Abstract

The highlands in the northern Andes, which are known as the páramo, are recognized worldwide for their unique and species-rich flora. Many páramo plant groups underwent radiations, which have been shown to be very recent and outstandingly fast. These radiations have usually been linked to (1) the uplift of the northern Andes, which provided new ecological opportunities in the highlands that originated in this process, (2) Quaternary climate change that produced range shifts of the páramo, resulting in periods of páramo contraction and isolation, during cold periods, and periods of páramo expansion and connection, during warm periods (3) the Andean physiographical and ecological heterogeneity, which provides extent oppornuties for isolation and for ecological divergence. In spite of increasing research efforts to understand the evolution of the páramo flora, the actual processes underlying species diversification remain unclear. The main aim of this thesis is to contribute to the understanding of these processes. We use three different approaches in two different study systems: (1) A population genetics approach, which remains rare among páramo plant studies, focuses on three páramo *Lupinus* species (*Lupinus alopecuroides, L. nubigenus, L. microphyllus*). These species belong to one of the best studied páramo plant radiations, the Andean *Lupinus* radiation, which is also one of the fastest radiations reported for plants to date. (2) A phylogenetic approach on a group of páramo *Senecio* species (former *Lasiocephalus*), implementing large-scale sampling and two different molecular markers. (3) A taxonomic approach applied also to a *Senecio* species. We find that most of the populations in the studied *Lupinus* species became genetically differentiated when warming forced the páramo to migrate to the isolated, colder mountaintops during the Holocene. Besides isolation, populations' differentiation was also driven by founder events during the colonization of the mountaintops. On the other hand, we find that the main genetic structure within the studied *Senecio* species corresponds to differences in ecological niches (elevation zones), suggesting that ecological divergence underlies its diversification. We also find that homoploid hybridization was involved in the origin of several *Senecio* species. We describe a new species (*Senecio sangayensis*), which accurately exemplifies the importance of ecological divergence in driving diversification of the páramo flora. We suggest that the interaction between geographic isolation, founder events, ecological divergence, and hybridization underlies plant diversification in the páramo. The relative role of each of these processes varies depending on species-specific traits, such as dispersal ability, and on the stage of speciation. The role of isolation may be particularly important at the initial stages of speciation because, further during the speciation process, this role is obscured by the influence of selection and gene flow. Founder events may be also important at the initial stages of speciation, particularly in plant groups with limited long-distance dispersal. The interaction between homoploid hybridization, geographic isolation, and ecological divergence was also particularly important in the diversification of the páramo flora.