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# Iron removal of water by using different parts of *Musa paradisiaca*

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**ABSTRACT**

In the present study, different parts of *Musa paradisiaca* were used for the purification of polluted water. It is inexpensive and safe to use.Banana stem juice was more effective than banana peel powder and fresh banana stem in reducing iron content and to maintain pH value of the water to the drinking water specification.

***Key words :*** *Iron removal, Musa paradisiaca, Bioremediation*

## Introduction

Heavy metals are major toxic pollutants which cause severe health effects on human. Bioremediation methods have attracted much attention due to its environment friendly nature. These include use of medicinal plants such as neem,tulsi, amlaci (Pompei *et al.,* 2020 and Beenakumari, 2017). Banana peel is a cheap alternative for biosorption of pollutants from contaminated water because of their low cost and easy availability Mohammed Nsaif Abbas, 2014). In this study, use of *Musa paradisiaca* parts such as banana peel powder, banana stem and banana stem juice for the purification of polluted water was explored.

## Materials and Methods

The contaminated water for the purification purpose was collected from a well. The adsorbent plant parts used for the purification purpose were banana peel powder, banana stem and banana stem juice. Fresh banana peels collected from domestic wastes were cut in to small pieces and were washed several times with tap water. Then it was dried in direct sunlight for about one week to remove the moisture contents from the peel. Then it was powdered and sieved in 10 US mesh. Banana stem used in this study was fresh and of small thin pieces. The banana stem juice was made by pressing small pieces of banana stem without adding water. The juice was sieved in 325 US mesh.0.1 g and 1 g of adsorbent material were added into beakers containing 200 mL of contaminated water sample each. The quality of water sample was analysed before and after the addition of the adsorbent material.

The pH of water samples at different temperatures were measured by using pH meter of Eutech. The conductivity and total dissolved solids (TDS) of the samples were determined with the help of conductivity meter of Systronics (307). The amount of iron in the sample was determined through titration method. All the reagents used were of analytical grade.

## Results and Discussion

The original contaminated water sample collected

**Table 1.** Quality of water with three different adsorbent material for a duration of 1 day.

| Parameters | Bananapeal powder | | Banana Stem | | Banana stem juice | |
|---|---|---|---|---|---|---|
| | 0.1 g | 1.0 g | 0.1 g | 1.0 g | 0.1 g | 1.0 g |
| pH | 6.61 | 6.51 | 6.64 | 6.53 | 7.08 | 7.01 |
| Conductivity (ppm) | 1.5 | 1.3 | 2.2 | 1.9 | 2.2 | 1.1 |
| TDS (ppm) | 1.7 | 1.6 | 2.5 | 2.0 | 2.0 | 1.9 |
| Temperature | 26.4 | 26.4 | 25.7 | 25.7 | 26.6 | 26.6 |
| Iron Content (ppm) | 0.102 | 0.100 | 0.084 | 0.081 | 0.025 | 0.011 |

from a well was analysed for determining its purity. Water sample has the pH 5.10, conductivity 1.4 mS, TDS 1.6 ppm and iron content 0.3612 ppm. The iron content was above the permissible level of drinking water (0.1 ppm) and pH value lies outside the specification limit of drinking (permissible level 6.5-8.5). The quality improvement of water sample with 0.1 g and 1 g dried banana peal powder, banana stem and banana stem juice were given in Table 1.

All the three adsorbent material were found to be good for reducing the iron content and maintain the pH value to the desired limit. Excellent result was produced by adding banana stem juice as the adsorbent material. The iron content of the water decreases from 0.3612 ppm to 0.011 ppm by using 1gm of banana stem juice as adsorbent material. The nitrogen, sulphur, and carboxylic acids present in adsorbent materialwere responsible for binding the metals present in water on adsorbent material. The pH of the water samples were within the specification limit by adding any of the three adsorbent materials to the water samples. Both TDS and conductivity of the water sample were increased after the experiment. Initially the water sample was slightly acidic. After treatment, it becomes neutral. The chemistry of coagulant depends on the pH during the flocculation/ coagulation process. The ferric ion formed during the oxidation makes complexes with the functional groups present in the adsorbent material and decreased the iron content. Even though, the conductivity and TDS increased with addition of adsorbent material but the values lies with the specification limit of the drinking water. In case of banana peel powder and banana stemas adsorbent materials, the water become more turbid and slightly blackish in colour. This may be due to the decaying of banana peel and stem material in water. Forbanana stem juice, no blackish colour was observed. Hence banana stem juice was found to be more efficient in removing iron content in water.

## Conclusion

*Musa paradisiaca* is a valuable sorbent material for water purification process. Different parts of *Musa paradisiaca* such as banana peel powder, banana stem and banana stem juice were used for water purification in this study. It is inexpensive and safe to use. It was found that banana stem juice was more effective than banana peel and banana stem in reducing turbidity and iron, thereby maintaining pH value of water to neutral level. While using banana peel powder and banana stem, the water become more turbid and slightly blackish due to the decaying of sorbent material. The iron content of the water decreases from 0.3612 ppm to 0.011 ppm by using 1 gm of banana stem juice as adsorbent material. The ferric ion formed during the oxidation makes complexes with the functional groups present in the adsorbent material and decreased the iron content. The conductivity and TDS increased with addition of adsorbent material but the values lies with the specification limits of the drinking water.

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