T1.2 Acclimation of plant processes

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Synergia Consortium Meeting

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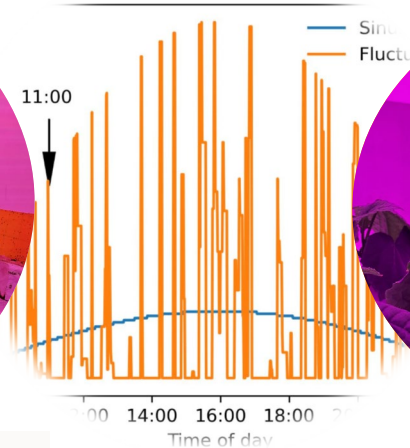

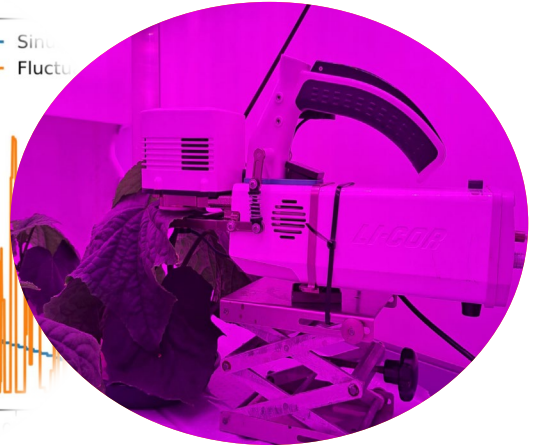

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Context: Making greenhouses more sustainable

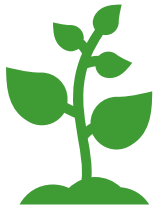
- Improve greenhouse sustainability in future → knowledge about plant responses to environmental factors such as light, CO_2, and temperature and their interaction can be useful

- Challenges:
  - Reduce costs, use of electricity
  - Reduce CO_2 use
  - Frequent temperature fluctuations in the future

PhD thesis outline

Leaf gas exchange measurements –
Photosynthesis (*A*) and stomatal conductance (gs)

Growth



Light

CO_2

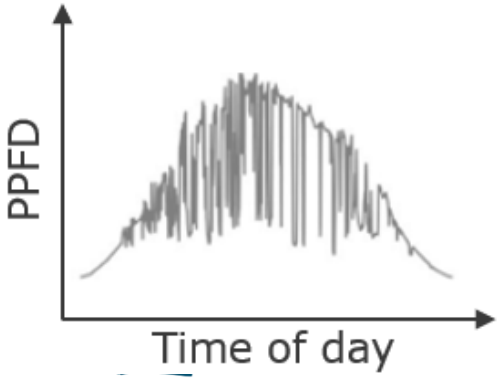
Temperature

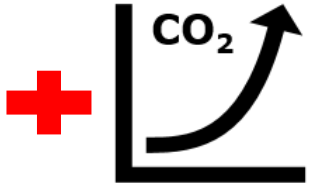
FL X CO_2

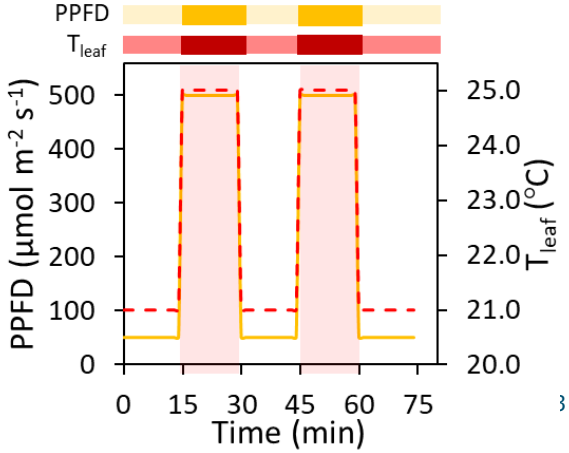
FL X Temperature

Fluctuating light (FL)

Several days

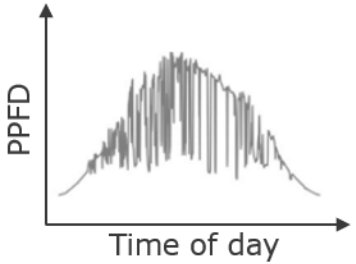




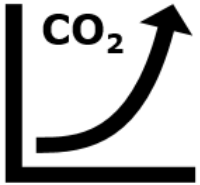


Interaction between light and CO_2

Fluctuating light (FL)



Elevated CO_2 (eCO_2)



Key findings:

⇩ Growth

⇩ Leaf density

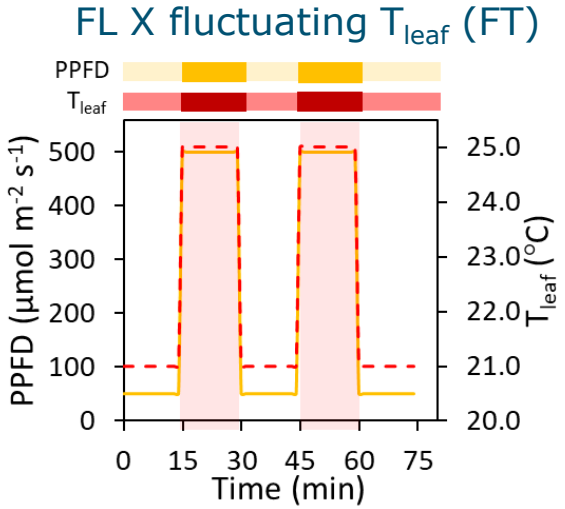
⇧ Growth

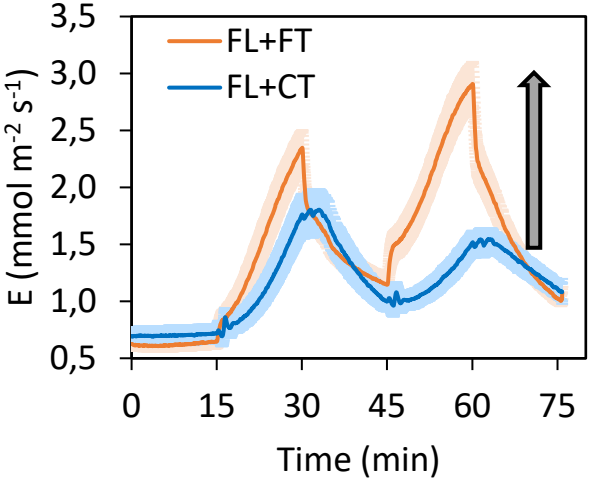
FL X eCO_2

⇩ Growth

- Plants grown under FL have specific acclimation
- eCO_2 did not fully mitigate the negative effect of FL on growth

Interaction between light and leaf temperature (T_{leaf})





- Concurrent increase of light intensity and temperature increased transpiration due to the cumulative effect on stomata
- Stomata not just responds to light intensity fluctuations but also to temperature fluctuations

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Conclusions

- Frequent fluctuations in light intensity has consequences on plant growth
- eCO_2 does not fully compensate for growth reduction under FL → maintaining constant light is better for production
- Fluctuations in light and temperature and CO_2 influence plant growth → there is need to have better measurement of these variables to predict plant growth
- Temperature fluctuations during the day can have cumulative effect on stomata and therefore transpiration → there is need to account these in models for better predictions