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# Biochar – Sustainable Material for a Green Future

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Biochar is a charcoal-like material that is produced from plant materials such as grass, agricultural and forest residues that are decomposed at high temperatures, often during renewable energy production. During the process, the physical and chemical properties of the plant material change into a highly porous, stable, carbon-rich material known as biochar. Recent research suggests it has the potential to be used as a soil conditioner and as a container substrate amendment in agriculture and horticulture, and it may improve several soil and substrate physical, chemical and biological properties. Production of biochar (the carbon (C)-rich solid formed by pyrolysis of biomass) and its storage in soils have been suggested as a means of abating climate change by sequestering carbon, while simultaneously providing energy and increasing crop yields.

## Biochar

1. Biochar is defined as a carbon-rich material produced during pyrolysis process that is a thermochemical decomposition of biomass with a temperature about ≤700°C in the absence or limited supply of oxygen.
2. It is a charred by-product of biomass pyrolysis produced from biological wastes, crop residues, animal poultry manure, or any type of organic waste material.
3. Pyrolysis is the chemical breakdown of a substance under high temperatures in the absence of oxygen (Lehman et al., 2003).
4. Biochar application has been promoted in agricultural practice that creates a win-win situation by improving soil quality and enhancing agricultural sustainability concomitant with mitigating greenhouse gases (GHG) emissions.

## Characteristics of Biochar

1. Biochar is a fine-grained and porous substance, similar in its appearance to charcoal produced by natural burning. It is produced by the combustion of biomass under oxygen limited conditions (IBI-International Biochar initiatives).
2. As a soil amendment, biochar creates a recalcitrant soil carbon pool that is carbon-negative, serving as a net withdrawal of atmospheric carbon dioxide stored in highly recalcitrant soil carbon stocks.

## Potential Use of Biochar as an Amendment

Adding biochar to soil or container substrate has several potential benefts, such as modifying soil physical and chemical properties by:

1. Increasing cation exchange capacity (CEC)
2. Increasing surface area
3. Increasing pH
4. Increasing plant nutrient availability

5. Enhancing water-holding capacity.

## Other Benefits

1. Biochar can increase the water-holding capacity, thereby reducing water and nutrient leaching.
2. Minimizing nutrient losses through leaching can improve grower profits and sustainability by increasing fertilizer use efficiency, reducing fertilizer costs, and avoiding the need for the enforcement of water-quality regulations for nonpoint source pollution.
3. Additionally, by increasing water retention, biochar can decrease irrigation requirements and make it possible to expand production on limited water supplies.
4. When combined, the above benefits modify the root-zone habitat for plants and the surrounding microbial community, often leading to greater microbial abundance and activity, and can also increase crop yields.

## Conclusion

Biochar can improve the physical and chemical properties of agricultural and horticultural soils and substrates and provide cost benefits by reducing water and nutrient losses. Biochar is produced under different production process and therefore has the potential to be produced and prescribed for a specific crop, soil or substrate.

## References

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