

Influence of cork oak seed origin on budburst and leaf pest damage



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Keywords

NWFP

Scale



Context

Climate change-induced warming has led to shifts in spring phenology in many plant species. These shifts have ecological consequences since they affect (i) the length of the growing season and the amount of net assimilation, affecting tree growth potential, and (ii) the defoliation patterns with significant disturbance in tree fitness.

The Portuguese cork oak provenance trials, growing in common conditions 35 populations covering the species distribution area, were used to evaluate adaptive traits (budburst and leaf pest damage) linked with the climate that affect plant performance.



Objective

- Evaluation of spring shoot phenology (timing of budburst) variation as a function of seed geographic origin.
- Understanding the adaptation potential of cork oak populations to biotic stress, assessing if earlier/later budburst timings have consequences on the amount of leaf pest damages.
- Identify the most frequent pests occurring on the damaged leaves. Relate budburst and plant-pest interactions with climatic conditions.



Results

Overall, cork oak populations exhibited earlier budburst in the years with warmer winter months.

Populations from Italy, Algeria, and Tunisia and some from Morocco, burst earlier than those from the western part of the species natural distribution. Differences reached 1 month!

Differences in budburst timing affected insect activity and consequently the amount of leaf damage.

Increased percentage of attacked leaves coincides with the year when budburst was more concentrated in time and budburst occurred later. Populations from North Africa, with earlier budburst, were more exposed to pest damages. The most frequent observed pest was *Periclista andrei*. Damages from *Tortrix viridana* and *Lymantria dispar* were observed sporadically.



Recommendations

The adaptation potential of forest ecosystems to rapid climatic changes is dependent on the existence of genetic variation within a species and constitutes a major challenge in forest management. Since cork oak populations do not perform equally for adaptive traits, such as budburst and leaf pest damage, future (re)forestation practices with the species, should consider seed origin to optimize the response to biotic threats and abiotic change. The use of well-adapted forest reproductive material will increase the competitive ability, survival and long-term success of tree species, contributing to healthier and more productive cork oak stands, and to economic gains for owners, rural populations and the cork industry.



Impacts and weaknesses

Monitoring budburst and leaf pest damage variation of cork oak populations allow the selection of more adapted seed material to use in (re)forestation.

Cork oak populations with earlier budburst benefit from a longer growing season, partially bypassing the Mediterranean summer drought by concentrating carbon fixation when environmental conditions are more favorable. However, these populations (mainly North African) also suffer more leaf pest damages, with consequences to tree vitality and growth.

Populations with higher growth will increase cork productivity gains and anticipate cork debark.



Future developments

Additional information of cork oak intraspecific variation on other adaptive traits (e.g drought tolerance) is required to better allocate forest reproductive material to cope with ongoing climate changes. Identify populations with higher cork quality traits (e.g., porosity, suberin content) will contribute to the long-term sustainability of cork oak stands and the cork industry.

The synchrony between budburst and insect egg-hatch and/or pupal diapause break and the possible effects of chemical foliage composition of cork oak populations on the susceptibility to pests should be considered.



Cork oak provenance trial in south Portugal; Credits: CSantosSilva

Further information

Sampaio, T., Branco, M., Guichoux, E., Petit, R.J., Pereira, J.S., Varela, M.C, Almeida, M.H., 2016. Does the geography of cork oak origin influence budburst and leaf pest damage? *Forest Ecol. Manage.* 373, 33–43. <https://doi.org/10.1016/j.foreco.2016.04.019>

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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.



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