Litter decomposition is predicted by community-weighted mean trait while non additive effect are driven by functional diversity of the species mixture

Rossignol Nicolas[1], Gouesbet -Riaud Valérie[1], and Anne Bonis*†

[1]UMR (ECOBIO) – UMR 6553 ECOBIO – France

Abstract

The role of functional traits of plant assemblages in ecological processes has been often hypothesized while the underlying mechanisms remain unclear. The Biomass-Ratio Hypothesis assumes that the community-weighted mean trait value (CWM) drives the community's effect while the Diversity Hypothesis assumes that functional diversity (FD) plays a significant role. As the CWM and FD values are two related variables in natural communities, an experimental design is required to disentangle their respective effects. This study quantified the independent effect of the CWM and FD value for the decomposition process of plant assemblages, considering the Leaf Dry Matter Content (LDMC) in particular. We tested whether the importance of the non-additive effects increases with increasing FD values. The experimental design consists of six groups of three-species combinations from a pool of 18 grassland species, combining CWM (high, low) and FD (high, medium, low) values. After six months of incubation in controlled conditions, the mass loss rate of the litter mixtures varied from 65% to 75%. The mass loss was overall higher for low CWMLDMC values. Non-additive positive effects occurred for five litter mixture groups out of the six CWM x FD modalities. The effect of FD on the importance of the non-additive effects was dependent on the CWM value, as it led to higher non-additive effects for mixtures with a high CWMLDMC only. Our results suggest that functional diversity constitutes a significant driver of decomposition but that its effect must be assessed while taking the role of dominant traits into account.

*Speaker

†Corresponding author: anne.bonis@uca.fr