POSTER SUMMARY

NEAR-INFRARED REFLECTANCE (NIR) SPECTROSCOPY: BEHIND THE SCENES

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Abstract

Near-infrared reflectance spectroscopy (NIRS) can provide rapid, non-destructive and quantitative analyses of most organic constituents found in plant tissues. Near-infrared radiation (750-2500 nm) is absorbed mainly by C-H, N-H and O-H bonds that are the primary constituents of organic compounds. The chemical constituents of a particular plant tissue or biochemical compound determine the nature and number of bonds present, and consequently, the wavelengths and amount of light that is absorbed, as a unique spectral pattern or fingerprint. Consequently, NIRS generates complex spectra which can only be interpreted through the use of chemometric models. Spectral features are combined with reliable compositional or functional analyses of the material ('wet chemistry') in a predictive statistical model. This calibration model is then used to predict the composition of new or unknown samples that are part of the same population. Samples falling outside the population can be analysed by traditional means and iteratively included in an expanded calibration model. NIRS can be used to analyse specific elements (e.g. N as protein), well-defined compounds (e.g. starch), or more complex, poorly defined attributes (e.g. animal food intake or pest and disease resistance). In these cases, the NIR reflectance must be of an important but unidentified biochemical constituent of resistance, quantitatively correlated with resistance expression. Both constitutive and induced resistance can be screened, before or after induction of a resistance reaction, respectively. This poster illustrates the processes currently being applied in the development of rapid, non-destructive, on-site NIRS screening techniques for rating the resistance of sugarcane clones to pests and diseases. Upon implementation, these techniques will allow the screening of larger plant populations at earlier stages within the plant breeding selection programme, resulting in cost savings, productivity benefits and increased numbers of resistant clones progressing to later selection stages.

Keywords: NIRS screening, spectra, chemometric, calibration, sugarcane, pests, diseases, resistance