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Resilience from perturbation of architectural scheme through planting varies largely in *Pinus pinaster*

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Keywords: Root architecture, *Pinus pinaster*, planting, root deformation, 3D digitizing, coarse root architecture

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Introduction: Planting is a widespread propagation technique for woody plants. Container-growth and plantation is likely to heavily alter root architecture and thus modify anchorage. The Landes forest is located South-West France and produces 20% of french wood, it is mainly composed of intensively managed even-aged stands of *P. pinaster* (Ad). Most reforestation is made by planting genetically improved varieties, from seeded nursery stock. Soils are entic to albic spodosols which are acidic, sandy, and lenses of cemented spodic horizon can occur. Root system architecture is a key component in mechanical stability of trees. In their first 15 years, pines are mainly anchored by a rigid vertical and deep taproot (Danquechin Dorval 2016). Older trees are anchored by a rigid cane mainly composed of regularly spaced shallow shallow roots from which branch secondary sinkers (Danzon et al. 2005). The main framework of the central part of the root system is established at 4-years-old with a clear identification of root types (Saint Cast et al. 2020).

In this study, we characterize the deformations of root systems of *P. pinaster* saplings grown in containers and planted in the field. Incidence on root system architecture is analysed.

MATERIAL AND METHODS

Three hundred 3 to 5-years-old *P. pinaster* saplings planted in 16 forest stands were uprooted with hand tool and digitized using a magnetic field Polhemus 3D digitizer (Danjon & Reubens 2008). They were compared to 30 direct seeded trees from one stand. The resulting database contained 67000 segments and trees from one stand. The resulting database contained 67000 segments and trees from one stand. They were compared to 30 direct seeded saplings planted in 16 forest stands. The studied planted stands showed low mortality and a small number of badly planted seedlings. They displayed a very large variability in type and degree of deformations which likely to provide a good anchorage, other trees posses a non-vertical or weak taproot or show large LABS, except in planted stands b3, e3 and f3 where less than 20% of the root systems has no unacceptable defect. We concluded that change in root tropism through nursery growth, planting and initial root regrowth is likely to weaken the anchorage of the trees both in juvenile or mature stage. Thus orientation of root ends at interface of the plug and the soil, just after plantation is a major issue for tree anchorage.

Conclusions: The studied planted stands showed low mortality and a number of badly planted seedlings. They displayed a very large variability in type and degree of deformations which could not be related to variables like the planting season or the type of soil preparation. About half the planted trees showed a good resilience as they were able to grow a root system which is likely to provide a good anchorage, other trees posses a non-vertical or weak taproot or show large LABS, except in planted stands b3, e3 and f3 where less than 20% of the root systems has no unacceptable defect. We concluded that change in root tropism through nursery growth, planting and initial root regrowth is likely to weaken the anchorage of the trees both in juvenile or mature stage. Thus orientation of root ends at interface of the plug and the soil, just after plantation is a major issue for tree anchorage.


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