

APPROACHING MODELLING OF SUGAR BEET QUALITY

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Introduction

The area where sugar beet is grown in Italy is a critical environment compared to central Europe. Weather variability significantly affects both crop yield and yield quality, via water and nitrogen availability.

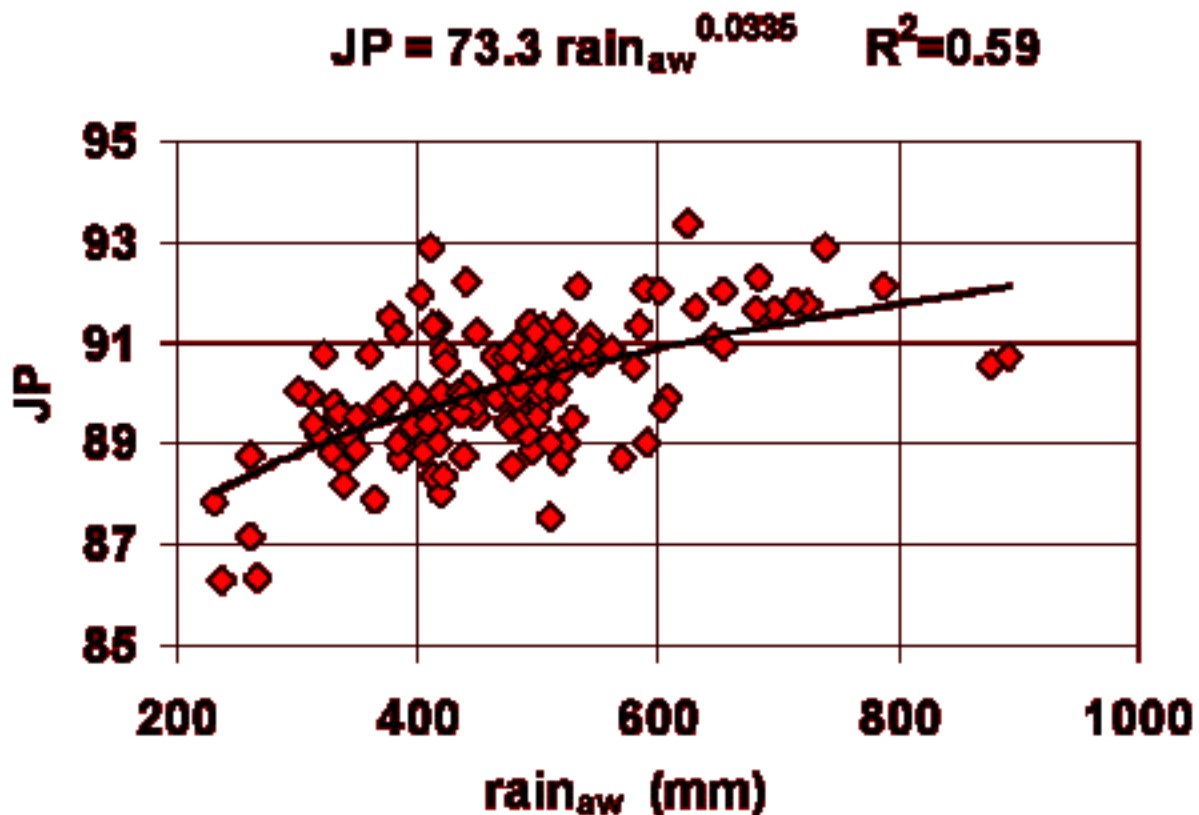


Fig. 1 - Relationship between fall-winter rainfall and sugar beet quality (JP, juice purity), years 1978-99,

Po Valley, Northern Italy.

The tight relationship between nitrogen availability and sugar beet quality is shown in fig. 1. Autumn-winter rainfall can cause N leaching thus decreasing N availability for the crop, and consequently improving sugar beet quality. Providing assistance for nitrogen fertilization to farmers, in order to explain the variability not accountable by a simplified water balance, requires a deep understanding of the water-nitrogen interaction as affected by both the history of the system and management.

As a first approach to sugar beet quality modelling we ran a field experiment in order to calibrate a growth model, trying to simulate N availability and N uptake by the crop.

Methods

- A field trial started in 1998 at Ca' Bosco, the research station of Agronomica, in Ravenna, Northern Italy. Sugar beet was protected against diseases.

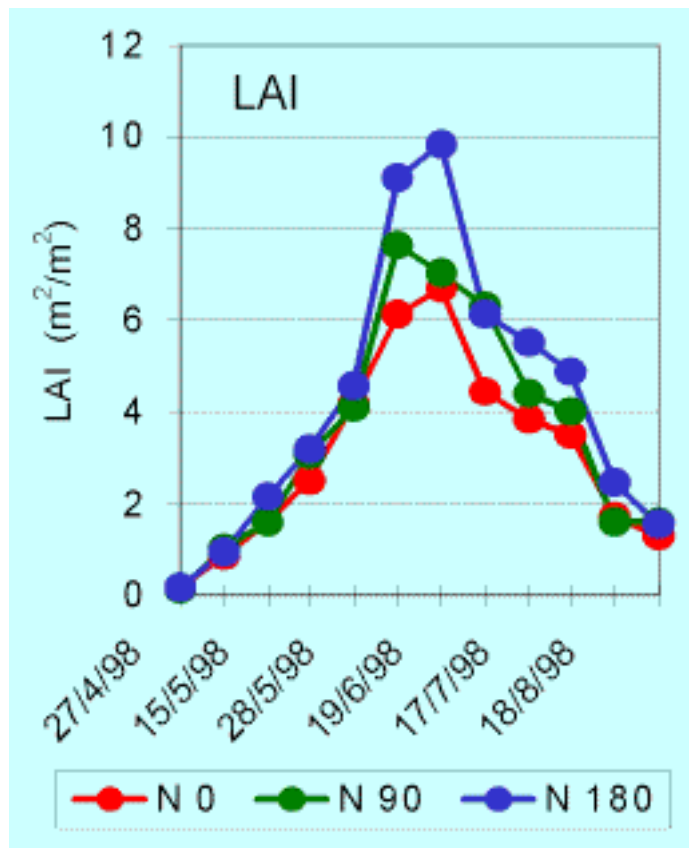
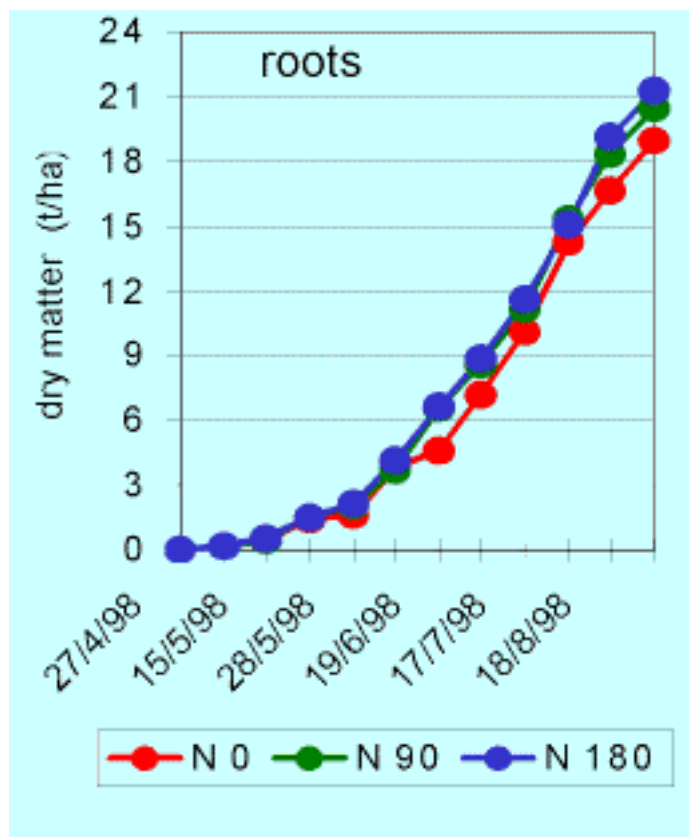
- The crop was fertilized with three levels of mineral nitrogen: 0, 90, 180 (kg N/ha).

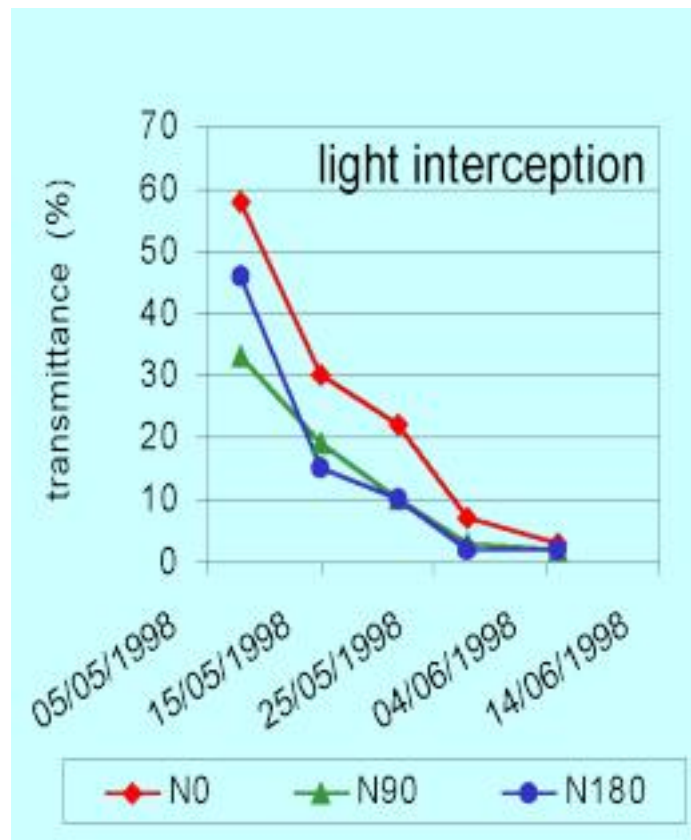
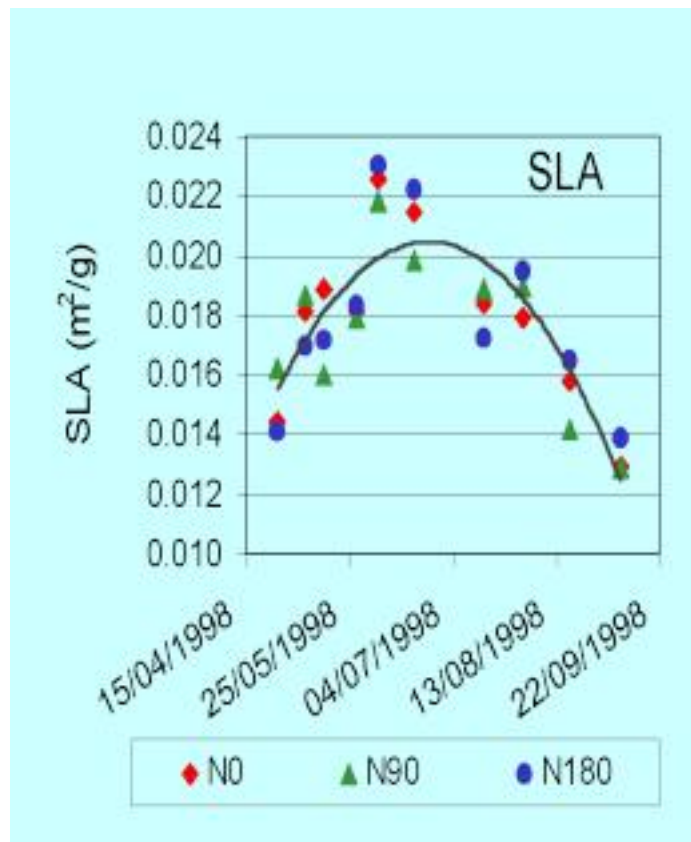
- Data of biomass, leaf area, and light interception were collected to calibrate crop growth models.

- A preliminary calibration of the model CropSyst was performed.

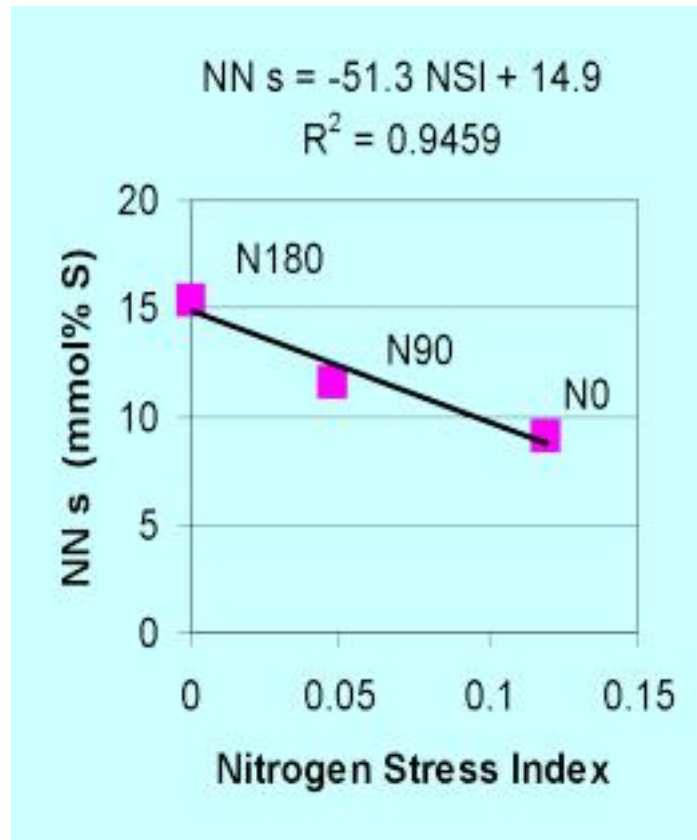
Results

Crop growth did not respond to N treatments, and it can be considered at potential level for the environment.





The simulations run are exploratory in order to investigate model capability to simulate sugar beet N uptake.



Conclusions

Although variable N availability did not affect growth, less than optimal N availability was estimated by the model as nitrogen stress index (NSI).

The estimated NSI correlated very well with beet quality: the greater the NSI the smaller the amount of alfa-N in the beet (NNs).

A better knowledge of the relationship between N availability for the crop and beet quality, to be gained from both literature and experimental trials, would allow developing a modelling tool for quality prediction and farmer assistance.

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