Biochar increases $^{15}$N fertilizer retention and indigenous soil N uptake in a cotton-barley rotation system

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Abstract: Biochar amendments can modify fertilizer nitrogen (N) availability in soil and crop N uptake. However, biochar addition affects crop N uptake and fertilizer N recovery under various N levels is not yet well understood. To address this question, we conducted a two-season [cotton (*Gossypium hirsutum* L.) -barley (*Hordeum vulgare* L.) rotation] pot experiment that included four N fertilizer rates (0, 75, 150, and 300 kg N ha$^{-1}$, supplied as urea-$^{15}$N) combined with two straw-biochar rates (0 and 15 t ha$^{-1}$). Soil properties, plant root morphology, N uptake, and biomass yield were studied. Biochar addition decreased soil inorganic N content but increased urea-N retention at cotton harvest, leading to 32% of the applied urea-N accumulating in soil compared with 27% without biochar, averaged across fertilizer N rates. Use of $^{15}$N fertilizer showed that biochar increased plant uptake of indigenous soil N, not fertilizer N. An obvious decrease in urea-$^{15}$N recovery induced by biochar was observed at 75 kg N ha$^{-1}$, but not at 150 or 300 kg N ha$^{-1}$. The efficiency of urea-$^{15}$N recovery by plants ($^{15}$NRE, 34-45%), measured using the tracer method, was much lower than that measured using the traditional non-isotope method (NRE, 67-96%). At barley harvest, 2-5% of the urea-$^{15}$N, applied in the first season, was taken up by plants, and 12-19% remained in soils receiving biochar. We concluded that straw-biochar addition increased soil $^{15}$N fertilizer retention and plant N uptake of indigenous soil N, not fertilizer N, and the increased indigenous soil N uptake persisted into the second cropping season.

Biography: Wang zhi will finished his PhD degree at Nanjing Agricultural university, Collage of agriculture in 2020, June. He has published the paper titled "Biochar increases $^{15}$N fertilizer retention and indigenous soil N uptake in a cotton-barley rotation system" at Geoderma.

Publications:
2. Genetic Diversity Using Random Amplified Polymorphic DNA (RAPD) Analysis for Aspergillus niger isolates
3. Au-Ag-Cu nanoparticles alloys showed antifungal activity against the antibiotics-resistant Candida albicans
4. Induce mutations for Bavistin resistance in *Trichoderma harzianum* by UV-irradiation
5. Biliary Sludge. Analysis of a Clinical Case

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