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Spent Tea Biochar Production: Characterization and Environmental Applications

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INTRODUCTION & AIM

The world suffering from a myriad of environmental issues.

solid wastes management

water scarcity

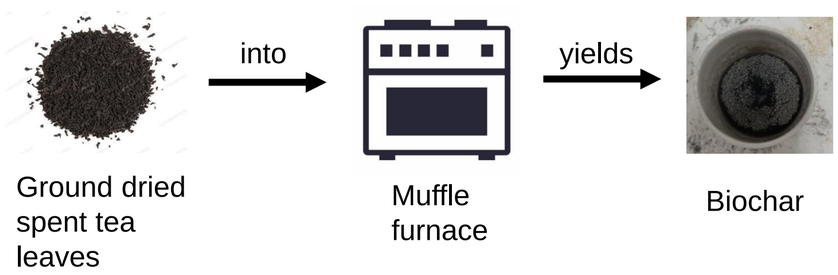
water/soil pollution and governance

In Lebanon, the most of rural municipalities dump the wastes into valleys or leave them untreated until people burn them themselves. Simultaneously, water resources in Lebanon are suffering from pollution induced by urban as well as industrial wastewaters.

This study aims to valorize tea waste and turn it into biochar which is a more valuable product. The produced biochar would be characterized and tested for the adsorption of three different organic pollutants: methylene blue, amoxicillin, and diclofenac.

METHOD

I. Biochar Preparation

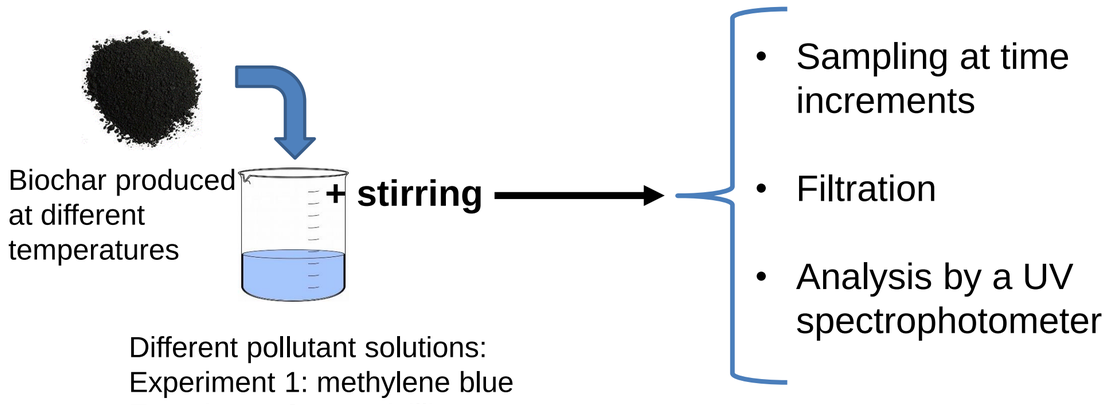


II. Biochar Characterization

Different characteristics of biochar were studied using different methods, after calculating the yield:
Ash content was calculated after calculating the yield at 700ºC.
pH was obtained using a pH-meter.
Electrical conductivity was obtaining using an EC meter

III. Adsorption Experiments

At room temperature,



RESULTS & DISCUSSION

The biochar yield ranged from 48% to 30%, decreasing with temperature increase. The ash content was 12.5%. The pH values ranged from 7.46 to 10.45, increasing with temperature increase. The electrical conductivity values ranged from 4.8 to 13.6 mS/cm, increasing with temperature increase as well.

For methylene blue, the biochar type was kept the same, but the methylene blue concentrations differed. Biochar was able to adsorb all of the methylene blue at concentrations 150 and 100 ppm after an hour of contact.

For amoxicillin, biochar was able to adsorb about 80% of the antibiotic after an hour.

For diclofenac, two biochar types were used and adsorption was measured as a function of time, and the biochar produced at 550ºC performed better than that produced at 350ºC. It should be noted that after an hour 53% of the drug was adsorbed, with untreated biochar.

It should be noted that this research was limited by the un-availability of advanced detection methods like HPLC, FT/IR and GC/MS, which were mostly used in the literature to measure the adsorption capacities of biochar. This has steered the experiments in the direction of adding dyes or using specific pH levels (highly acidic or highly basic) to ensure the conditions for spectrophotometric detection.

CONCLUSION

Based on these results, untreated tea biochar is a good adsorbent of organic persistent molecules. Thus, the valorization of tea waste as biochar for wastewater treatment is a promising method especially with the encountered problems of water pollution in Lebanon.

FUTURE WORK / REFERENCES

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