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Decreasing the Number of Coliforms of Wastewater Treatment Plants using Sand Filtration Together with Four-Seed Powder

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Abstract: *Lacking adequate supervision on quality of state wastewater treatment plants causes these materials to enter the environment raw and in most cases with no consolidation and cause lots of losses to the natural environment.*

Samples: *Samples were prepared in plastic cylinders with nearly 14 cm diameter and 50 cm height. Silica sand was poured into cylinders in three layers, bottom to up and tiny to coarse. Aligoudarz wastewater treatment plant was used for irrigation of lysimeters. On one hand, the operation of four-seed powder together with silica sand was remarkable in decreasing the number of coliforms. And removal efficiency for total coliforms and fecal coliforms were 98% and 99%, respectively. Using this method in refining urban wastewater can increase wastewater microbial quality to the high degree and can be used in agricultural land, feeding underground water resources, entering surface water, green space irrigation and using in car washes and etc.*

Keywords: *Wastewater, Total Coliform, Fecal Coliform, Turbidity, potassium permanganate, removal percentage*

1. INTRODUCTION

Due to water shortage in dry and semi-dry areas such as Iran, using agricultural, industrial, rural and urban wastewater can be taken into consideration. With the current situation of water resources using sewage is inevitable. On the other hand, increase in the volume of this sewage is a problem caused refinery plants to lack the necessary capacity for refining them. Reusing refined wastewaters with two aims of producing more water and also environmental protection against pollution is one way of solving the problem of water production and one of the potential resources for irrigation in agriculture. Microbial and chemical contaminations of water, soil and agricultural products, the prevalence of parasitic diseases and chemical poisoning are side effects of disposal and reuse of these materials. One of the indicators presented by the World Health Organization for reusing of wastewater is counting the number of fecal coliforms in wastewaters which can be used as a criterion regarding wastewater being healthy and safe.

In 19th and the early 20th century and in the contemporary era, in countries like German, England and the USA, the most important way of sewage disposal was sewage evacuation on agricultural lands. In 1996, in Japan nearly 13 million sqm. of refined sewage has been used in irrigation. We should bear in mind that the necessary condition for successful use of sewage and wastewater in agriculture is

considering its effects on the environment, agricultural product, hygiene and human health. So, it is necessary to have regulations and instructions for being informed of conditions and specifications of refined sewage or other kinds of wastewaters for preserving the proper quality of the product, preserving the environment and social hygiene.

2. Background Of Works Done

In the 10 centuries, sewage had been used in suburb areas of Esfahan. While using sewage in the past had been done with the purpose of fertility of the lands, today the main purpose of it is the water shortage. Using wastewater increases the plants' functions and has no negative effect on soil and its permeability. Already sewages, wastewaters and return flows have been used in three ways in agriculture:

- Non-normative use and the use without considering the related standards and proper cultivate model.
- After complete refining of the sewage and reaching its quality to the desired standard.
- Using low-quality wastewater for planting special kinds of plants and choosing appropriate irrigation way according to the wastewater quality and controlling people in exposure.

Different experiences regarding plans for reuse of wastewater and return flow in the state show that implementing these plans can have the following positive effects:

- Controlling desertification with using resources in irrigation of agricultural land, green space and tree planting.
- Optimizing and increasing the productiveness of water use by reuse of wastewater.
- Preserving present water resources by return the sewage wastewater to the land.
- Reducing the cost of using chemical fertilizers
- Expanding level of irrigation.
- Preserving soil and developing its quality by the growth of plants on it and preventing soil erosion.
- Reducing contamination of surface and underground water

The most influential factors on expanding usage of sewage summarized as:

- Shortage of needed water for agriculture.
- The High cost of developed refinery processes of sewage
- Identifying material value in sewage and the positive effect of sewage in increasing agricultural products.

3. Methodology And Materials

The necessary experiments have been done to examine the reduction of coli form wastewater amount in sewage refinery plant by using sand filtration system together with four-seed and *potassium* permanganate powder and also assessing wastewater quality by each of these plants and chemical-added materials used in this research.

The Four-seed powder consists of four plants including plant ago psyllium, plant ago major, alyssum homalocarpum, and lallemantia royleana

Figure1. *Plant powder of four-seed*

Research treatment includes Silica sand and four-seed plant: treatment 1: silica sand (control), the second treatment: silica sand in addition to 5 percent four-seed plant.

4. Discussion And Conclusion

In this research, the possibility of disinfection of wastewater using sand filtration system together with four-seed powder in the removal of coli form has been investigated. The treatment in this research was: 1st treatment silica sand (control), the second treatment: silica sand in addition to 5 percent four-seed plant. As sewage refining processes have not been done completely in some areas, the amount of microbial contamination is very high.

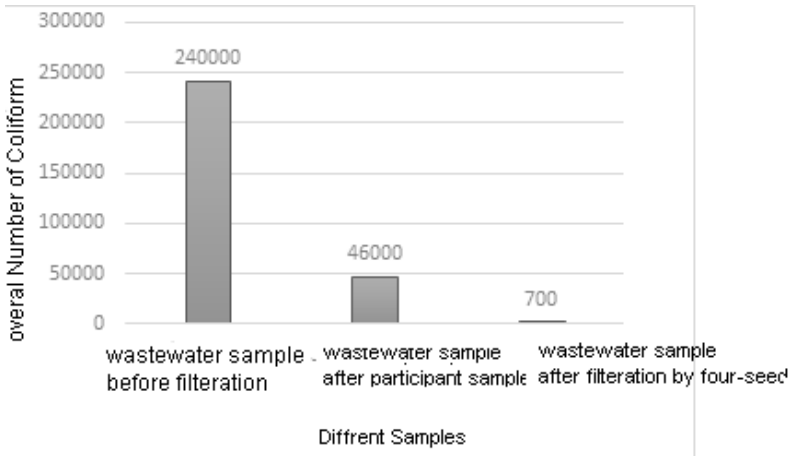

Figure2. The overall Number of Coliform after Participant Filtration in comparison to wastewater before Filtration

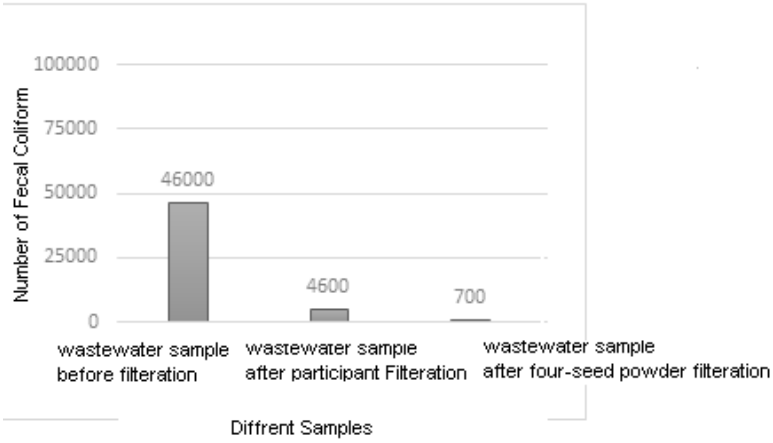

Figure3. *Number of fecal coliforms after participant filtration in comparison to wastewater before Filtration*

As can be seen in the diagrams, the number of total coliform and fecal coliforms has been decreased significantly. In this step, the amount of 300g four-seed powder added to the upper layer of the filter which was consisted of the tiniest parts of silica sand and after passing of wastewater and taking samples continually the following results according to table 1 were achieved.

Table1. *Wastewater Sample after Filtration by Four-seed Powder*

Number of Positive Reaction of Cylinders to 3-Cylinders				No. of Coliform
Dilustion	0/001ml.	0/01ml.	0/1ml.	
1st	1	2	3	$15 * 10^3$
1st Repetition of Confirmation Stage	0	1	1	700
1st Repetition of Supplemental Stage	0	0	1	400

In confirmation Stage, total number of coliforms is lower than the maximum standard of output wastewater and it resembles the influence of four-seed powder in significant decrease of total Coliform.

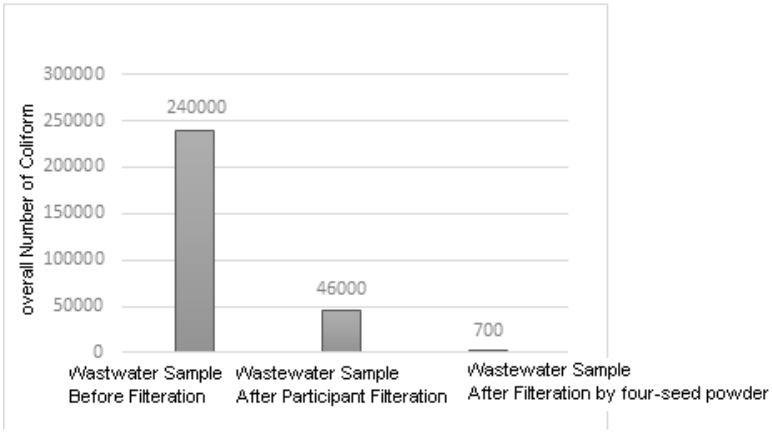

Figure4. *Overall Number of Coliforms after filtration by four-seed powder in comparison with wastewater before filtration*

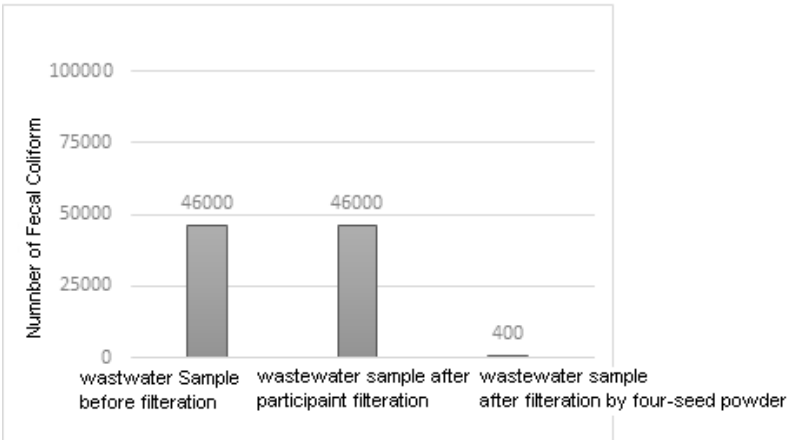

Figure5. *Number of Fecal coliforms after filtration with four seed powder in comparison with wastewater before filtration*

As can be seen in the diagrams the overall number of coli form and fecal coli form has been decreased significantly.

Removal random for the number of overall coli forms and fecal coli form is 98 % and 99%, respectively. The considerable point observed in the experiment related to filtration with four-seed powder was as follows: after wastewater passing the filter and combining with four-seed powder, the sample became sticky and its density increase in a way that it's sampling in the cultivation environment for experimentation became difficult. So, the second and third-time repetitions of the experiment were impossible practically and have not been performed.

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