

Findings on biochar, greenhouse gas emissions and ethylene

December 13 2011

Adding a charred biomass material called biochar to glacial soils can help reduce emissions of the greenhouse gases carbon dioxide and nitrous oxide, according to U.S. Department of Agriculture (USDA) scientists.

Studies by scientists with USDA's Agricultural Research Service (ARS) are providing valuable information about how biochar-the charred biomass created from wood, plant material, and manure-interacts with soil and crops. As part of this effort, ARS scientists in St. Paul, Minn., are studying biochar activity in soils formed from glacial deposits.

ARS is USDA's chief intramural scientific research agency, and this work supports the USDA priorities of responding to [global climate change](#) and ensuring international food security.

Soil scientists Kurt Spokas and John Baker, who both work at the ARS Soil and Water Management Research Unit in St. Paul, found that amending glacial soils with biochar made from macadamia nut shells reduced a range of [greenhouse gas emissions](#).

After the researchers amended the soils with biochar at levels ranging from 2 to 60 percent, emission levels for the [greenhouse gases carbon dioxide](#) and nitrous oxide were suppressed at all amendment levels. But the suppression in [nitrous oxide](#) emission was notable only in soils amended with 20, 40 or 60 percent biochar.

The amended soils also had lower microbial production of carbon dioxide and lower volatilization rates for the pesticides atrazine and acetochlor. The scientists plan to follow these findings with new investigations on how [volatile organic compounds](#) (VOCs) in biochar affect soil microbe activity. As part of this work, they have already identified 200 different VOCs on some biochars.

Spokas and Baker also conducted the first study that documented the formation of ethylene, a key [plant hormone](#) that helps regulate growth, from biochar and soils amended with biochar. They found that ethylene production in biochar-amended, non-sterile soil was twice as high as ethylene production observed in sterile, biochar-amended soil.

This strongly suggests that soil microbes are active in this biochar-induced ethylene production. The scientists also believe ethylene might be involved in plants' reaction to biochar additions, since even low ethylene concentrations produce various plant responses.

Results from this work have been published in *Chemosphere*, *Plant and Soil Journal*, and *Annals of Environmental Science*.

More information: Read more about ARS research on biochar in the November/December 2011 issue of *Agricultural Research* magazine. [www.ars.usda.gov/is/AR/archive ... ov11/biochar1111.htm](http://www.ars.usda.gov/is/AR/archive...ov11/biochar1111.htm)

Provided by United States Department of Agriculture

Citation: Findings on biochar, greenhouse gas emissions and ethylene (2011, December 13) retrieved 26 April 2024 from <https://phys.org/news/2011-12-biochar-greenhouse-gas-emissions-ethylene.html>

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