How does HLB harm tree health and what can we do about it?

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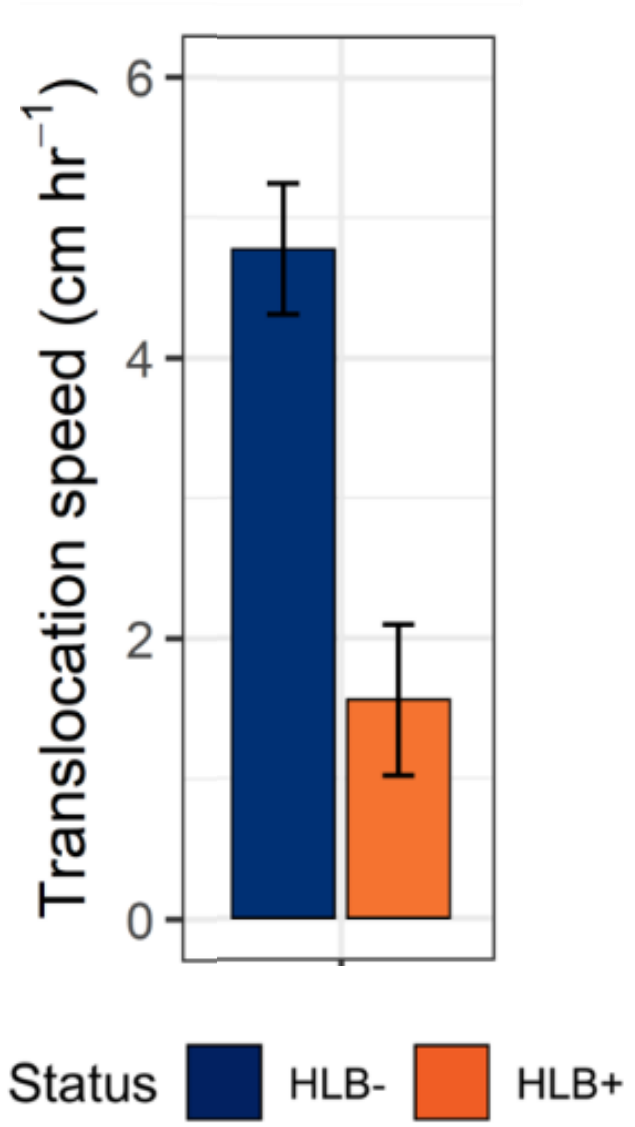
Take home message

- HLB affects growth by reducing sugar movement.
- We can design treatments based on:
  - Where and how sugar movement is affected
  - How sugar movement affects environmental interactions
- The best strategy is to prevent Clas from reaching sinks (roots, fruits, new shoots).

HLB symptoms stem from carbon transport

- CLas is phloem-limited
- Starch accumulates in canopy
- Starch depletes in root system
- Phloem transport speed slows



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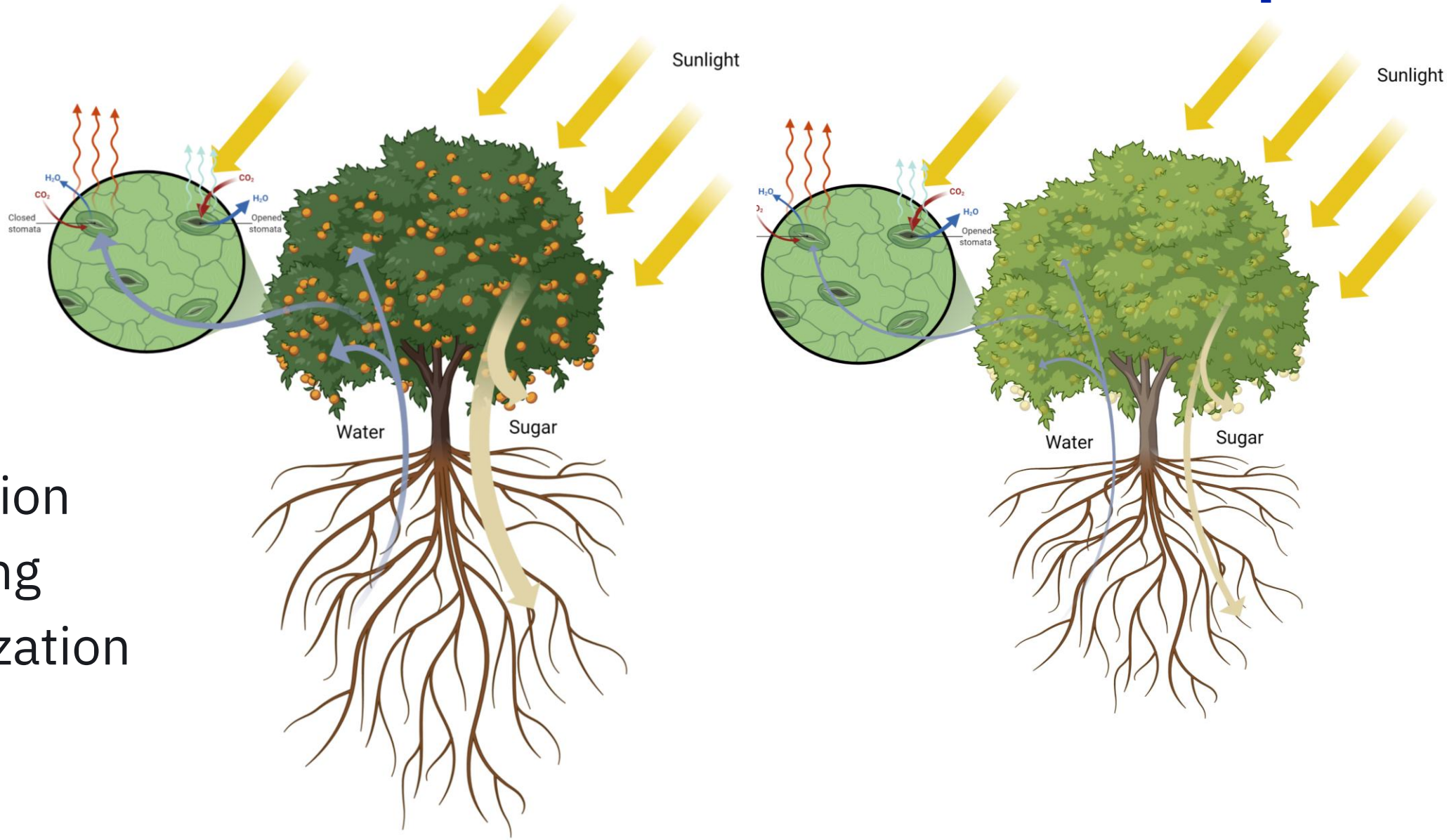
Environmental effects flow from carbon transport



- Irrigation
- Shading
- Fertilization

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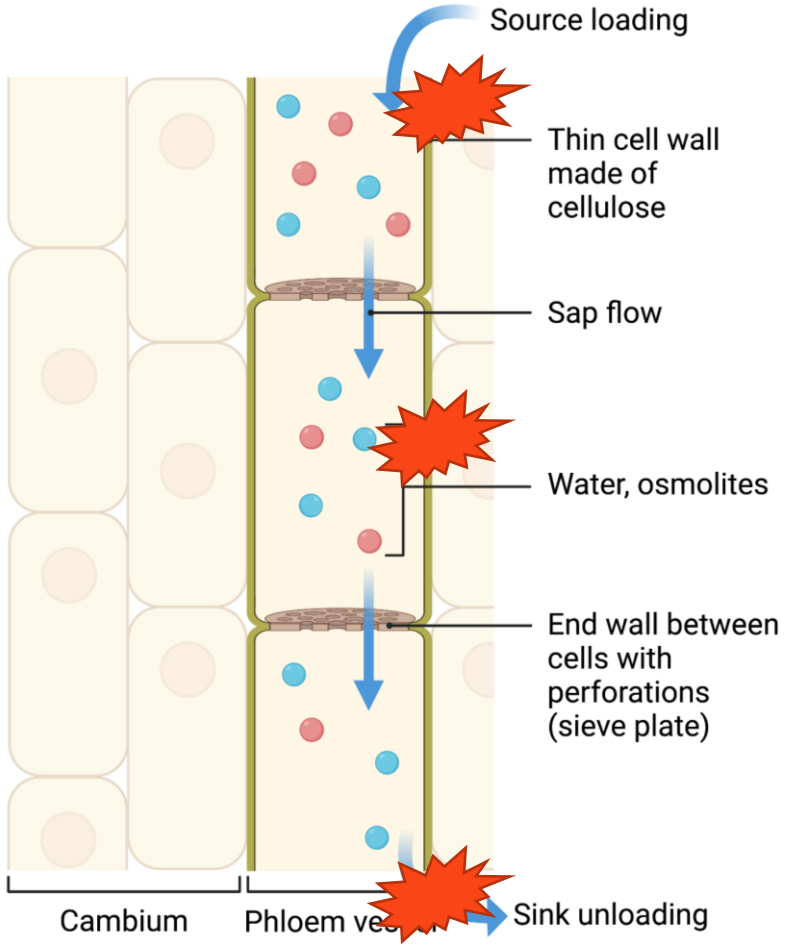
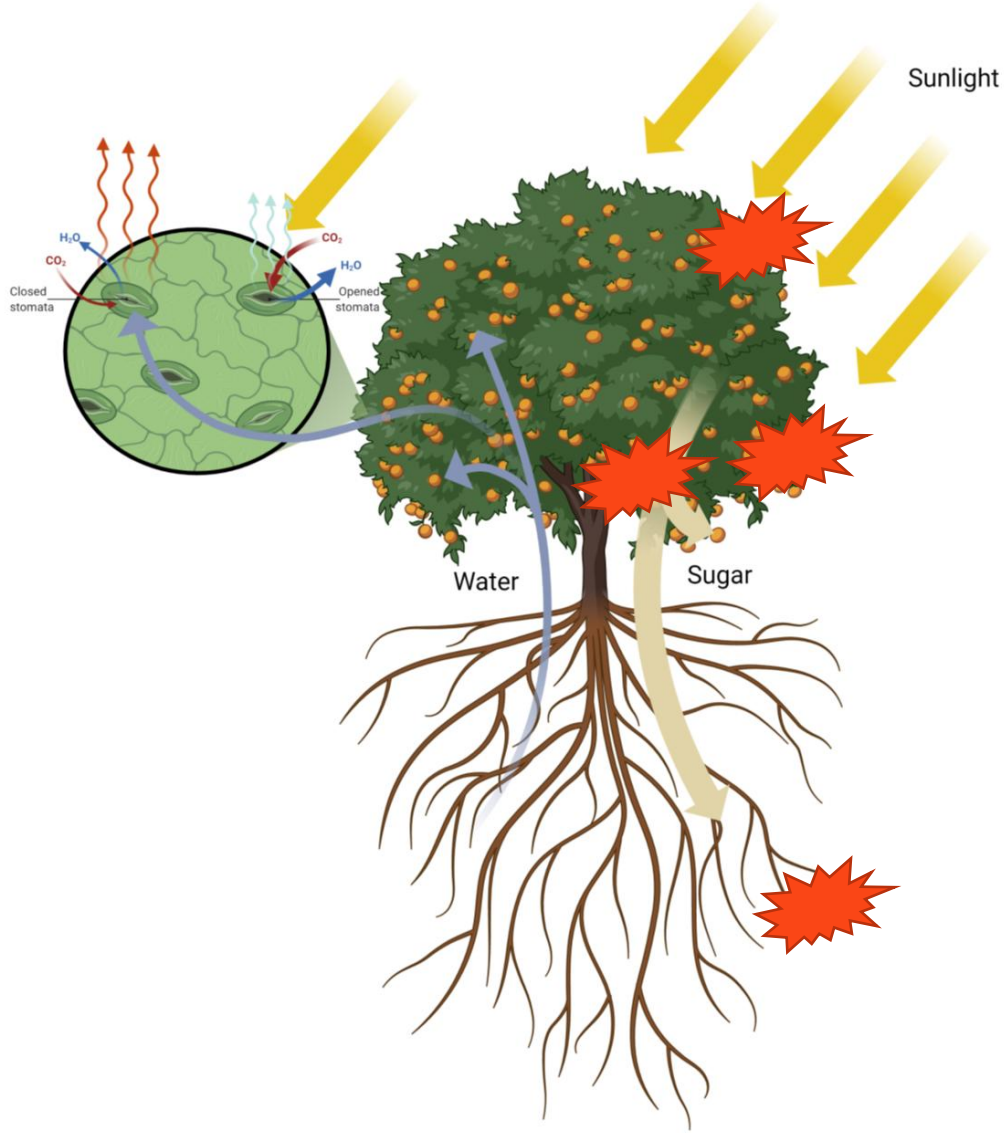
Callose slows sugar transport





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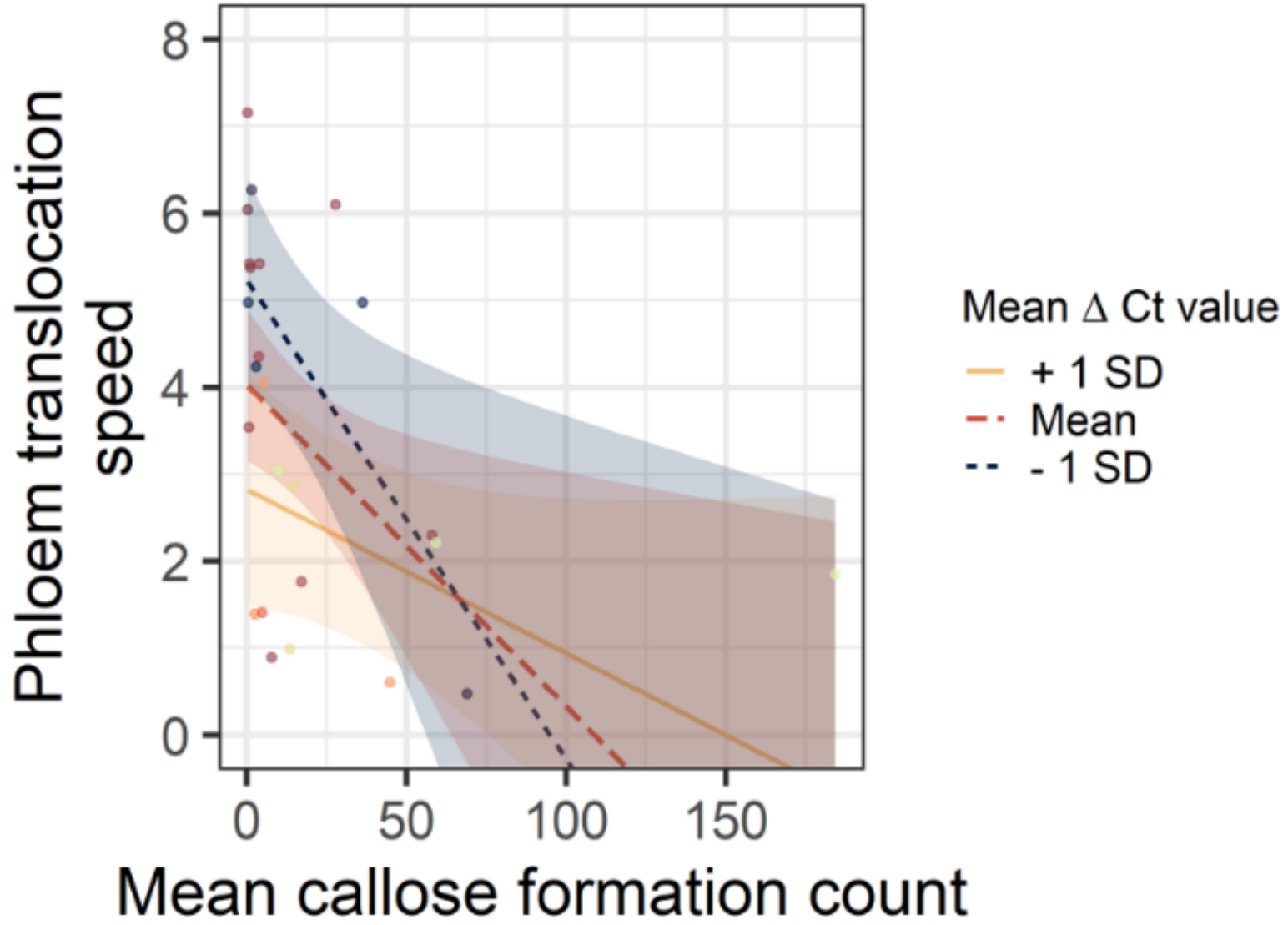
Callose slows sugar transport



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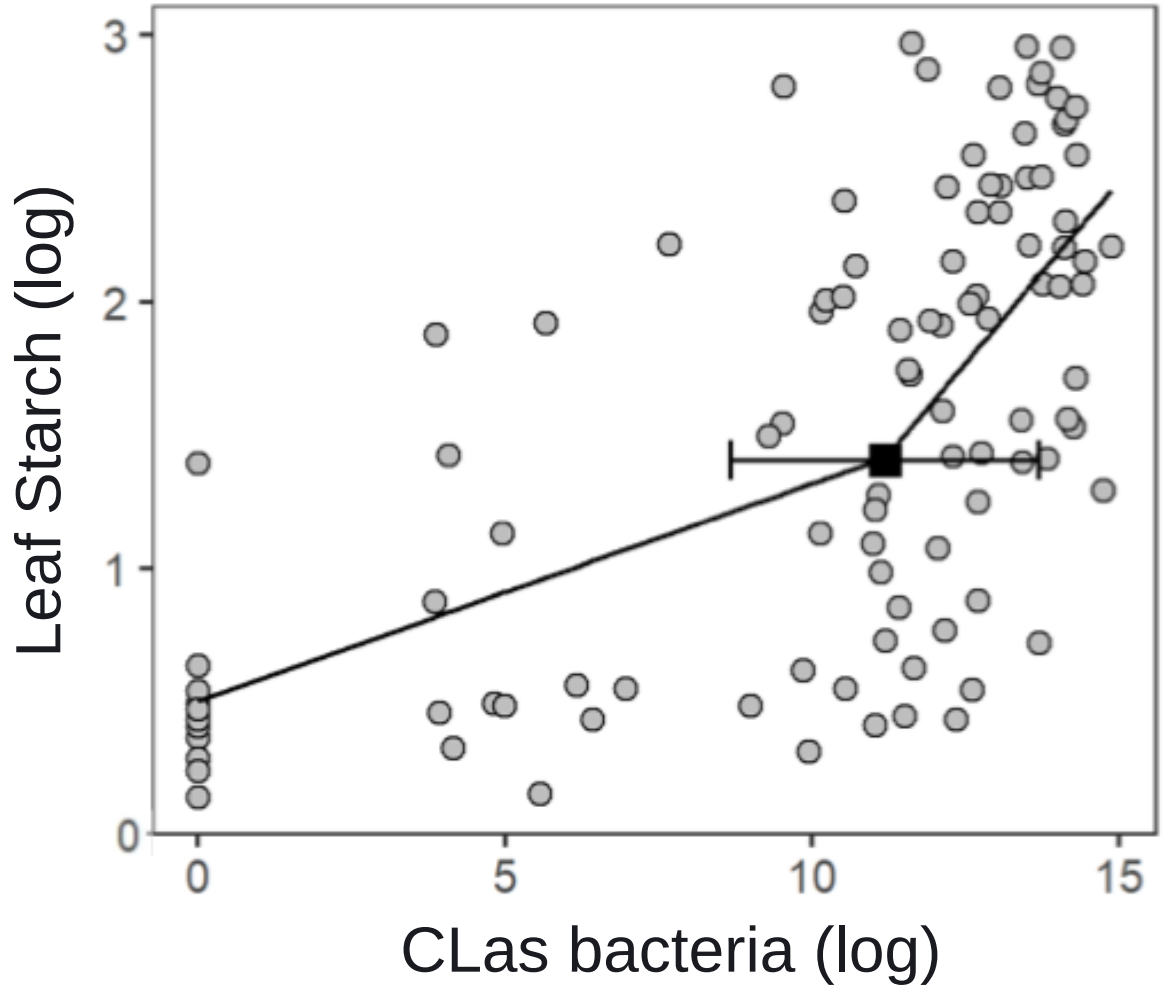
CLas slows sugar transport

- More bacteria = more phloem dysfunction



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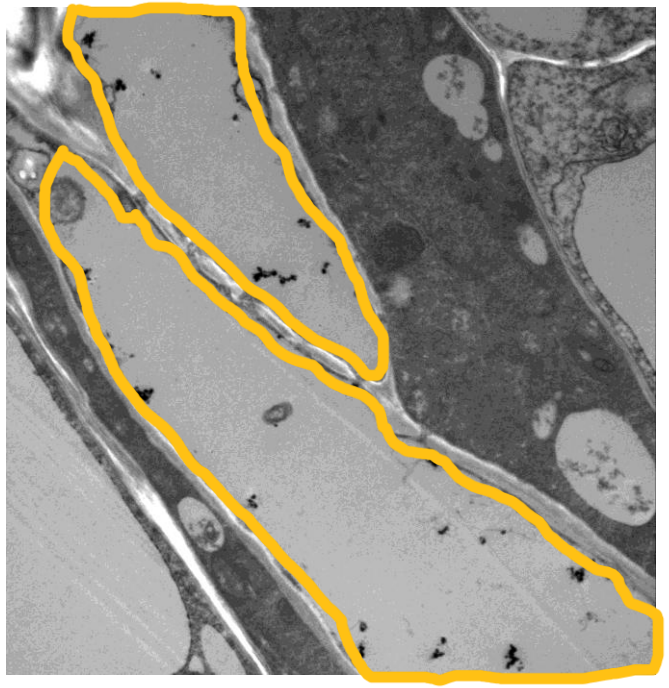
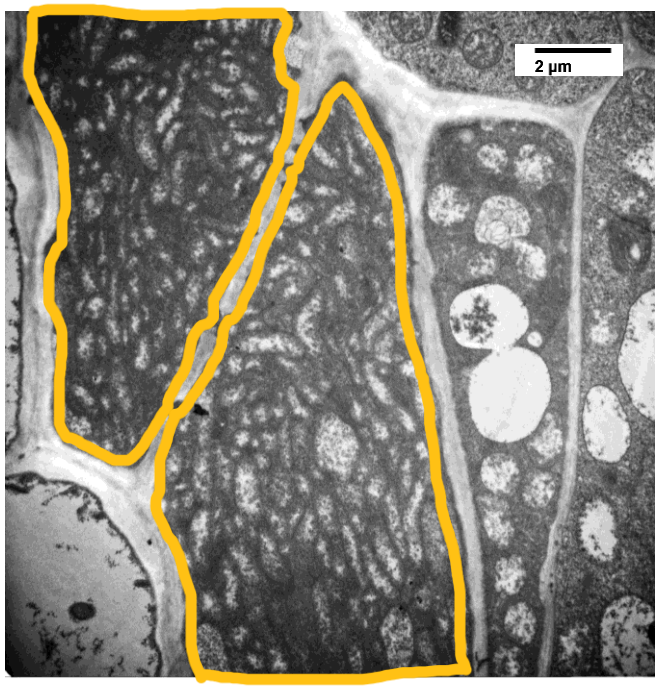
CLas accumulates in sinks



Open sieve tube



CLas in sieve tube of seed coat

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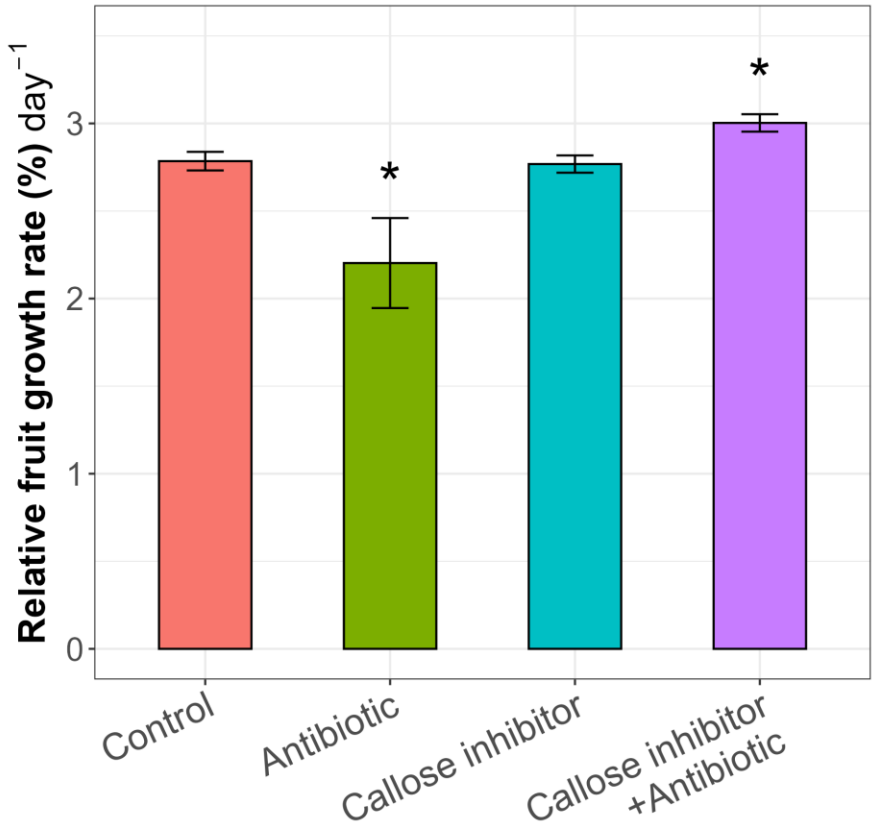
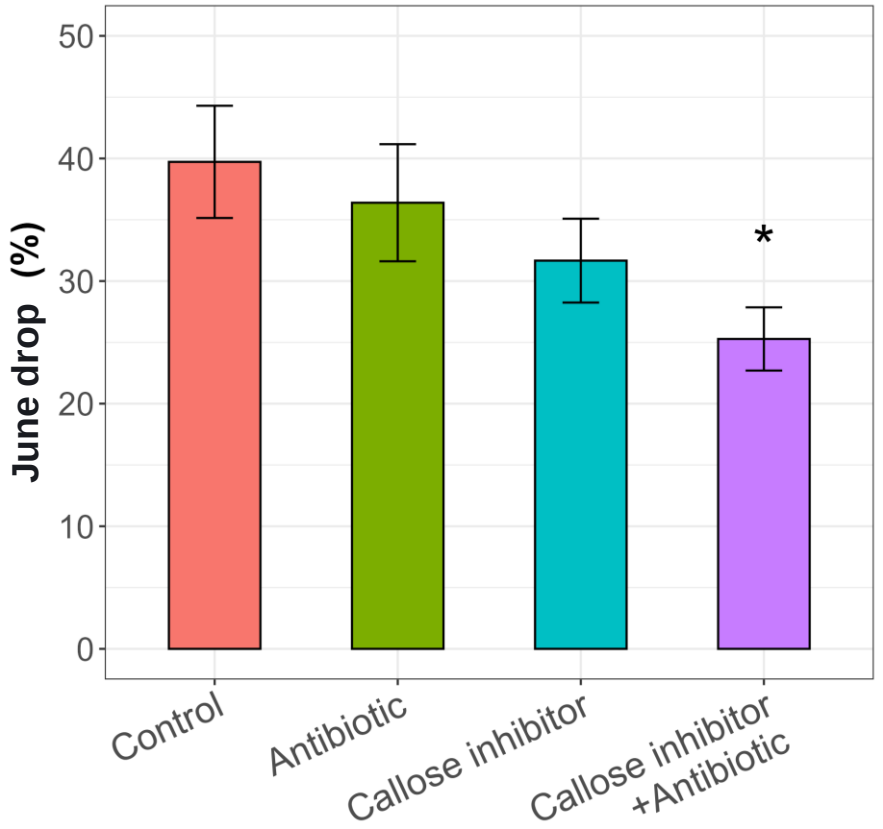
Reducing bacteria and callose affects fruit growth

- Injecting a callose inhibitor and oxytetracycline (Valencia):
  - Injected mid-April (fruit set complete)





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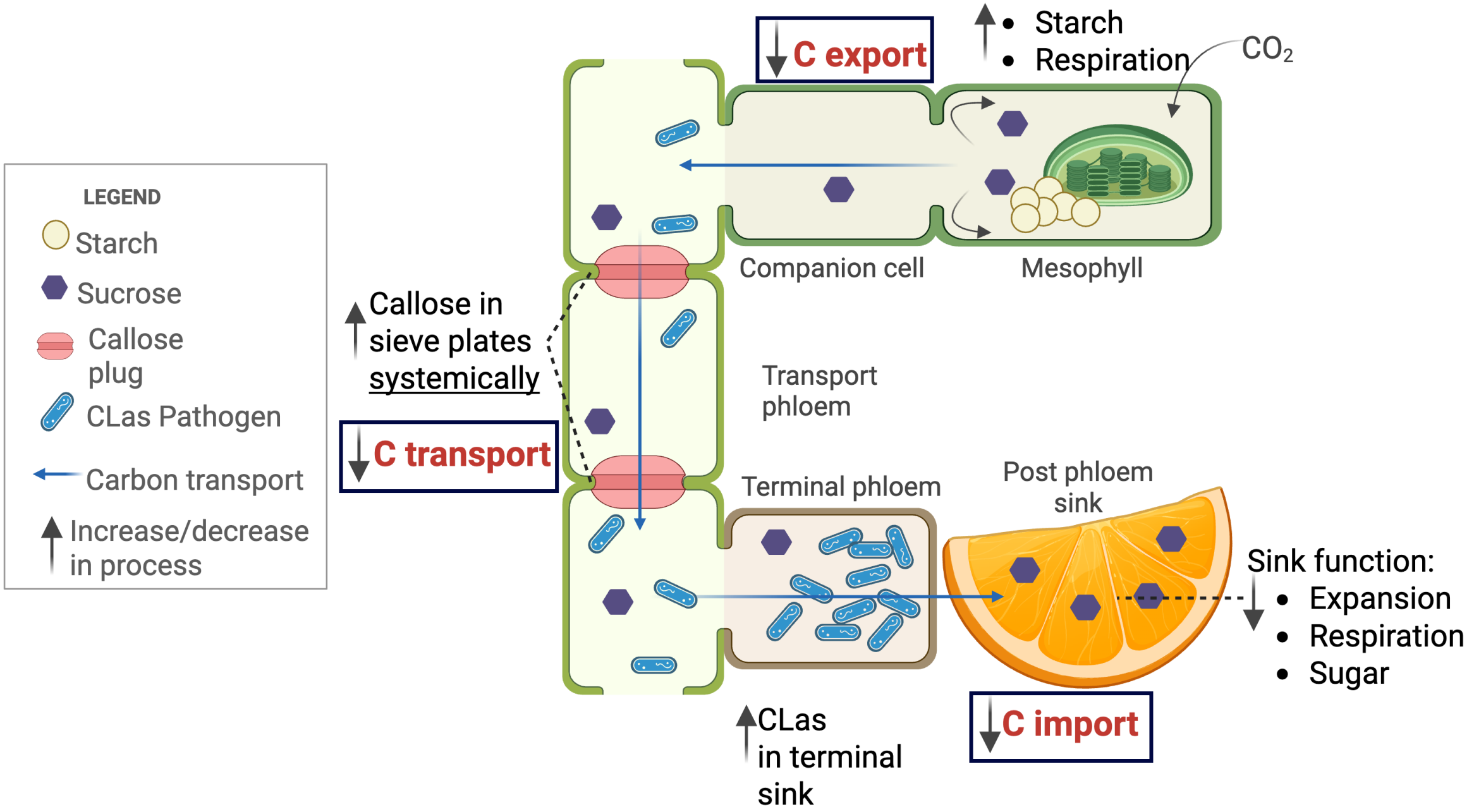
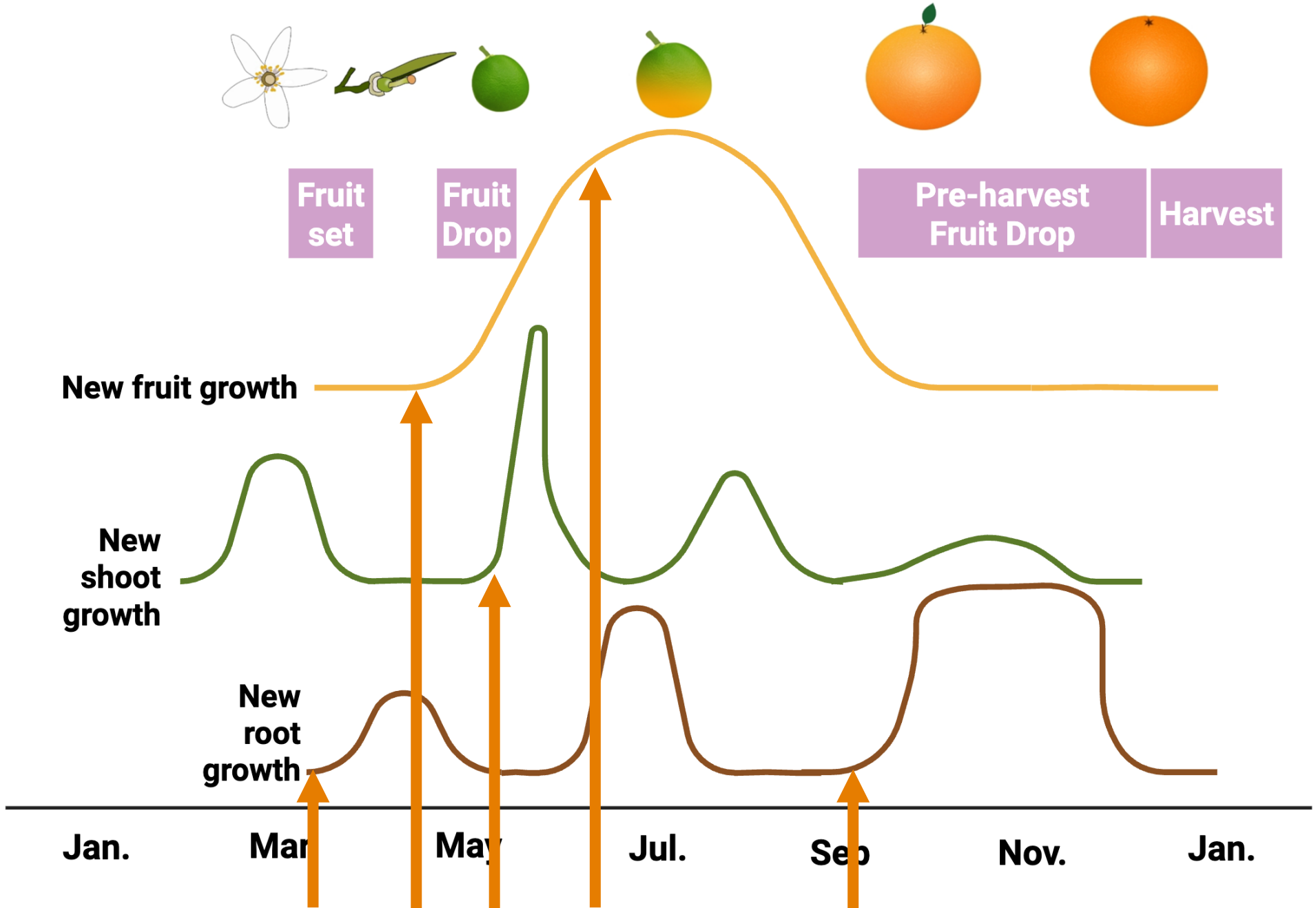

LEGEND
Starch
Sucrose
Callose plug
CLas Pathogen
Carbon transport
Increase/decrease in process
C export
Starch
Respiration
CO_2
Companion cell
Mesophyll
Callose in sieve plates systemically
C transport
Transport phloem
Terminal phloem
Post phloem sink
Sink function:
Expansion
Respiration
Sugar
CLas in terminal sink
C import

Where CLas is matters: tree phenology?

- Can tree phenology help time delivery?



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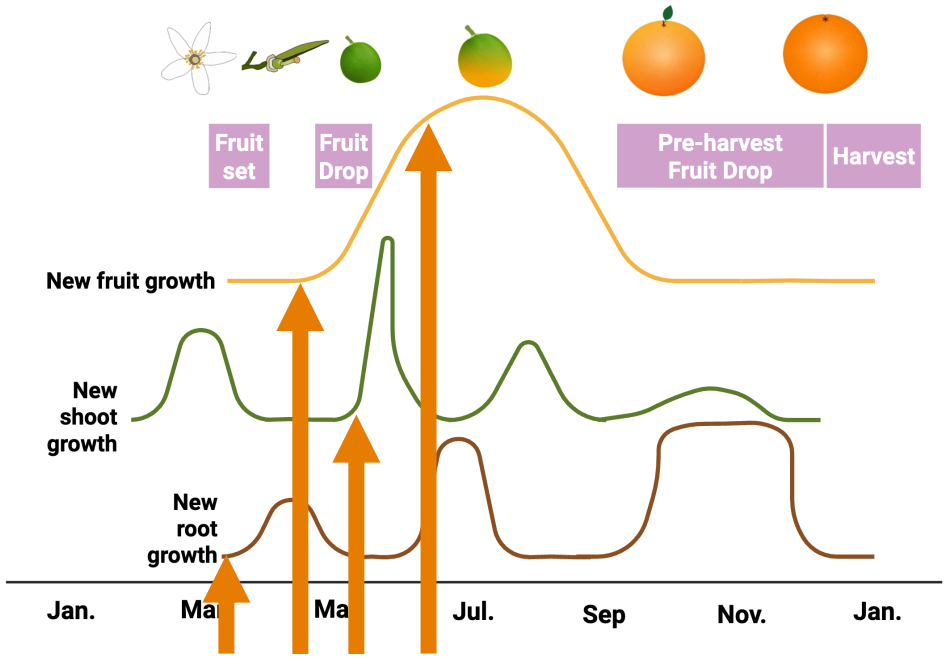
Phenology based timing and yield

- 1st year results:
- ‘Valencia’
- All trees injected once the year before
- Polk County
- Hurricane year (Milton)
- ReMedium 0.55 g ai per tree



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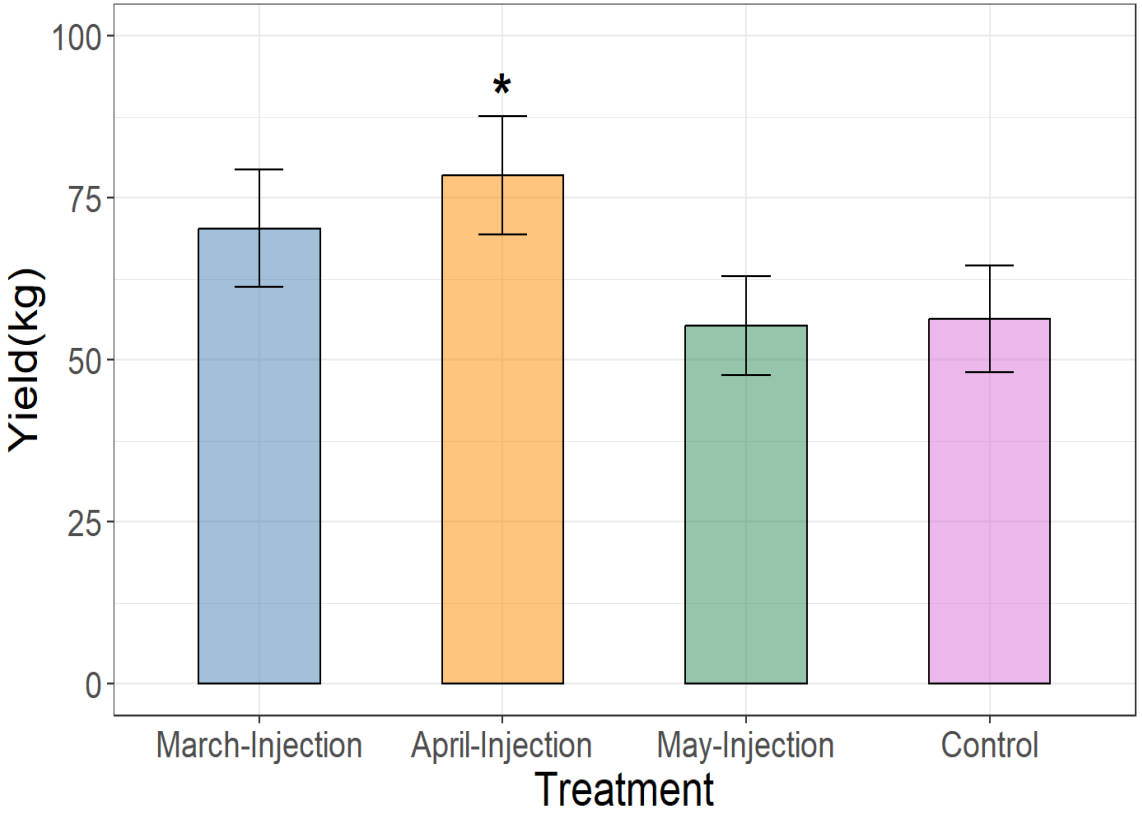
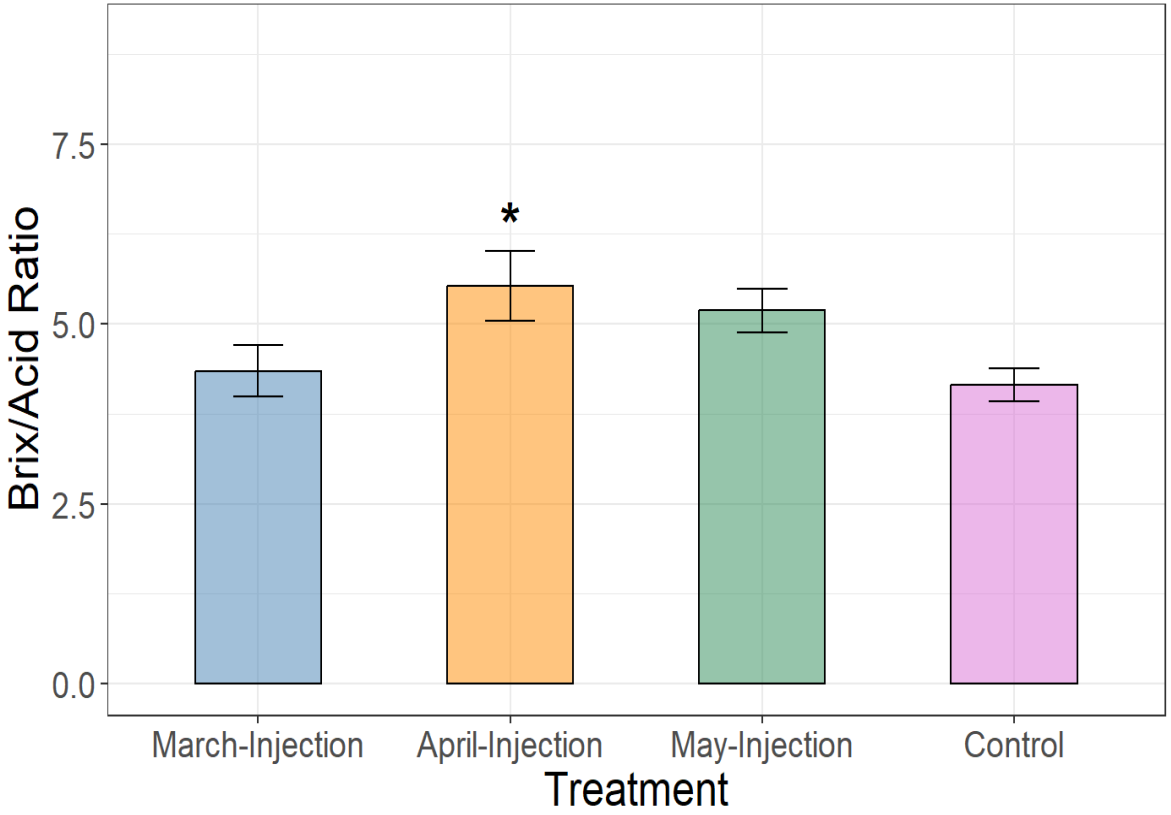
Phenology based timing and yield





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Take home

- How does HLB affect sugar movement?
  - Wherever CLas is and wherever callose.
  - CLas accumulates in sinks
- How might we use this knowledge?
  - Prevent CLas from arriving at sinks:
    - Injection based on phenology.
    - Better distribution?

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THANK YOU

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