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Analysis, Purification and Testing of Industrial Waste Water

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Abstract - *Development of industrialization and increased in human population have serious impact on the environment through discharge of industrial waste water into natural streams and colour is one of the parameter by which one can identify whether the water is normal water or it is a textile effluent. The presence of colour and other contaminants in aqueous streams, arising from the discharge of untreated wastewater into water bodies, is one of the most important environmental issues. Many techniques are emerging to purify water that can be grouped under chemical and biological treatment. Biosorption is a recent eco-friendly technique which gained importance in this decade. The process of Biosorption has many attractive features compared to the conventional methods. Hence, the bio-adsorbent purification powder is prepared for the purification of waste water.*

Key Words: Textile effluent, Biosorption, Bio-adsorbent filter bed, Eco-friendly technique.

1. INTRODUCTION

Water is essential for every living organism. It plays an important role in human's day to day life. The total volume of water on Earth is estimated at 1.386 billion cu.km with 97.5% being salt water and 2.5% being fresh water. Fresh water is available in earth in the form of river, lakes, streams, ponds, glaciers, etc.; only at 0.3% is in liquid form on the surface. The primary source of freshwater is rainfall and glaciers. Water is used for several purposes by humans but the level of purity of the water being consumed is very crucial since it has a direct effect on human health.

India is a developing country with an increasing population density. These developing countries are facing potable water supply problems because of inadequate financial resources. The cost of water treatment is increasing, and the quality of river water is not stable due to a suspended and colloidal particle load caused by textile industries, leather industries, food industries etc., Textile waste water includes a large variety of dyes and chemicals additions that make the environmental challenge, not only for liquid waste but also its chemical composition. Main pollution in textile waste water comes from dyeing and finishing process. Major pollutants in textile waste waters are suspended solids, oxidizable matter, acidity and other soluble substances. These processes require the input of a wide range of chemicals and dye stuff. Due to many problems created by using the synthetic coagulants such as aluminum sulphate which is used worldwide.

In order to develop the economy of India, it requires the establishment of new industries. Due to unplanned industrial growth, much of the land and nearby water bodies is polluted by indiscriminate damping of soil and liquid waste generated by these units. Increase in the level of metal irons and organic pollutants in environment are either due to the absence of laws for various industries to treat their wastes or if there are laws, there is no strict enforcement by the Ministry of Environment and other regulatory authorities of India.

Some of the recently available technique for water purification by shock electro dialysis, deionsation, filtration, separation, desalination, magnetic separation technique, slow sand filter, rapid sand filter, solar water purification are being used by some of the large scale industries and so for small scale industries there is a need for some new technologies which bring a great change in small scale and even in large scale industries. The environmental issues associated with residual color in textile effluent have posed a major challenge to environmental scientist as well as the textile coloration processors.

The requirement to remove color effluent from textile effluent on site prior to discharge to sewer have been progressively tightened due to increase public complaints about color water. Sometimes these water comes with soap lumps which is a serious issues that the people nearby are facing. There has been lot of research going in past few decades to develop efficient and cost effective technologies to remove color from the textile effluent. Cost involves in the construction of waste water treatment plants are un-economical, it consumes lot of space and commercially they are unattractive and have disposal problems. So there was a need for some alternative method which can overcome all these problems and treat the waste water in an appropriate way.

The removal of dyes from effluent using adsorption process provide an alternative treatment, especially if the adsorbent is inexpensive and readily available. A number of non-conventional low cost adsorbent used for dye removal, include fruit waste of Prosopisn juliflora, orange peel, banana pith, maze cobs, barley husk, bagasse pith, rice husk, apple pomace, wheat straw, etc. were used. Utilization of agricultural waste as low cost adsorbent has great significance in India, where more than 200 million tons of agricultural residues are generated annually.

1.1 WHY BIOSORPTION AND COAGULATION?

Biosorption and Coagulation are the most efficient alternative method for purification of effluent water. The main advantage of using Biosorption is that it gives the significant amount of energy saving from a more efficient wastewater treatment system operating for fewer hours; it is economically attractive because waste biomass is in expensive and widely available. Biosorption is done using banana peels, orange peels which are naturally available in community bins and used for production of compost and it is used for the removal of heavy metals. For color removal Calotropis Gingantea latex, Coconut Shell ash is used in the form of activated carbon.

Coagulation is a process which involves coming together of colloidal particles so as to change into large sized particles which ultimately settle as a precipitate or float on the surface. Coagulation is generally brought about by the addition of electrolytes. Coagulation is done using Strychnos potatorum seed.

2. SAMPLING

The effluent sample was collected from Valarpuram, near Arakkonam Vellore district in the month of December 2018.This effluent was discharged from an industry which has been running since 1995 and surrounding area and the ground water was getting polluted by the effluent discharge from the industries. The area is surround by agricultural land and the people over there were getting constantly affected by the discharged effluent.

3. INGREDIENTS USED

3.1 BANANA PEEL POWDER

Fresh banana peel was collected from the nearby locality. The collected banana peel were cut into small pieces and cleaned for removing unwanted particles, dirt present in banana peel. These were finally sun dried for one week. The dried banana peel were crushed into fine powder and sieved. The particle size should not exceed 3mm. This banana peel powder is used as an adsorbent. It adsorbs heavy metals and colour from the polluted water.

Figure 1: Banana peel powder

3.2 CALOTROPIS GINGANTEA LATEX

Calotropis Gingantea is an easily available plant which is locally called as Erukkampoo plant. This plant is very rich in latex .This latex gives unpleasant smell which leads to severe headache and irritation to skin. Hence, the latex is collected from the plant very carefully using a sharp knife or blade. Then the collected latex was heated in the muffle furnace until it got dried into powder form. Since, it is in a fine powdered form sieving is not needed. This Calotropis gingantea latex powder is used as an adsorbent to remove colour.

Figure 2: Calotropis Gingantea Latex powder

3.3 COCONUT SHELL ASH

The coconut was purchased from the locality market and the shell was taken separately. The coconut shell was cleaned thoroughly in a fresh water and sun dried. After drying the coconut shell was burned using a flame for 15 minutes. And the burnt sample was cooled at room temperature for overnight. Then the ash was checked for the temperature to carry on the process and it was crushed into powder. The crushed ash was collected separately in air tight container. The coconut shell ash will act as activated carbon.

Figure 3: Coconut Shell As

3.4 ORANGE PEEL POWDER

Fresh orange peel was collected from the nearby locality market. The collected orange peel were cut into small pieces and cleaned for removing unwanted particles, dirt present in orange peel. These were finally sun dried for one week. The dried orange peel were crushed into fine powder and sieved. The particle size should not exceed

3mm. This orange peel powder will act as an adsorbent. It adsorbs heavy metals and colour from the polluted water.

Figure 4: Orange peel powder

3.5 STRYCHNOS POTATRUM SEED POWDER

Strychnos potatorum seeds were collected from Devakottai, Sivaganga district. This seeds were cleaned and oven dried at 200°C for 4 hours. The dried Strychnos potatorum seeds were crushed into fine powder and sieved. The particle size should not exceed 3mm. This Strychnos potatorum seeds powder is used as a coagulant agent and removes turbidity from the polluted water.

Figure 5: Strychnos potatrum seed powder

4. PURIFICATION PROCESS

4.1 Treatment with Banana and Orange peel powder:

Initially in a beaker, 0.5g of Banana peel powder and 0.5g of Orange peel powder is added in a 250 ml of sample taken. The mixture was placed in a flocculater. It was mixed at the rate of 150 rpm for 10 minutes. Then it was kept 15 minutes aside for the sedimentation process. After the process of sedimentation the water is filtered. Then 0.5g of *Strychnos potatorum* seed powder is mixed with the filtered water for 10 minutes. Then coagulant formation was filtered, at last purified water is collected in a beaker. This filtered water gives 80% of the colour removal. This water can be supplied to the underground as the Colour is removed and this will not cause and thread to our environment. This process gives only 80% of results this water can be treated with other combinations of trials for the better results. The addition of *Strychnos potatrum* gives better taste of water and the pungent smell is also reduced.

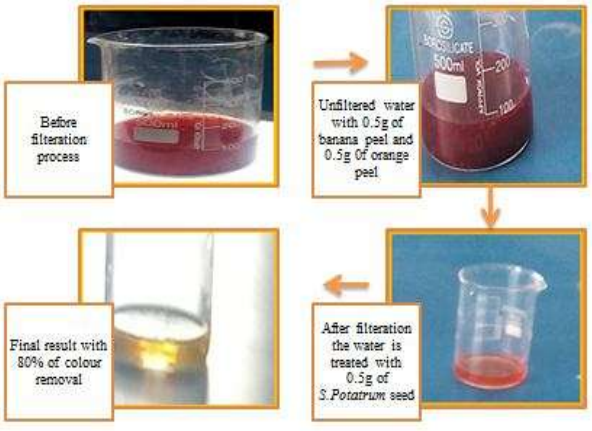

Figure 1: Process with Banana and Orange peel

4.2 Treatment with *Calotropis Gingantea* latex powder:

In another beaker, 0.1g of *Calotropis gingantea* latex powder which acts as an activated carbon is added in a 100 ml of sample taken. It was mixed at the rate of 150rpm for 10 minutes. Then it was kept aside for30 minutes for the sedimentation process. After the process of sedimentation the water is filtered. Then 0.5g of *Strychnos potatorum* seed powder is mixed with the filtered water, then after 10 minutes the coagulant formation was filtered, at last purified water is collected in a beaker. The filtered water gives 90% of colour removal. This filtered water can be supplied to the underground and this water can also be used by the industry again for the purpose of dying of cloths as the Colour is removed and this filtered water will not cause and thread to our environment and human life. Since the colour of water is reduced up to 90% the water can be treated and used for the industrial purpose for gardening and for other purposes.

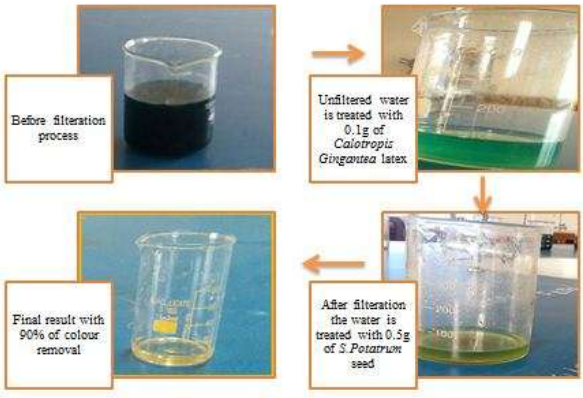

Figure 2: Process with Calotropis Gingantea latex powder

4.3 Treating with Coconut shell ash:

In other beaker, 40g of coconut shell ash powder is added in a 100ml of sample taken. The mixture was placed in a flocculater. It was mixed at the rate of 150 rpm for 10 minutes. Then it was kept 15 minutes aside for the settlement process. The sedimentation formed is filtered. Then 0.5g of *Strychnos potatorum* seed powder is mixed with the filtered water for 10 minutes. Then coagulant formation was filtered, at last purified water is collected in a beaker. The filtered water is about 70% of the clear water. As the Colour is removed is 70% and this will not cause and threat to our environment.

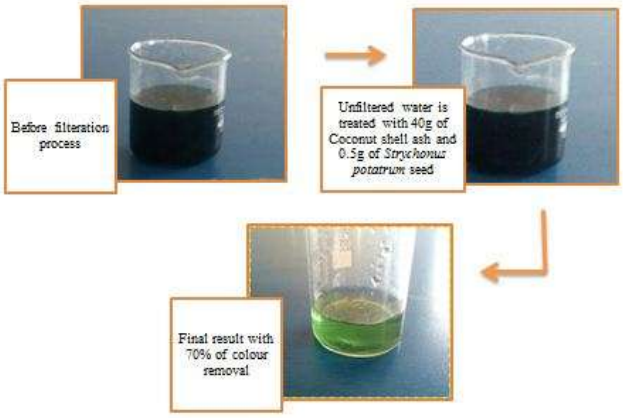

Figure 3: Process with Coconut shell powder

5. TEST REPORT OF SAMPLE

S.NO	PARAMETERS	UNITS	RESULTS OF UNTREATED WATER	RESULTS OF TREATED WATER
1.	pH	-	9.6	8.5
2.	Colour	-	Green	Colourless
3.	Odour	-	Pungent	-
4.	Total Dissolved solids(TDS)	mg/l	378000	28770
5.	Total Suspended Solids(TSS)	mg/l	1862	58
6.	Biochemical Oxygen Demand (BOD)	mg/l	2586	260
7.	Chemical Oxygen Demand (COD)	mg/l	20160	1240
8.	Turbidity	NTU	112	18
9.	Total Hardness	mg/l	600	240
10.	Dissolved Oxygen	mg/l	BDL(DL:0.2)	BDL(DL:0.2)

6. CONCLUSION

The effluent was treated using banana peel, orange peel, Stryconus Potatrum seed, Calotropis gingantea latex, and coconut shell. The efficiency is increased with the combination of Biosorption and coagulation process. The mixture of Calatropis Gingantea latex mixed with Stryconus Potatrum seed gives effective result compared with other combinations. Hence the treated water can be used by the industry again.

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