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Climatic drivers of cork growth depend on site aridity

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Cork is one of the main non-timber forest products in the world. Most of its production is concentrated in the Iberian Peninsula, a climate change hotspot. Climate warming may lead to increased aridification and reduce cork production in that region. However, we still lack assessments of climate-cork relationships across ample geographical and climatic gradients explicitly considering site aridity. We quantified cork growth by measuring cork ring width and related it to climate variables and a drought index using dendrochronology. Four cork oak (*Quercus suber* L.) forests located from north eastern Spain to south western Morocco and subjected to different aridity levels were sampled. Our results showed that warm conditions in spring to early summer, when cork is formed, reduced cork width, whereas high precipitation in winter and spring enhanced it. The response of cork to increased water availability in summer peaked in the most arid and continental site considering 14-month long droughts. A severe drought caused a disproportionate loss of cork production in this site, where for every five-fold decrease in the drought index, the cork-width index declined by a factor of thirteen. Therefore, site aridity determines the responses of cork growth to the soil water availability resulting from accumulated precipitation during winter and spring previous to cork growth and until summer. In general, this cumulative water balance, which is very dependent on temperature and evapotranspiration rate, is critical for cork production, especially in continental, dry sites. The precipitation during the hydrological year can be used as a proxy of cork production in similar sites. Assessments of climate-cork relationships in the western Mediterranean basin could be used as analogues to forecast the impacts of aridification on future cork production.