Is it possible to produce forest nursery stock to face droughty periods after transplanting?

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Nursery stock with higher tolerance to water stress conditions during the season following transplanting could increase field performance when subjected to seasonally conditions (i.e. Mediterranean climate). This could contribute to the success of forest restoration also in relation to the consequences of climate change. We specifically addressed: (a) the effects of two substrates and three fertilization rates on morphological (root and shoot system) and physiological traits (fluorescence and spectroscopy) after nursery cultivation in three *Quercus* species (18 combinations); (b) the morphological and physiological response of each nursery stock combination to hydric stress test in greenhouse and in the field after transplant. In 2017, *Q. ilex*, *Q. pubescens*, *Q. robur* seedlings were grown in peat and coir (a renewable, sustainable resource). In addition to the nursery-standard fertilization, two other fertilization treatments were tested (enriched in K and in P). In 2018, two parallel performance trials were carried out: a hydric-stress test in controlled conditions (comparing three regimes) and a field planting (central Italy). At the end of nursery cultivation, greater growth, both in shoot and root biomass, was observed in peat-K treatment in all species, followed by the other fertilization treatments within peat substrate. Seedlings in coir showed a general lower development despite a higher shoot/root ratio. Combinations responded differently to the hydric stress test, with generally higher survival and performance for seedlings grown in coir. Results were combined with data collected in the field providing useful information to identify the most promising stock of each species to overcome 'transplant shock'.

In vitro cultivation of *Ilex paraguariensis* A. St. Hil seeds

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Ilex paraguariensis seeds are involved in a wood endocarp and the embryos are immature in the ripe fruits. As a consequence the germination is low even after months of adequate conditions. In vitro cultivation in medium supplemented with growth regulators is an alternative for obtaining seedlings from seeds with poor germination. The aim of this work was evaluate the effect of diferent growth regulators in yerba mate seeds cultivated in culture medium. The medium Murashige e Skoog 1/4 was used and supplemented with 3% sucrose, 0.6% phytagel, 4 ml L^{-1} cercobin; 8 ml L^{-1} ampicillin and 16 ml L^{-1} chloramphenicol. The following growth regulators were tested: 0.1 mg L^{-1} gibberellic acid; 0.2 mg L^{-1} gibberellic acid; 0.1 mg L^{-1} NAA and 0.1 mg L^{-1} gibberellic acid; 0.1 mg L^{-1} NAA. For each treatment 60 tubes were used containing one seed cut longitudinally and disinfested with 70% alcohol; 0.5% bleach and ultrapure water. The tubes were incubated at 27 ± Celsius degrees with light during 14 hours during 60 days. MS medium supplemented with 0.1 mg L^{-1} NAA and 0.1 mg L^{-1} gibberellic acid was efficient with 7% of germination. Nonetheless it was not possible obtain normal seedlings once only the hypocotyl developed radicules with atrophy. New studies are necessary to improve the technic for yerba-mate seed propagation.

Genetic variation among half-sib families of *Tectona grandis* L.f. in Colombia

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Teak is a high interest commercial tree species, mainly for its outstanding physical and mechanical wood properties, growth rates and adaptability to different site conditions. Superior genetic stocks of teak are required to contribute to the maximization of production in increasingly short periods of time. A study was carried out to evaluate the genetic variation of growth and tree quality traits among 40 half-sib families from 4 provenances from the Atlantic Coast of Colombia. Traits were measured in a 4-year-old progeny test established with a single-tree-plot arrangement in the interior valleys of the country. Variance components were determined using restricted maximum likelihood to calculate narrow-sense heritabilities and genetic gains considering different selection indices. Genetic correlations among traits were computed using multivariate analysis of variance. Additionally, a ranking of families according to total wood volume per hectare was developed. The analysis showed that all the families had a higher survival rate ranging 73-100%. The genetic gains by selecting 30% of the best families were estimated in2.93, 4.83, 11.97, 6.53, 4.26 and 14.42%for diameter, stem volume, total volume per hectare, crown projection area, branch insertion angle and number of basal sprouts, respectively. Total wood volume per hectare showed signifcant positive genetic correlations with diameter (rg = 0.72), stem volume (rg = 0.69), crown projection area (rg = 0.66) and stem straightness (rg = 0.31) and a negative correlation with branch diameter (rg = –0.21). The study identified that the best families proceed from municipalities of Canalete and San Antero, Córdoba.

How does water availability and drought sensitivity impact water use and water use efficiency in three fast growing *Eucalyptus* plantations?

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As climate change continues to drive changes in temperature and precipitation, understanding the trade-offs between wood growth and water use is becoming increasingly important. While a large number of studies have focused on resource use efficiency of stands, less attention has been directed to individual trees. Furthermore, we lack a detailed understanding of how clonal selection and environment impact tree water use in *Eucalyptus* plantations. Our previous work showed that larger, dominant trees had higher rates of wood growth, water use and water use efficiency (WUE) than smaller trees and this pattern persisted with increased water supply in irrigated plots. Here, we expand on this work and examine total water use and WUE for a drought sensitive and drought tolerant *Eucalyptus* clone growing at three climatically different sites within the TECHS research platform in Brazil. At each site, we measured WUE for each clone in control and rainfall reduction treatments. We are testing three hypotheses; 1) water use increases with precipitation inputs and is higher in drought sensitive clones, 2) larger trees use more water and have higher WUE than smaller trees and; 3) this pattern with tree size persists across all treatments and sites regardless of drought sensitivity of the clone. Preliminary data indicates mean annual increment (MAI) was higher in control versus rainfall reduction treatments and dominant trees grew faster than dominated trees. Final results for our hypothesis tests will be available in June 2019 when data analyses are completed.