Inter-tree competition patterns in undebarked cork oak stands in Portugal

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◎ Objective

Assess inter-tree competition in permanent plots established in undebarked even-aged stands located in Portugal by i) comparison with the self-thinning line, ii) assessing when stand density is affecting cork production, iii) stand structure, and iv) tree relative growth rate (RGR) pattern over tree size. Spacing coefficient (SC) values <1.25 are assumed to affect cork production, therefore it is important to detect when stand density is approaching this value. Relative spacing (RS) is easier to evaluate being important to find the RS value equivalent to a SC=1.25.

◎ Context

Cork oak plantations are usually established with higher densities than those observed in adult naturally regeneration stands. Since there are no recommendations on thinning time, this is subjectively defined by the landowners. If thinning would be delayed until the second cork extraction, tree selection could be based on cork quality and not only on tree form, size and vigour. Understanding inter-tree competition, and how it affects stand structure and tree growth, is relevant to support the definition of optimal stand densities and thinning schedules and ultimately for cork quality.

✓ Results

Young cork oak stands (<25 years) are far from the self-thinning line but density-dependent mortality was detected in older stands with higher densities. SC decreases with stand age, being values <1.25 (equivalent to an RS=0.5) observed just in the stands close to the self-thinning. In young stands, RGR in diameter decreases with tree size, indicating that competition does not affect the growth efficiency of small trees, but the relationship between RGR and tree diameter tends to stabilize over time due to the suppression of small trees. The RGRs of larger trees (diameter at breast height class ⩾ 20) do not decrease over time, indicating that competition is not affecting their growth.

→ Future developments

The establishment of thinning trials in young undebarked cork oak stands is crucial to complement the present knowledge on inter-tree competition in young cork oak stands. Information of inter-tree competition should be used to improve cork oak growth and yield models (i.e., ALCORNOQUE and SUBER models). Additionally, the inclusion of size–density trajectories in those models is desirable to establish individual mortality rules required to predict density-dependent stand mortality.

♀ Recommendations

The most common stand densities of young cork oak plantations might not lead to serious inter-tree competition before the first cork extraction. When the stand is approaching values of SC=1.25 (RS=0.5), a thinning operation should be performed to favor trees with slower growth. If those values are not achieved, it is advisable to wait until second cork quality can be assessed and trees with poor cork quality selected for thinning. Assessment of inter-tree competition status may primarily consider RS rather than SC since this variable is easier to measure as it is not dependent on individual tree crown measurements.

⚠ Impacts and weaknesses

Knowledge of inter-tree competition status before the first cork debarking supports the decision on schedule and intensity of thinning operations. Information of stand growth patterns can support the decision of delaying thinning until the second cork extraction, favoring high cork quality producers that will bring economic benefits.

The self-thinning line used in this study might overestimate stand density since it was developed based on National Forest Inventory data that assumes trees bifurcated below 1.30 m as several individual trees while in this study 1.0 m was assumed as rule.
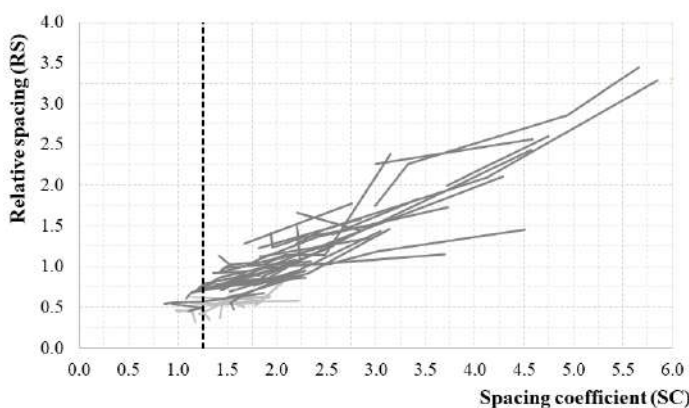
Representation of the relative spacing (RS) evolution over the spacing coefficient (SC); dashed black line is the Natividade (1950) SC reference value. Credits: SFaias

Further information

Faias, S.P., Paulo, J.A., Tomé, M., 2019. Inter-tree competition analysis in undebarked cork oak plantations as a support tool for management in Portugal. New Forests :1-17.
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About INCREDIBLE Project

INCREDIBLE project aims to show how Non-Wood Forest Products (NWFP) can play an important role in supporting sustainable forest management and rural development, by creating networks to share and exchange knowledge and expertise. 'Innovation Networks of Cork, Resins and Edibles in the Mediterranean basin' (INCREDIBLE) promotes cross-sectoral collaboration and innovation to highlight the value and potential of NWFPs in the region.