

LEAF RUST SEVERITY IN ACATENANGO, GUATEMALA, IS RELATED TO COFFEE NUTRITION FEATURES

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INTRODUCTION

- **Coffee leaf rust (CLR)** is a major disease in Latin America: ↘ coffee quality & quantity.
- Uncertainty remains on the effect of **plant nutrition** on CLR severity.

What is the effect of nutrition* on coffee leaf rust severity?

*soil fertility, leaf chemical composition, and fertilization practices

DATA COLLECTION IN A 2-YEAR EXPERIMENT IN ACATENANGO, GUATEMALA

Reported for
**96 unique
site-year
combinations**

CLR severity
assessments

23 nutrition features

= soil physico-chemical variables, leaf
chemical composition & fertilization practices

Potential confounding factors

= topography, shading environment,
other farming practices, and fruit load

SOIL FERTILITY FEATURES RELATED TO LEAF CHEMICAL COMPOSITION

Selection of 12 soil physico-chemical variables
related to 3 variables of leaf chemical composition
→ Aggregated into a nutrition score:

$$\text{Nutrition score} = \sum \text{selected variables} * \text{coefficient}$$

representing the nutrition status of each site-year

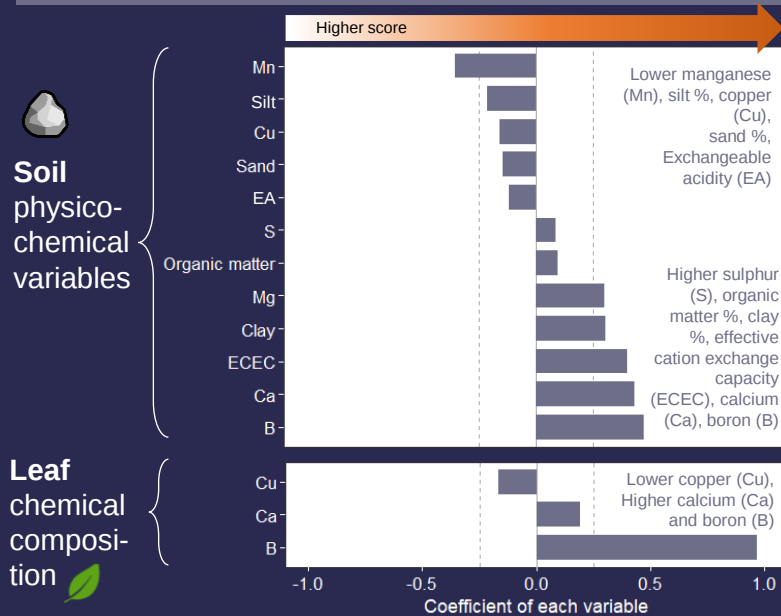
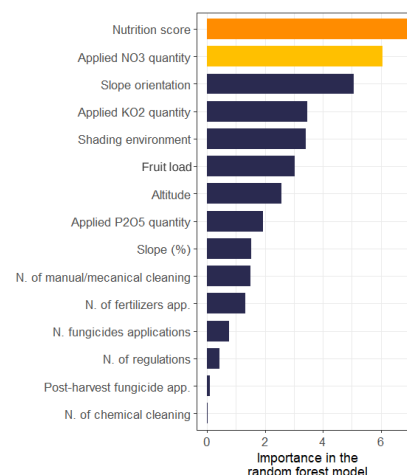


Figure 1: Selected variables of soil physico-chemical, leaf chemical composition and their associated coefficient in the nutrition score construction

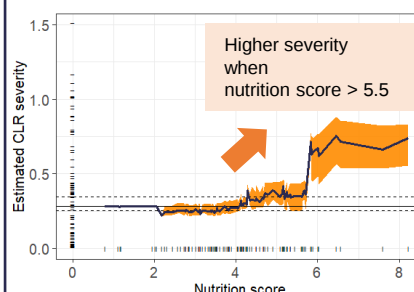
IMPORTANCE OF NUTRITION FEATURES FOR PREDICTING MAXIMUM CLR SEVERITY



Nutrition score and NO₃ applied = 2 most important predictors of maximum CLR severity in a random forest algorithm.

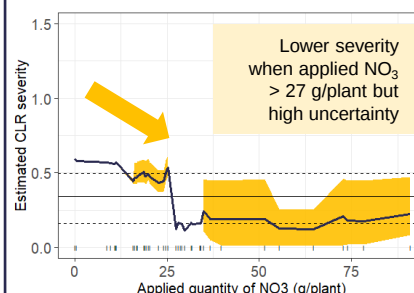
Figure 2: Importance of nutrition score, NO₃ quantity, and other factors in predicting maximum CLR severity using a random forest algorithm

INDEPENDENT ASSOCIATION BETWEEN NUTRITION SCORE & MAX. CLR SEVERITY



Nutrition score associated with maximum CLR severity in a linear mixed model:

↗ Nutrition score
↗ CLR



The model suggested **no association** with any fertilization practices.

Figure 3: Marginal effects of nutrition score and applied NO₃ quantity on predicted maximum CLR severity from a random forest algorithm

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CONCLUSIONS & PERSPECTIVES

- Maximum CLR severity is related to physico-chemical characteristics in soil and chemical composition of coffee leaves.
- High NO₃ applied reduced maximum CLR severity according to the random forest model, but not in the linear mixed model.
- Effect of fertilization practices must be further examined.