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# Removal of salicylic acid from aqueous solutions by magnetic biosorbent synthesized from pineapple peel

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**Abstract**
Pineapple fruit peel biomass has been use as biosorbent and magnetic biosorbent for removal from wastewater. The magnetic biosorbent efficiency of pineapple peel for salicylic acid was greatly enhanced after chemical oxidation probably due to introduction of carboxylic and hydroxyl groups onto the biosorbent surface. Magnetic biosorbent was prepared by using as an aqueous ferric/ferrous solution followed by NaOH treatment. Magnetic biosorbent effectiveness in removal of organic contaminants from water was evaluated using UV-vis spectroscopy.

**Keywords:** Adsorption, salicylic acid, UV-vis spectroscopy, pineapple peel

## 1. Introduction
Clean water is a most valuable and important natural resources. Wastewater pollution by heavy metal, organic contaminants is an emerging concern because of potential health impacts [1]. If concentrations of organic contaminants are above their permissible, inducing toxic effects in organisms. Salicylic acid is emerging contaminants and frequently used in different industries vis., pharmaceutical, cold chain, cosmetic industries. It is also used as an intermediate component in some dyes [2]. Different types of technologies such as membrane filtration, precipitation, electrochemical, ion exchange, reverse osmosis, reduction flocculation have been proposed by many scientific workers for removal of salicylic acid from wastewater [3]. But these technologies required high maintenance and operational cost and also generate toxic sludge [4].
Magnetic biosorbent is an emerging technology which utilize natural waste material from food industries to remove the organic contaminants from industrial wastewater. The aim of present study was to utilize waste material from food industries for removal of organic contaminants from industrial waste water. These biosorbent materials are less expensive, high bio removal efficiency, non-sludge generation, metal selective, possible ion recovery [5]. Total production of pineapple is 16 to 19 million tonnes worldwide. It can be consumption as fruit, salad, jam, juice from food processing industries [6]. Pineapple contains about 60% edible part and 40% waste Parts like peel which are consist of cellulose, pectin hemicellulose, lignin [7].

## 2. Material and Methods
### 2.1. Chemicals
All chemicals used were either analytical grade or GR grade and supplied by scientific fischer. The chemical used in this study were salicylic acid, ferric chloride, ferrous sulphate, hydrochloric acid, sodium hydroxide, ethyl alcohol.

### 2.2. Preparation of biosorbent and magnetic biosorbent
Pineapple peels produced from food processing industry were used for making adsorbents. The collected material was washed with distilled water for several time to remove the dirt particles. It was cut to small pieces and dry with tray dryer at 50-60 temperature for 8-9 hours. Now the dried materials were then crushed and sieve (320 micron) and stored in a bottle.
Biosorbent was magnetized using a chemical precipitation method) [8]. Briefly, 25g biosorbent was suspended in 250ml distilled water for one hour. Ferric chloride (9g in 650ml DW) and ferrous sulphate (10g in 75ml DW) solutions were mixed together and magnetic stirred at 60-70 temp for 30 minutes. Adding the biosorbent in mixed solution and slowly stirred for 30 minutes. Now 10M-NaOH, add drop wise into suspension until the pH raised to 10-11 and stirred for 60 minutes, the suspension was aged at room temp for 24 hours and after that

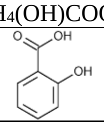
several time washed with DW followed by ethanol. Now sample was filtered and dried overnight at 50 in a hot air oven as illustrated in Fig.1.

**Fig 1:** Picture of magnetic biosorbent onto magnetic rod.

### 2.3. Adsorption studies

Batch adsorption studies were conducted to determine equilibrium time. A stock solution of salicylic acid was prepared by dissolving 1g of salicylic acid in 1L of distilled water. The dosage of magnetic biosorbent was decided by the requirement of the experiments. All those experiments were conducted for 24 hours at 30, 35 and 40 temperature, at the pH working solution (2-8) and at an agitation rate at constant speed of 150 rpm. After equilibrium, the sample was filtrates and analysed by a UV-visible spectrophotometer at 298nm (Lee *et al*., 2015) [9]. Percentage of adsorption and capacity of adsorption $q_e$ (mg/g) at equilibrium was calculated and properties of SA is listed in Table 1.

**Table 1:** Selected properties for SA

| Property | SA |
| --- | --- |
| Molecular formula | $C_6H_4(OH)COOH$ |
| Structure |  |
| Molecular weight(g mol$^{-1}$) | 138.12 |
| Solubility in water | 1g/L |

## 3. Results and Discussion

### 3.1. Effect of adsorbent dosage

The removal percentage of adsorbate is depends on the effect of adsorbent dosage. These were plotted on a graph against the adsorbent dosage (g/L). Adsorbent dosage varies from 1g/L to 7g/L keeping the concentration of salicylic acid fixed as shown in Fig.2. Therefore, adsorption rate increase when increase the adsorbent dosage, so it is only due to more vacant spots available for adsorption. During experiment, at a point, increases in adsorbent dosage did not show any change in adsorption, this point was 5g/L for salicylic acid, and it was optimum dosage.

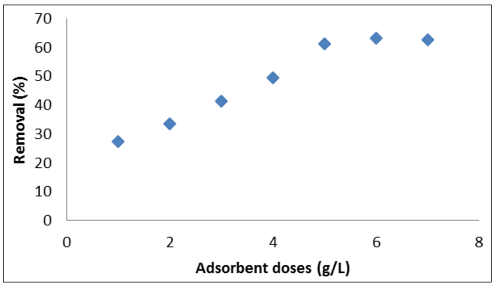



**Fig 2:** Effect of adsorbent dose on SA removal.

### 3.2. Effect of pH

Adsorption capacity depends on the different value of pH of a solution [10]. And also depends on plant material, this is only due to active group and bound present on them. Adsorption of salicylic acid on pineapple peel in pH range 2-8 as shown in Fig.3. It was adsorption increase up to pH 3.8, while further increase the pH range from then decrease the adsorption capacity. Graphs (2) show the pH range against the removal percentage of salicylic acid.

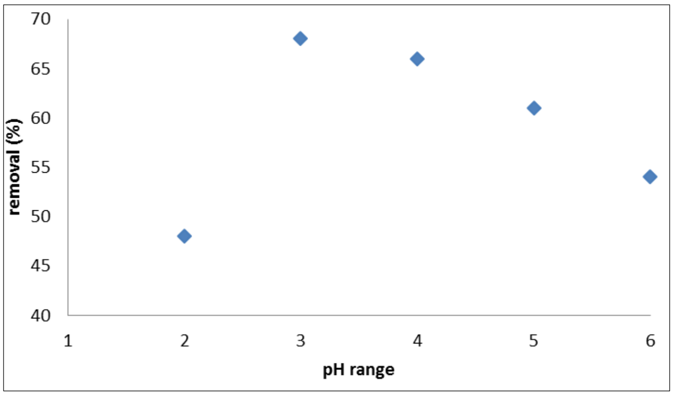



**Fig 3:** Effect of pH on SA removal.

### 3.3. Effect of contact time

Fig-4 show the effect of contact time on adsorption. In this figure show the removal of salicylic acid increased up to 15hr and stop completely after 21 hrs of contact. During early stage of adsorption time, the more number of vacant site are available on the surface of pineapple peel for removal of adsorbate. At the beginning time, more surface area was available while as the time goes on, the removal capacities decreased. This is only due to the mesopore which are filled up after more contact time and subsequently resist diffusion of salicylic acid [11].

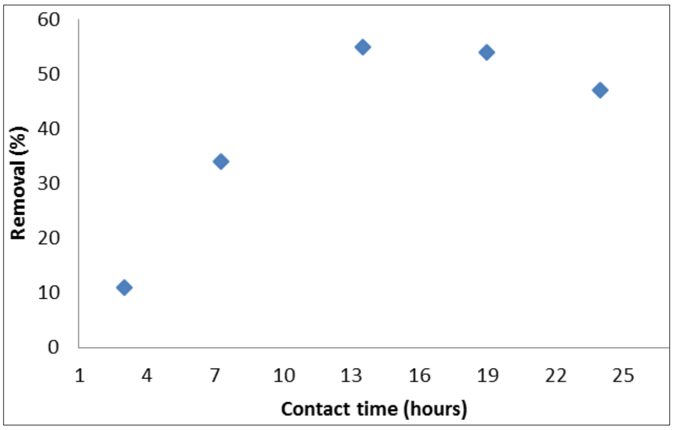



**Fig 4:** Effect of contact time on SA removal.

### 3.4. Effect of temperature

Experiment was carried out at 30 °C 35 °C and 40 °C by varying initial concentration between 5ppm to 30ppm for optimum conditions. Increase in the temperature and initial concentration of adsorbate correspondingly increased the equilibrium capacity. In the case more removal of salicylic acid was done between at 30 °C to 35 °C.

## 4. Conclusion

The pineapple peel waste were modified as a magnetic biosorbent for removal of salicylic acid from wastewater.

Adsorption equilibrium increased with increasing initial magnetic biosorbent concentration, contact time and pH solution. The pineapple peel will be a promising, economical, alternative, and cost effective magnetic biosorbent for removal of organic contaminants from wastewater.

**5. Acknowledgement**
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**6. Reference**

1. Karunanayake AG *et al.* Salicylic Acid and 4-Nitroaniline Removal from Water Using Magnetic Biochar: An Environmental and Analytical Experiment for the Undergraduate Laboratory. J Chem. Educ. 2016; 93:1935-1938.
2. Pathak PD, Mandavgane SA, Kulkarni BD. Utilization of banana peel for the removal of benzoic and salicylic acid from aqueous solution and its potential reuse. Desalin. water Treat, 2015, 1-13.
3. Panneerselvam P, Norhashimah M. ATK. Magnetic nanoparticles (fe3O4) impregnated onto tea waste for the removal of nickel (II) from aqueous solution. J Hazard. Mater. 2011; 186:160-168
4. Panda G, Das S, Bandopadhyay TS, Guha AK. Adsorption of nickel on Husk of Lathyrus sativus: behavior and binding mechanism. Bio interfaces, 2007, 135142.
5. Tunali S, Akar T. biosorption properties of Botrytis cinerea Biomass. J Hazard. Mater. 2013; 11:1164-1170.
6. Siva DIS, Nogueria GDR, Duzzioni AG, Barrozo MAS. Change of antioxidant constituents in pineapple (*Ananas comosus*) residue during drying Process. Ind. Crop. Prod. 2013; 50:557-562.
7. Hu X, Hu K, Zeng L, Zhao M, Huang H. Hydrogels prepared from pineapple peel cellulose using ionic liquid and their characterization and Prymary sodium Salicate release study, Carbohydr. Polym. 2010; 82:62-68.
8. Sharma R, Sarswat A, Pittman CU, Mohan D. Cadmium and lead remediation using magnetic and non-magnetic sustainable biosorbents derived from Bauhinia purpurea pods. RSC Adv. 2017; 7:8606-8624.
9. Lee XJ, Chemmangattuvalappi N, Lee LY. Adsorptive removal of salicylic acid from aqueous solution using new Graphene- based Nano sorption. Chem. Eng. Trans. 2015; 45:1387-1392
10. Castro RSD *et al.* Banana peel applied to the solid phase extraction of copper and lead from river water: preconcentration of metal ions with a fruit waste, Ind. Eng. Chem. Res, 2011, 3446-3451.
11. Achak M, Hafidi A, Quazzani N, Sayadi S, Mandi L. Low cost biosorbent banana peel for the removal of phenolic compounds from alive mill wastewater: kinetic and equilibrium studies. J Hazard. Mater. 2009; 166:117-125.