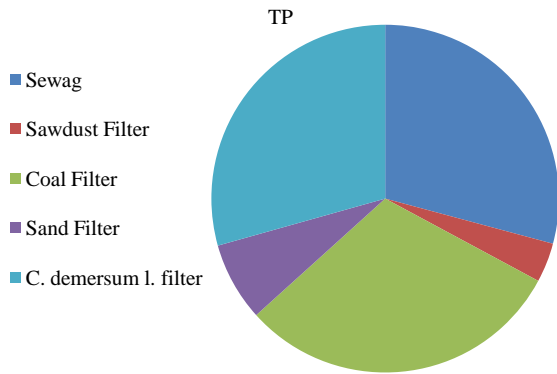


Figure 6 values of total phosphorus (TP) µg/L variations for all filters of the study

Table 1 properties of wastewater after passed through selective filters

| Properties Filters | COD mg/l | BOD mg/l | TP µg/L | TN µg/L | TS mg/l | EC µs/cm | pH |
|-----------------------|----------|----------|---------|---------|---------|----------|------|
| Sewage | 180 | 54 | 1.59 | 3.75 | 5790 | 8.56 | 7.44 |
| Sawdust Filter | 54 | 25 | 0.2 | 2.20 | 4660 | 7.24 | 6.56 |
| Coal Filter | 75 | 35 | 1.66 | 3.00 | 5200 | 9.09 | 7.13 |
| Sand Filter | 12 | 7 | 0.4 | 0.7 | 1100 | 3.35 | 6.39 |
| C. demersum l. filter | 90 | 44 | 1.60 | 3.05 | 5500 | 8.06 | 7.55 |

Table 2 Number of fecal coliform (Fc) bacteria in wastewater after passed through selective filters (cell/100ml)

| Samples | FC |
|-----------------------|-----|
| sewage | 898 |
| C. demersum l. filter | 125 |
| Sawdust Filter | 35 |
| Sand Filter | 15 |
| Coal Filter | 76 |

Table 3 Concentrations of heavy metals in wastewater after passed through selective filters (µg /L)

| Heavy metals filters | Zn | Pb | Ni | Cu | Cd |
|-----------------------|-----|-----|------|------|------|
| Sewage | 5.5 | 4.6 | 1.13 | 0.7 | 0.23 |
| Sawdust Filter | 2.9 | 2.4 | 0.9 | 0.6 | 0.1 |
| C. demersum l. filter | 3.8 | 2.4 | 0.8 | 0.6 | 0.11 |
| Coal Filter | 4.4 | 3.5 | 1.0 | 0.5 | 0.16 |
| Sand Filter | 1.7 | 1.9 | 0.5 | 0.09 | 0.05 |

MATERIALS AND METHODS

Samples collected from wastewater treatment station near Al-Nassyria city center - south Iraq on 1-12-2014 from the inner pelvis before treatment by three replicates and put samples in containers of plastic the size of the 3-liter clean and stored in the refrigerator temperature 4 ° until the required actions following the work described in Methods (Standard Method procedure, 2005)

potential hydrogen (pH)

The pH of the wastewater directly by PH-meter device type (NIG303)

Electrical Connectivity (EC)

It was measured electrical wiring of the sewage using EC-meter device type (NIG303).

Biochemical Oxygen Demand (BOD5)

calculate (BOD5) by measuring the dissolved oxygen directly in the field in the water sample by a DO-meter type (Oxi 200) and incubated the samples at a temperature of 20 C for five days, dissolved oxygen, and according to the vital requirement of the difference between concentration dissolved oxygen before and after incubating

Chemical Oxygen Demand (COD)

It was extracted according to the value of the chemical requirement Dichromate Reflux method which relies on the existence of a standard sample heating compound mixture (K2Cr2O7) a normative (0,2 N) and sulfuric acid with the intensification of Dichromate with standard solution of ferrous sulfate the presence of Freon guide.

Total nitrogen (TN)

Water samples were measured using a mixture of (H2SO4 + K2SO4) and then treated material digestion solution (NaOH + Na2S2O3) and then as in the distillation

Total phosphorus (TP)

Water samples were measured using a mixture of nitric acid and sulfuric centers and phosphorus as a way to color-ascorbic acid and using the color spectrum device type Spectrophotometer (Pu 8670) and the wavelength of 880 nm.

Total solids (TS)

Solids sewage calculated and so drained of known size of the sample in a glass jar known weight and a temperature of 50 ° and then measured by the equation:

TS = Total solids weight of the container after drying - the weight of a container is empty

Pathogenic bacteria (fecal coliform)

Begins (MF) Membrane Filtration as a technique to isolate organisms living organisms and origin, as it took 10 ml of water sample is then added to the sterile filtration device that has a filter histologically and were cellular 0.45 µ m, pulled the sample shed vacuum pressure, microorganisms in the sample rose to surface as a filter in growth dishes (Petri -dish) and after be clear visible colonies promised developing and measured by the number of colonies (CFU) per 100 ml of the original sample, as described in James.

The total content of heavy metals

Digested raw sewage samples and filtered using nitric acid and HClO4 Concentrated with heating, and measured the concentration of copper, lead, zinc, cadmium and nickel using Atomic Absorption Atomic Absorption Spectrophotometer type Phoenix - 986

RESULTS AND DISCUSSION

pH of the water

Figure (1) The pH value decreased in samples of filter compared with sewage, the study showed that the cause of the decline is due to the biodegradation process that occur in sandy candidate (Akporhonor and Asia, 2007)

Total suspended solids

Figure (2) the efficiency of the filters in the removal of total suspended material from sewage because of the nomination process and the process of physical adsorption this is consistent with the findings of the Imram (2005), and ranks candidates according to the efficiency of removal as follows: Sand < sawdust < coal filter < C. demersum filter can be explained by the sandy filter works as vital framework (Biofilm) any dynamic growth on top of the sand filter, which is a mixture of algae and bacteria, unicellular, and between filtration to remove suspended solids and materials work Organic and viruses efficiently using those mechanical (Rockson, 2007).

Biological oxygen demand (BOD5)

Showed the efficiency of the filters used in the study (Fig. 3) has proved the efficiency of removal can be arranged according to the values of reduced BOD Sand < coal < sawdust < C. demersum filter To increase the efficiency of sand and coal filters and sawdust back formation materials coagulant, effective and are important in the removal of pollutants and this is in line what he got Eljamal *et al.*, (2006) the high values (BOD) in the C. demersum filter attributed to the release of some organic material biodegradable (Al-amiri, 2006)

Chemical oxygen demand (COD)

The removal efficiency filters to values (COD) of waste water (Fig. 4) and taken ranking follows Sand < sawdust < coal < C. demersum filter this can be explained for the reasons mentioned previously about its role in the reduction of BOD values

Total Nitrogen (TN)

The fig. (5) Removal efficiency of filters in removing total nitrogen (TN) delegation incurred as follows: Sand < sawdust < C. demersum < coal The contrast removal efficiency total nitrogen filters due to the nature of the circles used in the study, installation and different chemical properties Bio example sawdust where you get reverse nitrification process because it is the organic carbon source, one of the factors that affect the reverse nitrification This is consistent with the Eljamal *et al.*, (2006)

Total phosphorus (TP)

Results shows the efficiency of the filters in the removal of total phosphorus in waste water fig. (6) And consequent removal efficiency as follows: Sand < sawdust < C. demersum < coal

The percentage of removal of the filter sand 90% due to high efficiency due to the filter nomination process and adsorption (Metcalf, 2003)

Pathogenic bacteria (fecal coliform)

Evidenced by the results of the study are described in Table (2) that the number of bacteria (FC) in the wastewater before treatment was too high has contributed to the filters used in a prominent role and efficient in the removal of bacteria so as not to exceed 150 cells / 100 ml according to EPA (2004) and can be explained by the removal of bacteria from sewage water after using the filters due to the physical size of the bacteria or as a result of the process of adsorption (Al-amiri, 2006).

Heavy metals

Results shown in the table (3) that the concentrations heavy metals (Zn, Pb, Ni, Cu, Cd) in sewage water was higher than the ranges proposed for the Environmental Protection Agency of the United States (EPA- US, 1992) and this indicates a lack of wastewater validity for drinking purposes and irrigation, filters used in the study contributed to the reduction of the concentration of heavy elements Feris *et al.*, (2003) and improve the quality of sewage regulation and in accordance with the parameters used in the study can be explained, for example, to mechanical working by which material sawdust is that they contain Totals carboxyl (Carboxyl group) which is effective portion with whom the heavy elements as themselves (Korshin *et al.*, 1998). In a study by the Basso *et al.*, (2002) on the substance lignin in shell nut Brazil, sugar cane, sawdust in the removal, elemental copper and cadmium from sewage and reached a removal efficiency reached 57% and 28% respectively. noticed that the material Lignocelluloses have a very high surface area so water can permeate portion containing cellulose and get complicated heavy elements process, and in the study carried out by Feris *et al.*, (2003) Pointed out that the use of coal as an adsorbed heavy metals such as Cu and Zn and Ni have made it clear that coal susceptibility to adsorption of heavy metals such as Cu and Zn and Ni and the main reason responsible for adsorption is contained a substance Uitriniter and Kaolimine and a little Quartz and Pyriteg.

As for the C. demersum Shaw Shaltout *et al.* (2009) The chemical composition of the C. demersum contain proteins, carbohydrates, crude fiber and high in Mg, Co, Na. features the C. demersum plant's ability to focus on the elements interweave.

CONCLUSIONS

- Reduced chemical and physical and microbial properties and trace elements studied values when using the filters proposed in the study is an indication of the success of these filters to get rid of pollutants
- We note that the sandy candidate was the best filters in the reduction of chemical and physical properties and germ and concentrations of trace elements studied values

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