

Assessing Nitrogen level in maize (*Zea mays*) with infrared thermography

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1- Introduction

Because of the important role of Nitrogen (N) in various physiological processes, such as chlorophyll synthesis, numerous techniques aim to make Nitrogen utilization more efficient. Infrared Imaging is a promising method that aims to substitute direct measurements. Previous studies presented a contradiction over the correlation between N and leaf temperature

❖ Therefore, this study aimed to detect Nitrogen status in early stages via infrared imaging on maize in a greenhouse experiment.

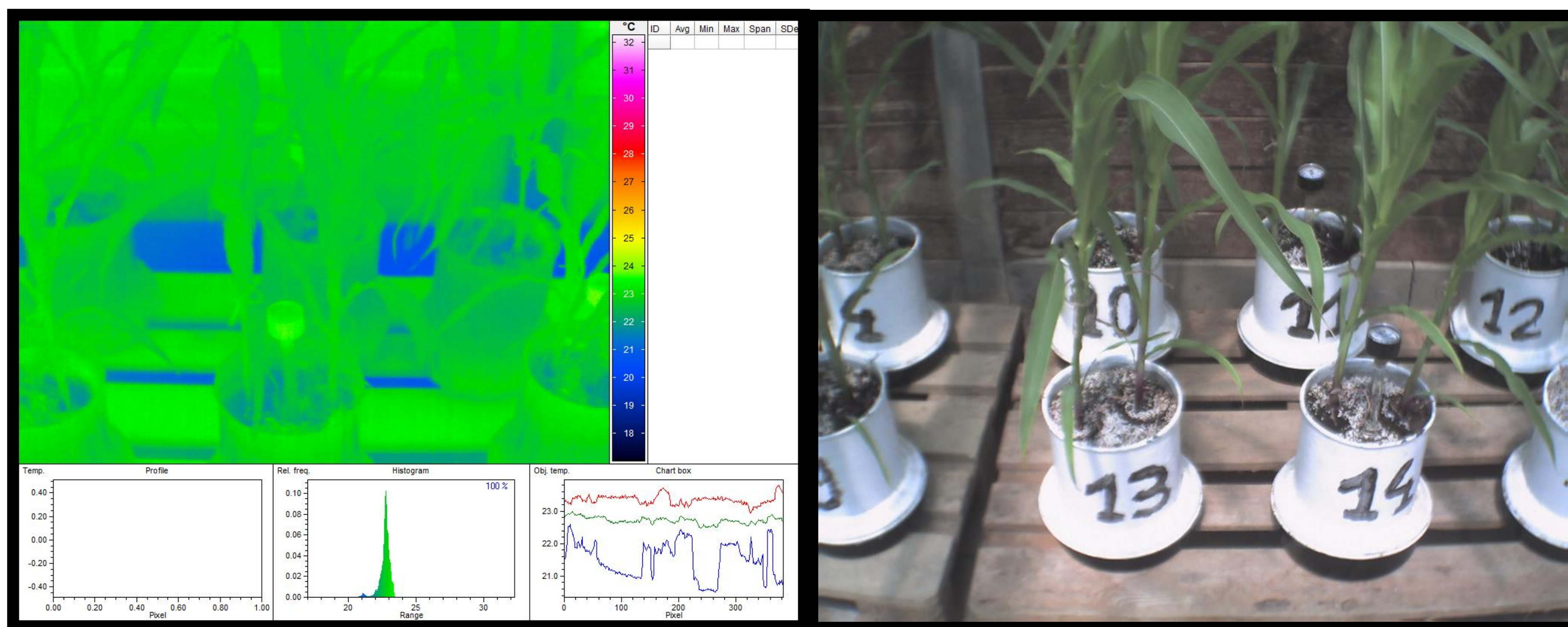
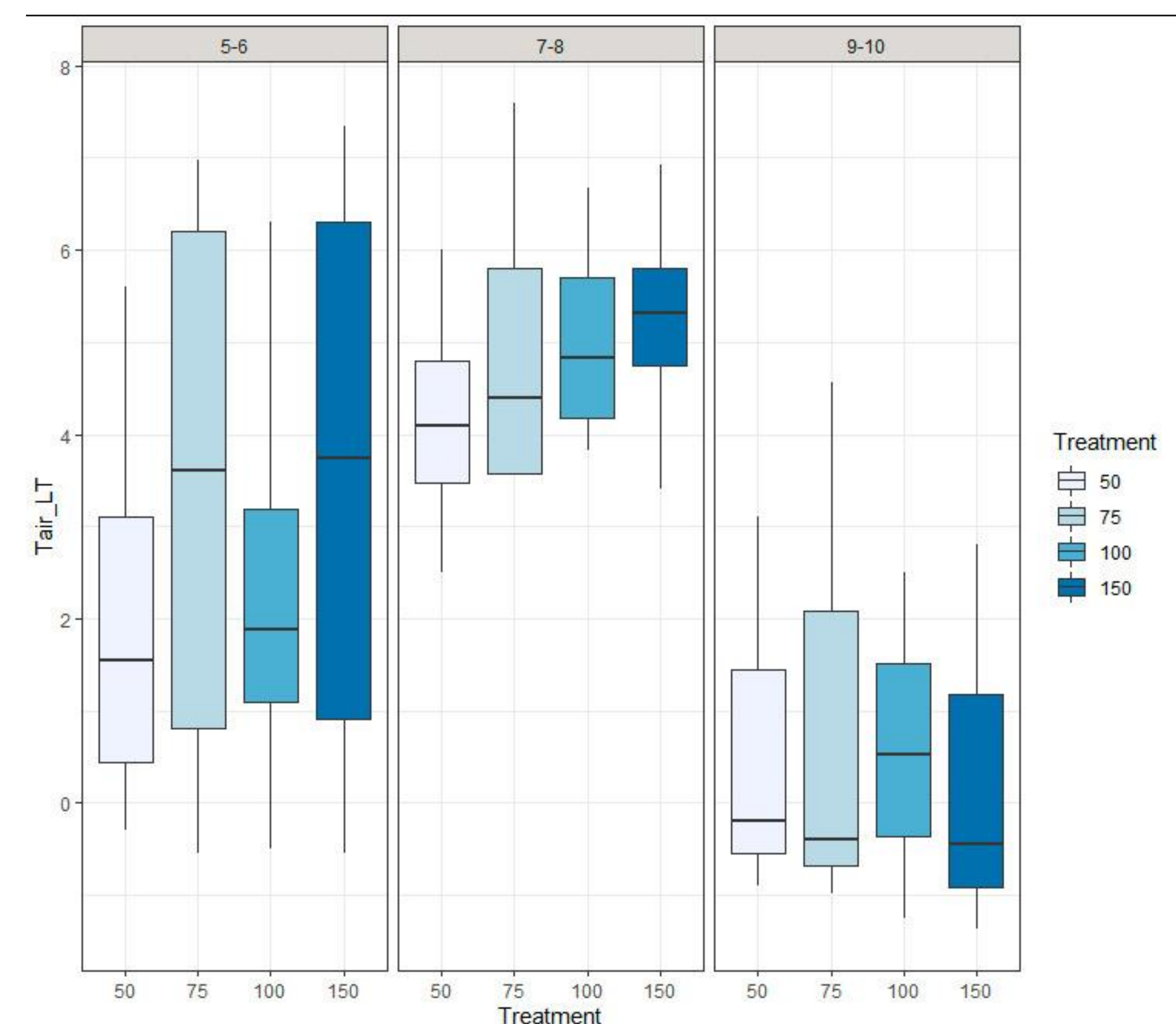


Fig. 1 - Infrared image of maize in greenhouse experiment analyzed with IRBIS 3 Plus.

Fig. 2 - Maize plants disposed in the greenhouse experiment over pallets to facilitate the transposition between treatments

3- Results

- There is a significant difference between treatments for chlorophyll content (P-value < 0.001)
- No significant difference in the leaf temperature was found in the greenhouse experiment between treatments (P-value = 0.91).
- Also, no significant correlation (P-value = 0.72) between chlorophyll content and deltaT (Tair-Tleaf)



Graph 1 – Boxplot of the different treatments allocated in 3 grouped stages. The “y” axis represents the value of the Air temperature minus Leaf temperature and the “x” axis stands for the different stages.

2- Material and Methods

- Greenhouse experiment
- Plants measured every two days
- 4 Nitrogen treatments: 50%(II), 75%(III), 100%(I) and 150%(IV)
- 12 pots (5L) with 2 replicates per treatment
- Substrate fertilized in 6x
- Tensiometers to avoid water stress;
- Maize: AMADEO
- Measurements: chlorophyll content, stomatal conductance, leaf area index (LAI), plant height and infrared imaging
- Harvests (V6, V9, V12 and VT)

4- Discussion

- ❖ The hypothesis that plants with more Nitrogen, therefore more chlorophyll, would have a lower leaf temperature could not be confirmed in the experiment in the greenhouse, possibly due to heat and water stress.
- ❖ Our results showed contrary results to Lu and Zhang (2000) but it's in line with the results of Carroll (2015). To understand more this complex plant behavior, we have repeated the same experiment under field studies. Results are being analyzed and will be published later.