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ANALYSIS OF VARIATION IN PHYSIO-CHEMICAL PROPERTIES OF WATER USING LOW C0ST ADSORBENTS

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Abstract- *The waste water as we know contains a large amount of undesirable impurities which if not removed in the treatment plants can prove to be hazardous for the human health. These impurities are treated in a treatment plant with the help of various adsorbents and chemicals. Though they are very effective these adsorbents can very costly and thus can affect the overall economy of the treatment process. Therefore finding out a cheaper alternative to these adsorbents and chemicals can be very beneficial and can reduce the cost of treatment process significantly. Thus our present study focuses on picking out a cheaper and efficient adsorbent or chemical for the removal of turbidity, total dissolved solids, pH and chlorine from waste water. The results obtained have showed that the rice husk ash and activated carbon both have good turbidity removal efficiency. On the same time neem leave powder and orange peel powder proves out to be efficient natural coagulants. The TDS removal through flyash showed a maximum of efficiency of 59.24% while pH removal through it showed a maximum efficiency of about 16.91%.*

Keywords: *Adsorbents, Turbidity, Coagulation, TDS etc…*

1. INTRODUCTION

Adsorption technique has been used as an easy and quick means to remove the impurities from water from a very long time. Gravity filter is the most widely used equipment which consists of layers of gravel and sand in it for the proper filtration of water. We have carried out our study to find out an efficient and cheaper adsorption media that is capable of removing impurities from waste water thus making the treatment process economical. We have prepared our own filter out of a 20litre bottle that consists a layer of 10cm of gravel at bottom and a 10cm layer of sand above it. At the top we added a 5cm layer of each adsorbent and then carried out the filtration.

2. MATERIALS

- 20 Liter Water bottle
- Pipe and connectors
- Adsorbents like activated carbon, Neem leaves powder, Fly Ash, Fruit peels powder, Rice husk ash, Sugarcane Bagasse and Groundnut shell powder
- Sand and Gravel as base of filter medium
- Water samples from different sites i.e. Yamuna river, Najafgarh drain and college premises

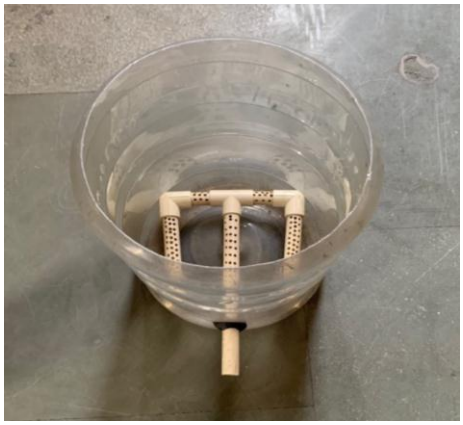

Fig 1: Filter Model

3. METHODOLOGY

The filter model shown above was first prepared and then the testing was done.

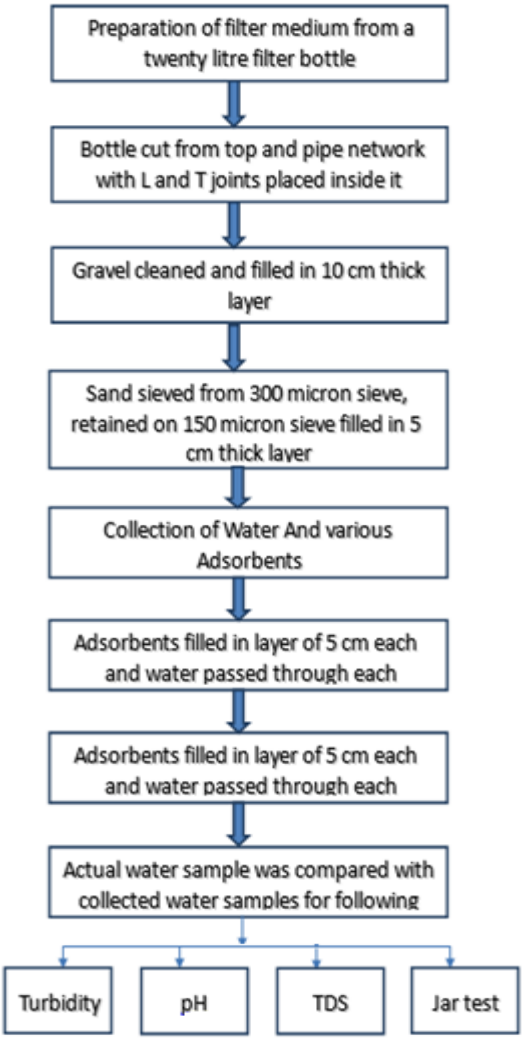

Fig-2: Methodology

4. APPRATUS USED

1. Nephelometer
2. Jar test apparatus
3. TDS meter
4. PH meter

5. RESULTS

5.1 Change in Turbidity by adsorption

The turbidity removal through adsorption was carried out by simply preparing a layer of thickness about 5cm with various adsorbents through which waste water samples obtained from different sites were then passed and the adsorbent for which the turbidity removal efficiency comes out to be maximum was reported.

I. Yamuna water

Table -1: Removal of turbidity by adsorbents.

Adsorbents	Initial turbidity (NTU)	Final turbidity (NTU)	Turbidity removed (NTU)
Activated carbon	87	53	34
Sugarcane Bagasse	87	76	11
Flyash	87	62	25
Fruit peels powder	87	67	20
Groundnut shells powder	87	63	24
Rice husk ash	**87**	**49**	**38**

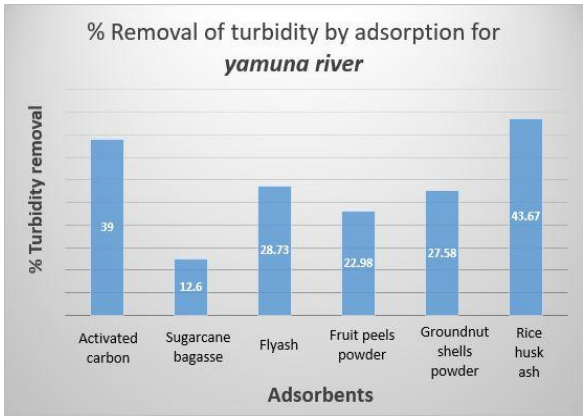

Chart-1: % Removal of turbidity vs Adsorbents for Yamuna River

II. Nazafagarh Drain

Table -2: Removal of turbidity by adsorbents.

Adsorbents	Initial turbidity (NTU)	Final turbidity (NTU)	Turbidity removed (NTU)
Activated carbon	**109**	**88**	**21**
Sugarcane Bagasse	109	102	7
Flyash	109	96	13
Fruit peels powder	109	93	16
Groundnut shells powder	109	91	18
Rice husk ash	109	90	19

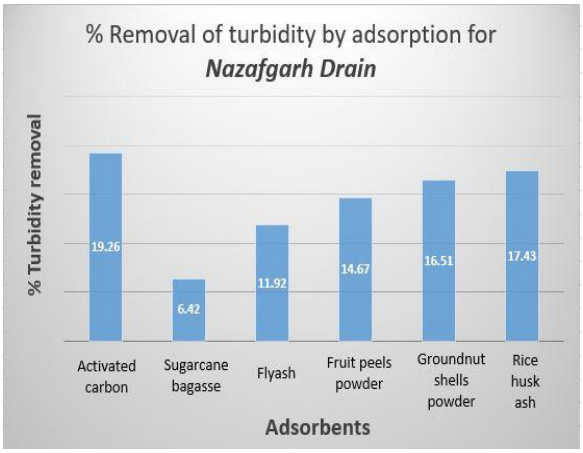

Chart-2: % Removal of turbidity vs Adsorbents for Nazafgarh Drain

III. College premises

Table -3: Removal of turbidity by adsorbents.

Adsorbents	Initial turbidity (NTU)	Final turbidity (NTU)	Turbidity removed (NTU)
Activated carbon	**62**	**30**	**32**
Sugarcane Bagasse	62	58	4
Flyash	62	43	19
Fruit peels powder	62	47	15
Groundnut shells powder	62	52	10
Rice husk ash	62	36	26

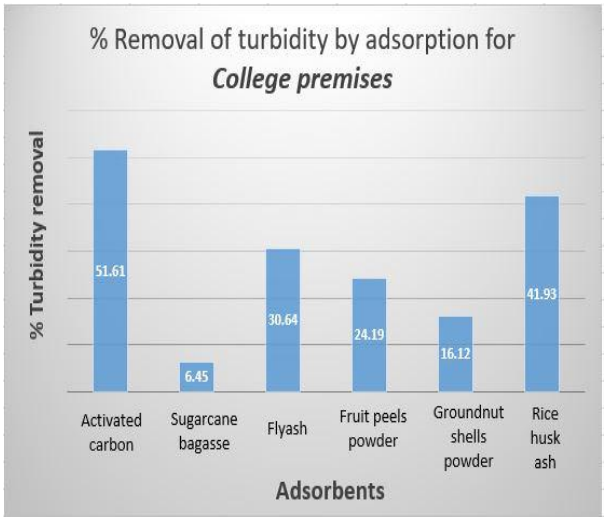

Chart-3: % Removal of turbidity vs Adsorbents for College premises

5.2 Change in Turbidity by Coagulation

Neem leaves powder and orange peel powder were tested as a coagulant to remove the turbidity from waste water with the help of the jar test apparatus. They were added in dosages of 0.2, 0.4, 0.6, 0.8 and 1g/l in different jars and the dosage for which the removal efficiency comes out to be maximum was reported.

Coagulant: - Neem Leaves powder
Initial Turbidity: - 146 NTU

Table -4: Removal of Turbidity for various dosage of Neem Leaves Powder

Dosage (grams/liter)	Final Turbidity (NTU)	Turbidity removed (NTU)
0.2	58	88
0.4	**42**	**104**
0.6	63	83
0.8	81	65
1	87	59

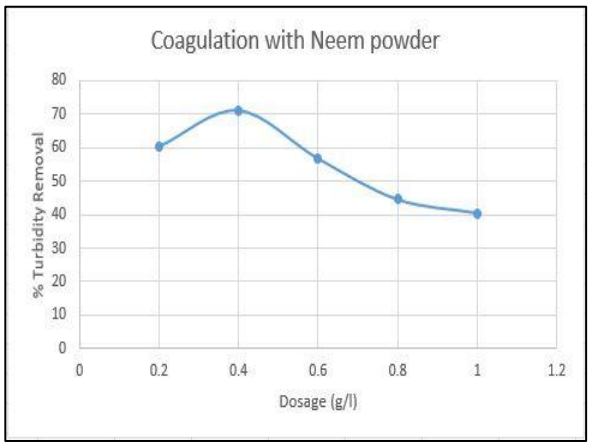

Chart-4: % Removal of turbidity vs Neem Powder Dosage

Coagulant: - Orange peels powder
Initial Turbidity: - 139 NTU

Table -5: Removal of Turbidity for various dosage of Orange peel Powder

Dosage (grams/liter)	Final Turbidity (NTU)	Turbidity removed (NTU)
0.2	86	53
0.4	62	77
0.6	57	82
0.8	**45**	**94**
1	78	61

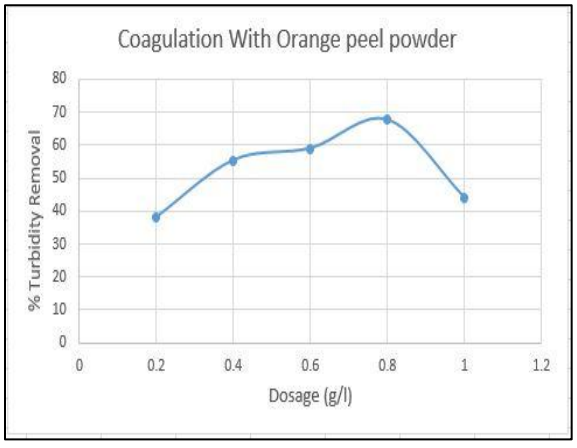

Chart-5: % Removal of turbidity vs Orange peel Powder Dosage

5.3 Change in TDS using Flyash

Flyash in various thickness layers were tested for the removal of total dissolved solids from waste water.

Initial concentration of Total dissolved solids in the sample: 503ppm

Table -6: Removal of TDS using Flyash

Flyash Layer Thickness (cm)	Final TDS concentration (ppm)	TDS removed (ppm)
1	268	235
2	236	267
3	205	298
4	256	247
5	381	122

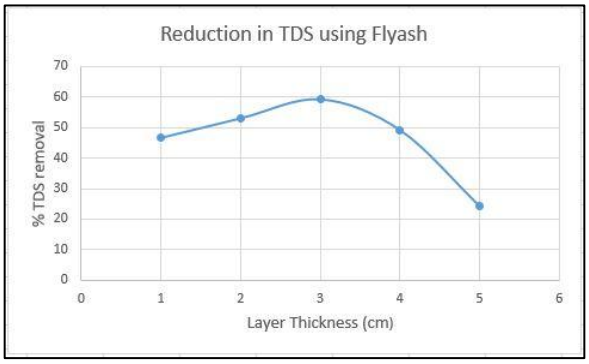

Chart-6: %TDS Removal Vs flyash Layer thickness

5.4 Change in PH using Flyash

After carrying out the testing for the variation in the removal of the total dissolved solids from waste water using the flyash as the adsorbent, the sample obtained from the different flyash thickness were also tested out for the value of PH in them.

Initial pH of the sample: 8.69

Table -7: Removal of pH using Flyash

Flyash Layer Thickness (cm)	Final pH
1	7.52
2	7.19
3	7.22
4	7.34
5	7.36

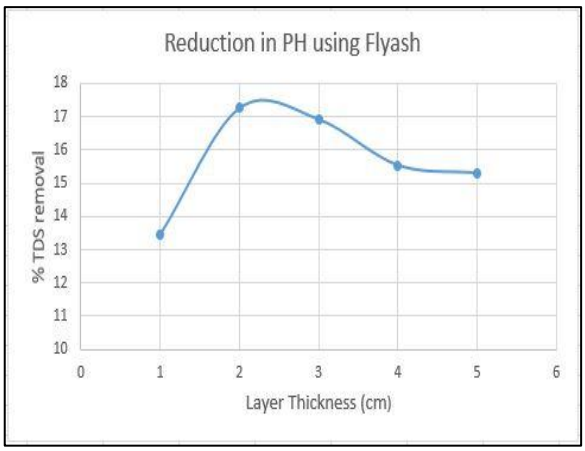

Chart-7: %pH Removal Vs flyash Layer thickness

6. CONCLUSION

The results obtained in the adsorption test have showed that the turbidity removal efficiency of rice husk ash and activated carbon comes to be maximum and both of these adsorbents have showed somewhat similar removal efficiencies.

It is though highly advisable to properly wash these adsorbents in order to remove all the impurities from them before using them in the filter media.

The removal of turbidity through coagulation by using jar test apparatus has showed that the neem leave powder can be used as potential natural coagulant to remove turbidity from waste water.

Though orange peel powder has lesser turbidity removal efficiency than neem leave powder it could still be considered as a good natural coagulant considering its cost.

When we used fly ash in the filter media in order to reduce TDS (total dissolved solids) and pH in waste water, the results obtained reflected that flyash does remove a large part of TDS and pH from the water. Thus it can be used effectively for the treatment of waste water.

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