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Improving poor soil with burned up biomass

Researchers at the RIKEN Center for Sustainable Resource Science in Japan have shown that torrefied biomass can improve the quality of poor soil found in arid regions. Published in Scientific Reports, the study showed that adding torrefied biomass to poor soil from Botswana increased water retention in the soil as well as —the amount of plant growth.

When high temperatures and the absence of oxygen are used to bring about the decomposition of biomass residue from agricultural products such as grains, the result is a charcoal-rich substance called biochar. Torrefied biomass — sometimes called bio-coal — is a type of biochar made at relatively lower temperatures that has recently received attention as a pretreatment method for biomass utilization.

In order to characterize the biological properties of soil treated with biochar, the team incorporated torrefied plant residual biomass from the biodiesel crop *Jatropha curcas* into aridisol, a type of soil found in arid regions such as Botswana, and compared several soil properties with samples that had not been treated.

Explained team leader Jun Kikuchi, "Jatropha is a potential biomass resource for dryland African landscapes, but the poor climate and soil conditions have limited its production. Our study shows that treating the poor soil with torrefied biomass improves a variety of factors that ultimately lead to greater plant growth."

An important quality of good soil is its ability to retain water. Tests showed that water retention increased with the percentage of torrefied biomass, with 5% biomass yielding a soil that contained about 5% more water than the control soil. A good soil also remains structurally sound deeper in the ground where pressure from above is higher. Soil treated with 5% torrefied biomass showed significantly higher levels of compression stress than the control soil, and significantly shorter relaxation time — the time needed for it to relax back into its normal shape after being compressed.

After finding that the torrefied biomass retained more water, the team tested the chemical properties of the soils. They found that levels of potassium, phosphorous, and sulfur were higher in the soil treated with torrefied biomass, as was the availability of potassium, sodium, and phosphorous — three elements regularly take up from the soil by plants.

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