

The burning question: what is biochar?

You might have heard of biochar before. It's looks and feels like charcoal and many people are adding it to their farms and gardens.

While it may feel new, it's actually been around for hundreds of years. The substance has a long history of use by indigenous peoples in the Amazon Basin. Leftover charcoal from fires would be added to the soil as a fertilizer, helping to create fertile soils called Terra Preta (black soil in Portuguese) to farm in.

These are man-made soils (called anthrosols outside of the U.S.) that have been historically important to agriculture. Terra Preta has other inputs, such as bones, but biochar was a very important element to add.

That's because the biochar they used added important nutrients to the soil, like potassium and phosphorus. When you go to the store today to look at fertilizers, you might notice they have an NPK analysis on them. N (nitrogen) P (phosphorus) and K (potassium) are still a critical part of our fertilization programs.

The biochar used to make Terra Preta is a little different than what we are using in agriculture today, however. When using a biochar product, the material has gone through a process called pyrolysis. Pyrolysis is the process of burning down plant matter (feedstock) without any oxygen.



Logan Bennett
Extension Spotlight

This is often a byproduct of renewable energy production.

The result of this process is a stable, charcoal like substance that we know as biochar.

There are many kinds of feedstocks that create biochar. Dr. Stephen Machado out of Oregon State's Columbia Basin Agricultural Research Center has conducted field trials with biochar made with pine wood and other forest debris from the Umatilla National Forest.

Rice hulls, citrus wood and wheat straw are some examples of other materials that can be used to make biochar.

No matter what the feedstock is, the physical and chemical properties change after it is heated. This often results in a higher-nutrient content than the raw feedstock. This can potentially make biochar a good source of fertilizer for crops.

Biochar becomes very spongy and porous when it is finished, which allows for higher water holding capacity in the soil, as well as increased surface area, and cation exchange capacity.

Adding biochar to the soil can also reduce nutrient loss and leaching and increase the efficacy of the fertilizer that you do use. Increasing water



COURTESY PHOTO

Biochar can be used to add nutrients back into the soil. Plant matter is burned without oxygen to create a charcoal like substance that can be used in farming and gardening.

holding capacity in the soil reduces the need for irrigation and may make it possible to expand production in areas where water usage is limited.

Sometimes, the use of biochar can increase microbial abundance and diversity, which may help promote plant growth. These are all positives for the garden and farm.

However, I urge you to refrain from thinking that biochar is the silver bullet. Not all biochar acts the same, and some sources may even have negative impacts on certain microbial species. It's important to know what feedstock went into the product, and what the effects it may cause.

Biochar is typically created in two temperature and time windows. It can either be made with high temperatures (above 1,200 degrees) in a short period

of time (seconds) or in lower temperatures (600-1,200 degrees) over a period of minutes or hours. The result of the pyrolysis temperature and burn time will affect the pH, surface area and particle size of the biochar.

The species of plant used to make the biochar will also make characteristic changes in the finished material. For example, biochar made from switchgrass will look and feel different than that made from pine wood. pH and mineral concentration will also change based on the species the biochar was initially made from.

Research on the use of biochar shows that it can be an effective tool for many crops. It likely will be most effective in soils that are nutritionally deficient, hard packed or otherwise

considered poor quality.

It also has the potential to be important in systems with low water availability and as an addition to soil mixes and raised beds.

Oregon is in a special position when it comes to biochar, as we have a large amount of forest debris and other forest products that could potentially be converted into biochar. Slash piles and other forest debris that might be burned in the open air have the potential to be turned into valuable agricultural inputs.

These resources should only be accessed on private lands with proper legal permitting and permission however, as debris can be a very ecologically valuable resource.

Reducing the fuel load in forests also has the potential to reduce wildfire risk in Oregon. The combination creates a potential to sequester carbon in the soil, reduce fuel in forests and turn a low-value residue into a valuable agricultural additive.

If you are interested in using biochar in your farming or gardening system, feel free to reach out to me with questions on production, feedstock or nutritional values.

Logan Bennett is the Small Farms Program Outreach Coordinator at the Oregon State University Extension. He can be contacted at logan.bennett@oregonstate.edu and 541-236-3015.