Supplementary Material and Methods 1

1 Supplementary Material 1. Climate data description

We combined several databases to characterise the climate at the origin of provenances and the climate at the field trials. This was achieved by downscaling the CRU-TS dataset (Harris et al., 2020) from ~50km to 30-arc sec (~1 km) using WorldClim v1.4 (Hijmans et al., 2005) with the 1961-1990 climatic normal period as baseline. Our downscaling technique used the delta method (Ramirez-Villegas and Jarvis, 2010), a technique that accounts for topographic variation and improving the reliability and spatial resolution of coarser spatial datasets (Moreno and Hasenauer, 2016; Frejaville and Benito Garzón, 2018).

To characterize the climate of the future (called the 2070s), we aligned future climate scenarios from CMIP5 at 1km resolution (WorldClim v1.4. - Hijmans et al., 2005) to the normal period (1961-1990) of the previously downscaled CRU-TS climate data. The use of such a common baseline (WorldClim v1.4) used for present and future climatic conditions avoids statistical artefacts that may occur when different data sources are combined. For each of the four RCPs we used five GCMs from the Fifth Assessment Report of IPCC (IPCC, 2014) with the time slice 2070s. The GCMs selected were: BCC-CSM1-1, HadGEM2-ES, MRI-CGCM3, MIROC-ESM-CHEM and NorESM1-M; based on the availability of the RCPs for the 2070s period. The raw global files of the downloaded GCMs are available at (https://worldclim.org/data/v1.4/cmip5_30s.html).

1.1 Reference list of Supplementary Material 1

Fréjaville, T., and Benito Garzón, M. (2018). The EuMedClim Database: Yearly Climate Data (1901–2014) of 1 km Resolution Grids for Europe and the Mediterranean Basin. Front. Ecol. Evol. 6, 1–5. doi:10.3389/fevo.2018.00031.

Harris, I., Osborn, T.J., Jones, P., Lister, D. (2020). Version 4 of the CRU TS monthly high-resolution gridded multivariate climate dataset. Sci. Data 7, 109. doi:10.1038/s41597-020-0453-3.

Hijmans, R.J. (2020). raster: Geographic Data Analysis and Modeling. R package version 3.3-13. https://CRAN.R-project.org/package=raster

Moreno, A., and Hasenauer, H. (2016). Spatial downscaling of European climate data. Int. J. Climatol. 36, 1444–1458. doi:10.1002/joc.4436.

Ramirez-Villegas, J., and Jarvis, A. (2010). Downscaling global circulation model outputs: The delta method decision and policy analysis working paper no. 1. International Center for Tropical Agriculture (CIAT). Consultative Group on International Agricultural Research. Report, May 2010.