Two-year evaluation of different agronomic practices on standard and new low-nicotine tobacco cultivars by non-destructive photonic sensing

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Application of a non-destructive photonic sensing method to the proximal detection of Tobacco N status

↓

comparisons among agronomic practices and varieties

↓

Location: Fattoria Autonoma Tabacchi (FAT - Città di Castello [PG], Italy)

	2020	2021
Virginia Bright cvs:	PVH2310, **MS K326 LA**, **ITB697**, K326	PVH2310, **NCLA 926**, **ITB697**, K326
Local Best Practices (LBP):	115 kg/ha N topping 115 x 37 cm	108 kg/ha N topping 115 x 36 cm
Low-Nicotine Management (LNM):	55 kg/ha N no topping 115 x 26.5 cm	54 kg/ha N no topping 115 x 26 cm
Transplanting:	May 16	May 27

The fluorescence sensor

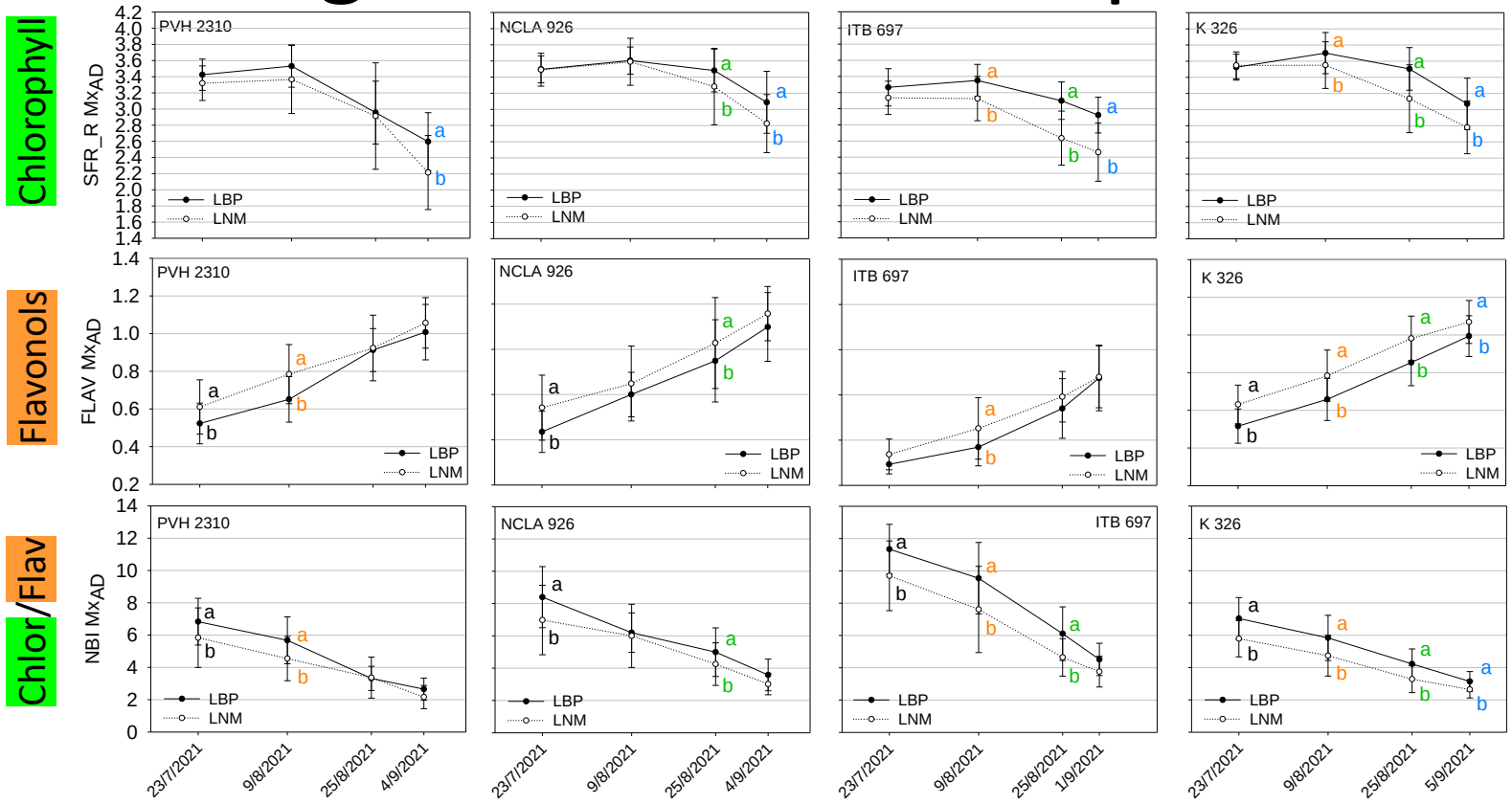
- *single leaf per plant*
- *upper sun-exposed side*
- *directly in the field*

provided optical indices of leaf :

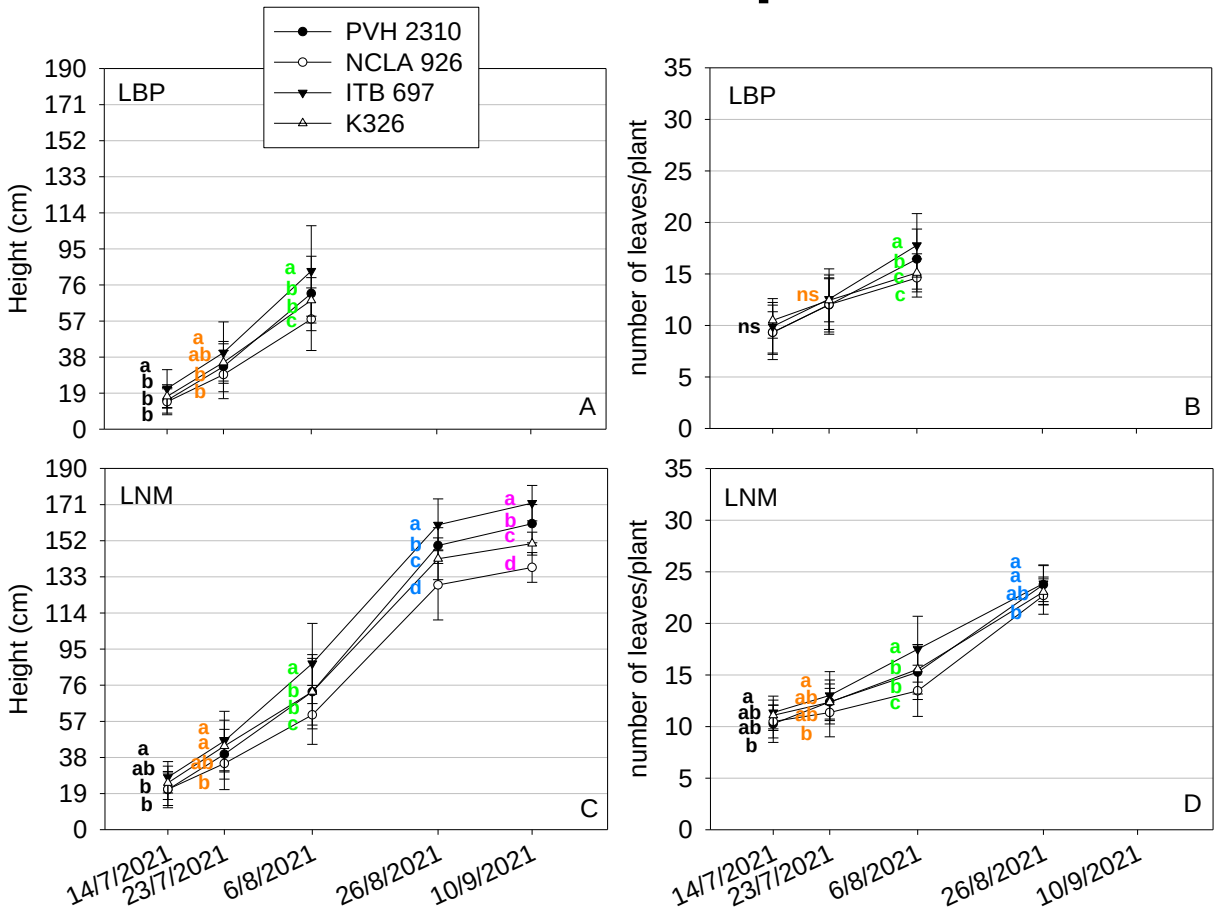
- chlorophyll (SFR_R)
- flavonols (FLAV)
- nitrogen (Nitrogen Balance Index, NBI=SFR_R/FLAV)

Management effect on optical indices

2021



Plant biometric parameters

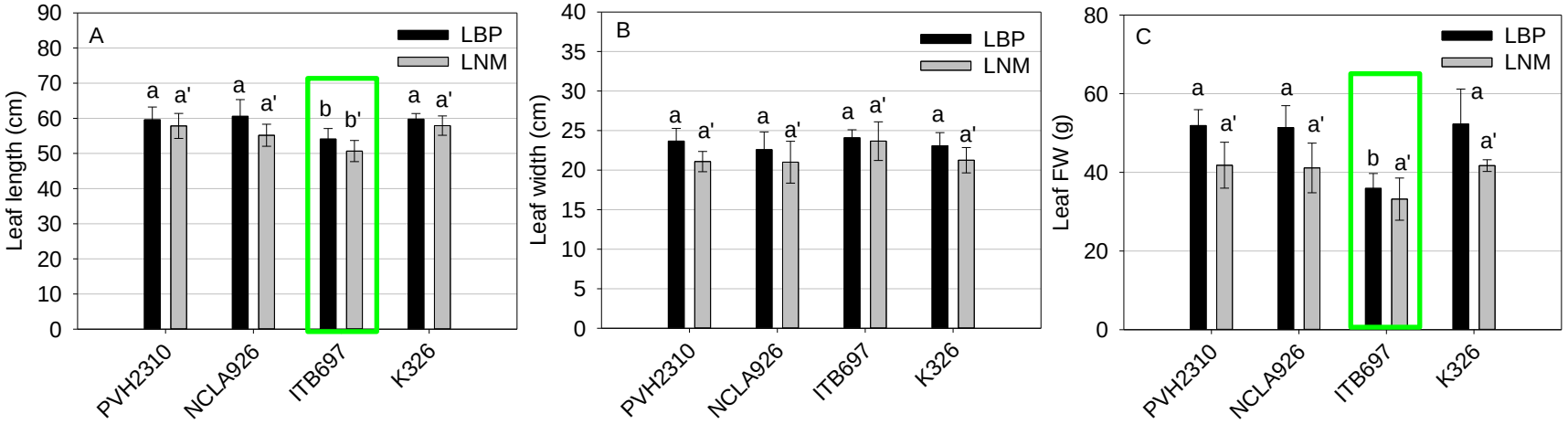


08/06/2021
LBP = LNM

08/17 – 26/2021
LBP topping

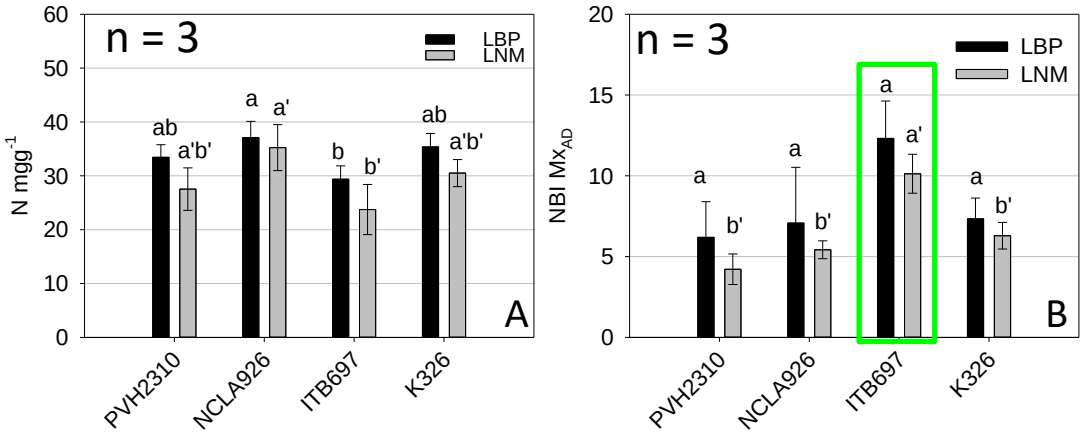
Leaf biometric parameters

2021

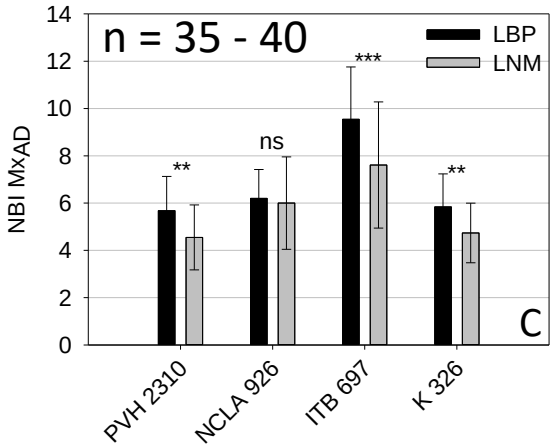


Management effect on leaf N

2021



In lab measurements
phenological stage 5, code 50-55
(Classification Coresta Guide n°7)
https://www.coresta.org/sites/default/files/technical_documents/main/Guide-No07-Growth-Stages_Dec19.pdf

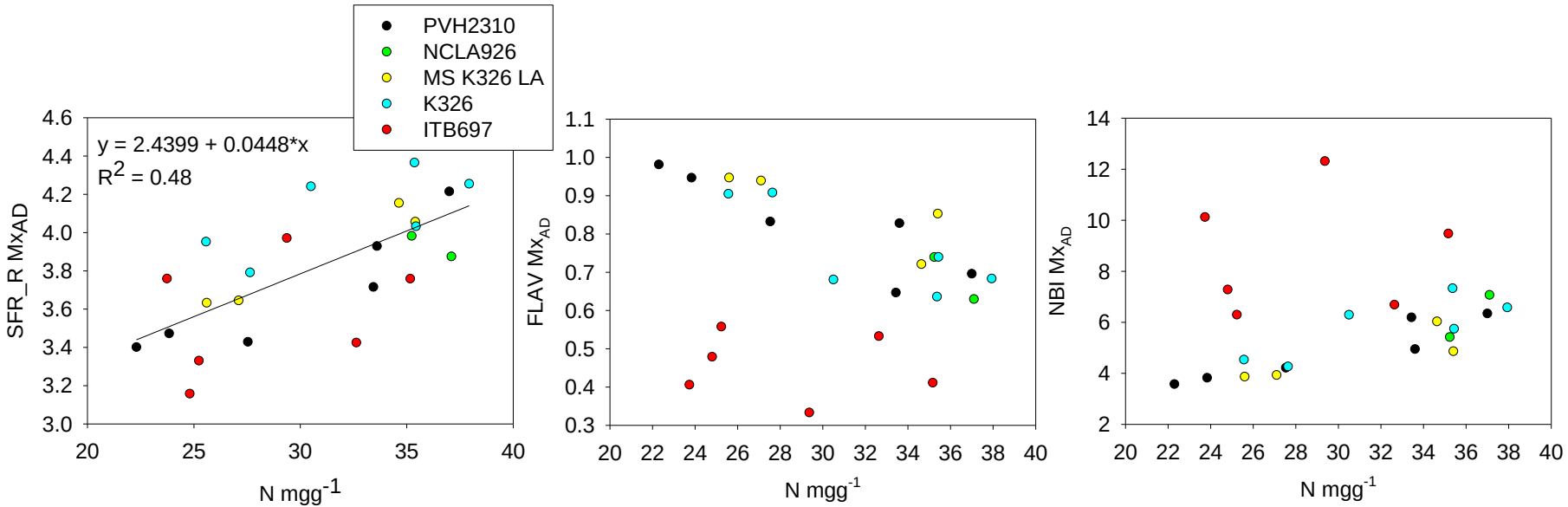


In field measurements
09/08/2021, pre-flowering

Leaf N estimation by optical indices

N range = 22 - 38 mgg^{-1}

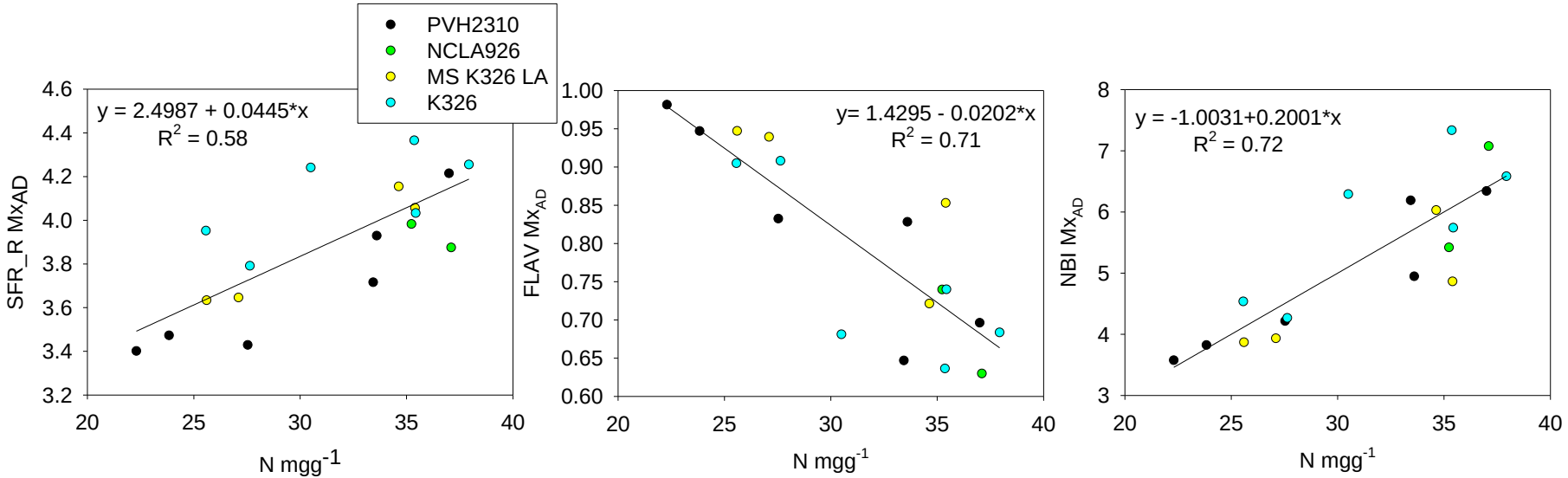
2020 - 2021



Leaf N estimation by optical indices

N range = 22 - 38 mgg^{-1}

2020 - 2021

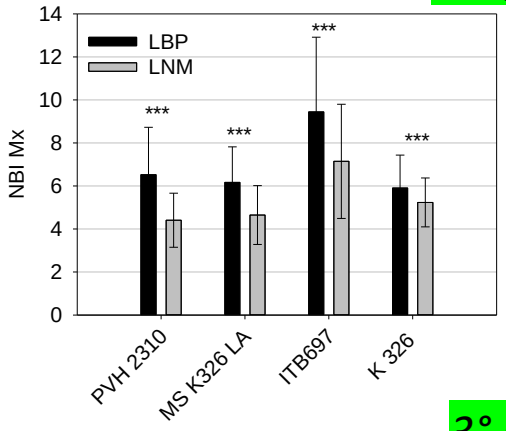


NBI index and nicotine

Work in progress

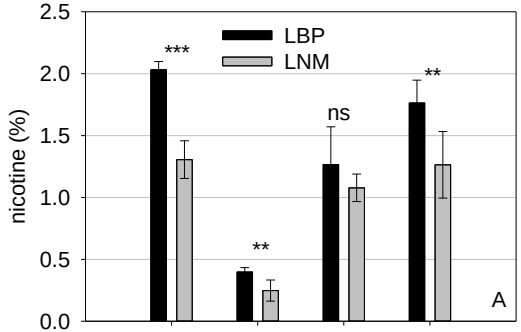
2020

Pre-flowering



n = 140

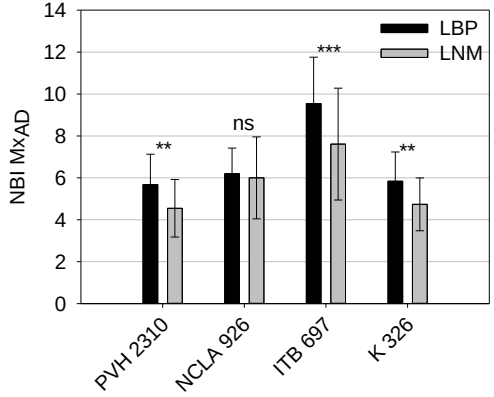
3° harvest



n = 4

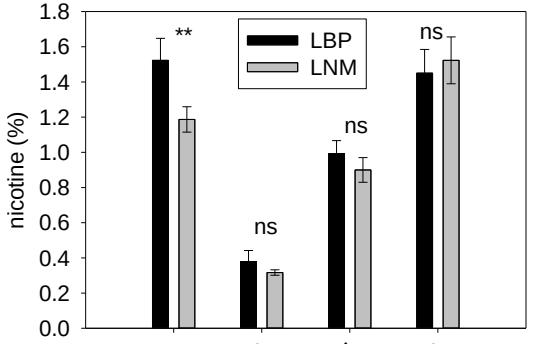
2021

Pre-flowering



n = 35 - 40

1° harvest



Conclusions

Photonic sensing technology can be usefully integrated in tobacco cultivation

It provides:

- Additional information in the identification of new low-nicotine varieties
- Evaluation of the impact of agronomical practices on the resulting leaf nicotine content.

LNM:

- Didn't reduce plant growth
- BUT, reduced leaf N and nicotine (incomplete 2021 data)

NBI index:

- Estimates effectively leaf N - BUT a specific calibration is required for ITB697
- Gives a better N estimation than the simple SFR_R and FLAV indices
- Has potential for early prediction of leaf nicotine

THANK YOU FOR THE ATTENTION

A special thanks to
Fattoria Autonoma Tabacchi Soc. Coop Agricola;
Regione Umbria 2019 Project: 'RTK Umbria 2.0: prototyping an RTK network for innovative technological applications, automated cropping processes and information management for precision farming'
Agro-sensing project: space, aerial, ground sensing and robotics for Precision Agriculture – Foe CNR 2021

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