Kivlin

Climate change may differentially disrupt leaf and root phytobiomes

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While the direct effects of climate change on plants are now readily apparent, determining how climate change affects the interactions between plants and their associated microbiomes is still not resolved. For example, fungal symbionts may not be able to track shifting plant distributions and phenology under future climates. Plants may therefore leave behind their original fungal symbiont communities and encounter novel fungal symbionts as their temporal and spatial distributions shift. Here we characterized how dispersal limitation, environmental factors (climate, soil nutrients), and plant hosts affected the abundance and composition of horizontally transmitted leaf and root fungal endophytes and arbuscular mycorrhizal (AM) fungi along steep elevational gradients in the Colorado Rocky Mountains and used these community assembly rules to predict how plant-fungal symbioses may be disrupted with climate change.
Plant hosts were the main factor affecting the composition of all three fungal phytobiome groups. However, leaf endophytes were more sensitive to elevation and associated differences in climate than belowground fungal symbionts. Yet, in samples of airborne fungi collected to characterize dispersal potential, leaf endophytes were more abundant than root endophytes, and AM fungi were totally absent. Thus, leaf endophyte communities were structured by plant host and environmental filtering and not dispersal limitation per se. In contrast, root endophytes were structured by dispersal limitation and plant hosts. Taken together, these data suggest that as plants move to higher elevations with climate change, leaf endophytes will be able to co-disperse but root endophytes will not, resulting in belowground phytobiome disruption in future climates.