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# Soil fauna communities are facilitated by plant nurse species in coastal sand dunes

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## Abstract

Facilitation is an ubiquitous biotic interaction which has been well extensively studied by plant ecologists in many ecosystems. Most of these studies demonstrated that nurse plants might directly or indirectly improve environmental conditions for beneficiary plants. This ecological process is particularly important to maintain biodiversity in stressful environments (c.f. Stress Gradient Hypothesis). However, the facilitation by plants on soil fauna has been rarely explored although both plant canopy and rhizosphere might directly and indirectly influence belowground organisms. This positive effect of plant on soil fauna could be modulated both by plant functional traits and stress level. Thus, to explore these interactions, we tested in a coastal sand dune environment whether soil fauna communities (Nematodes, Collembola and Mites) better establish under the protection of 3 nurse species (*H. stoechas*, *C. canescens* and *A. arenaria*) comparatively to adjacent open gaps. This sampling was repeated along 330 km of the Atlantic French coast, from Vendée to south of Landes. Our results revealed a strong and positive effect of nurse species on soil fauna communities (density and diversity). The intensity of these effects depends both on functional traits and species identity (i.e. nurse plants and soil fauna). As a consequence, the functional characteristics of the belowground communities might in turn modulate core ecosystem processes, such as nutrient cycling with positive feedback on nurse growth and plant-plant interactions. We thus will discuss the concept of facilitation and mutualism in the context of plant-soil interactions. Lastly, in such constraint habitat, the role of plants in soil processes is so relevant that they can be considered as ecosystem engineers since they create suitable habitats for other organisms.

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