Summary

Plant-soil microbe interactions, or plant-soil feedbacks (PSFs), have profound impacts on plant community dynamics and have received increasing popularity over the past two decades. Most PSF experiments assume instantaneous and constant microbial effects throughout plant development without a time lag between soil conditioning and plant response. However, growing studies have begun to recognize the importance of time in plant-soil microbe interactions. The duration of conditioning and response phase as well as the timing of interactions at certain plant developmental stage can influence the growth rates and biomass production of responding plants. Moreover, microbial communities may continue to change after the senescence of conditioning plants, thus leading to alterations of the strength and direction of microbial effects on succeeding individuals. Besides plant biomass, which most PSF studies have focused on, soil microbes also govern plant population dynamics via their effects on key demographic processes over plant life cycle, including seed survival, germination rate and timing, seedling survival, flowering phenology, and susceptibility to herbivores. By incorporating temporal dimensions of plant-soil microbe interactions and plant demographic processes into theoretical models and connecting these models with empirical results, we envisage a better prediction of long-term plant-soil microbe community dynamics in the natural contexts.