Remote control of chemicals accumulation within vegetation

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Rationale: Chemicals within growing canopy are diluted with time. Techniques to measure the chemicals status in vegetation can assist in its management. In this study a nondestructive (remote) method to determine the dilution rate with time was developed and described.

Objectives: a) Demonstrate applicability of image analysis and digital color imaging to monitor chemicals accumulation in vegetation’s canopy. b) Formulate a general dilution equation of chemicals within the canopy of vegetation; c) Monitoring the dilution function of a case study;

Methods: Carrot (Daucus carota) was grown on loess soil at five nitrogen (Ntot) application rates. Ntot weight (kg/ha) was obtained by standard laboratory analysis and by image processing.

Results: A new logistic decay curve \( Nc=a/[1+(W/W0)b] \) agreed with experimental data. \( Nc \) (g/kg) is the critical nitrogen level, \( a \) and \( b \) are coefficients and \( W/W0 \) is the relative dry matter biomass. Values of Nitrogen Nutrition Index (NNI) \( \geq 1.0 \) indicated that there was no nitrogen deficiency in treatment larger than 100% application of Ntot.

Conclusions: The weight of Nitrogen in form of multiplication of the dry leaves weight (W) and N percent is suitable for the determination of nitrogen status. The availability of image-based data for N content within the vegetation is faster, timely and less expensive than that of laboratory test. Applicability of digital color camera to monitor total N uptake by vegetation instead of laboratory test was successfully demonstrated.