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Responses of biomass allocation to warming: a global synthesis

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Knowledge of aboveground and belowground biomass allocation is fundamental for our understanding of terrestrial carbon sequestration and cycling. Global warming would considerably affect plant biomass allocation, which is crucial for the climate – carbon cycle feedback in the future climate. As an important composition in root zone, mycorrhizal fungi (MF) often mediates carbon and nutrient cycles of host plants. However, how MF regulate responses of biomass allocation to climate warming remains unclear. In this study, a meta-analysis was conducted to determine the central tendency of biomass allocation in plant community and populations with arbuscular mycorrhizal (AM) and ecto-mycorrhizal fungi (EM) under warming conditions. Our results showed that warming significantly induced positive effects on total plant biomass for populations with AM and EM as well as community. Warming also enhanced root: shoot (R/S) in populations with both AM and EM, but didn't alter it in community. Interestingly, warming decreased aboveground biomass (AGB) for those populations with AM, while it increased AGB and belowground biomass (BGB) for that with EM. Furthermore, the plants with AM exhibited a greater priority in development of roots (+8.70%) and depressed aboveground biomass accumulation (-13.75%) in response to warming. The results suggest that mycorrhizal fungi should be incorporated into a trait-based model to improve prediction of terrestrial carbon cycle in a warming climate.