Effects of changes in rainfall patterns on the germination of the soil-seed bank of a Cistus-dominated shrubland

B. Céspedes & J. M. Moreno [1]

Abstract

It is anticipated that climate change might affect fire-prone ecosystems through its impacts on regeneration processes like seed germination. This might be particularly important after fire, and more so for seeder species that must recruit the whole population once burned. Soil temperature and moisture are the two climatic variables that most affect plant germination. Changes in rainfall patterns (i.e., accumulation of rainfall in winter with climate change) may thus affect regeneration by modifying the time and temperature at which seeds become moistened. The objective of this research was to evaluate how sensitive is the germination of the soil-seed bank of a seeder-dominated Cistus shrublands to changes in rainfall patterns. Soil samples from the 4 cm upper soil of a mature (< 16 yr-old) shrubland located at Los Puntales, Cordoba, S. Spain, were brought to the laboratory. Half of the content of each sample was subjected to a heat shock, mimicking the passage of a fire, and the rest was untreated. After that, all samples were divided into three sets and were laid to germinate upon sand-trays in a walk-in chamber. Photoperiod and temperatures (day/nigh) in the chamber were established to mimic autumn (12h-12h, 17.5ºC/10ºC), winter (10h-14h, 12.5ºC/5ºC) and spring (12h-12h, 20ºC/12.5ºC) conditions. Each season lasted 4 weeks, and the transition between seasons lasted one week. Irrigation treatments were applied as follows: R1 treatment (samples were irrigated throughout all the simulated seasons); R2 treatment (irrigation started at the end of fall (one week) and continued until the beginning of spring); R3 treatment (irrigation lasted only 4 weeks during winter conditions). Seeds germinated readily after being moistened under the three precipitation regimes. No cold exposure was needed to germinate and fall-watered samples exhausted the bank, and when spring conditions were set no additional germination was observed. Total germination of herbs was similar in heated or unheated samples, and was smaller under winter conditions. Dicots were more negatively affected by the winter precipitation treatments than monocots. Cistus germination was sensitive as well to rainfall treatments and to heat: fewer seedlings emerged in unheated samples as well as in winter-watered ones. The conclusion is that concentrating rainfall in winter might affect overall germination. However, the response was such that, provided that sufficient rain is available for a certain period, germination is likely to proceed, allowing the population to persist.

[1] Departamento de Ciencias Ambientales
Universidad de Castilla-La Mancha
Toledo
JoseM.Moreno@uclm.es.