

Nitrogen deposition depletes the soil seed bank of a kermes oak thicket

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Aims Nitrogen (N) deposition is a major driver of global change that can influence soil seed bank composition and abundance and seed germination. We investigated how eight years of simulated N deposition impacted the soil seed bank of a semiarid Mediterranean shrubland in Central Spain.

Methods The soil seed bank used in this study was collected from a kermes oak thicket located in the Nature Reserve El Regajal-Mar de Ontígola (Central Spain, 4°9'N, 3°29'W). Samples were collected on September 2014, following the spring/summer seed rain and prior to the onset of equinoctial rains. Consequently, we collected both transient and permanent seed banks without distinction. Three soil cores, 4.5 cm diameter and 4.0 cm deep, were collected from each of 24 plots that are fertilized since October 2007 (72 cores). Fertilization treatments corresponded to simulated N deposition rates of 0, 10, 20 and 50 kg N ha⁻¹ year⁻¹. Soils were incubated under semi-controlled conditions in a greenhouse and emerged plants were recorded.

Results During the course of the study, a total of 198 seedlings belonging to 21 species were recorded. When the number of germinated plants were compared among N treatments no significant differences were found ($p < 0.05$). However, when the between-plot variations in soil variables were considered in the analysis, the highest N treatment had a significantly lower number of germinated seeds than the control ($p < 0.05$). Soil organic matter, organic nitrogen and total nitrogen content masked the effects of nitrogen deposition on soil seed bank.

Conclusions

N deposition can influence the emergence of soil seed bank species. However, the mechanism linked to this effect, alteration of seed emergence physiology or compositional shifts of the seed bank, remains unknown.

Keywords Nitrogen deposition. Soil Seed bank. Mediterranean ecosystems. Global change. Plant-soil interactions.

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