

Closely related and novel range expanders influence native plant communities by changing soil communities

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Climate change induced range expansions of plants drive the formation of novel communities both belowground (microbes) and aboveground (plants). Range-expanding plants can influence native species by disrupting original plant-soil feedbacks. Further, plant species, which are successful in expanding their range as a response of climate warming, are expected to thrive in their new range due to the lack of above-and belowground enemies. However, it remains unclear how the relatedness of range expanding plant species to native plants determines their effects on natives and whether these effects depend on the evolutionary history between plant species and soil communities.

Here we show that range expanding plant species experience enemy release not by moving long geographical distances but by establishing in the soil of distantly related species. We grew plant communities of native as well as their closely and distantly related range expanding species in communities with soil communities across the Europe. We demonstrate that not signal of plant species determines microbial community composition and effect. In all soils, native and closely related range expanders shaped similar microbial communities, which differed from these of associated with novel expanders. In all soils, plant communities experienced negative feedback from soil communities, shaped by their closely related species. Our community-level study demonstrated that considering phylogenetic distance of plant communities can help to predict plant species success in expanding their range.