TITLE:
DEVELOPMENT OF BIOCHAR: PYROLYSIS FROM COCONUT SHELL

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2023

ABSTRACT

The term "biochar" describes a type of charcoal made from organic material, usually leftover food, forestry byproducts, or agricultural waste. Pyrolysis, a process that includes heating organic material without oxygen to produce a carbon-rich substance, is how biochar is made. Due to its potential advantages in terms of sustainability and environmental preservation, biochar has drawn attention recently. For instance, it has been demonstrated to have advantageous impacts on soil fertility, including better nutrient availability and greater water retention. By storing carbon in soil for hundreds or even thousands of years and lowering the quantity of carbon dioxide released into the atmosphere, biochar can also assist to slow down climate change. Biochar has a variety of potential use beyond its advantages for soil and the environment, such as as a fuel source, a water purification filter, and an ingredient in the manufacture of fertilisers and other agricultural goods. Even though biochar has many potential advantages, there is still much that is unknown about it, including the ideal circumstances for its creation, the best techniques for putting it into soil, and the long-term effects of employing biochar in farming and other applications. To fully appreciate the potential of this fascinating substance and to decide how to effectively utilise its advantages for the benefit of the environment and human health, more research is required. Despite these doubts, the use of biochar is gaining ground quickly as a way to enhance soil quality and lessen the effects of climate change.

TABLE OF CONTENTS

CHAPTER ONE
BACKGROUND

1.1 Introduction

Biochar is a charcoal-like substance that is produced by heating organic matter in the absence of oxygen. This process, known as pyrolysis, results in a highly porous and stable carbon material that can be used for a variety of purposes, including soil amendment, water purification, and carbon sequestration.

Use of biochar as a soil amendment is among its most promising uses. By enhancing water and nutrient retention, minimising nutrient leaching, and encouraging the development of beneficial microbes, biochar may be put to soil to increase soil fertility. Studies have demonstrated that biochar may increase crop yields in a number of agricultural settings, including agroecosystems, tropical rainforests, and temperate forests. Additionally, by storing carbon in soil for hundreds to thousands of years, biochar can aid in reducing the effects of climate change. Biochar can increase soil structure, which in turn increases water-holding capacity, in addition to increasing soil fertility. This can help crops flourish in places that are prone to droughts, as well as cut down on water usage and erosion. The use of biochar as a substrate for microorganism growth can also aid to enhance soil health.

The capacity of biochar to absorb carbon and lower greenhouse gas emissions is another advantage. Climate change can be lessened by using biochar, a stable form of carbon that can stay in soil for hundreds to thousands of years. Additionally, the creation of biochar can lessen emissions related to the creation of synthetic fertilisers as well as the release of greenhouse gases from the burning of biomass.

Despite the potential advantages of biochar, it is critical to remember that further study is still required to completely comprehend its impacts on soil characteristics and crop growth. Concerns have also been raised concerning the possibility that biochar would have a deleterious effect on soil microbes and biodiversity. Overall, biochar is a promising soil additive that may increase soil health and fertility while also assisting in the fight against global warming. The usefulness of biochar as a soil amendment or water purifier, however, relies on its characteristics, including its specific surface area, pore volume and pore size distribution, and chemical makeup. It is crucial to keep in mind that not all biochars are made equal. To guarantee the best outcomes, it is crucial to choose the kind of biochar and the application technique carefully. Store biochar away from direct sunlight in a cold, dry environment.(Wang et al., 2022)

1.2 Literature Review

1.2.1 What Is Biochar?

Biochars are carbon-rich compounds that are primarily created by pyrolyzing biomass at low temperatures (between 300 and 700 °C) with little oxygen (Lehmann and Joseph 2009). Biomass, the raw material used to make biochar, is typically produced from municipal garbage, green and food waste, as well as agricultural and forestry waste products. The production of biochar from these materials transforms carbon (C) into a recalcitrant form that may persist for hundreds to thousands of years (Spokas 2010; Kuzyakov et al. 2014; Wang et al. 2016), indicating that biochar may help mitigate climate change as one of the few negative greenhouse gas emission technologies with concomitant benefits for sustainable development (Tripathi et al. 2016). (Smith et al. 2019). Biochars have been demonstrated to improve environmental quality over shorter time scales (e.g., one to several years) by sorbing heavy metals and organic contaminants (e.g., Sigua et al. 2019; Cui et al. 2019; Novak et al. 2019a), positively affecting soil water relations (e.g., Lentz et al. 2019; Kammann et al. 2011), reducing greenhouse gas emissions (e.g., Fu Although choosing the right feedstock may make the manufacture of biochars for the aforementioned uses seem straightforward, producing biochar for environmental gains is complicated. The final biochar product can be significantly influenced by the feedstock choice, pyrolysis temperatures, and pyrolysis types (Cao et al. 2017; Cha et al. 2016). It's crucial to comprehend how initial feedstock qualities affect final biochar attributes in terms of feedstock.

1)Feedstocks have been demonstrated to have a significant impact on the development of biochars with substantially different chemical characteristics (Funke and Ziegler 2010; Novak et al. 2019b).

2)Biochars with different chemical and structural qualities can be produced using different pyrolysis temperatures and production methods.

3)In comparison to quick pyrolysis, slow pyrolysis typically results in biochars with higher N, S, accessible P, Ca, Mg, surface area, and cation exchange capacity