

Evaluating the success of the reforestations with native species performed during last 50 years along a desertification gradient in Alentejo

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Introduction

Climate change scenarios suggest that in southern Portugal aridity will increase. Reforestation with native species is an adaptation measure, by improving ecosystems' resilience and ecosystem services provision. For example, preventing soil loss, while providing products such as wood and cork.

The low success of native species reforestation impairs its use.

Our aim is to evaluate the current status of areas subjected to reforestation efforts over the last 40-60 years, along an aridity gradient located in a semi-arid region of Portugal, Alentejo.

Methods

We sampled 23 sites, 16 are plantations of oaks (*Quercus suber*, *Q. ilex* or both) – we call these 'Quercus plantations'; 7 are 'mixed plantations' of oaks and pines (*Pinus pinaster* or *P. pinaster*).

In each plantation, in a 1 ha area and also in understory we:

- 1) counted the number of trees,
- 2) identified the tree species,
- 3) measured height using a hypsometer,
- 4) shrub species richness with the transect method,
- 5) counted all *Quercus sp.* saplings.

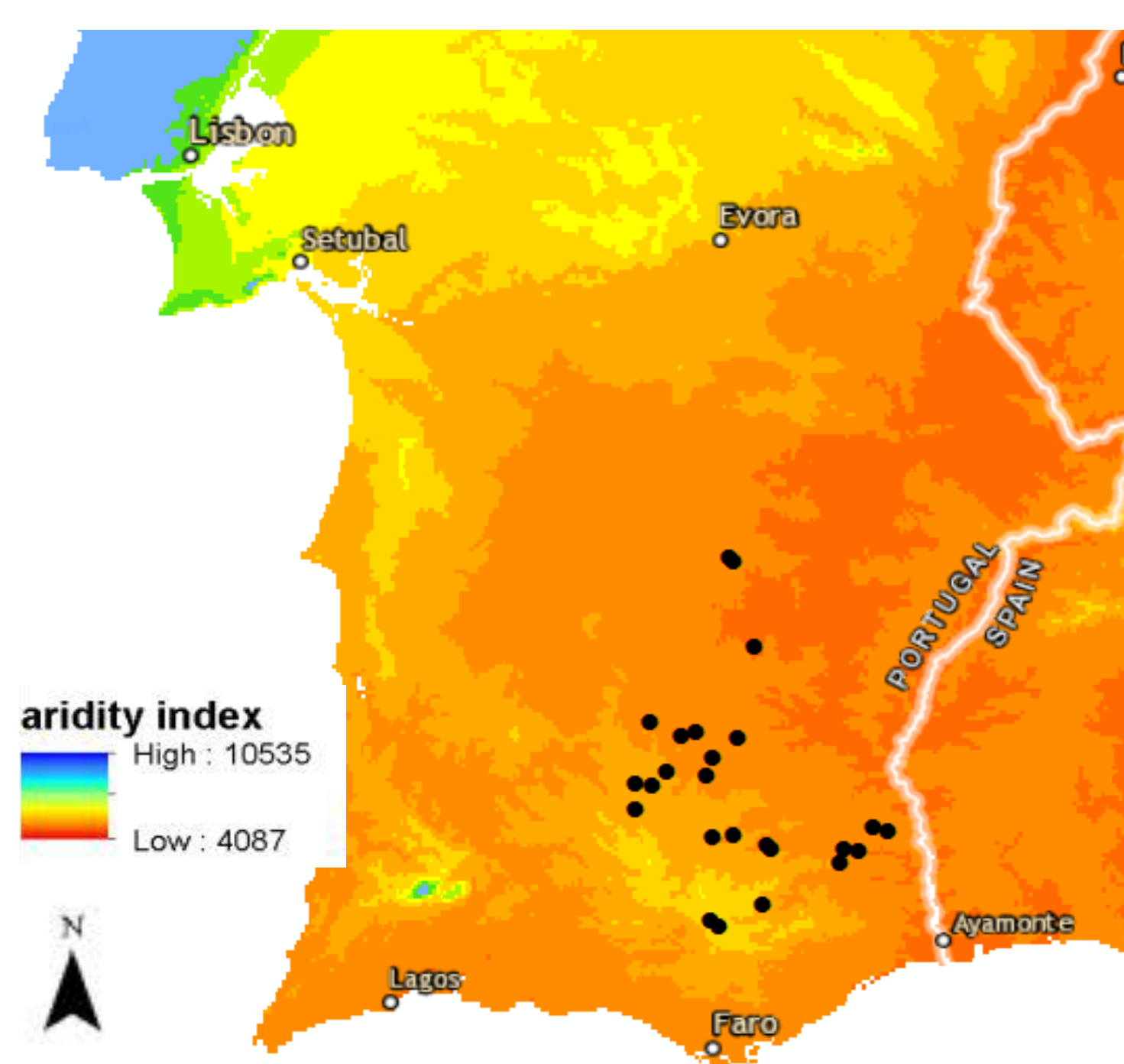


Fig. 1: (A) Reforested sites sampled along the aridity gradient. (B) and (C) are two sampling sites in the end of the growing season, with contrasting aridity levels.

Final Remarks

- Increasing aridity affects the diversity of the understory and oaks natural regeneration, which may compromise long term sustainability of reforestations.
- High density plantations and competition with pine trees seems to negatively impact oak trees growth.

Results

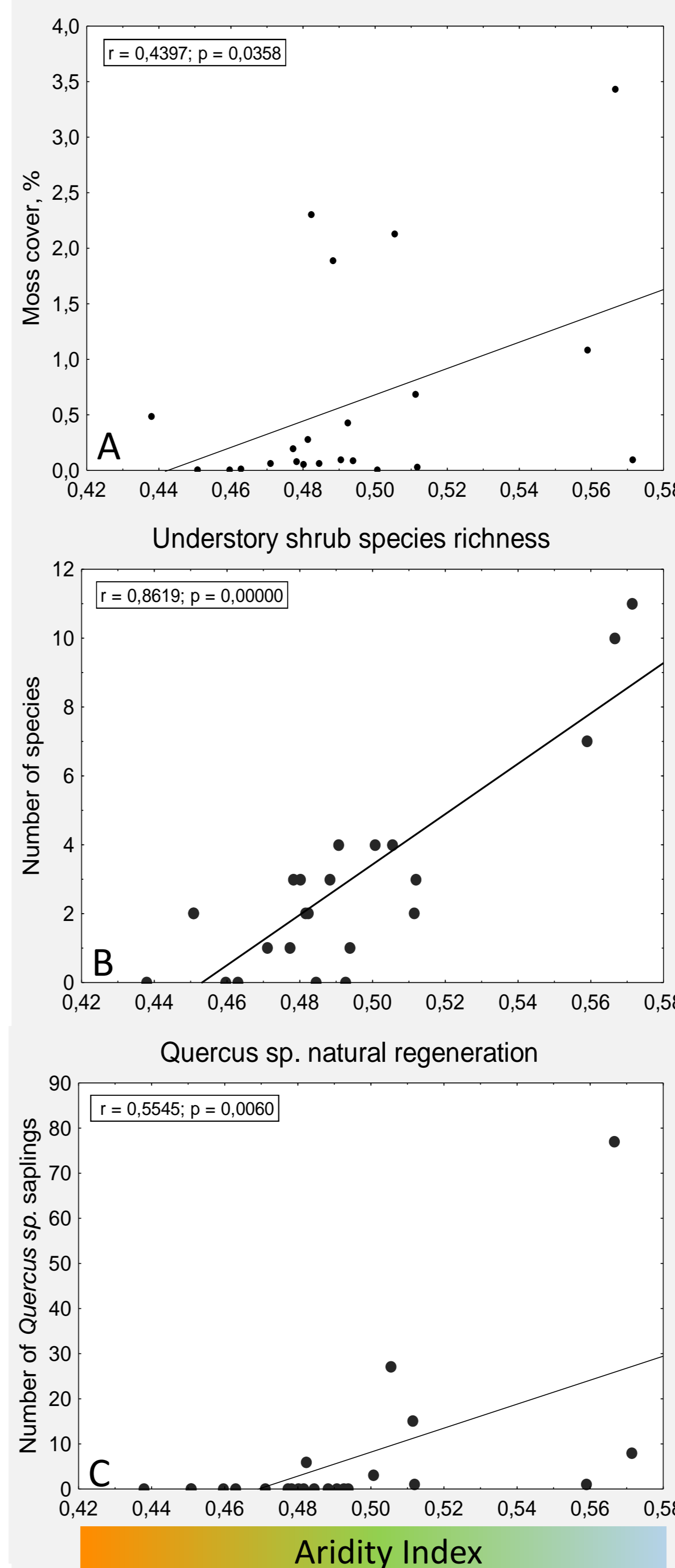


Fig. 2: Response of the understory community to aridity, showing correlation coefficient r and p -value. (A) Moss cover, (B) species richness of shrubs and (C) number of *Q. suber* and *Q. ilex* saplings. Lower values of aridity index correspond to dryer sites.

The planted oaks seem to be mainly affected by the type of plantation.

The height of the oaks did not correlate with aridity (data not shown).

However, oaks are significantly shorter in plantations mixed with Pines (fig. 3A), and if planted in high densities (fig. 3B).

Aridity affected negatively several components of the ecosystem:

1. More arid sites showed lower moss cover than more humid sites (fig. 2A).
2. The shrub community in the understory of the plantations located in more arid sites is less diverse (fig. 2B)
3. Tree natural regeneration is potentially affected by aridity, as saplings were only found in less arid sites (fig. 2C).

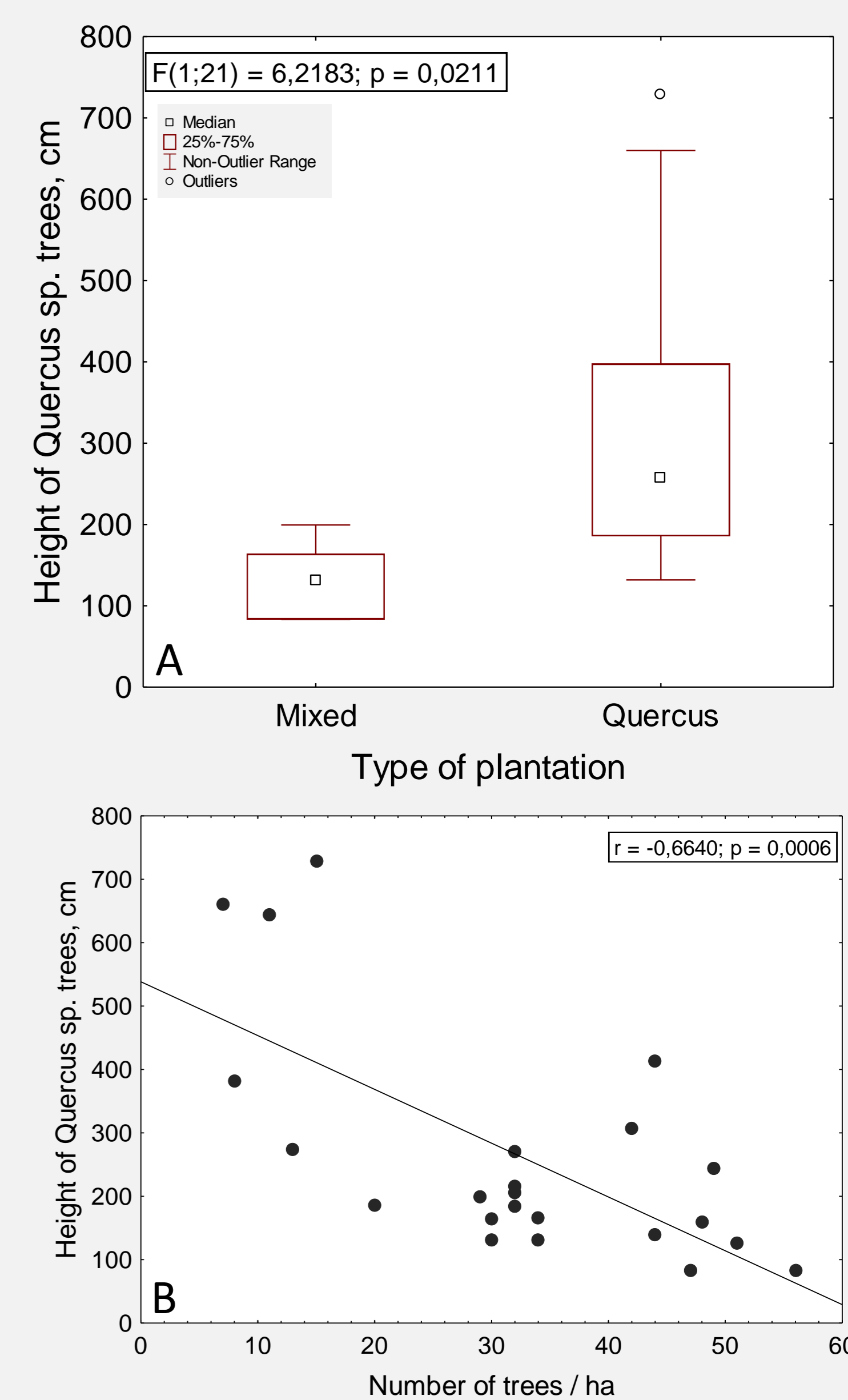


Fig. 3: Height of the *Q. suber* or *Q. ilex* trees in 'mixed plantations' or 'Quercus plantations' (A), and in relation with tree density (B).

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