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Enhancing planting stock quality of Italian cypress (*Cupressus sempervirens* L.) by pre-cultivation in mini-plugs

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ABSTRACT

Native species are important in ecological restoration of degraded forest ecosystems provided that their ecological engineering potential is exploited. Their failure to get established is usually due to the use of low-quality planting stock and adverse site conditions. Mini-plug transplants are a relatively new and promising production system in the forest nursery area. Objectives of our study were the evaluation of seedling production of Italian cypress (*Cupressus sempervirens*) in mini-plug containers, the study of the effect of mini-plug density and substrate on planting stock quality, the comparison of the performance between mini-plug seedlings and the standard planting stock produced by Greek nurseries and the evaluation of physiological and morphological variables as predictive indicators of Italian cypress field performance. Our results showed that cypress seedlings could be produced using the mini-plug technique, resulting in higher quality seedlings than the standard stock type. Pre-cultivation of cypress seedlings under favorable conditions for a period of 5 weeks using peat and high mini-plug densities (1800–3500 mini-plugs m^{-2}) could be recommended. Grading of seedlings by using both easily measured morphological variables (root length, leaf area, root and shoot dry weight) and physiological tests, such as shoot electrolyte leakage, may improve survival and transplanting success. It is concluded that mini-plugs can serve ecological restoration of degraded forest ecosystems more efficiently than standard planting stock.

1. Introduction

Degraded forest ecosystems can be successfully restored if the ecological engineering potential of the native species is exploited (Simmons et al., 2007). In the Mediterranean region, forest degradation is usually caused by devastating wild fires which necessitate the implementation of large-scale reforestation projects. In these projects, appropriate native species need to be selected and suitable bioengineering techniques should be applied so that ecologically oriented, sustainable restoration is achieved (Beikircher et al., 2010). However, the Mediterranean environment is stressful, thus posing a continuous threat to the successful establishment of seedlings (Navarro et al., 2006). For this reason, there is an increased need for a large-scale production of high-quality planting stock of the species to be used.

Among the species suitable for reforestation and restoration programs is Italian cypress (*Cupressus sempervirens* L.), native in the Mediterranean region. It is considered very important as a landscape species (Spanos et al., 1999) and for ornamental purposes in urban forestry due to its aesthetic value. It is also widely used in wind breaks and in reclamation of burned areas because it is less flammable compared with the other coniferous species and as a general reforestation species. In addition, Italian cypress is also known for its medicinal, cosmetic and wood uses. This species is tolerant to calcareous, clayish, dry and poor soils (Xenopoulos et al., 1990) and is generally considered suitable for marginal and sub-marginal sites.

Although information regarding containerized seedling production of conifer species is abundant (Fan et al., 2004; Rose and Haase, 2005; South et al., 2005; Ortega et al., 2006; Navarro et al., 2006), studies referring to the ability of Italian cypress seedlings to be produced in containers are rather sparse. One of the major problems in the production of cypress seedlings is the poor quality of the seed material, which has been attributed to the high percentage of empty seeds normally present in seed lots (Spyroglou et al., 2009). In addition, cypress seeds are characterized by low germination and relatively slow growth rates during the early stages of seedling development.

Abbreviations: EP, enriched peat; SM, stabilized medium; F, cypress of Fasouri origin; L, cypress of Lagadas origin; RL, root length; SH, shoot height; AGA, above ground area; RCD, root colar diameter; RDW, root dry weight; SDW, shoot dry weight; SEL, shoot electrolyte leakage; RGP, root growth potential.

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