VALORIZATION OF WINTER CORK THROUGH NIRS-BASED CHARACTERIZATION

Clara Esteban Álvarez, Verónica León Fernández, Mariola Sánchez-González

Institute of Forest Science (ICIFOR-INIA, CSIC), Cork Laboratory, Ctra. De La Coruña km 7.5, Madrid, Spain, email: msanchez@inia.csic.es

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An adequate management of cork oak forests prevents shrub accumulation, which can compromise productivity due to competition for resources, as well as increase wildfires risk. However, in recent years, the decrease in profitability of silviculture operations has limited these practices.

One way to restore profitability to silvicultural management is through the valorization of the residues generated during these activities, as winter cork. This material is obtained from pruning and thinning operations, which are carried out outside the cork harvesting season. Cork harvesting takes place from late spring to mid-summer, when the phellogen is physiologically active and its cells are fragile. Outside this period, phellogen cells do not separate easily, which results in winter cork always containing fragments of wood or "impurities".

To commercialize the different fractions with distinct characteristics (cork and wood), a process of grinding and separation is necessary, which is costly and lacks efficient mechanization solutions. The characterization of this granulate based on cork content could allow the estimation of the viability of an investment to process and separate the cork from the wood particles.

This study focuses on evaluating the feasibility of using Near-Infrared Spectroscopy (NIRS) for this characterization: in first place, cork and wood from pruning and thinning operations are received in the ICIFOR-INIA-CSIC cork laboratory. There are first grounded to obtain homogeneous granulate of 0,5mm. From these processed materials, 150 samples are prepared with known cork-to-wood proportions (2%, 25%, 50%, 75%, and 100%). These constitute the calibration set.

Diffuse reflectance NIR spectra are acquired from all samples using a Bruker MPA I FT-NIR spectrophotometer, equipped with a rotating integrating sphere and a 2.5 cm-diameter measurement channel. Spectra are collected across the 12.500–4.000 cm^{-1} range, at an 8 cm^{-1} resolution.

A quantitative analysis is applied using Partial Least Squares (PLS) regression to develop the calibration equation that allows the prediction of the percentage of cork present in a granulate sample based on its NIRS spectrum.