Title Rapid and non-destructive measurement of nitrogen-status in ornamental cuttings by near-infrared-spectroscopy as part of a quality assessment system in supply chains of young plant production

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Abstract

Role of nitrogen in adventitious root formation of leafy cuttings is discussed extensively for different ornamental species. To date, this knowledge is rarely used for a quality assessment system in supply chains of young plant production. As analysis of growing media or nutrient solution during stock plant cultivation have limited significance and plant analysis e.g. Kjeldahl- or Dumas-N are too time consuming and expensive. In the present study[1], we explored the potential of Near-Infrared-Spectroscopy (NIRS) as fast and non-destructive alternative. Cuttings of *Pelargonium* x *hortorum*, *Pelargonium* x *peltatum* and *Chrysanthemum* x *grandiflorum* from current production of three companies and from stock plants cultivated with different levels of N-supply at Weihenstephan research institute have been used for calibration. NIR-spectra were taken from intact, fresh cuttings using a Zeiss NIR-Diode-Array-Spectrometer fitted with a rotary plate for sample presentation. As reference, four N-fractions (amid-N, nitrate-N, amino-N, protein-N) and total-N were analysed using a modified Kjeldahl procedure. Additionally, sums of extractable N-fractions (enf-N=amid-N+nitrate-N+amino-N) and organic bounded N-fractions (onf-N=amid-N+amino-N+protein-N) were calculated. The dataset was 241 samples in total, thereof 161 were used for calibration and 80 samples build the validation set. Best prediction power was achieved for protein-N with a standard error of prediction (SEP) of 1.98 mg N·g DM^{-1} and a R^2 of 0.89, for total-N (SEP = 2.91 mg N·g DM^{-1}; R^2 = 0.88) and for onf-N (SEP = 2.61 mg N·g DM^{-1}; R^2 = 0.87). Amid-N showed a poorer but acceptable accuracy with SEP = 0.40 mg N·g DM^{-1} and R^2 = 0.70. For nitrate-N, amino-N and enf-N, prediction power was poorest with R^2 between 0.55 and 0.67. Results reveal that protein-N fraction, total-N and sum of organic bounded N-fractions can be predicted by NIRS non-destructively within a few seconds. This makes NIRS a promising tool for quality assessment of ornamental cuttings.