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Removal of Heavy Metals By Means of Banana and Orange Peels

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ABSTRACT: "When there is a choice of Smart, why to choose only Better." Environmental pollution by toxic heavy metal contamination due to rapid industrialization is a challenging problem for maintaining the quality and hygiene of water. The discharges of industrial effluents into aquatic environment cause a potential threat to the aquatic life as well as human health, which is a matter of great concern due to their toxic nature and adverse effect. Techniques used to remove heavy metal are namely physical, 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 method. The present study investigates that successful use of eco-friendly adsorbents Fruit peels. Banana and orange peels which are discarded as fruit waste and are available as waste in the market were used to prepare environment gentle bio adsorbent for the adsorption of heavy metals from aqueous solution. Fruit peels were washed and dried, before being used for the treatment of pharmaceutical wastewater. Mainly different heavy metals solutions were prepared to test whether the fruit peels absorb toxic metals are not. It is found that the maximum efficiency of removal of heavy metal is 60% and 70% respectively.

We thought of minimizing a load of heavy metals present in the water by using effective and cost cutting method. Fruits are rich in giving required vitamins to our body but are they good in removing heavy metals from our water. Mainly banana peels contain nitrogen, carboxylic acid, carbohydrate, fiber, potassium, manganese, iron, sodium which attracts toxic metals present in the water. Metals found in impure water are lead, copper, mercury, and iron. These are lethal to humans. Fruit peels don't kill parasites or bacteria, and they aren't going to protect children from viruses. But, fruit peels may offer millions of families around the world the opportunity to drink water free of heavy metals.

KEYWORDS: Bio sorption, eco-friendly, adsorbents

I. INTRODUCTION

India is a developing country with an increasing population density. In order to develop its economy, India requires the establishment of new industries. Due to unplanned industrial growth lot of land and nearby water bodies is polluted by discharge solid as well as liquid waste. Increase in level of metal ions and organic pollutants in the environment are present mainly due to the absence of environmental laws and other regulatory authorities in India. The land is getting polluted by increasing heavy metals in it and it is becoming an environmental, health, economic and planning issue in India.

Due to brisk industrialization growth, the waste effluent is discharged directly into river water causing pollution to the environment. This mainly occurs due to the presence of heavy metals in it. There have been many incidents when heavy toxic metals have led to massive death. The removal of heavy toxic metals from effluent can be achieved by

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various methods. The methods available for removals heavy metals involve a lot of initial costs. It even consumes a lot of space and they are not attractive plus they have disposal problems. The technologies are divided into three types namely physical, chemical and biological. They have their own merits and demerits caused because of high cost and disposal problems.

So we thought there is need of an alternative solution for such problem. Heavy metals are present in each and every water body. There is a need to extract these metals from our water. Fruits are liable to provide necessary vitamins, minerals for our body but will there peel be that effective in removing of heavy metals for our body? To make a firm study we decided to take banana and orange peels and their powder for extracting Silver Nitrate (AgNO_3) from the aqueous solution. This study shows that the importance of using an eco-friendly approach, by using banana and orange peels for removing heavy metal from wastewater.

II. LITERATURE SURVEY

G. ANNADURAI, R.S. JUANG, AND D.J. LEE PRESENTED THE RESEARCH PAPER ON ADSORPTION OF HEAVY METALS FROM WATER USING BANANA AND ORANGE PEEL AND CONCLUDED THAT

This work examined the adsorption of metals (Cu^{2+} , Zn^{2+} , Co^{2+} , Ni^{2+} , Pb^{2+}) from synthetic solutions using the acid-, alkali-, and water-treated banana and orange peels. The adsorption capacity was found to be 7.97 (Pb^{2+}), 6.88 (Ni^{2+}), 5.80 (Zn^{2+}), 4.75 (Cu^{2+}), and 2.55 mg/g (Co^{2+}) using banana peel; and was 7.75 (Pb^{2+}), 6.01 (Ni^{2+}), 5.25 (Zn^{2+}), 3.65 (Cu^{2+}), and 1.82 mg/g (Co^{2+}) using orange peel. Favorable adsorption was achieved at high pH, with its maximum level of Pb^{2+} reaching about 7.97 (banana) and 7.75 mg/g (orange). The banana and orange peels appeared to be useful in the removal of trace metals from synthetic solutions. The banana appeared to be useful in the removal of trace metals from synthetic solutions.

KIU Arunakumara, Buddhi Charana Walpola, and Min-Ho Yoon presented the research paper on Banana Peel: A Green Solution for Metal Removal from Contaminated Water and concluded that

Based on the scale of production, banana peel could certainly be recognized as a promising crop-based material available for exploring alternative uses. The proven metal removal capacity of banana peel provides with a favorable platform to researchers to work on and to come out with a sound technology applicable in removal and recovery of metals from water and wastewaters. Such a green technology would not only address the much needed sustainable tool for cleaning contaminated waters but of course bring an additional value to banana peel enhancing the fruit industry worldwide.

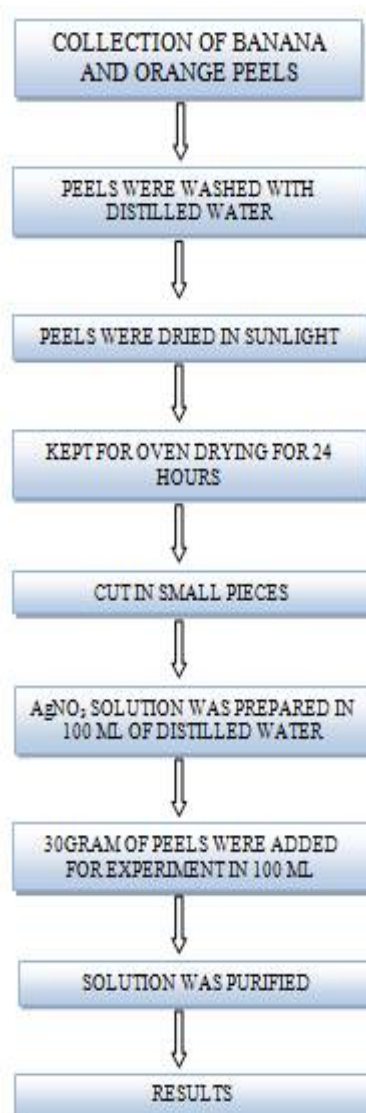
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FLOW CHART:



III.METHODOLOGY

We collected banana and orange peels from various juice centres. The peels were washed several times with distilled water. We dried them 1st in sunlight and then in an oven at 100°C for 24hrs. The banana and orange peels were later cut into small pieces and half of the peels were converted into powder form. After drying, the powder was sieved. The particle sizes were 1 to 5 mm. We prepared 1.6-gram Silver Nitrate solution in 100 ml of water. We took 30 grams of fruit peels powder and 30 grams of dried fruit peels each. We made a purifying set up in plastic bottle starting from bottom pebbles-cotton- filter paper-banana/orange peels or powder- cotton.

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Figure no.1

We converted orange and banana peels into powder form with the help of grinder for getting better result for our experiment respectively.



Figure no.2

Figure no.3

The figure no 2 shows the set of our experiment from bottom cloth-cotton-pebbles-filter paper-banana and orange powder-cotton-filter paper. The figure no. 3 shows water obtained from dried banana and orange peels, powder peels, orange peels respectively from left to right.

IV. EXPERIMENTAL RESULTS

The first graph shows that we were able to make our silver nitrate solution from acidic to basic but dried peels were more effective as compared to powder because the solution used to turn in to brownish color which looked unfit for any purpose. The dried orange and banana peels gave us a colorless as well basic solution free from silver nitrate to prove our experiment more successful we not only conducted ph test but also conducted turbidity and hardness test. The results obtained were quite acceptable. The graph 2 shows that before filtering the solution contains some impurities and after filtration, the impurities got to disappear from the solution. This means that peels extracted the silver nitrate from the solution. The graph and table give the better result. The graph 3 shows the presence of hardness in the solution before and after the filtration.

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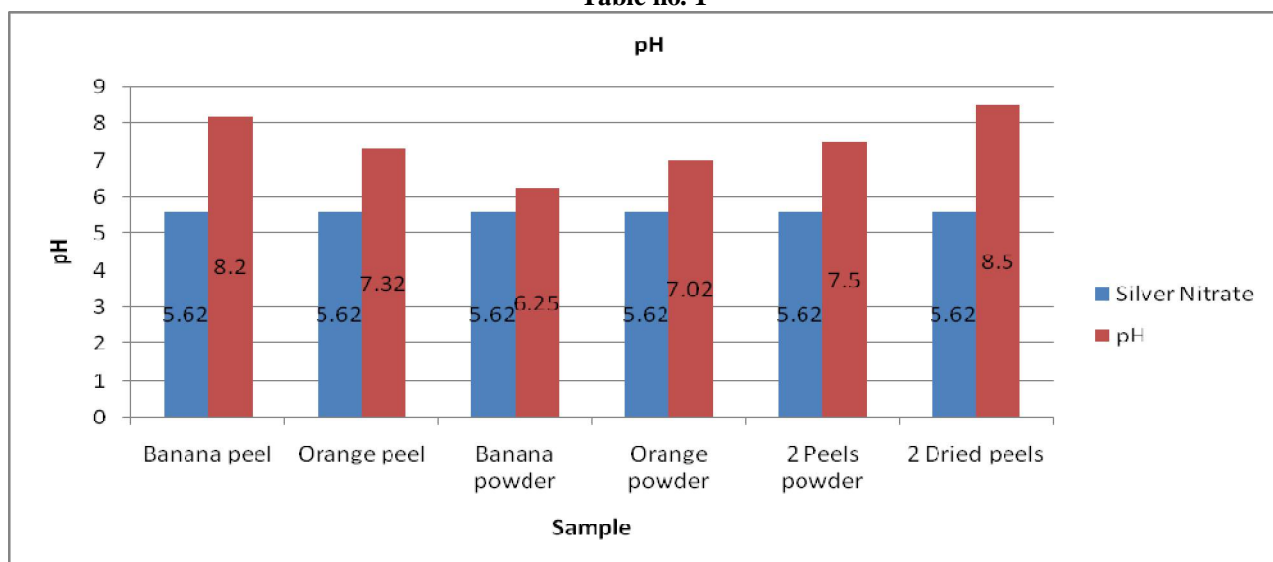
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CONTENTS	SILVER NITRATE(pH)	Filtered sample pH
Banana peel	5.62	8.20
Orange peel	5.62	7.32
Banana powder	5.62	6.25
Orange powder	5.62	7.02
Orange and Banana Peels powder	5.62	7.50
Orange and Banana Dried peels	5.62	8.50

Table no. 1



Graph no. 1

The above table no. 1 and graph no.1 shows the comparative studies of pH value of silver nitrate and the filter solution. The blue bar shows the pH of silver nitrate and red bar shows the pH of filtered solution. The result is clear that dried peels give the best result

CONTENTS	SILVER NITRATE TURBIDITY	FILTERED SAMPLE TURBIDITY
Banana peel	41	6
Orange peel	41	8
Banana powder	41	13
Orange powder	41	12
Orange and Banana Peels powder	41	11
Orange and Banana Dried peels	41	1

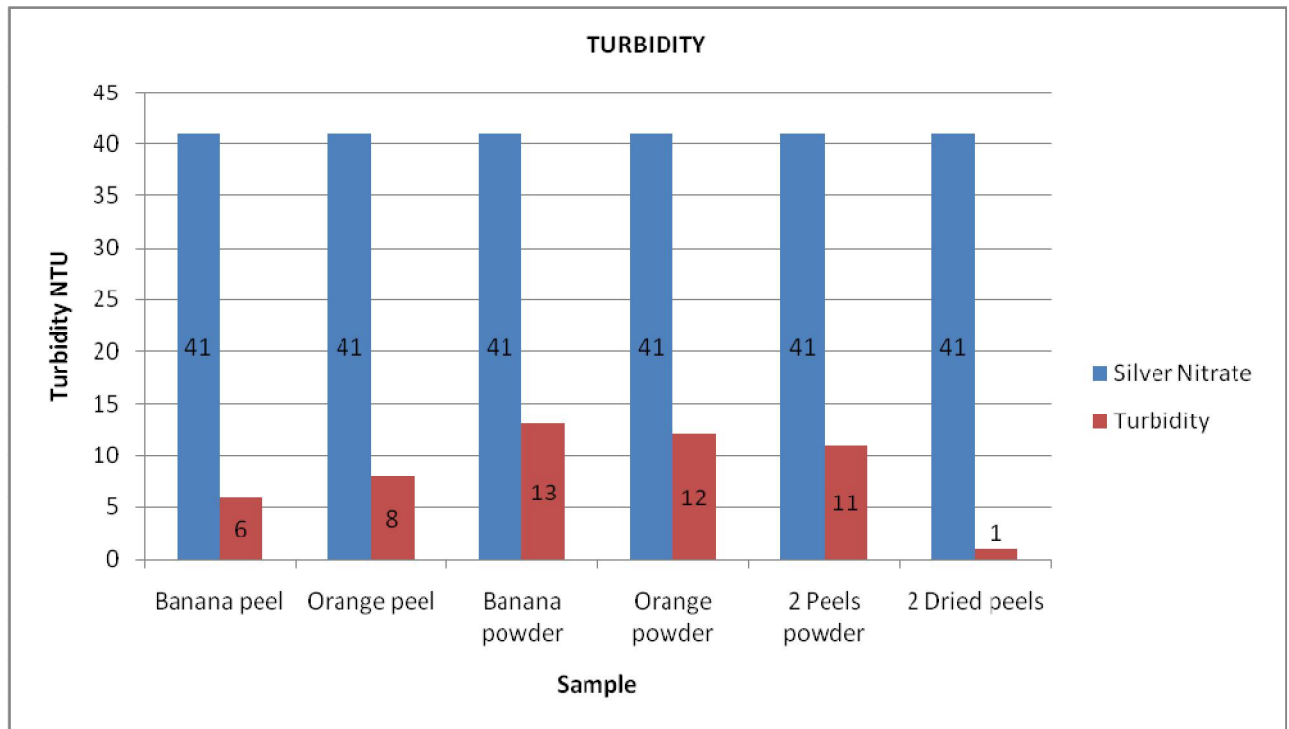
Table no. 2

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Graph no. 2

The above table no. 2 and graph no.2 shows the comparative studies of turbidity value of silver nitrate and the filter solution. The blue bar shows the turbidity of silver nitrate and red bar shows the turbidity of filtered solution. The result is clear that dried peels give the best result.

CONTENT	SILVER NITRATE HARDNESS	FILTERED SAMPLE HARDNESS
Banana peel	180	70
Orange peel	180	126
Banana powder	180	163
Orange powder	180	145
Orange and Banana Peels powder	180	108
Orange and Banana Dried peels	180	86

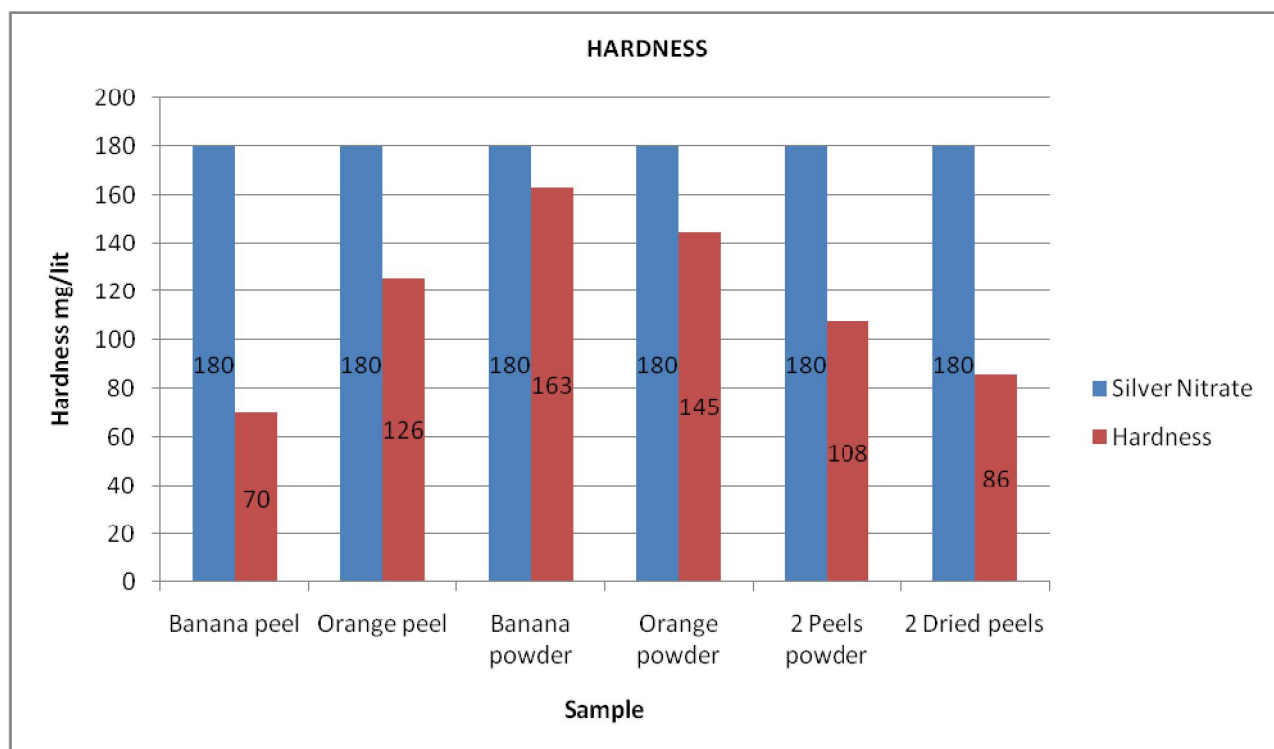
Table no. 3

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Graph no. 3

The above table no. 3 and graph no.3 shows the comparative studies of hardness value of silver nitrate and the filter solution. The blue bar shows the hardness of silver nitrate and red bar shows the hardness of filtered solution. The result is clear that dried peels give the best result.

V. CONCLUSION

When both the dried peels of bananas and oranges have used the result obtained by us were quite accepted. We used not only ph test but also hardness and turbidity test was performed for supporting our project. The results obtained were positive and it is been proved that this method is going to be most effective. The peels were able to remove silver nitrate metal present in the solution. The dried peels were been proved more beneficial as compared to individual powder and peel. As this method is based on agricultural waste automatically it can be said that it cost effective as well. This technique is eco-friendly and cost-effective as well, it will surely enhance the growth of our environment. The industry sector can make a wide use of it as it will prove the best cost-cutting their waste water. The river will no longer be polluted and it will remain as fresh as it was used to be. There will no harm to our aquatic life as well and they can remain alive. Soon our environment will be clean and healthy.

VI. FUTURE SCOPE

This method of using fruit peels can be utilized in wastewater treatment and it is going to be beneficial for treating heavy metals. It will be cost-effective and eco-friendly in nature. As fruit peels are available in abundant so the cost of this filter will be low. Use of heavy equipment can be minimized and we can go green by using fruit peels.

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