

## Evolutionary mechanisms in colonizing plant populations

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In a rapidly changing world, human activities offer opportunities for many plant species to colonize new areas. Increasingly, it is recognized that colonization can be accompanied by different ecological and evolutionary processes, acting over relatively short periods of time. When populations colonize novel environments, individuals' phenotypes will depend on a combination of different, non-exclusive processes, including phenotypic plasticity (PP), local adaptation (LA), environmental maternal effects (EME) and genetic drift (GD)(Monty and Mahy 2009b). Despite these processes have long been studied independently, few attempts have been made to simultaneously address the importance of those processes in plant colonization.

Here, we present a set of related studies aiming at disentangling the role of PP, LA, EME and GD in *Senecio inaequidens* (Asteraceae) in southern France, where it was introduced at a single wool-processing site in the late 19th century. We used seeds from populations growing in contrasted climates to explore the phenotypic variation related to climate. We performed several common garden experiments (Monty et al. 2009, Monty and Mahy 2009a, 2010), as well as a reciprocal sowing experiment with gardens under Mediterranean and Pyrenean climates (Monty et al. in revision). We analyzed climatic phenotypic variation in germination, growth, reproduction, leaf physiology and survival. We characterized genetic structure in the studied populations using AFLP.

We found consistent genetic differentiation in growth traits but no home-site advantage, thus weak support for LA to climatic conditions. In contrast, genetic differentiation showed a relationship to colonization history. PP in response to climate was observed for most traits, and it played a particularly important role in leaf trait variation. EME mediated by seed mass influenced all but leaf traits under harsh climate. Heavier, earlier-germinating seeds produced larger individuals that eventually produced more flower heads throughout the growing season. However in a milder climate, EME were negligible.

Our different studies suggest that phenotypic variation in response to climate depends on various ecological and evolutionary processes associated with geographical zone and life history traits. Therefore, we argue that a “*local adaptation vs. phenotypic plasticity*” approach, as often considered in the literature, is not sufficient to fully understand what shapes phenotypic variation and genetic architecture of colonizing populations.

### References

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