



The use of biochar in horticulture

Biochar is a charcoal-like substance produced by burning biomass at high temperatures and under low oxygen (a process known as pyrolysis). It has potential as a soil amendment with some research suggesting it improves soil structure, soil carbon, pH and nutrient availability, however, biochar is highly variable and not all research agrees on its effectiveness.



What is it made of?

Biochar can be produced from a variety of starting materials, making use of a waste product adds to the sustainability of the process.

Plant sources

Straw and crop residues
Wood chips and bark
Twigs
Leaf litter
Forest debris
Maize stalk
Bioenergy crops



Animal sources

Poultry, pig, cattle or dairy manure



Waste sources

Sewage sludge
Municipal solid waste



The starting material greatly influences the composition and quality of the biochar. If contaminated starting material is used, these will also be present in the biochar. The high variability of biochar makes it difficult to establish its potential effects, optimum application rate, application frequency etc.

How is it used?

As there are no hard and fast rules on how to use biochar, it is advisable to first test the target soil to establish what it is lacking and whether biochar will help. Key characteristics of biochar:

 Alkaline it has a high pH and a liming effect.	 Carbon highly effective carbon sequestration.	N & P biochar from poultry litter is high in nitrogen and phosphorous.	CEC biochar from plant sources has high cation exchange capacity which improves soil fertility.
SOM improves soil organic matter	Structure improves soil structure and binding ability	Microbes it can support increased microbial biomass and activity.	Density It can reduce soil bulk density and improve porosity which gives good water infiltration.



To reduce the risk of contaminants in biochar:

- Ensure the starting material is free of contaminants
- Carefully select the type of feedstock
- Use a lower pyrolysis temperature
- Separate liquids and solids after pyrolysis
- Use post-production treatments



The biochar is then mixed with an organic fertiliser (manure) or compost and applied, it is not a suitable replacement for fertilisers. Because it is resistant to decomposition and persists in the soil it should not be applied with each crop.

Moisten or mix with
manure/compost to avoid wind
loss

Biochar is susceptible
to water erosion

May be applied as a
top dressing but
consider wind loss

It is best applied using
uniform topsoil mixing

Many studies have reported that biochar used in conjunction with fertiliser/manure improves yields (of tomato, lettuce, radish and corn) and in some cases fruit quality (tomato).

Biochar and the environment



- Biochar is resistant to decomposition and locks carbon away securely, acting as an effective carbon store.



- Using what would otherwise be a waste product and turning it into a useful output is economically and environmentalall valuable.



- Application of biochar has the potential to reduce organic and non-organice fertiliser use, though it is not a suitable replacement.

Drawbacks

Biochar is not without its drawbacks:

- It can contain harmful contaminants such as heavy metals, hydrocarbons and dioxins.
- It is highly variable in its composition and therefore its effectiveness
- It is highly susceptible to wind and water loss
- During application, inhalation poses a health risk
- It binds to and inactivates some pesticides and herbicides



Useful resources

[Farming Connect article - Biochar for climate change, is it a viable strategy?](#)

[EIP project report - The use of Molinia biochar and sheep manure/wool in horticultural applications](#)

[Scientific review - The role of biochar and biochar-compost in improving soil quality and crop performance](#)