"Resistance is futile!" - or is it? A study on natural colonisation resistance and colonisation success in experimental plant communities along functional and phylogenetic diversity gradients.

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Abstract

Community resistance to colonizers remain a central question in ecology. While functional and phylogenetic diversity (FD and PD respectively) of the resident community are expected to exert a role in community resistance, very few studies have assessed this experimentally or evaluated their interactive effects. We used a diversity experiment to disentangle the role of FD and PD by sowing monocultures and mixture of 6 species, drawn from a pool of 19 species naturally coexisting in Czech mesic meadows. The mixtures were designed to cover four independent combinations of high and low FD and PD. Species covers were estimated in spring and late summer over 3 seasons. We then assessed the resistance of the resident (sown) communities to natural colonizers, and characterized the success of colonizers in relation to their functional and phylogenetic distance from the resident communities.
Results generally indicated that FD decreased community resistance to natural colonisation. However, PD tempered this effect: with high PD, FD was not significant, suggesting overlapping information between these components of biodiversity. Decomposing the community

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structure in trait means and diversity values, we were able to identify key features of dominant species promoting colonisation resistance. From the colonizers perspective, greater difference in functional traits from the resident community tended to improve colonisation success. However, the effect was subtle and significant only for a reduced proportion of colonizers (14%). Phylogenetic distance had no detectable effect.
Our results confirm a certain interplay between FD and PD in their support of ecosystem functioning, namely resistance to colonizers, suggesting that they only partially overlap in their information about community structure. The widespread hypothesis that higher FD increases resistance by a more complete use of resources was challenged, suggesting rather that greater FD could provide an unsaturated functional trait space allowing functionally unique species to occupy it.