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2018

Functional Ecology

BRITISH ECOLOGICAL SOCIETY

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Plant-soil feedbacks refer to how plants change the soil's abiotic and biotic properties where they grow, which can in turn influence the growth of the same or other plant species that grow later in this soil. Each plant influences the soil differently, hence plant-soil feedbacks are spatially varied in the field. Ecologists are beginning to realize the importance of spatial variation of plant-soil feedbacks for plant species coexistence, but we lack empirical evidence.

Here we conducted a two-phase experiment. First, in an experimental garden, we planted sweet vernal grass (*Anthoxanthum odoratum*) and the broad-leaved herb (forb), brown knapweed (*Centaurea jacea*), in monocultures in separate experimental plots. After three years, we collected soils from these plots, hence we had two types of soil: one that had been influenced by the grass (grass soil) and the other one by the forb (forb soil). Then, in a greenhouse we created heterogeneous soils consisting of patches of the two soils in a chessboard manner, and homogeneous soils where the same amount of the two soils were evenly mixed. We planted the grass and the forb together in the heterogeneous and homogeneous soils to examine how the spatial configuration of plant-soil feedbacks may influence plant species coexistence.

We found that the growth difference between the two species was reduced in heterogeneous soil compared to homogeneous soil, indicating that heterogeneous soil can promote species coexistence by reducing growth inequalities.

Greenhouse experiment.

But how? When we looked at the growth of the two plant species in the heterogeneous soil, we found that the grass grew better in forb soil patches than in grass soil patches while the reverse was true for the forb, which may contribute to the more equal growth of the two species in the heterogeneous soil. Future study should examine whether this phenomenon is generally true in the field.