Research Article

Corn Waste with Addition of Biochar as New Alternative of Soil Media

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Abstract: *Corn waste is now an alarming environmental issue. Every year, an estimated 300,000 metric tons of corn waste was produced in Malaysia. Most of the waste is either landfilled or burned which releases methane, a potent greenhouse gas. Corncobs and husk as organic planting medium are a potential solution to this issue. It is abundant, easily obtained and offers multiple benefits as planting media. They are light, porous, absorbent and aid in soil structure as well as holding nutrients that are good for plants. It helps to minimize the amount of waste and improve soil quality and crop yields. Furthermore, using corn waste might be a cost-effective strategy to boost crop yields and have great economic potential as planting media. The organic planting industry is growing and there is rising demand for sustainable and cost-effective alternatives for plant media. To satisfy the need, corn waste is a potential choice. Our product is made of corn, and it went through a few processes to become a soil media such as grinding and drying process. With the addition of biochar, we also provided steps of making it such as baking process until it forms into carbon rich charcoal. To compare our product with coco peat, we raise an argument on the amount of carbon dioxide that was produced and preserving environment quality.*

Keywords: corn; waste; cost-effective; sustainable; plant media; biochar.

1. INTRODUCTION

The lack of improvement in corn waste management in Malaysia becoming the main concern as the country has spent a lot of money and time importing corn from other countries, but only using a small part of the corn to be commercialised. The corn waste will be thrown away without any proper management. According to the article, it shows that Malaysia only produced 58,000 metric tons of corn in 2017 compared to what was demanded by Malaysian which is 3.7 million metric tons with a value of RM 3 billion (USD 737 million) (Rosali, 2020). Following the prior trend, Malaysia only produced 60,000 metric tons of corn in 2022 and 2023 respectively (USDA, 2023). Most of the corn available in Malaysia was imported from Argentina and Brazil. Due to the nation's substantial reliance on import, it has led to a drastically risen in corn waste in our country. In Malaysia, over 1.2 million metric tons of

agricultural waste was produced which all end up either landfilled, burned or used for livestock feed (Agamuthu, 2009). Methane, a strong greenhouse gas is released into the environment when the corn waste is burned or dumped in the landfill. This gas has a significant impact to climate change as it retains the heat 25 times more effectively compared to carbon dioxide. Apart from that, agriculture waste management has become an economic burden for the country as Malaysia spends so much money every year to cover the cost of landfilling and burning corn waste. It would be better for such an amount of money to be spent and distributed on other priorities such as agricultural development, food security project or technologies. In this project, the aims are to reduce corn waste in Malaysia by developing new soilless media that later can be used in the agricultural sector and helps farmers to find a new alternative for cocopeat or peat moss. Hopefully this innovation, can reduce the amount of corn waste, providing new alternatives to crop media and increasing the production of corn in Malaysia.

2. METHOD & MATERIAL

For the innovative product, corn waste will be used which is consisting of corn cob and husk from the food manufacturers. The cob will be used as a base for the media and the husk become raw material for biochar that later will be used in the production of Biochar Corn Soil (BCCS). Making the product is amazingly simple. Firstly, the corn waste must be boiled or cooked for over 100 °C to soften the cob and stem and remove any microorganisms as well as proteins and fibre from the cob. Then, the waste will go through the air drying process to remove all moisture inside the cob. This process helps ease the chopping and grinding process and prevents the waste from becoming mushy and moist which will cause mould growth on the media later.

After it is completely dried, the corn cob will go through the chopping and grinding process to get a fine texture by using a feed grinder. A fine texture helps the base to have good water retention. The base will be mixed with biochar made from the husk and other corn waste to enhance the nutrient availability in the corn soil media. Finally, the media is prepared for the packaging process and ready to be sold and used by the customers.

For biochar, the husk will be baked slowly until it becomes carbon-rich charcoal. This process is known as pyrolysis where the chemical decomposition of organic matter was exposed to elevated temperature in a low oxygen environment which leaves most of the carbon in the original solid form. During the production of Biochar Corn Soil, all the corn parts will be fully utilised to reduce agricultural waste.

3. FINDINGS

The impact Malaysia will gain after the production of biochar corn soil as a planting medium from corn waste is farmers can apply organic planting media and prevent soil-borne diseases (Jyoti Rawat, Jyoti Saxena & Pankaj Sanwal, 2018). The infection was brought on by microorganisms that infected the host through the soil. Farmers receive benefit from using our product as farmers use an alternative by being soilless when planting their crops. The usage of pesticides can be minimized, and soil erosion can be prevented by using a soilless approach. Reducing corn waste also helps to lessen the environmental impact when improper agricultural waste disposal occurs such as open burning in fields, it produces a significant amount of greenhouse gases (GHGs) and has both negative environmental and economic impacts on agricultural production management.

In addition, by analyzing and observing how coco-peat was produced, it is made from coconut husks, and the byproduct known as coco-peat is obtained when coconut fibre is extracted from the husks. In peat soils, it contains 600 gigatons of carbon, which is equivalent to up to 44% of the soil's carbon. The impact of applying the product, corncob planting media, which produces biochar, can lower atmospheric CO2 levels by reducing carbon emissions. A specialized procedure is used to create biochar to minimize contamination and securely store carbon. Furthermore, a variety of biomass types

are used in the production process, allowing for the creation of biochar corn soil products containing various physical and chemical characteristics.

Based on the problem statement, it delivered an argument about the urgent need to stop biodiversity loss and reduce greenhouse gas emissions. The biochar corn soil aims for conservation, restoration, and sustainable management product and is prioritized in the offering. The transition to a society with zero carbon emissions depends on worldwide efforts to prevent climate change and accomplish other sustainable development goals for preservation.

4. DISCUSSION

4.1 Benefits of biochar

The general recommendation for action to reduce food waste in corn is to make food for livestock (chicken, cow etc.). By doing this, it might reduce a bit of food waste. The purpose is to focus on soil media, therefore have decided to fully alter corn waste into soil media with an addition of biochar to added commercialize value since it has a few benefits such as 1) reducing Pb2+ from water by increasing the pH value (Assirey & Altamimi, 2021) the adsorption of biochar, potassium hydroxide activated biochar and Pb(II) created K2Pb2O3 (Fan, 2010) ; 3) reduce soil-borne disease.

The findings open a new avenue of study that focused on how to fully utilize corn waste and give it back to farmers to overcome corn waste in this country. If the findings are parallel to future problem statements, more information regarding this issue may be a lot and can be explained in detail and in full mannered.

4.2 Effect of biochar on soil biota and microbe activities

Based on research, biochar can increase soil biota such as earthworms. It can be proved by an experiment that was conducted by Peter Lentzsch, the number of worms increased to 20-75/ m^2 in soil quadrat (Biochar dalam pertanian- perspektif untuk Jerman dan Malaysia, 2013). Apart from that, biochar can also increase microbial such as Alphaproteobacterial with high respiration rates (Lanza, 2016). It changes the soil condition and makes the soil fertile. It was also recorded that moisture content and CEC in the soil were increased along with the microbial biomass after biochar was added to soil (Halmi, 2018). These effects are what make the product more outstanding than other soil media.

5. CONCLUSION

The increase in corn waste is the main concern for Malaysia since the government spending a lot of money to import corn but failed to manage its waste. This study is to overcome corn waste by turning it into soil media. Based on the findings, the corn waste that is turned into soil media can give few benefits to the environment such as reducing soil-borne disease and lower carbon emissions.

Malaysia still finding ways to combat food waste and researchers are trying to find ways to alter food waste into useful things. If it is untreatable, food waste will lead to environment pollution because of leachate. As leachate increases, the treatment cost also increases which becomes a burden to the government because they need to spend money to treat it even though it can be avoided at the first place.

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