Supplementary Material

1   Supplementary Figures and Tables

1.1   Supplementary Figures

Figure S1. All corn plants displayed; soil trial row is closest to the camera.

Figure S2. Corn pots 1-4; soil control trial group.

Figure S3. Corn pots 5-8; manure control trial group.

Figure S4. Corn pots 9-12; MRO trial group.

Figure S5. Corn pots 13-16; MHAP trial group.

Figure S6. Corn pots 17-20; MHAPE trial group.

Figure S7. All soybean pots displayed; soil trial row is closest to camera.

Figure S8. Soybean pots 1-4 in front view (left) and top view (right); soil control trial group.

Figure S9. Soybean pots 5-8 in front view (left) and top view (right); manure control trial group.

Figure S10. Soybean pots 9-12 in front view (left) and top view (right); MRO trial group.

Figure S11. Soybean pots 13-16 in front view (left) and top view (right); MHAP trial group.

Figure S12. Soybean pots 17-20 in front view (left) and top view (right); MHAPE trial group.
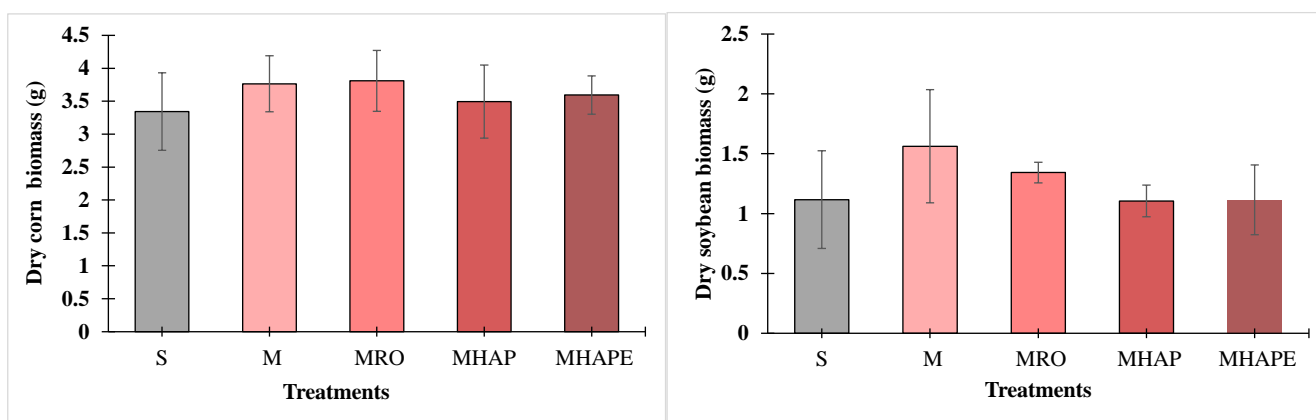
Figure S13. The effect of treatments on the biomass yield for corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
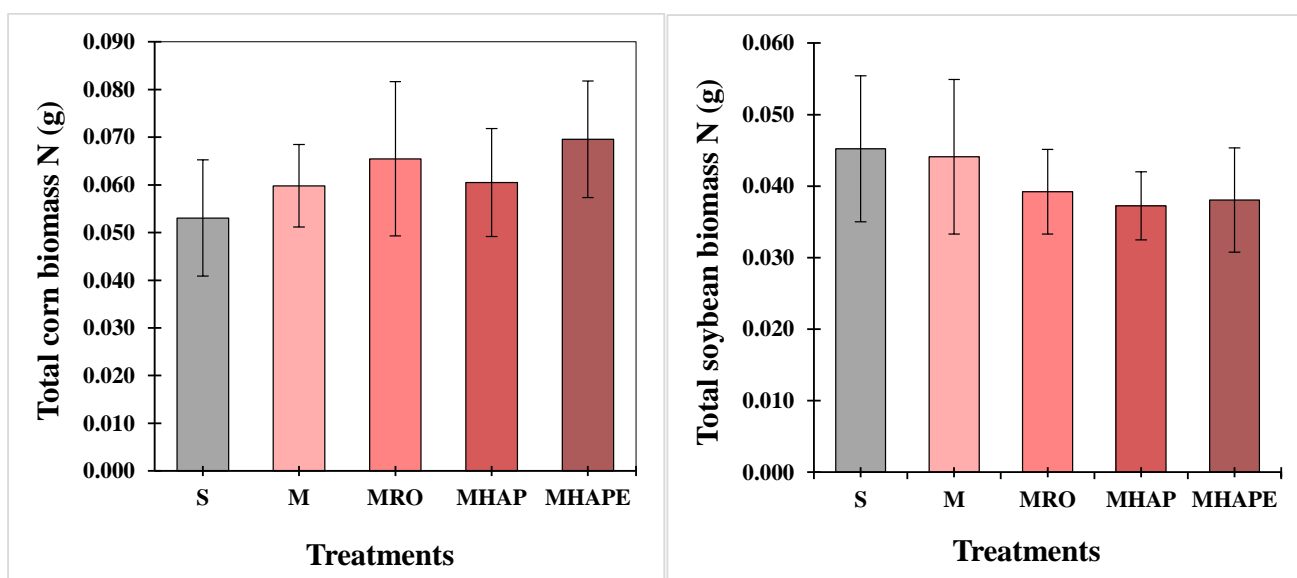

Figure S14. The effect of soil treatment on the nitrogen uptake for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
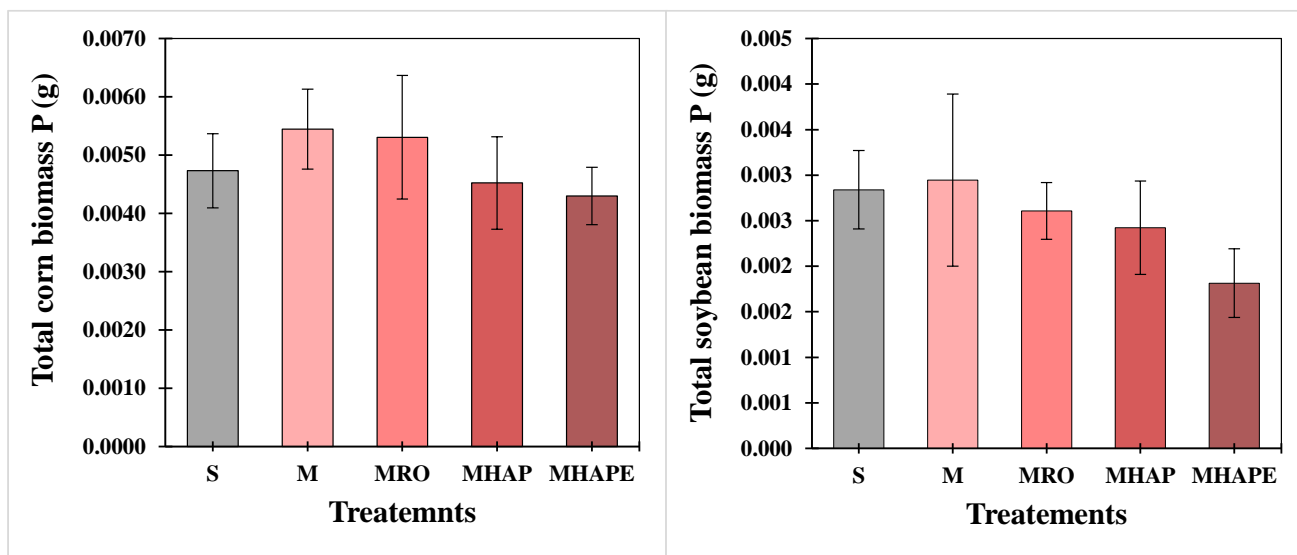
Figure S15. The effect of soil treatment on the phosphorus nutrient biomass for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure+ highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
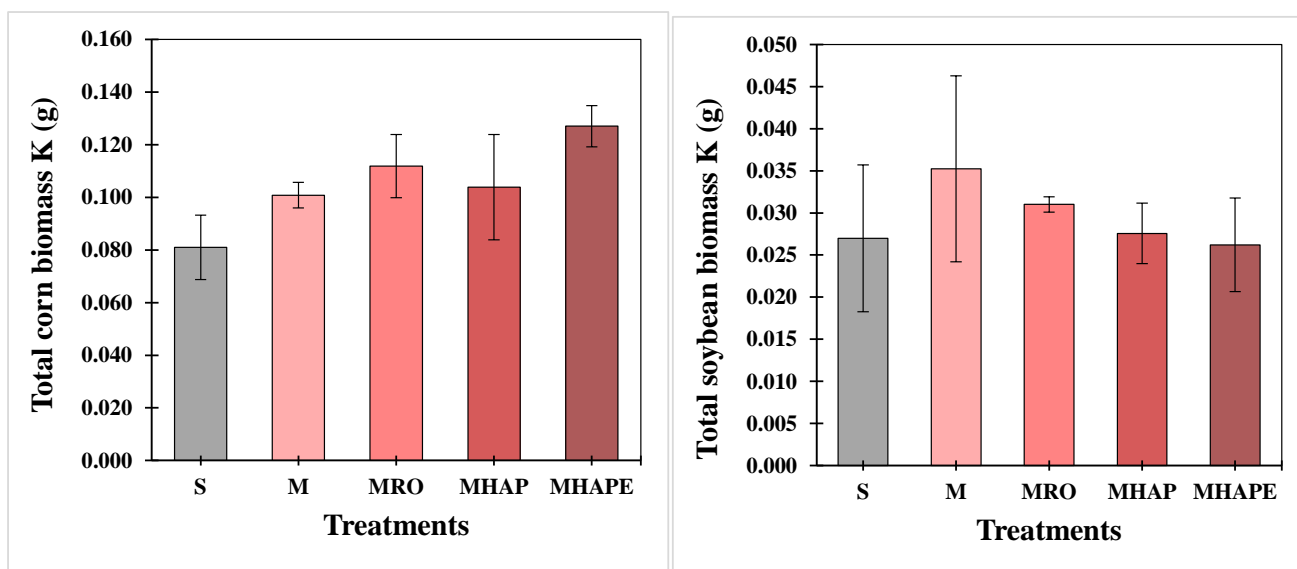

Figure S16. The effect of soil treatment on the potassium nutrient biomass for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
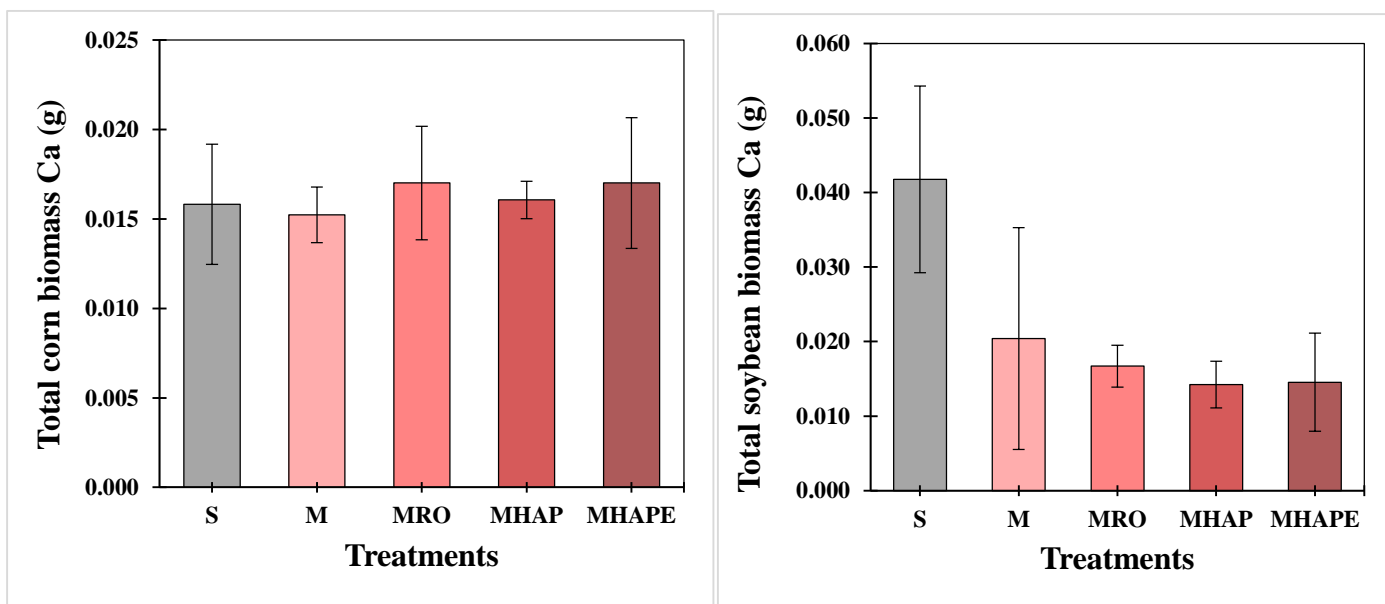
Figure S17. The effect of soil treatment on the calcium nutrient for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
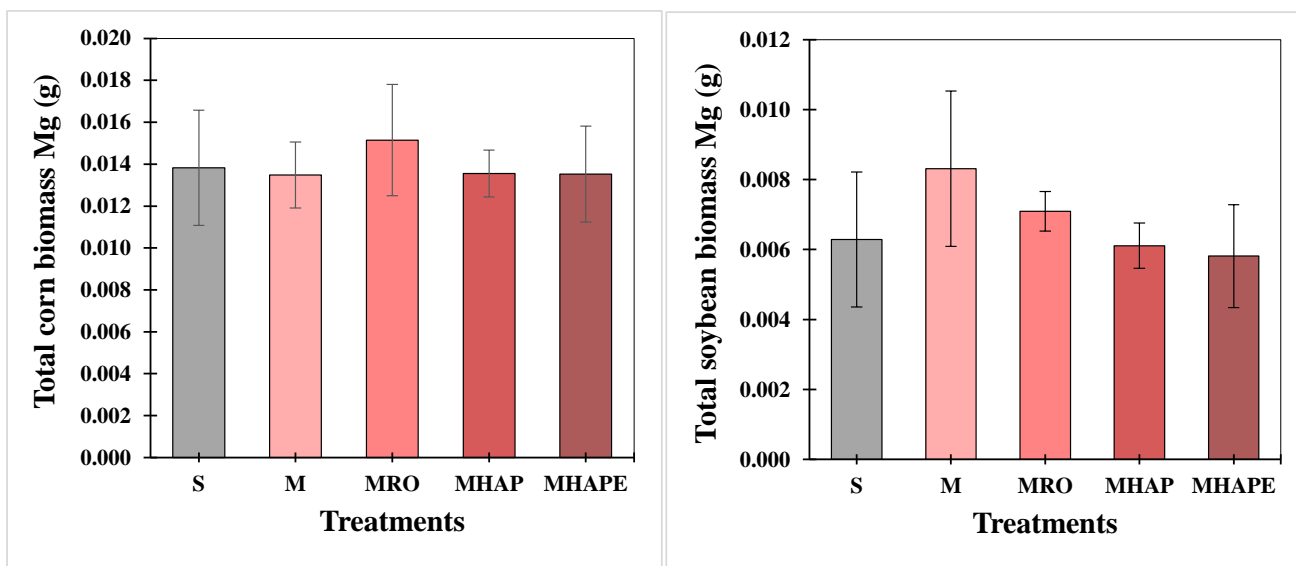

Figure S18. The effect of soil treatment on the magnesium nutrient for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
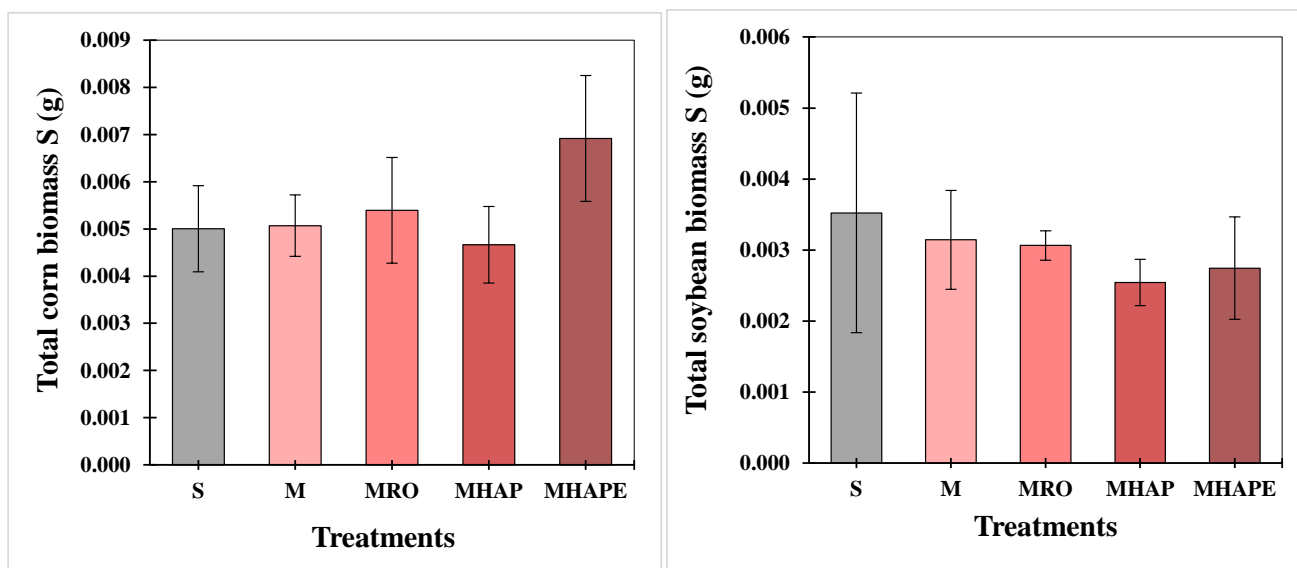
Figure S19. The effect of soil treatment on the sulfur nutrient for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
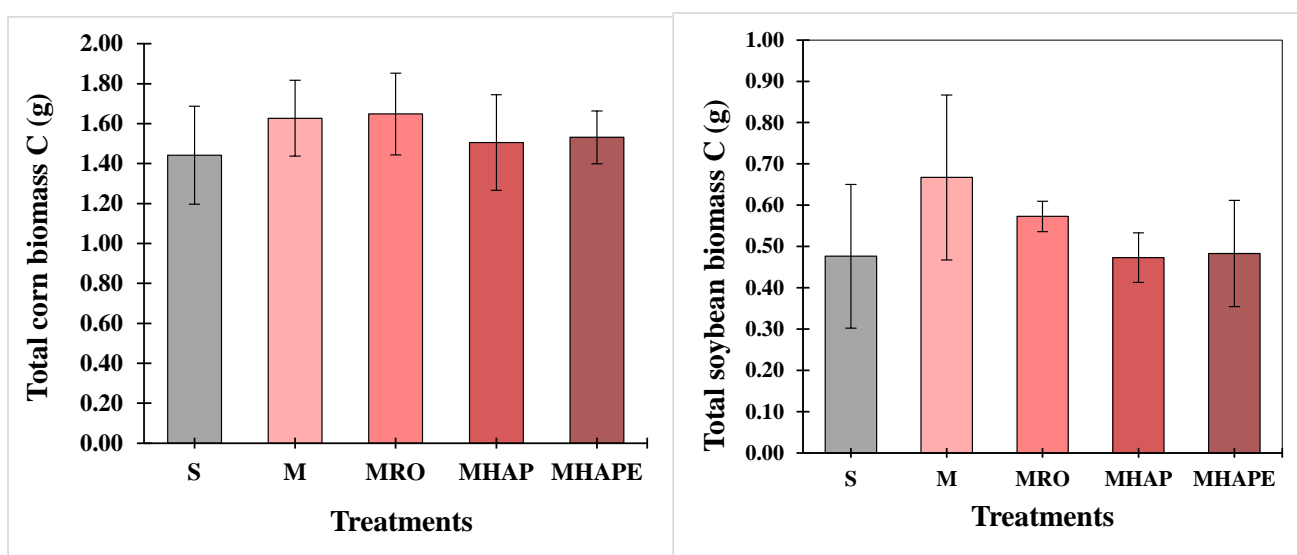

Figure S20. The effect of soil treatment on the carbon nutrient for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
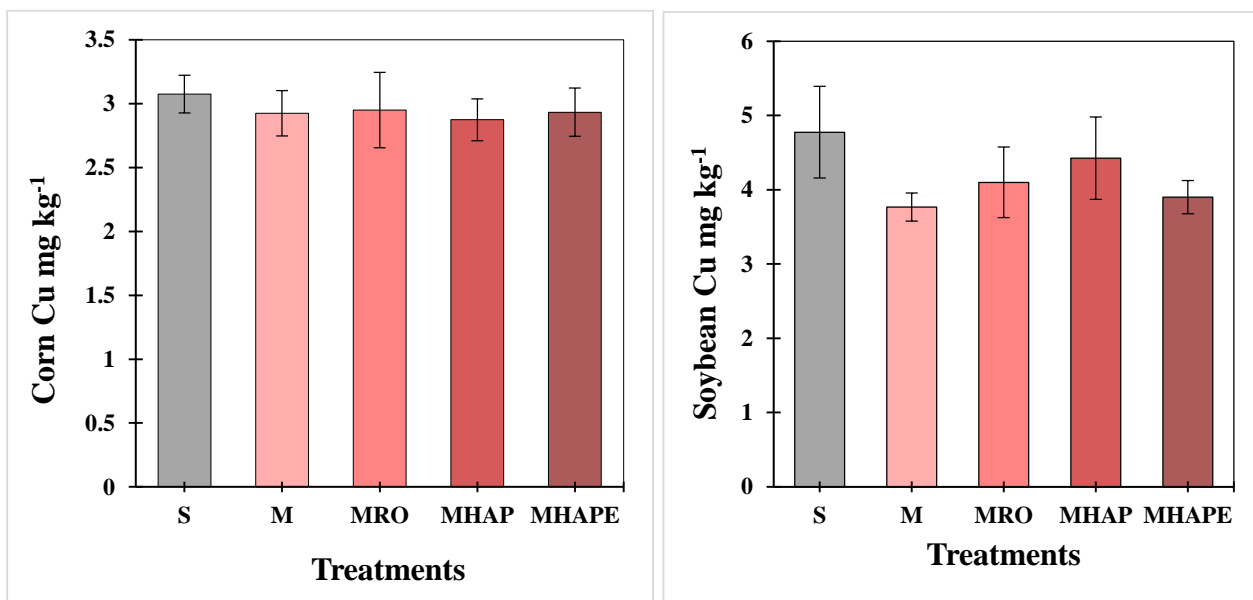
Figure S21. The effect of soil treatment on the amount of copper present for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.
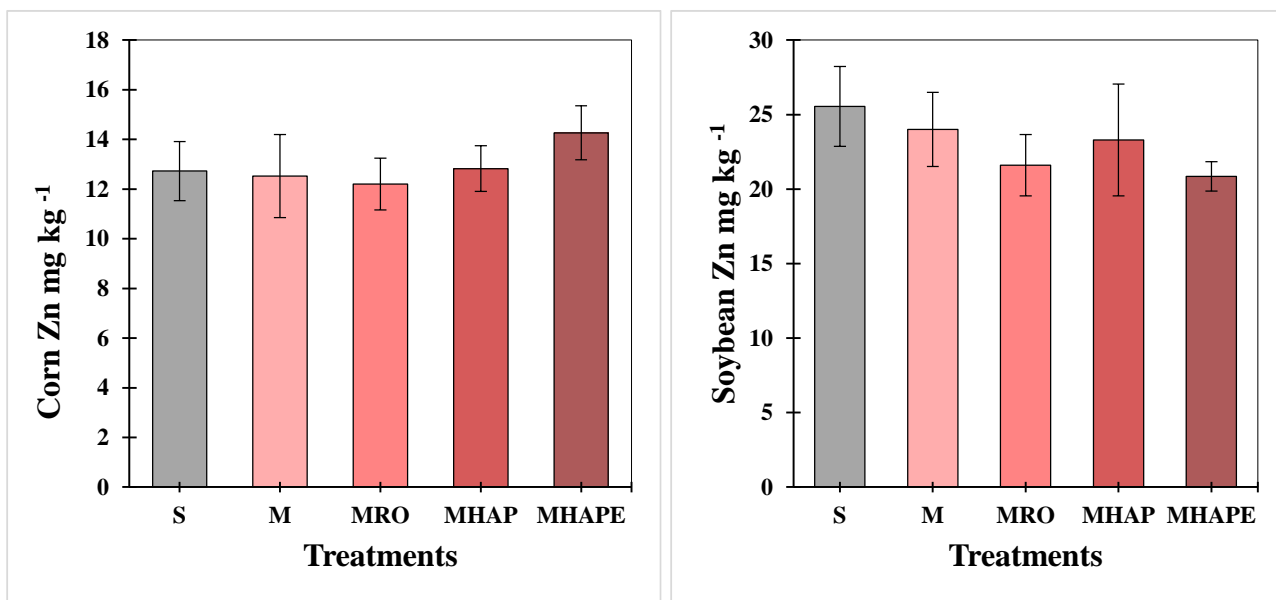

Figure S22. The effect of soil treatment on the amount of zinc present for both corn (left) and soybean (right) biomass. Each bar represents an average of 4 replications ± standard deviation. S = soil control; M = manure control; MRO = manure + red oak biochar; MHAP = manure + highly alkaline porous biochar; MHAPE = manure + corn feedstock autothermal porous Fe- engineered biochar.