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Indicators of nitrogen status for ornamental woody plants

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Introduction

- Indicators of plant nitrogen (N) status adapted to woody ornamental plants are essential to adjust fertilization to plant N demand in ornamental plant nurseries.
- N supply influences the synthesis of both proteins and polyphenols, because their biosynthetic pathways share a common precursor.

Objective

To test if optical measurements of

- epidermal polyphenol (EPhen) content
- chlorophyll (Chl) content
- the Chl / EPhen ratio

could be used as N status indicators for woody deciduous and evergreen ornamental plants.

Material and methods

- One year old plants of *Lagerstroemia indica*, *Callicarpa bodinieri* and *Viburnum tinus* were grown outdoors in containers.
- They received high (105 mg. l⁻¹) or low (4 mg. l⁻¹) levels of nitrogen in June and July 2002.
- EPhen content was recorded weekly by fluorescence and Chl content by transmittance, with Dualex™ and SPAD-502 leaf-clip meters, respectively, on young expanded leaves exposed to direct sunlight. Chemical analyses of shoot and leaf N contents were performed regularly.

Results

1) Mass-based leaf N content (Nm)

- Nm of young expanded leaves exposed to direct sunlight correlated well with shoot N content in the 3 species (Tab. 1).
 - Nm differentiated the treatments several weeks before shoot growth was reduced in the 3 species.
- Nm was used as an index of plant N status.



Lagerstroemia

2) Dualex values and SPAD/Dualex ratio

- Dualex values and SPAD/Dualex ratio differentiated the N treatments early, and this response lasted over time in the 3 species.
- Dualex values and SPAD/Dualex ratio were highly correlated with Nm in the 3 species (Tab.1).

3) SPAD values

- SPAD values differentiated the N treatments early. This response lasted over time in *Lagerstroemia* and *Callicarpa*, but was inconsistent in *Viburnum*.
- SPAD values were positively correlated with Nm in *Lagerstroemia* and *Callicarpa*, but not in *Viburnum* (Tab.1).
- The particular response of *Viburnum* was due to large variations in leaf mass per area that compensated for variations of mass-based chlorophyll content.



Viburnum



Callicarpa

Tab. 1. Correlation coefficients (r) for relationships between mass-based leaf N content (Nm), shoot N content and optical measurements

Y vs X relationships	<i>Lagerstroemia</i>	<i>Callicarpa</i>	<i>Viburnum</i>
Nm vs shoot N	0.94 ***(1)	0.88 ***	0.94 ***
Nm vs Dualex values	-0.92 ***	-0.70 ***	-0.92 ***
Nm vs (SPAD/Dualex ratio)	0.92 ***	0.65 **	0.68 **
Nm vs SPAD values	0.85 ***	0.44 **	-0.31 *

(1) Significance: * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Conclusion

Dualex measurements and SPAD/Dualex ratio could be used as N indicators in the three species (early diagnosis, high sensitivity, consistency of the response over time), whereas SPAD measurements were only adapted to *Lagerstroemia* and *Callicarpa*.

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