
Forest tree recruitment in the margin of the distribution range: a question of forest canopy and microclimate for *Fagus sylvatica*

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Abstract

As a mesophilic tree species, beech (*Fagus sylvatica*) is highly threatened in the southern margin of its distribution range. Its recruitment decreases with mild winter temperatures, but also with water stress and extreme heat events in summer. At the edge of their distribution range, marginal populations can persist locally in areas with favourable site conditions. In order to understand how these populations persist, 49 pairs of mesocosms have been installed in the Ciron Valley in the south-west of the distribution range, using a factorial design of canopy structure (open environment, pinewood, mixture, hardwood). The microclimate has been quantified along our gradient of canopy cover: hemispheric pictures were taken in winter and summer to assess light resource availability, and climate sensors have been measuring air temperature and humidity under the tree canopy. Canopy effects depend on the season and the type of cover. As for light availability, the results show a significant difference between open environments and all other forest canopies during the winter. In summer, pine forests show intermediate levels of light between open and broad-leaved environments. Preliminary results for two-year old plants show a lower growth in height, diameter and number of branches in open environments, but no difference between the various forest canopies. Similar results for survival and growth of tree seedlings are observed, and no difference can be noticed for seed germination. Our results suggest that in the margin of its distribution range, conditions for *Fagus* are favourable for germination, and the presence of forest plays an essential role in the recruitment of trees, irrespective of the canopy type.

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