Use of NIR-HIS and dichotomist classification tree based on SVMDA models in order to discriminate roots and crop residues of winter wheat

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Monitoring of both crop residues decomposition and root system development is important to improve agricultural practices. In this study, NIR hyperspectral imaging was used to discriminate roots and crop residues of winter wheat (*Triticum aestivum* L.) and soil. This technique has been proposed as an alternative to the tedious hand sorting commonly needed with the soil coring method in studies on roots and crop residues (Eylenbosch et al., 2014). Organic matters collected after washing of soil cores have to be separated before quantification and characterization. Sorting is time-consuming and depends on operator subjectivity (Plaza-Bonilla et al., 2014).

Dichotomist classification trees based on successive Support Vector Machine Discriminant Analysis (SVMDA) models were used to predict spectral nature of pixels on hyperspectral images (Fernández et al., 2004). Images were acquired with a push-broom imaging system working in the range of 1100-2500 nm and combined with a conveyor belt.

Our study highlighted the importance to select carefully pixels intended for models construction. A sufficient number of pixels have to be selected to have a high variability of spectra (Lebot, 2012) and care must be taken to select spectra of shadow separately to increase sensitivity of predictions. In our case, spectra of the conveyor belt, on which samples were laid under NIR camera, have been combined with spectra of root shadow in a single class (background).

Pixels coming from the background and soil particles were well predicted. Mean percentages of correctly predicted pixels were respectively 100% and 98.4% (± 1.0%). For root sampled during the growing seasons, 97.7% (± 0.9 %) pixels were well predicted. Prediction of pixels of dead roots and crop residues was more difficult. Central area of crop residues was always well predicted but most pixels located on the edge were predicted as roots. Only 79.4% (± 4.7%) pixels of crop residues were well predicted. Use of model pattern recognition should allow to better predict pixels of crop residues and to better separate them from roots.

References:

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