

Plant community impact on productivity: the interplay of community-level functional attributes, species, and environmental selection

Philipp Brun¹, Cyrille Violle², David Mouillot³, Nicolas Mouquet², Brian Enquist⁴, François Munoz⁵, Tamara Munkemuller⁶, Annette Ostling⁷, Niklaus Zimmermann⁸, and Wilfried Thuiller⁹

¹Swiss Federal Institute for Forest Snow and Landscape Research

²CNRS

³Université Montpellier-CNRS-IFREMER

⁴University of Arizona

⁵Université Grenoble Alpes

⁶Univ. Grenoble Alpes

⁷University of Michigan

⁸Swiss Federal Research Institute WSL

⁹Laboratoire d'Ecologie Alpine

July 5, 2021

Abstract

While the impact of biodiversity, notably functional diversity, on ecosystem productivity has been extensively studied, little is known about the effect of individual species. Here, we identified species of high importance for productivity (key species) in over 28,000 diverse grassland communities in the European Alps, and compared their effects with those of community-level measures of functional composition (weighted means, variances, skewness, and kurtosis). After accounting for the environment, the five most important key species jointly explained more deviance than all statistics of functional composition. Key species were generally tall with high specific leaf areas. By dividing the observations according to distinct habitats, the explanatory power of all non-environmental predictors increased considerably, and the relationships between functional composition and productivity varied systematically, presumably because of changing interactions and trade-offs between traits. Our results advocate for a better consideration of species' individual effects on ecosystem functioning in complement to community-level measures.

Hosted file

manuscript_v3.pdf available at <https://authorea.com/users/423862/articles/529089-plant-community-impact-on-productivity-the-interplay-of-community-level-functional-attributes-species-and-environmental-selection>