

Divergent responses of carbon-degrading enzyme activities to litter alterations: Implications for soil respiration

Qianhao Xu¹, Ji Chen², Kees-Jan van Groenigen³, Dejun Li⁴, Daryl Moorhead⁵, Brooke Osborne⁶, Zilong Ma¹, Jørgen Olesen², Bruce Hungate⁷, Pete Smith⁸, Xibin Sun¹, Chengjin Chu¹, and Hao Chen¹

¹Sun Yat-Sen University

²Aarhus Universitet

³University of Exeter College of Life and Environmental Sciences

⁴Chinese Academy of Sciences

⁵The University of Toledo

⁶Utah State University

⁷Northern Arizona University

⁸University of Aberdeen

October 20, 2022

Abstract

Global change affects terrestrial litter inputs with cascading effects on soil respiration (SR). Cellulase and ligninase are dominant carbon-degrading enzymes, targeting the decomposition of readily decomposable and structurally complex carbon pools, respectively. Nevertheless, how litter alterations influence cellulase and ligninase activities and the implications for SR remain unclear. We conducted a meta-analysis to show that litter addition increased cellulase activity by 25.2%, whereas litter removal decreased it by 25.9%. Neither litter addition nor removal influenced ligninase activity. The changes in cellulase activity correlated positively with changes in SR, but not for ligninase activity. The effects of litter addition and removal on cellulase activity decreased with treatment duration. These results indicate that litter alterations affect SR primarily by controlling the microbial decomposition of readily decomposable rather than structurally complex carbon pools. Altogether, we suggest that the total and long-term effects of litter alterations on SR might be smaller than previously thought.

Hosted file

MS- ecology letters.docx available at <https://authorea.com/users/516351/articles/591262-divergent-responses-of-carbon-degrading-enzyme-activities-to-litter-alterations-implications-for-soil-respiration>





