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Adsorption of Cu ions from Wastewater by Natural Medicinal Bioadsorbent

Prachi N. Raut[1], Sulekha R. Gotmare[2]
[1]*Ph.D Scholar, Department of Analytical Chemistry, S.N.D.T. Women's University, Santacruz (W), Mumbai, 400049, Maharashtra, India*
[2]*Associate Professor, Department of Analytical Chemistry, S.N.D.T. Women's University, Santacruz (W), Mumbai, 400049, Maharashtra, India*

Abstract: ***The utilization of activated biocarbon as adsorbents offers an attractive option in contrast to the conventional chemical materials utilized in water and wastewater treatment. Especially Cadmium, Lead, Chromium, Nickel and Copper are the most toxic metals of across the board in industrial wastewater. Henceforth, treatment water and wastewater and conceivable evacuation of toxic pollutants are basic before discharge into receiving environmental frameworks. There are number of adsorbents are utilized in water treatment process in the flow investigation. Biocarbon made from medicinal plant Tridax procumbens is used for adsorption of copper with different parameters like pH, Adsorbent dose, Contact time.***
Keywords: Tridax procumbens, Biocarbon, Heavy metals, Pollution

I. INTRODUCTION

Water pollution brought about by heavy metals is a serious issue and has gotten worldwide attention. Water containing heavy metals utilized for drinking purpose, if not treated appropriately can make major medical issue individual and harm to the environment. A high concentration of heavy metals is toxic and due to their non-biodegradability, they caused different maladies and disorders. Copper exists in both free-state and hydroxyl forms. Free copper (II) ion and mono-hydroxyl copper (II) are viewed as exceptionally toxic (Malairajan Singanan and Sathianesan Starlin Shyla (2017)). Copper mining, manufacture of Brass, electroplating industries and use of copper containing compounds caused copper pollution (Nurchi V.M et al, 2008). Copper exposure can prompt cerebral pains, loose bowels, sickness and vomiting at low portions. Increased portions of copper can result in gastrointestinal bleeding, hepatocellular toxicity, renal disappointment, Liver damage, Wilson disease, Insomnia (Ashutosh Tripathi et al, 2015).

Several conventional methods exist for the expulsion of heavy metal pollutants from wastewater. These methods include precipitation, electroplating, chemical coagulation, ion-exchange, film separation, and electro kinetics. In any case, these methods often incur high operational expenses, long treatment time, and complex (M. Singanan et al, 2008). Adsorption is exceptionally promising method for expulsion of different pollutants from wastewater. It is ecofriendly, inexpensive, safe, ease of adsorbents, effortlessness and high expulsion effectiveness (A. I. Okoye et al, 2010) (D. S. Malik et al, 2016). In order to make this method more environment friendly, well-disposed and efficient, regeneration of adsorbent is important viewpoint. Biosorption is proper process to treat wastewater with low concentration of heavy metals (M. Singanan, 2011). The main point of the present research work is to utilize a novel biomaterial for the expulsion of copper metal from synthetic wastewater.

Tridax procumbens: It is commonly known as coat buttons. In India this plant used from ancient times to treat diabetes, Jaundice, healing of wounds, inflammation, insect repellent, diarrhea, hair loss (Samantha Beck et al, 2018).

II. MATERIALS AND METHOD

1) Preparation of biocarbon: Tridax procumbens entire plants collected and washed multiple times with demineralized water to expel soil. Then this biomass was dried under sunlight for 5-6 days. Crisped biomass squashed in mortar-pestle to make powder and kept in 1:1 HCl for 3 hrs for activation. Resulting item kept in air-dried oven at 200ºC for 2 hrs pursued by washing multiple times by demineralized water to expel excess acid then dried at 120ºC. Resulting dark colored substance store in sealed container for further use (Prachi Raut et al, 2019).
2) Preparation of synthetic wastewater: stock solution of Cu is set up from $CuSO_4$ and from which working standard of 100-ppm solution is readied. UV Spectrophotometer used to measure absorbance of solution before and after adsorption of heavy metals by biocarbon.

The percentage removal of copper was calculated as:

1) **%** Removal = Co-Ct × 100/Co
2) Where, Co: Initial Copper concentration
3) Ct: Copper concentration at equilibrium after treatment with adsorbent

III. RESULT AND DISSCUSSION

1) *Effect of pH of Solution:* Biomass is consider as complex ion exchanger as it has active sites for binding metal ions (T. Karthika et al, 2010). The solution pH is one of the parameters with greatest influence on the adsorption of metal ions and organic compounds on activated carbon as the ionic activity assumes the major job in metal take-up this is because the hydrogen ion competing with the positively charged metal ions on the active sites of the adsorbent. (M. Rafatullah at al, 2009). Maximum adsorption was observed at pH 4.

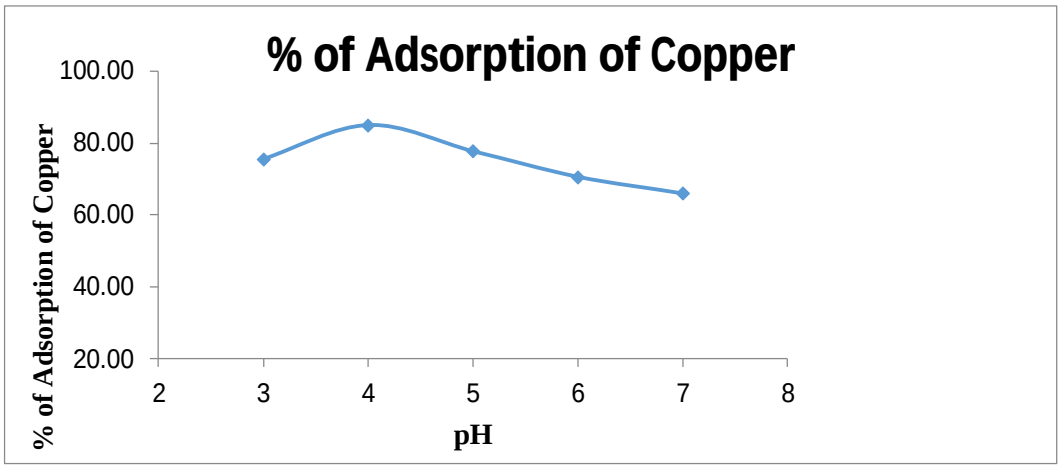


Fig 1. Effect of Ph

2) *Effect of Contact Time:* For the metal ions present in the synthetic wastewater, there was a progression in the rate evacuation of metal ions present in the synthetic wastewater with time. Rate of Cu ions removal increased with an increase in contact time before equilibrium is reached (Saifuddin M. Nomanbhay et al, 2005) Maximum adsorption was observed at 120 minutes.

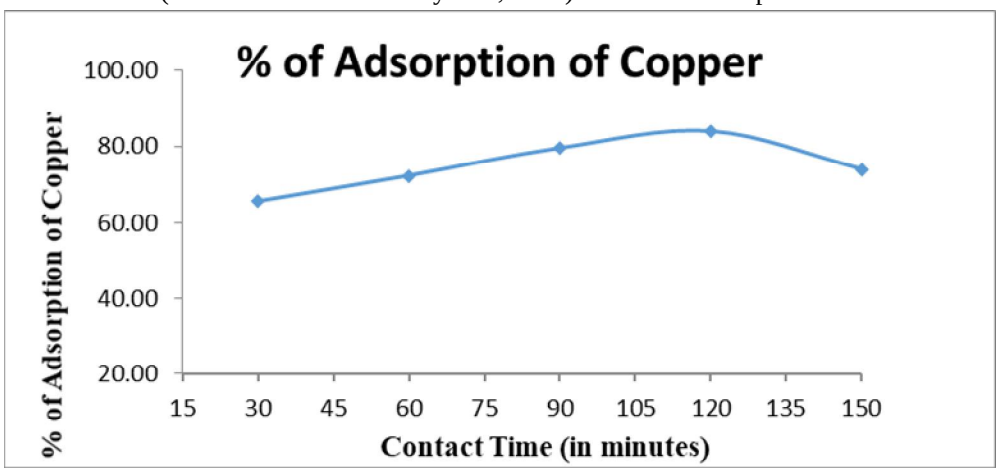


Fig 2. Effect of contact time

3) *Study of Effect of Adsorbent Dose:* It is important to fix the measure of the activated biocarbon to plan the ideal treatment frameworks and for a fast reaction of the analysis. There are large vacant sites for adsorption at initial stage but after time passes attraction remaining vacant site was difficult because repulsive forces between Cu ions and liquid phase (Malairajan Singanan, 2015). Maximum adsorption was observed to be at 2.5 g/100ml.

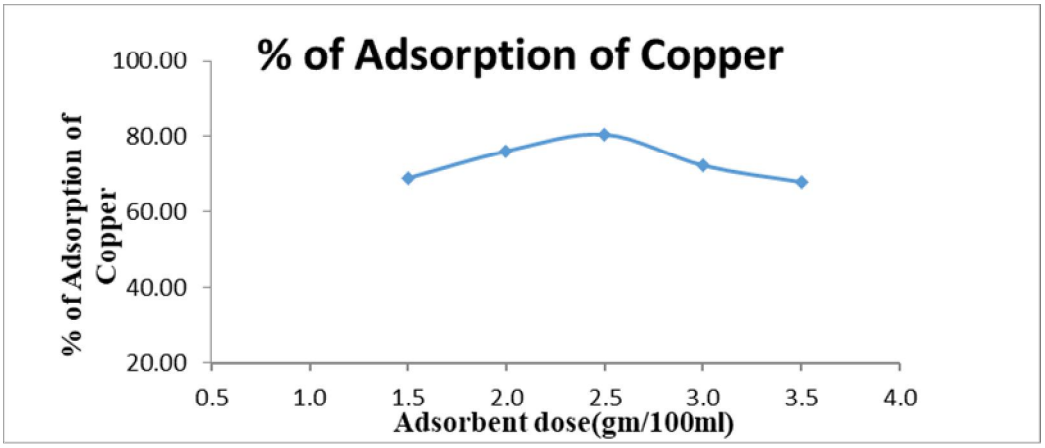


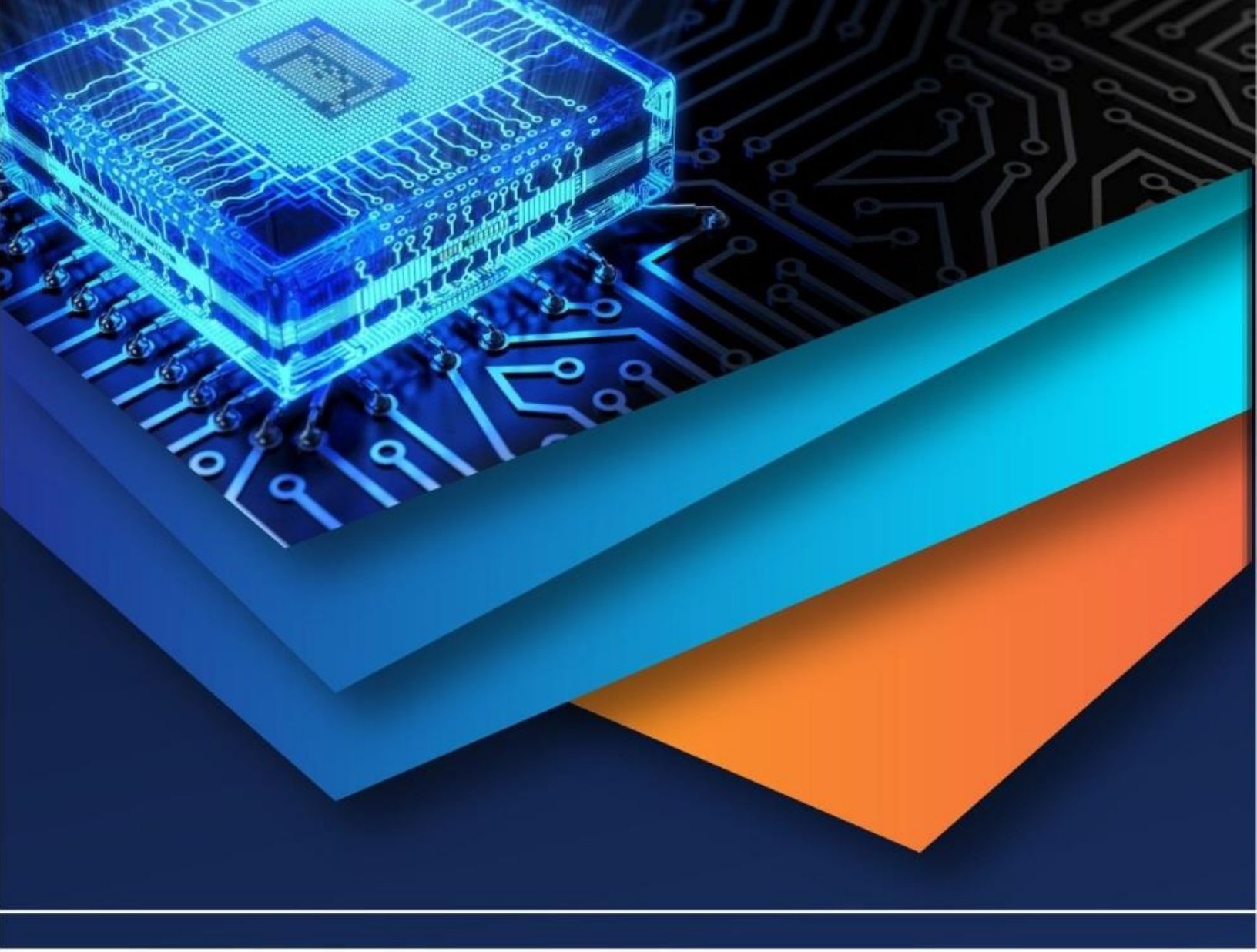
Fig. 3 Effect of adsorbent dose

IV. CONCLUSION

The sorption limit of the adsorbent relies on the pH of the solution, measure of biocarbon portion, concentration of metal ions and contact time. It could be inferred that biocarbon prepared from Tridax procumbens plant in the present examination is promising as far as both financial and environmental perspectives and could improve the adsorption economy for the expulsion of toxic heavy metals like Cu (II) and other dangerous materials from wastewaters. Appreciable adsorption of Copper by Biocarbon of Tridax procumbens is at pH 4, contact time 120 minutes and 2.5 gram adsorbent dose.

REFERENCES

[1] A. I. Okoye et al, "Lead removal from wastewater using fluted pumpkin seed shell activated carbon: Adsorption modeling and kinetics", Int. J. Environ. Sci. Tech., 7 (4), 793-800, September 2010
[2] Ashutosh Tripathi et al, "Heavy Metal Removal from Wastewater Using Low Cost Adsorbents", J Bioremed Biodeg 2015, 6:6
[3] D.S. Malik et al, Determination of Adsorption Isotherms and Kinetic Parameters for Biosorption of Cu(II) on Raw Pine Needles: An Experimental Study, International Journal of Innovative Research in Science, Engineering and Technology,. 5[10], 17755-17763, 2016
[4] M. Rafatullah et al, "Adsorption of copper II, nickel II, Lead II ions from aqueous solutions by meranti sawdust", Journal of Hazardous Materials, 2009, 170, 969-977
[5] M. Singanan 'Removal of lead(II) and cadmium(II) ions from wastewater using activated biocarbon" Science Asia 37 (2011): 115–119
[6] Malairajan Singanan and Sathianesan Starlin Shyla (2017) "THE ROLE OF BIOCARBON ON THE REMOVAL OF Cu (II) IONS FROM SYNTHETIC WASTE WATER", European Journal of Environmental Ecology. 2017:4(1): 1-6.
[7] Malairajan Singanan, "Biosorption of Hg (II) ions from synthetic wastewater using a novel biocarbon technology", Environ. Eng. Res. 2015; 20(1): 33-39
[8] Nurchi V.M and Villaescusa I. (2008), "Agricultural biomasses as sorbents of some trace metals", Coordination Chemistry Reviews, 252 (10): 1178 – 1188
[9] Prachi N. Raut et al, " Use of Activated Biocarbon for Water Treatment- Adsorption Process", International Journal of Innovative Research in Science, Engineering and Technology, 8(10), 10539-10543, 2019
[10] Singanan, M., Singanan, V. and Abebaw, A. (2008). Biosorption of Cr (III) from aqueous solutions using indigenous biomaterials. International journal of Environmental Research, Vol.2: 177-182.
[11] Saifuddin M. Nomanbhay et al, "Removal of heavy metal from industrial wastewater using chitosan coated oil palm shell charcoal", Electronic Journal of Biotechnology, Vol.8 No.1, Issue of April 15, 2005
[12] Samantha Beck et al, A Review of Medicinal Uses and Pharmacological Activities of Tridax Procumbens (L.), Journal of Plant Studies; Vol. 7, No. 1; 19-35, 2018
[13] T. Karthika, A. Thirunavukkarasu and S. Ramesh (2010) "BIOSORPTION OF COPPER FROM AQUEOUS SOLUTIONS USING TRIDAX PROCUMBENS", Recent Research in Science and Technology 2010, 2(3): 86–91



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