Comparison of Stomatal Conductance in Ozone Tolerant and Sensitive Soybean.

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Ozone is harmful to soybean

1. Foliar injury.
   - Caused by accumulation of H_2O_2.
   - Red bronzing and chlorosis in soybean.
2. Decrease in photosynthesis.
   - Decrease in Rubisco activity.
3. Reduction in yield.
   - Reduced photosynthesis leads to reduction in growth and yield
   - Also attributed to early senescence.

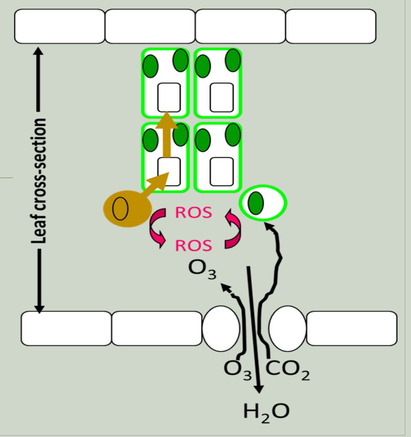
- O_3 levels are projected to climb 20-25% between 2015 and 2050.
- Economic losses caused by O_3 are estimated at $3 to $5 billion each year.

Stomatal conductance as a tolerance mechanism

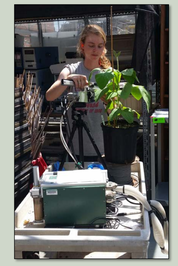
- O_3 enters the leaf through the stomata.
- With lower conductance, less O_3 would enter into the leaf resulting in less injury.
- Lower conductance resulting in less injury has been observed in wheat.

Objective

- Examine leaf gas exchange measurements at different canopy leaf positions in contrasting soybean genotypes.

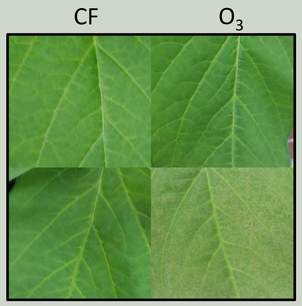


Materials and methods

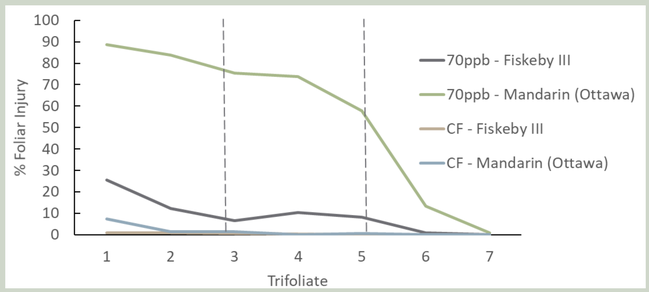


- Genotypes: Mandarin (Ottawa) and Fiskeby III, known to be sensitive and tolerant to O_3, respectively.
- 3 week old soybeans placed in CSTR.
- Treatments of charcoal filter air (CF) or 70ppb O_3.
- Measured leaf gas exchange measurements with LI-COR 6400 on the 3rd, 4th, and 5th trifoliate on the 4th day of exposure.
- Foliar injury scores collected 3 days after the exposure ended.

Leaf injury highest in Mandarin (Ottawa)

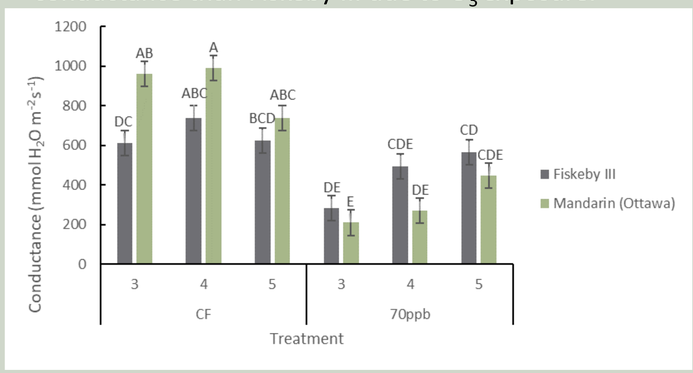


- Fiskeby III exhibited less foliar injury than Mandarin (Ottawa).
- Leaf age was a factor in the extent of damage to leaf with younger leaves having less injury.



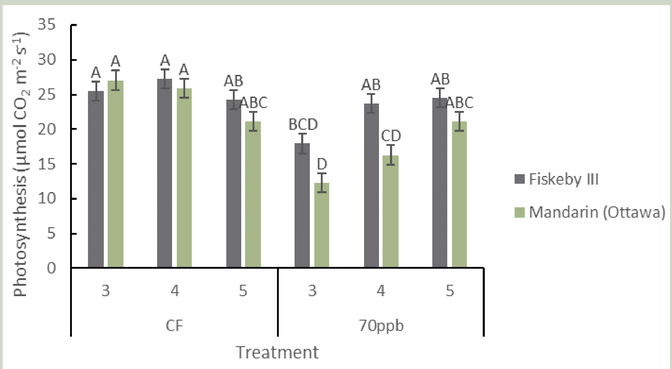
Differences in stomatal conductance

- Fiskeby III had lower conductance in the CF than Mandarin (Ottawa).
- In the O_3 treatment, Fiskeby III had higher conductance than Mandarin (Ottawa).
- Mandarin (Ottawa) had a greater reduction in conductance than Fiskeby III due to O_3 exposure.



Differences in photosynthetic rates

- O_3 reduced photosynthesis in both genotypes.
- Mandarin (Ottawa) had greater reduction in the older leaves.
- In CF treatment Fiskeby III and Mandarin (Ottawa) had similar rates of photosynthesis.



Conclusions

- Confirmed Fiskeby III to be an ozone-tolerant genotype.
- Reduced stomatal conductance contributes to the observed ozone-tolerance through limiting ozone uptake.

Future Work

- Investigate how Fiskeby III is able to maintain rates of photosynthesis similar to Mandadrin (Ottawa) at a lower conductance.

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