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Treatment of industrial effluent water using green waste adsorbents

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Abstract

An industrial effluent contains large extent of dissolved metals & organometallic complexes. These complexes are generally formed during treatment of ore or produced naturally with organic substances like long chain carboxylic acids. The presence of these dissolved metals & organometallic complexes make it alkaline or acidic. Seepage of such effluents results in deteuoration of ground water quality if direct discharge of such effluents takes place.it is reported that ground water having these dissolved metals & organometallic complexes produce many skin, lung, respiratory & stomach diseases.

These effluents affect the chemistry of water effluent. Keeping the above facts, treatment of ground water with an adsorbent banana peels was carried out. After treating with banana peels for definite time period, satisfying changes were obtained. The important parameters like pH, Conductivity, Fluoride content, Chloride content, C.O.D., and Hardness were affected & show permissible values.

Keywords: Industrial Effluent, Pollutants, Adsorbent, Banana peels.

Introduction

India is considered to be a developing country; where Industries are backbone for its economic growth & development. Industrial effluents consist of major pollutants which are produced worldwide[1].These effluents cannot be neglected but can be treated by some treatments like screening, grit removal, sedimentation, floatation, biological treatment, aeration, filtration, chemical treatment, thickening, digestion & dewatering. There is a necessity to treat these effluents before discharging into water bodies[1]. The industrial effluent contains many toxic pollutants like benzene, naphthalene, phenol, cyanide, Anthracene, Ammonia, Cresol collectively known as Poly Aromatic Hydrocarbons[2]. UV photolysis, Hydrogen peroxide, Ozone oxidation & electro-oxidation are the technique which has been utilized to reduce pollution caused by PAH[2]. With respect to all life and human survival, water plays a vital role in domestic purposes and industrial applications[3]. The problem of water scarcity can be reduced by adopting cost effective and convenient method.[3] There are 'N' numbers of advanced technique developed for the treatment of water effluent but it includes the major percentage of chemicals which leads to threat to natural ecosystem[3.]

In all different methods, Adsorption and coagulation method have proved to be more effective and efficient for water treatment[3]. With the advancement in Research, many natural materials are used in the form of Adsorbent. Adsorbents like Activated carbon, Zeolite, polymer materials, farming waste has considerably more potential than chemical adsorbent. This Paper includes application of dried banana peels for adsorption purpose of industrial water effluent. As Adsorption impacts much more in aspects of pH, contact time, adsorbent dose and temperature. Banana peels have potential as bio-adsorbent due to presence hemicellulose, cellulose and many other organic compounds. Banana plant has already been

used to reduce risk of diseases as it constitutes bioactive compounds like phenol, Carotenoids and Phytosterols[5]. Both peels and leaves of banana have shown applications as antioxidant ad biological properties[5]. The Bioactive compounds also exhibit properties to inhibit the growth of bacteria and fungi [5]. These constituents in banana peels have capacity to adsorb pollutants from effluents effectively. The effectiveness of banana peels may vary on the basis of type and concentration of pollutants present in effluents. Treated water effluent can be utilised further for non-potable purposes. In, Thermal power plants too these water can be used for cooling purpose. Studies have revealed that globally reuse of treated water for agricultural purposes varies from 1.5%-6.6%.

Materials & Methodology

Descriptive Process for Preparation of Banana Peels Powder

Fresh Banana peels were taken, cleaned & cut into small pieces.

These small pieces were further dried in Hot air oven at 150-200°C for about 3-4 hours.

After 2 Hours

After 4 Hours

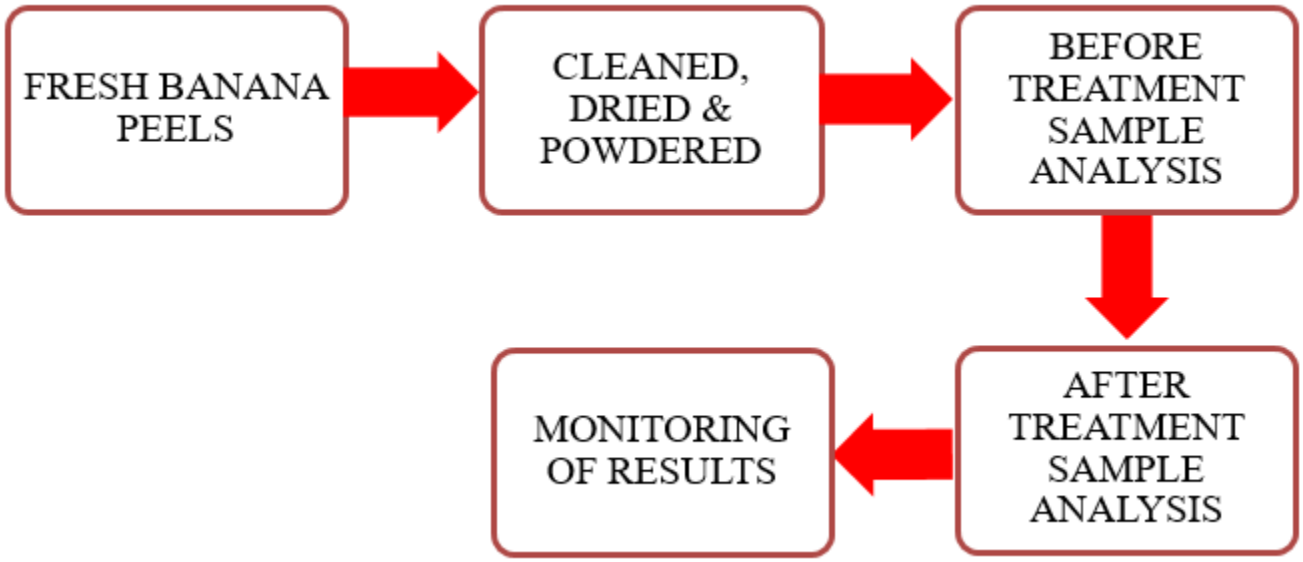
This Heating is continued until the peels get converted into Fine powder.

Peels were grinded to make fine powder so as to increase surface area for adsorption.

Procedure for Treatment of effluents using Banana Peels Powder:

1. Before Treatment with Peels Powder, Both Steel and Pharmaceutical samples were checked with respective parameters.
2. Then, 2.5% of Peels powder was added to both Sample No.1 & Sample No. 2.
3. Both the sample were sealed and kept aside for about 48 hours for better adsorption.
4. After 48 hours, both Samples were separated through filtration process.
5. Various parameters like pH, Conductivity, Chloride content, Fluoride content & Hardness were checked after treating with banana peels.
6. After treating with banana peels, signifying changes in parameters were obtained which are suitable for aquatic life & acceptable by ecosystem.

Flow Chart



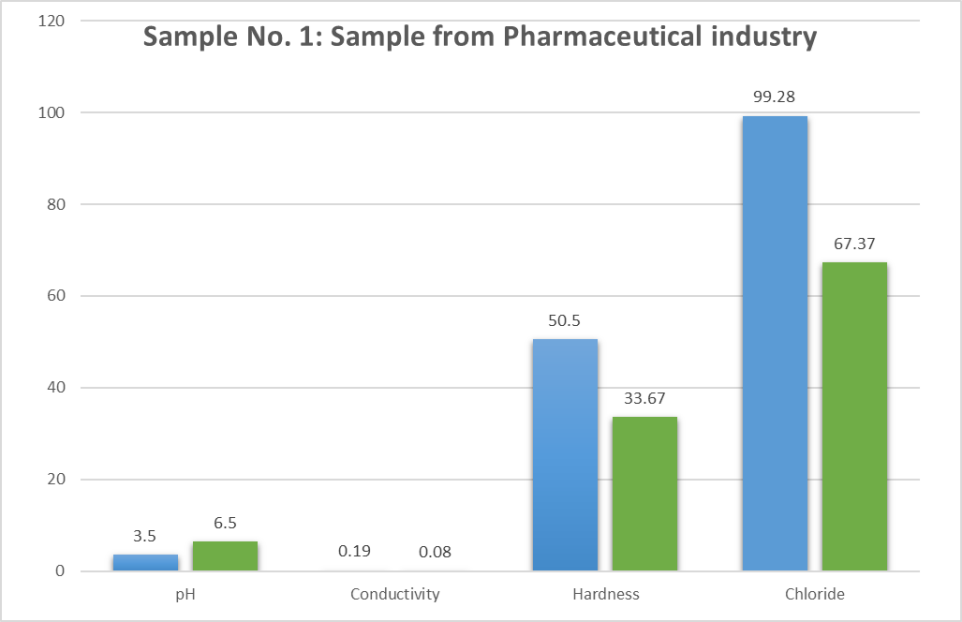
Results

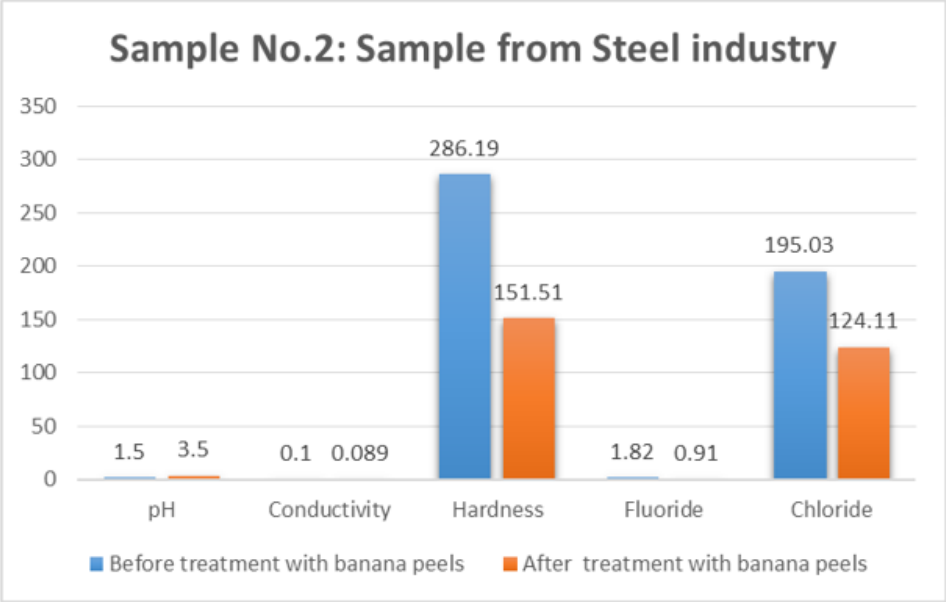
Table 1: Sample from Pharmaceutical industry

Parameters	Before treatment with banana peels	After treatment with banana peels
pH	3.5	6.5
Conductivity	0.19	0.08
Hardness	50.50 mg/ litre	33.67 mg/ litre
Fluoride	B.D.L.	B.D.L.
Chloride	99.28 mg/ litre	67.37 mg / litre

Table 2: Sample from Steel industry

Parameters	Before treatment with banana peels	After treatment with banana peels
pH	1.5	3.5
Conductivity	0.1	0.089
Hardness	286.19 mg/ litre	151.51 mg/ litre
Fluoride	1.82 mg/litre	0.91 mg/ litre
Chloride	195.03 mg/ litre	124.11 mg/ litre





Conclusion

1. Adsorption methods like Natural Organic adsorbent, Inorganic Adsorbent and Synthetic Adsorbent. Among these three, Natural Organic adsorbent proves to be more inexpensive, less hazardous and easy to adopt.
2. Banana peels are Natural Organic Adsorbent, which are considered as a waste after having banana but its peels can be utilised as a remedial for effluent treatment.
3. After Treatment, It was observed that the quality of water was improved remarkably.
4. Such method can be concluded as green method for effluent treatment.
5. The treated water can be conveniently use for non-potable purposes such as building construction, fire fighting, vehicle washing, Toilet flushing and also in thermal power plants.

6. The values of parameters after treatment with banana peels are acceptable by ecosystem & suitable to aquatic life.

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