

Prediction of the content of white clover and perennial ryegrass in fresh or dry mixtures made up from pure botanical samples, by near infrared spectroscopy

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Pasture composition, an important attribute determining sward condition and value, is normally assessed by hand separation, drying and measuring weight contribution of each species in the mixture. This is a tedious, time and labour consuming procedure. NIRS has demonstrated the potential for predicting botanical composition of swards, but most of the work has been carried out on dry samples. The aim of this work was to evaluate the feasibility of developing NIR models for predicting the white clover and ryegrass content in fresh or dry mixtures artificially prepared from pure samples of both species. Mixtures from pure stands of white clover (*Trifolium repens*) and perennial ryegrass (*Lolium perenne*) were prepared with different proportions (0 to 100%) of each species (fresh weight). A total of 55 samples were made (11 mixtures, 5 cuts). Spectra (400 to 2500 nm) were taken from fresh chopped (rectangular cuvettes, transport sample module) samples, in a NIRSystems 6500 scanning monochromator controlled by the software NIRS 3 (Infrasoft International), which was also utilized for calibration development. Different math treatments (derivative order, subtraction gap and smooth segment) and a scatter correction treatment of the spectra (SNV and Detrend) were tested. Equations were developed by modified partial least squares. Prediction accuracy evaluated by cross-validation, showed that percentage of clover or ryegrass, as contribution in dry weight, can be successfully predicted either on fresh or dried samples, with equations developed by different math treatments. Best equations for fresh samples were developed including a first, second, or third derivative, whereas for dry samples best equations included a second or third derivative. Standard errors of cross validation were about 6% for fresh and 3.6% for dry samples. Coefficient of determination of cross validation (1-VR) were over 0.95 times the value of SECV for fresh samples and over 8 times the value of SECV for dry samples.

Scatter correction (SNV and Detrend) in general improved prediction accuracy. It is concluded more precise on dried and ground samples, it can be used with an acceptable error level and less time and labour, on fresh samples.

Keywords : Near infrared spectroscopy, NIR, botanical composition.