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Effects of nursery shading on seedling quality and post-planting performance in two Mediterranean species with contrasting shade tolerance

Jaime Puértolas · Luis F. Benito · Juan L. Peñuelas

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Abstract In Mediterranean climates, seedlings are frequently shaded in the nursery to avoid heat damage and save water. However, the impact of this shading on the seedling quality and transplanting performance of Mediterranean species is not well known. We studied the effect of nursery shading on pre-planting features and post-planting performance of two Mediterranean tree species: the shade-intolerant pioneer *Pinus halepensis* and the shade-tolerant late-successional *Quercus ilex*. We grew one-year-old seedlings of both species under 100, 40 and 5% full sunlight. Shade had a low impact on the morphology and physiology of *Q. ilex* seedlings. In pines, only the deep shade treatment produced low quality seedlings with poor root development. In both species, transference to high light at planting in autumn did not impose any additional stress than that caused by frosts, but initial root growth was impaired in the two shaded treatments in pine. Post-planting growth and survival of oak seedlings showed no difference between treatments. Pine seedlings grown in deep shade showed higher mortality and lower growth after planting than those grown in full sun and intermediate light treatments, while intermediate light only reduced growth. For the nursery culture of *Q. ilex* seedlings, we advise using low light levels during summer to save water without impairing field performance. In *P. halepensis*, seedlings should be cultured under full sunlight conditions to maximize post-planting growth, but they can be cultured under intermediate light without impairing survival.

Keywords Chlorophyll fluorescence · Winter photosynthesis · Plantation · *Quercus ilex* · *Pinus halepensis*

J. Puértolas (✉) · L. F. Benito · J. L. Peñuelas
Centro Nacional de Conservación de Recursos Genéticos Forestales, Apdo. 249, 19080 Guadalajara,
Spain
e-mail: jaime.puertolas@ua.es

Present Address:

J. Puértolas
Dpto. Ecología, Fundación Centro de Estudios Ambientales del Mediterráneo (CEAM), Universidad de
Alicante, Apdo. 99, 03080 Alicante, Spain