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From Forest Nursery Notes Winter 2013

123. © Mycorrhizal symbiosis affected by different genotypes of *Pinus pinaster*.

Sousa, N. R., Ramos, M. A., Franco, A. R., Oliveira, R. S., and Castro, P. M. L. *Plant and Soil* 359:245-253. 2012.

Mycorrhizal symbiosis affected by different genotypes of *Pinus pinaster*

Nadine R. Sousa · Miguel A. Ramos ·
Albina R. Franco · Rui S. Oliveira ·
Paula M. L. Castro

Received: 28 June 2011 / Accepted: 23 February 2012 / Published online: 16 March 2012
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Abstract

Background and aims Higher growth rate and morphological traits have been the major criteria for selecting trees in breeding programs. The symbiotic associations between *P. pinaster* and ectomycorrhizal fungi can be an effective approach to enhance plant development. The aim of this work was to assess whether the establishment of mycorrhizal symbiosis at nursery stage was affected by tree breeding.

Methods Seeds of *P. pinaster* from a clonal population, designed to select for various traits, and from neighboring wild plants were inoculated with compatible ectomycorrhizal fungi: *Suillus bovinus*, *Pisolithus tinctorius* or *Rhizopogon roseolus*, and grown in individual cells containing forest soil, in a commercial forest nursery. Growth and nutritional traits, colonisation parameters and the fungal community established were assessed.

Results *R. roseolus* and *P. tinctorius* were the most efficient isolates in promoting plant development. Inoculated selected saplings had an overall superior

development than their wild counterparts, with up to a 4.9-fold in root dry weight and a 13.6-fold increase in the total number of ectomycorrhizal root tips. Differences in fungal community were revealed through the denaturing gradient gel electrophoresis profile of each treatment.

Conclusions The results from our study suggest that the selected genotype benefits more from the mycorrhizal association and therefore this could be a valuable biotechnological tool for the nursery production of *P. pinaster*.

Keywords Tree breeding · Selected trees · Ectomycorrhiza · Forest nursery inoculation · Maritime pine

Introduction

It is currently known that to establish good quality and productive plantations the genetics of the planting material needs to be taken into consideration. Genetic variation in plants can occur naturally or be induced by human manipulation through breeding or genetic manipulation (Barker et al. 2002). Maritime pine (*Pinus pinaster* Ait.) covers a large area of Southwest Europe and is one of the most economically important forest species (Fernandes and Botelho 2004). The vast importance of this conifer to the Portuguese economy (Correia et al. 2004) led to the start of a breeding program in the early 1980s (Miguel et al. 2004) which is presently in its second generation (Gaspar et al. 2009). This conventional breeding

Responsible Editor: Angela Hodge.

Electronic supplementary material The online version of this article (doi:10.1007/s11104-012-1196-5) contains supplementary material, which is available to authorized users.

N. R. Sousa · M. A. Ramos · A. R. Franco · R. S. Oliveira ·
P. M. L. Castro (✉)
CBQF/Escola Superior de Biotecnologia,
Universidade Católica Portuguesa,
R. Dr. António Bernardino de Almeida,
4200-072 Porto, Portugal
e-mail: plcastro@porto.ucp.pt