Abstract

Plant invasions represent a major ecological and socio-economical issue and understanding the drivers as well as consequences of plant invasions is thus one of the main goals of plant ecology. It is equally important to reveal general patterns underlying plant invasions and to understand the details of biology of individual invaders. In this thesis I explored plant-soil feedback (PSF) as a possible general mechanism underlying plant invasiveness, and also focused in detail on drivers and consequences of *Impatiens parviflora* invasion.

The aims of this thesis were to i) assess the differences in intraspecific PSF between invasive and alien non-invasive species using a large set of species; ii) explore the relationship between PSF, residence time and phylogenetic novelty of the alien species; iii) compare the importance of PSF and other plant characteristics for plant invasiveness; iv) compare PSF between invasive and native congeners of similar level of dominance in the field; v) evaluate the effect of cultivating conditions on results of PSF experiments; vi) describe invasion dynamics and determine factors affecting spread of invasive *I. parviflora* using a method of monitoring its natural spread in several types of habitats, and vii) assess the impact of *I. parviflora* on native vegetation of oak-hornbeam forests using a removal experiment.

The results of the thesis may be summarized as follows: i) Invasive species have more positive PSF for seedling establishment, but not for biomass of adult plants, than alien non-invasive species; ii) Phylogenetically novel species have more positive PSF than species with a native congener, suggesting greater release from natural enemies. The relationship between PSF and residence time differs between invasive and alien non-invasive species, indicating that individual alien species differ in the extent of enemy release or subsequent accumulation of local pathogens; iii) PSF for seedling establishment belongs to the best predictors of invasive status for our set of species, following specific leaf area, height, residence time, and seedling growth rate; iv) Under standard conditions, invasive species do not differ from native dominants in terms of PSF; v) Cultivating conditions have substantial effect on results of PSF experiments. Individual stages of plant lives, as well as invasive and native dominants, respond differently to the conditions, suggesting that different processes underlie the feedback; vi) *I. parviflora* spreads most easily through oak-hornbeam forests, followed by acidophilous oak and mixed coniferous forests, but is able to penetrate dry grasslands on rocks and termophilous oak forests as well. Most important factors determining its spread are cover of herb layer, soil moisture and canopy openness, but individual stages of *I. parviflora* are affected by them to different extent; vii) *I.*

parviflora has weak, yet significant negative impact on native vegetation of oak-hornbeam forests, suppressing mostly small, early flowering species.

Overall, I showed that PSF is one of the mechanisms distinguishing between invasive and alien non-invasive plants. However, further investigations are needed to understand the processes underlying the feedback and reveal plant traits determining it. I pointed to the importance of studying some overlooked aspects of PSF such as role of cultivating conditions or inclusion of multiple phases of life cycle. The thesis illustrated that monitoring natural spread of invasive species can provide important insights into the determinants of their distribution, and I showed that in case of *I. parviflora* the determinants depend on spatial scale studied and differ between life stages of the species.

Key words: alien plant species; cultivating conditions; impact of invasive species; natural spread observation; phylogenetic relatedness; plant functional traits; plant invasiveness; plant-soil interactions; removal experiment; residence time; small balsam (*Impatiens parviflora*).