

Plant range shifts and reduced enemy impact imply exotic invasion potential due to climate warming

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Ecosystems worldwide are increasingly being invaded by plants from exotic origin. It has been stressed that these invaders perform better than similar native species in the invaded communities. Although plant invasions have taken place for more than a century, the mechanisms explaining the success of invaders are not well understood yet. Considerable attention has been paid to the role of plant specific traits and natural control by aboveground herbivores, both in the original and new ranges of the invading plants.

Release from belowground or aboveground natural enemies has been widely stressed as the biggest advantage for invaders to become successful. These novel biotic interactions, if favorable, characterize these invasive plants by local dominance in their new community, thereby displacing native species, and strong dispersal reaching high abundances. Currently the consequences of climate warming are being noticed in range shifts of plants and animals to higher elevations and latitudes. Although biotic interactions strongly affect responses to warming, they are not included in climate studies. Hence, when plants spread faster than their natural enemies or than the enemies of their enemies, multi-trophic interactions can become, at least temporarily, disrupted. These changes in relations may create invasion opportunities for species within geographical regions. In order to understand how exotic plant species affect the soil microbial community and their aboveground enemies relative to that of native species we conducted a phylogenetically controlled experiment with cross comparison of plants grown in self conditioned soil and soil conditioned by other species. We investigated how exotic plants from warmer climatic regions within Eurasia respond to soil communities from an invaded ecosystem in North-Western Europe and to aboveground non-coevolved (desert locust (*Schistocerca gregaria*) and cosmopolitan generalist (green peach aphid *Myzus persicae*) shoot herbivores. Effects of range shifts of plant species within the continent were compared to exotic species originating from continents other than Eurasia.

We show that biomass of native plants was significantly negatively affected by their own soil community, whereas exotic plants, irrespective continental origin, experienced a neutral feedback effect. In addition we also found that the suitability of exotic plants towards the naïve locust was much lower than that of native plant species, while the cosmopolitan aphid performance was not affected by host origin. These results suggest that exotic species have been released from their enemies and resist novel enemy pressure both below –and aboveground. Since these effects were not different between Eurasian range expanders and exotics originating from other continents we conclude that climate warming could lead to biological invasions over continuous expanded ranges, influencing new encountered local ecosystem functioning.