

Using NIRS to assess the presence of cork anomalies



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Keywords

cork

Quercus suber

NIRS

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quality control

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Scale

Global

Context

The manufacture of natural and technical cork stoppers requires the use of cork free of certain anomalies to prevent the cork from acquiring unwanted characteristics. Two of those anomalies are 'yellow stain' and 'corkbark'. Yellow stain produces a yellow discoloration in the stoppers and confers a mould-like taste due to the TCA biosynthesis it causes. Corkbark changes the density of the cork, affecting the mechanical behaviour of the stoppers. Quality control for such anomalies is only standardized for cork stoppers. Such techniques cannot be applied to raw cork due to the high cost and high variability of the material; hence cork planks are currently assessed visually.

Objective

The cork used in the manufacture of natural cork stoppers or technical stoppers must meet a number of conditions, including being free of certain anomalies. The use of NIRS (near infrared spectroscopy) technology has proven to be a valid technique for detecting yellow stain and corkbark, which are defects that must be avoided due to their harmful effects on the properties of the cork.



Results

NIRS has been applied in quality control in the food and agricultural industry. It is a non-destructive technique, quick to perform, requires a small sample and provides information on different variables simultaneously. It has already been successfully used in characterizing cork planks according to their porosity and visual quality. Other anomalies such as earthy cork and stained cork have also been evaluated. Each sample analyzed with NIRS presents a spectrum, which is similar to that of other samples with similar qualities. After analyzing more than 600 cork samples with and without anomalies using NIRS, it was shown that the NIRS analysis allows samples free of anomalies and those with yellow stain or corkbark to be differentiated. Likewise, quantitative equations have been developed that allow the percentage of these anomalies in granulated cork to be estimated.



Recommendations

The results show that NIRS technology is capable of detecting whether a cork sample contains yellow stain or corkbark or is free of anomalies. In this type of qualitative analysis, what is detected is the presence of those anomalies in a sample of cork plank chosen randomly. It is a preliminary result in terms of use by the industry, since detecting whether or not a cork plank presents acceptable anomalies during the production process would require the design of a protocol to establish the quality control methodology applied. The results of the analysis in granulated cork are of a quantitative type, which can be applied directly to the granulated cork since we can assume that its composition is homogeneous and the proportion of anomalies in the samples will remain constant.



Impacts and weaknesses

The application of this type of NIRS technology represents an important step forward in the control of anomalies in cork planks, specifically in the presence of yellow stain or corkbark. However, for the results obtained with this type of analysis to be decisive for its use by the industry, it is necessary to design quality control standards to determine whether a given cork plank deemed free of anomalies is acceptable to the industry (number of random samples taken on a plank, location of these samples, among others).



Future developments

NIRS technology has proven to be a suitable technique for detecting cork anomalies, such as those described in this document, in addition to detecting other properties (porosity, humidity). In this case, to generalize its application, analyses could be carried out on cork samples from different sources and which present anomalies other than those already analyzed. It is also important to implement quality standards so that the NIRS results can be used directly by the industry.



Diferent cork samples. (c) INIA

Further information

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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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