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ORIGINAL ARTICLE

Evaluation of growth slowdown nursery treatments on *Prunus avium* seedlings by means of allometric relationships and relative growth rates

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Abstract

To evaluate the effects of carbonic fertilization and apical brushing (brushing of shoot apices to induce a negative thigmonastic response) on *Prunus avium* growth under nursery, carbon dioxide (CO_2) was fed to cherry trees. Later, carbonic fertilization was withdrawn and apical brushing was applied. Finally, the original conditions were reinstated. Height and trunk diameter, allometric relations with plant biomass and relative growth rate were followed. Contrary to expectations, apical brushing resulted in increased trunk diameter and, hence, growth rate. Carbonic fertilization did not produce differences in the initial growth, probably owing to the deciduous characteristics of the species. Continuous application of carbonic fertilization maintained growth rate, whereas no fertilization or its withdrawal reduced the growth rate, but acclimation of the CO_2-fed plants appeared by the end of the growing period. No differences in root growth potential at the end of the assay were observed between treatments. In conclusion, owing to the observed acclimation, carbonic fertilization is not advised throughout the complete period of growth. The tested treatments did not help to adapt supply of plant material of this species to the demand for revegetation. However, growth-slowing treatments may be applied to *P. avium* without any negative effects on potential root growth.

Keywords: *apical brushing, carbonic fertilization, growth slowdown, nursery, potential root growth,* Prunus avium.

Introduction

The Mediterranean ecosystem has been historically affected by natural and anthropogenic disturbances, which developed and modelled the landscape. It is particularly prone to recurrent wild fires (Trabaud, 1987). Currently, land use changes (farming and livestock abandonment) and reduction in forest harvesting have favoured big fires (Moreno et al., 1998). The high interaction between people and nature promotes the need to restore the affected landscape. In this process, revegetation is central and there is a need to adapt the supply of quality vegetal material to its demand.

Recently, the use of a carbon dioxide (CO_2)-enriched atmosphere during nursery growth (carbonic fertilization) has been used as a promising technique to increase plant production and to obtain high-quality plants under Mediterranean conditions (Wullschleger et al., 2002; Biel et al., 2004, 2006, 2008; Cortes et al., 2004). Several studies have shown very positive effects of carbonic fertilization on plant growth in a number of species (Wittwer, 1990; Rogers & Dahlman, 1993; Biel et al., 2003). In particular, photosynthesis enhancement (Radin et al., 1987; Long & Drake, 1992) and reduction in dark respiration (Bunce, 1990; Amthor et al., 1992; Wullschleger et al., 1994) can contribute to an increase in carbon capture resulting in higher biomass production, including the roots (Ceulemans & Moussseau, 1994; Norby, 1994; Taylor et al., 1994; Curtis & Wang, 1998; Rogers et al., 1999; Savé et al., 2007), although some controversy exists about the capacity of carbon mobilization to underground organs under CO_2-enriched atmospheres (Tingey, 2000). Hence, carbonic fertilization has been successfully used in nursery production, resulting in larger seedlings with a good proportion of above- and below-ground organs, making them suitable for reforestation events (Biel et al., 2004).

However, difficulties in foreseeing the appearance of new perturbations necessitates adapting the

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