**Title: Seed longevity patterns in alpine fellfield and snowbed communities**

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Abstract:

In alpine landscapes, topographic roughness determines local environmental conditions along microhabitats such as fellfields vs snowbeds, which are supposed to act as local refugia under climate change. A functional ecological approach is still needed for understanding how these small-scale drivers modify the regeneration niche in alpine communities. Here we focused on seed longevity, a plant trait generally used to assess long-term ex-situ conservation of seeds, but with implications in seed persistence in the soil of natural habitats. We hypothesized that seed longevity of co-occurring species differs as a response of species preferential microniches, meaning that we can identify species groups which are consistently more short-lived than others. We analysed seed longevity of 25 species occurring in alpine communities from the Cantabrian Mountains (southern Europe) in two study systems (calcareous and siliceous) above 1900 m a.s.l. Seeds were exposed to laboratory-controlled accelerated ageing and then regularly sampled for germination tests. Initial viability (Ki), deterioration rate (r-1) and time taken for viability to fall to 50 % (p50) were estimated using probit analysis and microniche effects tested by GLMM in R. Our results show that seed longevity responses vary greatly across species, with p50 ranging from 3 up to 42 days. Seed longevity were ecologically and phylogenetically constrained, with some plant families adapted to cold and wet microhabitats (i.e., snowbeds) consistently showing short-lived seeds. Such results highlight that survival and persistence of alpine species facing climate change may depend on species microhabitat. While low average temperatures of alpine climates contribute to protect seeds from deterioration, some species might be particularly threatened with climate warming, especially those from cool-wet environments. The large variation of seed longevity, here observed within the alpine zone, may also have important implications for ex situ conservation.

LIMIT 300 words