Physiological effects of Fungicides on Sugar Beet Growth and Yield

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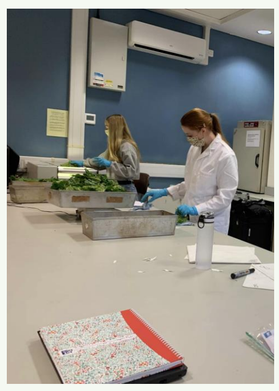
Introduction:

Fungicides can improve yields of sugar beet even when disease pressure is low, suggesting there are processes aside from disease control involved. The specific physiological reasons for these improvements have not yet been determined in sugar beet. Possibilities include increased chlorophyll content, delayed senescence, improved use of fertiliser and improved stress tolerance. This project aims to determine the nature of these physiological improvements.



Methods:

Plants were treated in August and September with either an azole, strobilurin, SDHI, or combination fungicide. Physiological measurements were made throughout the field experiment to compare between fungicide treatments, including SPAD (leaf greenness), canopy area, and various reflectance indices. Disease scoring was carried out later in the season. At harvest, total leaf area, leaf weight, sugar % and root weight were assessed.

Results:

- SPAD was consistently highest for the azole + strobilurin, the azole + SDHI, and the SDHI (p=0.001, **Figure 1, left**).
- The non-treated plants started with high SPAD, but decreased over the season.
- At harvest, specific leaf area (leaf thickness) was high for the strobilurin and the azole + strobilurin combination (p=0.05, **Figure 2, below**).
  - These two treatments were also the highest sugar yields (p=0.042, **Figure 3, below**).

Figure 1. *Comparison of SPAD (estimated chlorophyll content) across the growing season between fungicide treatments.*

Figure 2. *Comparison of specific leaf area between fungicide treatments.*

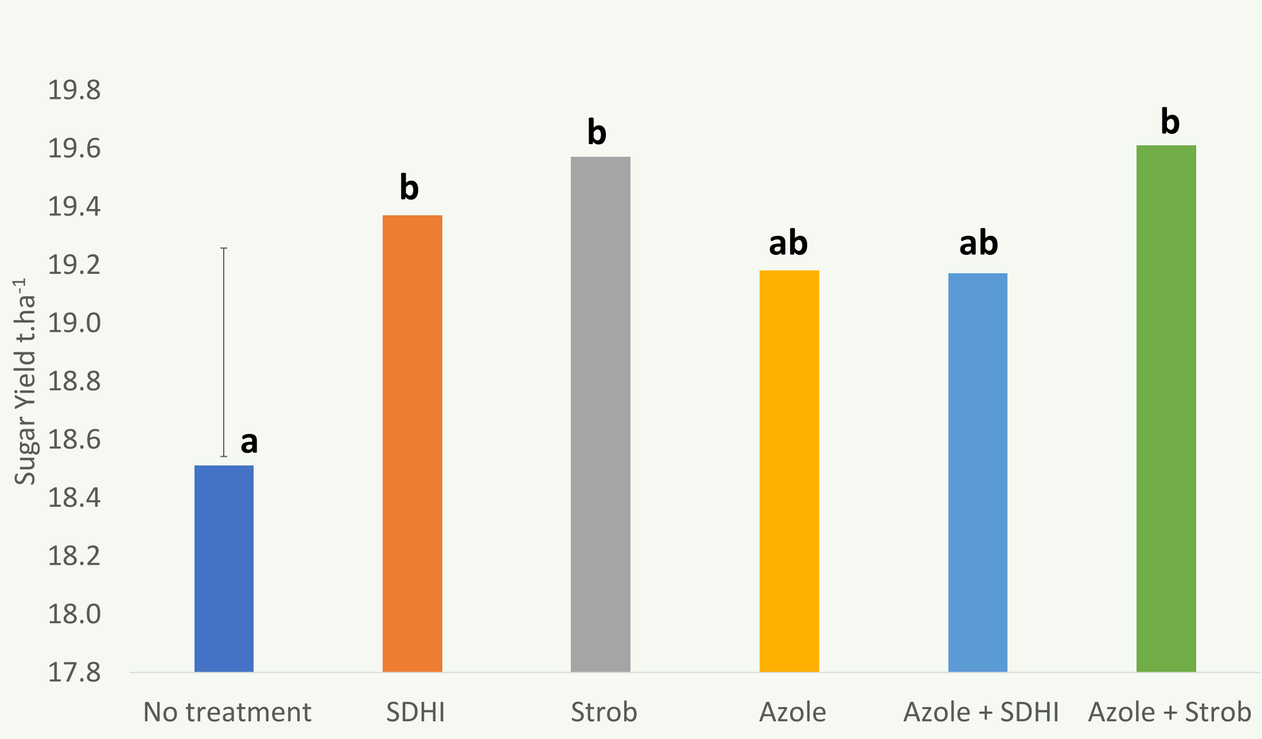


Figure 3. *Comparison of sugar yield between fungicide treatments.*

Future aims:

This year's trials will have similar treatments, but more in-depth data collection. A LI-COR will be used to measure photosynthetic activity and CO_2 assimilation, and chlorophyll content will be calibrated with reflectance indices, including SPAD. Activity of specific enzymes involved in biomass production will be assessed. Disease will be scored frequently to improve understanding of the extent to which early disease control affects yields.

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