Short title (<120 character)

Seeds from drier sites germinate better under drought

Seeds species potential to adapt germination to drier conditions

Summary (250-350 words)

The ability to successfully regenerate depends on complex physiological and ecological processes, and of the first vital stages is seed germination which depends on temperature ranges and water availability. Nevertheless, to successfully regenerate in the long haul, we must also take a look at variation within species. Variability allows to differential responses when facing stimuli and is key for evolution and adaptation in the natural world. There has been abundant research about germination responses to temperature changes but much less is known about germination responses to water availability, specifically the limits and the potential variation within a single wild species. Knowing the minimum amount of water required for germination as well as if exists variation within a species, potentially having the ability to adapt and evolve, is of vital importance under ongoing climate change with increasing drought episodes.

We focused on a wild carnation (*Dianthus langeanus*), endemic to northwestern Spain. We collected seeds from 18 different mountain sites, some only 10 m apart, and with contrasting climatic conditions due to topography, slope and orientation. We measured germination responses to water stress using polyethylene glycol (PEG) solutions, a polymer that increases water density and allows us to mimic different drought intensities. We expect that, even at this small scale, seeds from drier and warmer sites will be able to germinate under more intense drought conditions. In fact, we found considerable germination differences to water stress between each site, and seeds from warmer and drier sites were able to germinate under higher water stress, meaning their germination was more drought-tolerant.

Our results, highlight the importance of germination responses to water availability. Variation within species appears to be important even at small scales, suggesting an important previously unknown potential for seed germination adaptation to future drier conditions.