

EFFECT OF REVEGETATION METHOD (DIRECT SEEDING VERSUS OUTPLANTING) ON HOLM OAK ROOT ARCHITECTURE

**Raquel Juan-Ovejero, Jorge Castro, Francisco B. Navarro,
E. Rodríguez-Caballero, M. Reyes-Martínez, Domingo Alcaraz-Segura,
M.N. Jiménez, and Alexandro A. Leverkus**

The development of a proper root system is essential to increase the long-term success of reforestations and forest restoration. In the case of large-seeded species, like oaks, the cultivation of the plants in containers typically produces the deformation and even abortion of the tap root. By contrast, direct seeding is more likely to produce a normal, deeper tap root. In this study, we compared the root system of 104 holm oak (*Quercus ilex*) saplings grown in a common garden site. Half of the plants were cultivated in 300 ml containers for 1 year in a nursery, and the other half were established through direct seeding in the field. After 5 years, the plants were uprooted with a bulldozer until circa 50–60 cm depth, and the roots were scanned using a 3D laser scanner. The point clouds were then used to reconstruct the roots with quantitative structural models to calculate different metrics of root architecture. Metrics differed in their capacity to differentiate between the effect of revegetation method on root morphology. Nonetheless, seedling cultivation in the nursery consistently produced permanent deformities in the roots, with a lower proportion of the volume directed to the central root, which even disappeared as a unique axis in many cases. This could have implications for the resistance and resilience of the plants to environmental stressors such as drought or pests and supports that direct seeding should be a revegetation method to consider for oak forest restoration.

Raquel Juan-Ovejero, Department of Ecology, University of Granada, 18070 Granada, Spain, and Centre for Functional Ecology, Department of Life Sciences, University of Coimbra, 300-456 Coimbra, Portugal, and Department of Ecology and Animal Biology, University of Vigo, 36310 Vigo, Spain

Jorge Castro, Department of Ecology, University of Granada, 18070 Granada, Spain

Francisco B. Navarro, Area of Agriculture and Environment, Institute of Agricultural Research and Training, Government of Andalusia, Camino de Purchil s/n, 18004 Granada, Spain

E. Rodríguez-Caballero, Department of Agronomy, University of Almería, Almería, Spain

M. Reyes-Martínez, Department of Ecology, University of Granada, 18070 Granada, Spain

Domingo Alcaraz-Segura, Department of Botany, University of Granada, 18070 Granada, Spain

M.N. Jiménez, Department of Botany, University of Granada, 18070 Granada, Spain

Alexandro A. Leverkus, Department of Ecology, University of Granada, 18070 Granada, Spain