Trophic interaction effects on nutrient release from decomposing leaves

Sharon A. Cantrell[1], María F. Barberena Arias[1], Griselle González[2], D. Jean Lodge[3], Krista McGuire[4]

[1]Department of Biology, School of Science and Technology, Universidad del Turabo, PO Box 3030, Gurabo, PR, 00778; [2]International Institute of Tropical Forestry, USDA Forest Service, Jardín Botánico Sur, 1201 Ceiba St., Río Piedras, PR 00926-1119; [3]Center for Forest Mycology Research, USDA Forest Service, Northern Research Station, PO Box 1377, Luquillo, PR, 00773; [4]University of Oregon, Institute of Ecology and Evolution, Eugene, OR 97403

Emails: [1]scantrel@suagm.edu, mbarberena1@suagm.edu; [2]ggonzalez@fs.fed.us; [3] dlodge@fs.fed.us; [4]kmcguire@uoregon.edu;

Understanding the mechanistic processes of litter decay is essential for predicting nutrient cycling dynamics in tropical forests. While models of litter decay mostly rely on climate and litter chemistry, it is increasingly apparent that the decomposer communities, fungi, bacteria and arthropods interacting during leaf litter decomposition, can significantly influence decay rates and mineralization of nutrients. White-rot basidiomycetes are the most efficient biodegraders of lignin, breaking down bonds to expose the assimilable cellulose and hemicelluloses surrounding lignin. This assimilable cellulose and hemicellulose is available for the bacterial community to degrade. Litter with more lignocellulose promotes the fungal decomposition pathway, which in turn favors soil and litter food webs dominated by arthropods. The objective of our study is to determine how fungi, bacteria and arthropods interact during leaf litter decomposition and the subsequent release of nutrients during a simulated hurricane experiment in Puerto Rico where two treatments (control and trim plus debris) were monitored for two years. Microbial diversity have been documented using TRFLP and Illumina Sequencing. Diversity and abundance of arthropods was determine using the Berlese funnel technique. Nutrient release was documented using Plant Root Simulators (PRS probes). TRFLP and Illumina Sequencing are showing that the diversity of fungi is higher in the unmanipulated control at least for the first 6 months after the manipulation. Differences are largest between 3-5 weeks post treatment. Community structure are significantly different between control and trim plus debris. Arthropods abundance increases with the increase in the diversity of fungi. Nutrients release is higher in the trim plus debris during the first 5 weeks after treatment and when all the trophic groups are present. In conclusion, trophic dynamics during leaf litter decomposition changes when the microclimate is altered by the combined effects of canopy opening and debris deposition after a hurricane.