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# MOST EFFICIENT PART OF A PLANT FOR BIOCHAR PRODUCTION

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## ABSTRACT

***The aim of the study was to examine the efficiency of different bio char parts as an adsorbent to remove the organophosphate pesticide (malathon) from water. Three types of adsorbents, namely water hyacinth leaves, water hyacinth stem, water hyacinth root were prepared.***

***Biochar is a powder material having carbon-rich form of charcoal derived by pyrolysis process at temperatures ranging from 300$^{o}$C to 800$^{o}$C under oxygen-limited conditions. Biochars shown effectiveness at removing heavy metals and organic pollutants from wastewaters through a process known as adsorption. Biochar produced from water hyacinth (Eichhornia crassipes) has been demonstrated to be a very effective adsorbent for removal of some heavy metals and pesticide and also as a means of control for this highly invasive species.***

***In this study we find out which part of a plant is best biochar which will adsorb more pesticide from water using HPLC.***

## INTRODUCTION

Because of increases in population, and industrialization, water contamination has increased globally. Water can be contaminated by the disposal of toxic metals from industries, pesticides and by other pathogens. Moreover, rapid industrialization to ensure self- sufficiency , the quality of water resources is under serious threat. These type of pollutants are very dangerous for all living beings and they can cause negative effects on the ecosystem. Therefore, there is a need to focus research on the preservation of water quality.

Biochar is a carbon-rich form of charcoal derived through pyrolysis at temperatures ranging from 350 C to 800C under oxygen-limited conditions .The preparation and its characterizations are best explained in reference [2]. Biochar is an adsorbent widely used to remove contaminants from polluted water [2]. Some studies have reported higher potential for heavy metal adsorption from biochars derived from rice husks , banana peels, and other waste feed- stocks when applied to wastewaters. For enhance the sorptive capacity of biochar, some of the researchers used magnetic modification toincrease the surface area and pore volume , or alkaline treatment that impregnates biochar with metal ions . Feedstock composition, the pyrolysis temperatures, and residence time are strongly influences the physio-chemical characteristics of biochar,including the adsorption capacity for heavymetals Biomass conversion technologies Biochar applications Modified biochars for water filtration are well explained in reference [3].

## BIOCHAR

Biochar can be considered as a type of heterogeneous mixture of solid residues remaining after pyrolysis, which comprises the range of char, charcoal, graphite, ash, and soot. The original biomass is various type of organic materials such as plant residues, sludge, animal manures,etc. From the chemical point of view, biochar has a high content of recalcitrant aromatic forms of organic carbon (two fold higher carbon content than the feedstock) characterized by irregular- arranged rings of six carbon atoms linked together without oxygen or hydrogen [8]. Because of the high interactions between biochar and the compositions of soil and/or water(e.g.,ions,mineral particles, and organic materials) and also the slow rates of biochar degradation , the carbon of biochar can not be easily be returned to the atmosphere as $CO_2$ also under favorable environmental and biological conditions and can remain in the environment for more than thousand years [11]. Annual atmospheric flux of $CO_2$ and consequently decreasing the earth warming. Interests in the application of biochar are heightened by its potential co-benefits .In agriculture ,soil application of bio char as a conditioner enhances soil quality physically, chemically, and biologically. Bio char stabilizes or even increases soil organic matters, reduces soil deterioration, retains water and nutrients, and releases them in the soil slowly improving crops yield and quality [9]. Some bio chars have high pH can act as liming agents to increase the pH in acidic soils. This soil amendment increases the micro elements bio-availability and consequently prevents these nutrients deficiencies in plants [10]. It can also

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stabilize heavy metals and decrease their release at levels toxic to the soil.

Water hyacinth biochar has recently shown that it is potential for metal adsorption from industrial, agricultural, and household wastewaters evaluated biochar derived from water hyacinths, generated at four different pyrolysis temperatures, as a method for adsorbing element cadmium from the aqueous solution. In their study, maximum cadmium removal (70 mg g-1) was achieved at a pyrolytic temperature of 450$^{o}$C in a nitrogen gas environment. Alginic acid and magnetic modification, has been used to improve heavy metal removal efficiency and to generate a higher density particle. Alginate encapsulation results in the surface functional groups that bind with cations, such as heavy metals, through ion exchange of the crosslinking cations . Significant research has been conducted on the use of alginate capsules or gels to remove pollutants from wastewater. Specifically, alginate-based composites have been used to remove Cd2 from aqueous solutions with sorption capacities ranging from 9.3 to 191mg-1 under different temperature and pH conditions . The reusability of biochar-alginate capsules (BAC) through consecutive adsorption-desorption cycles was evaluated and demonstrated that the BAC can be used up to 10 times while maintaining almost 70% of the initial adsorption capacity.

## PROCEDURE OF BIOCHAR PRODUCTION

First collect the water hyacinth and clean it using distilled water then allow to dry in sunlight. After drying one whole day sunlight separate the plant into 3 parts such as leaves, stem and root. Again dry these in sunlight for 1 day. Then reduce its size and place in oven for one day at 60 degree Celsius and then powder it and pyrolysis. Mark these 3 type biochar separately.

**Fig 1.1 Water Hyacinth (WH)**

**Fig 1.2 Drying in Sunlight**

**Fig 1.3 Leaf**

**Fig 1.4 Stem**

**Fig 1.5 Root**

**Fig 1.6 Powder Form**

**Fig 1.7 Biochar**

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## BEST BIOCHAR SELECTION

Add 10 mg of leaf biochar into known concentration of pesticide solution (water and 0.1 ppm melathion solution). Mix well and place in magnetic stirrer about 2 hours. Then filter the solution and finding the remaining concentration of pesticide in the solution using HPLC. Then finding the percentage removal of pesticide. Repeat the procedure using stem and root and finding the percentage removal of pesticide.

## RESULTS

Biochar of water hyacinth leaves, water hyacinth stem, water hyacinth root are prepared.

The removal percentage of pesticide from water by leaf of the water hyacinth biochar is 62%. The removal percentage of pesticide from water by stem of water hyacinth biochar is 65% and the percentage removal of pesticide from water by root biochar is 71%.

## CONCLUSION

Which biochar adsorb best is selected using HPLC. Then concluded that the biochar of root of water hyacinth will absorb more. It absorb almost 71% of pesticide from water.

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