UTILIZATION OF SPECTRORADIOMETER (FIELDSPEC-3) FOR MEASURING LIGNIN CONTENT AND AGE OF WOODEN SURFACES

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This abstract describes the use of spectroradiometer (Fieldspec-3) for analyzing various characteristics of wood products based on the spectral response curves from the surface. Recently, many of the wood industries who produce value added wood products and those restore ancient wooden items are adopting computer-automated technologies to increase efficiency and recovery. Colour is an important aspect of the appearance of wooden surface features and hence colour based wood-scanning systems were employed before to indentify the defects. Primary determinant of the colour of an object is its spectral reflectance. Reflectance of an object contains more information compared to chromaticity. Selection of adequate sensors and filters are determining factor in a field experiment to measure spectral response of wood surfaces. Near-infrared reflectance has been proved its efficiency in rapid and accurate estimation of physical properties such as moisture content, microfibril angle, colour and chemical composition of the wood. Fieldspec-3 is a portable spectroradiometer which offers the modular Goetz spectrometer engine with a spectral range from 350 nm to 2500 nm and is ideal to perform solar spectral reflectance, radiance and irradiance measurements. Scanning time is approximately 100 milliseconds and hence it allows more data in less time. Slash Pine (*Pinus elliottii*) is commonly cultivated in southern Brazil and is used for making value added wood products like furniture. Wood samples of different age after cutting the tree and a polished furniture surface made of Slash pine were taken as samples. Lignin content and biomass show a negative correlation but in the qualitative analysis of wood used for making furniture, high lignin content ensures that the material is highly durable. Aromatic lignin is abundant in conifers (which includes pines). Lignin content is highly depends on the age of the wood (decreases with the age). The absorbances at 1135 nm and 1672 nm have been found to be important for lignin (in the aromatic portion) determination. This region in the electromagnetic spectrum is available with Fieldspec-3 (350 nm – 2500 nm). Radiometric measurements (with the help of software called RS[3]) were done by a microcomputer connected with the Fieldspec-3. These data were converted into .txt with the help of Viewspec[TM] Pro software which is then used for calculating the spectral response curves in Microsoft Excel. Spectral response of each sample was calculated and analyzed. Reflectance of newly cut wooden piece showed a little bit lower response curve, probably due to higher water content. Dry wooden pieces were found to be having similar but lowered spectral response curves with aging, probably due to decrease in the lignin content. Interestingly, it is seen that an extremely dry sample (and almost degenerated without any lignin content) has showed a spectral response curve very similar to dry soil. Polished wood surface simply showed a similar elevated spectral response similar to that of dry wood surface with high lignin content. Statistical analysis has been showed that the complete loss of lignin from the wood changes the radiometric characteristics of the material. Chemical analysis of wood with various ages is highly recommended for future work for a comparative study in combination with a more sophisticated spectroradiometer. Samples taken from other species of conifers is also recommended for comparison.