

Plant characterization using advanced sealed environment technology

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Guelph BlueBox sealed environment systems



A collaboration between
CESRF,
CONVIRON,
and **Intravision Light Systems**
was established in order to develop
the next generation high resolution
sealed environment systems



Sealed Environment System

A precision tool to better study plant physiological responses to environment manipulation of multiple parameters including:

- Temperature
- Humidity
- Carbon dioxide
- Oxygen (higher or lower)
- Light (quantity, quality)
- Nutrients
- Plant water status
- Insect predation
- Pathogen application/response
- Chemical application (pesticide, biocontrol, fertilizer)



Using a sealed environment chamber, we can answer the question “what happens to photosynthesis when you change _____?”

Hardware

Modified CONVIRON A1000 growth chamber

- New door and frame with multipoint closure and hermetic seal
- Specular aluminium interior cladding
- Mettler Toledo 32 kg 0.1g balance for ET measurement

HVAC

- Custom design with chilled and hot water heat exchangers
- Variable speed air flow with bottom up distribution

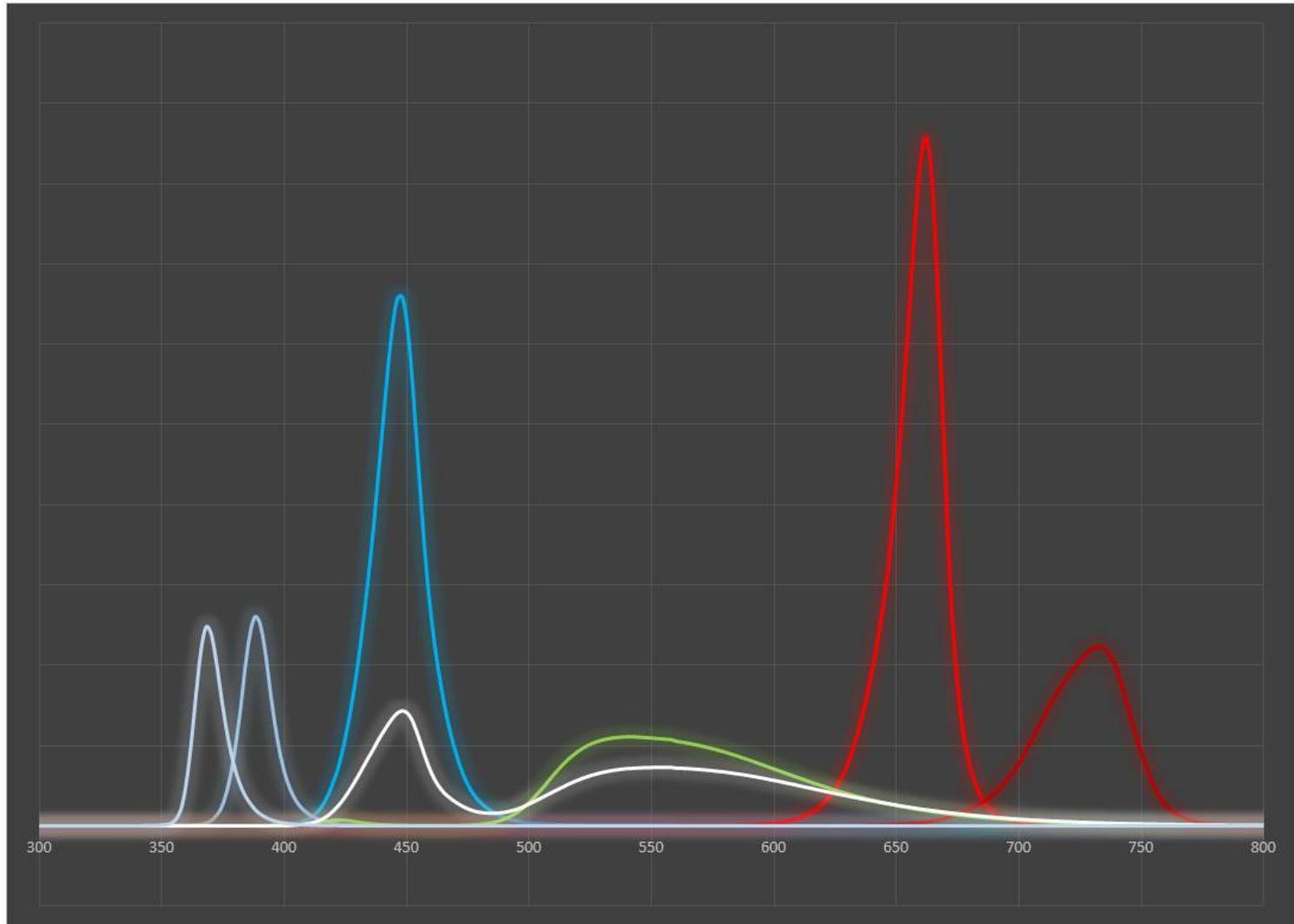
Control

- ARGUS control system

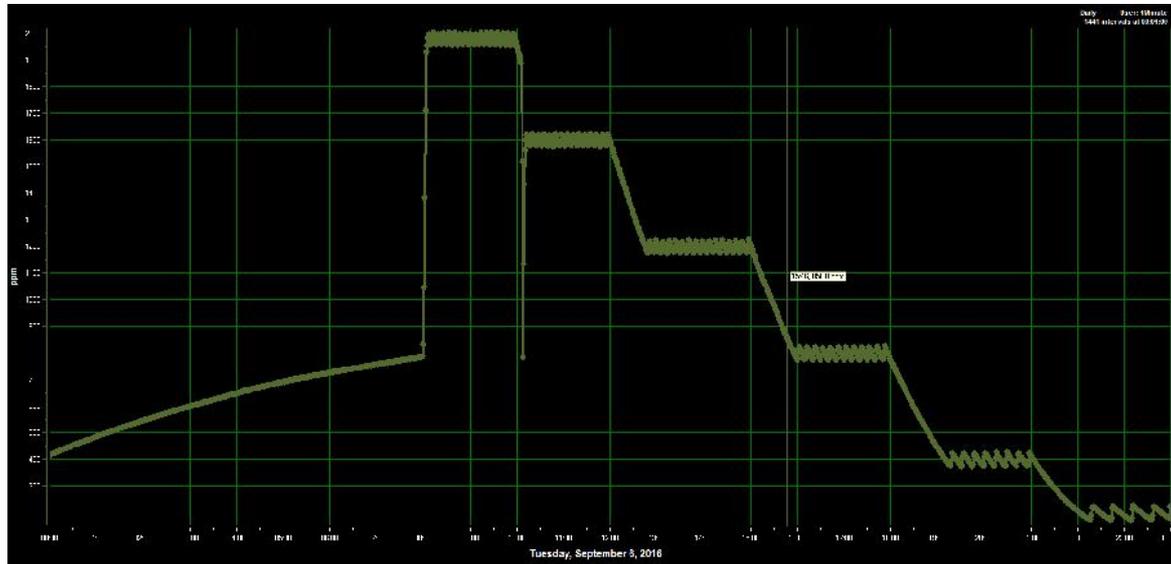
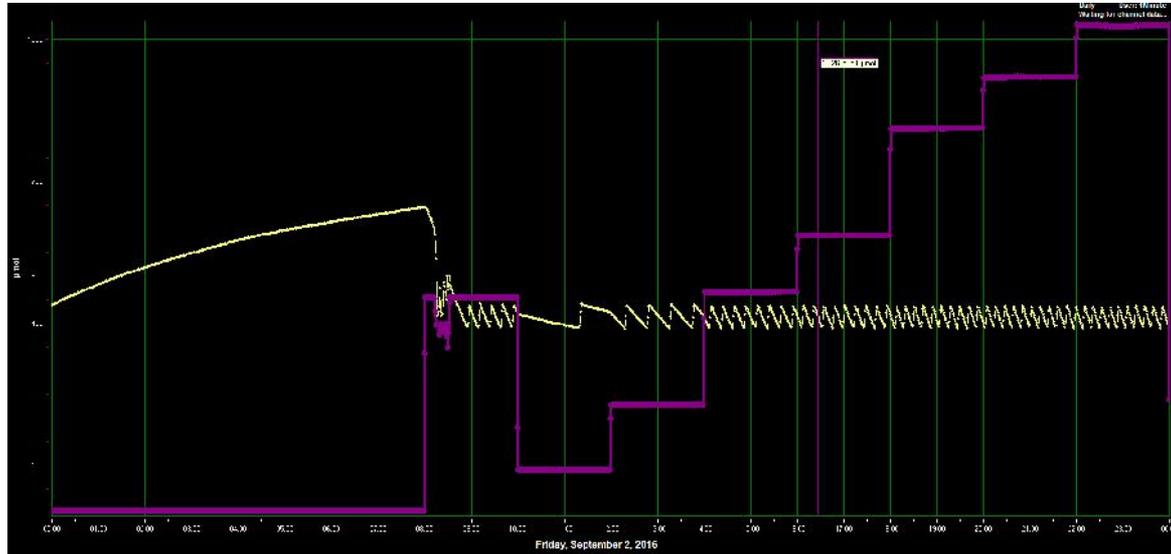
Lighting

- 2200 Watt water cooled LEDs with seven independently controlled channels
- UV (368 & 380), blue (448), white (5650K), green (568), red (655), far red (735)
- Wavelength and intensity programming through Argus interface

Full Available Spectrum



Light and CO2 control



Preliminary Testing

Preliminary testing with a variety of plant species including:



Capsicum annuum CV Mini Bell Red

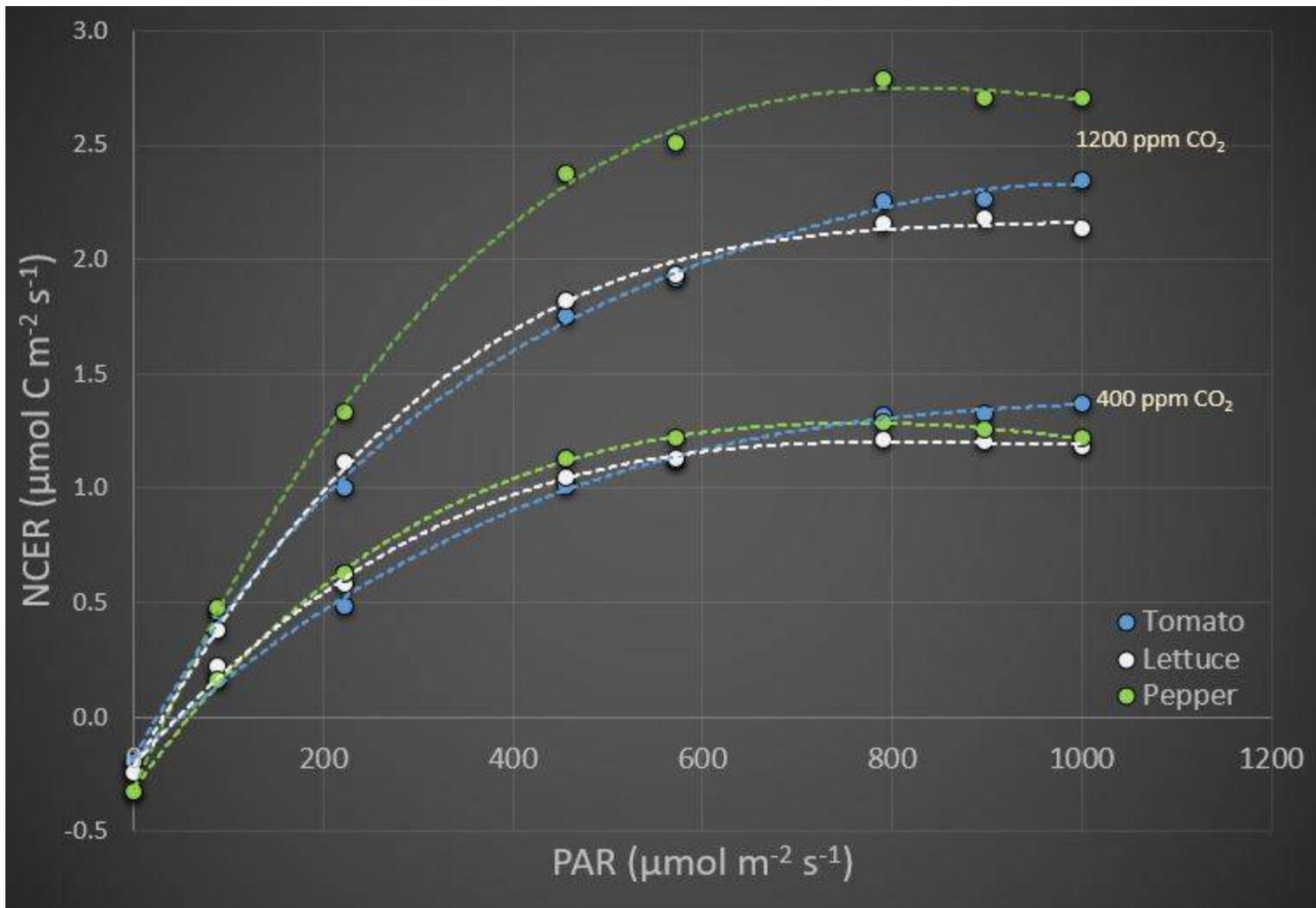


Solanum lycopersicum CV Red Robin

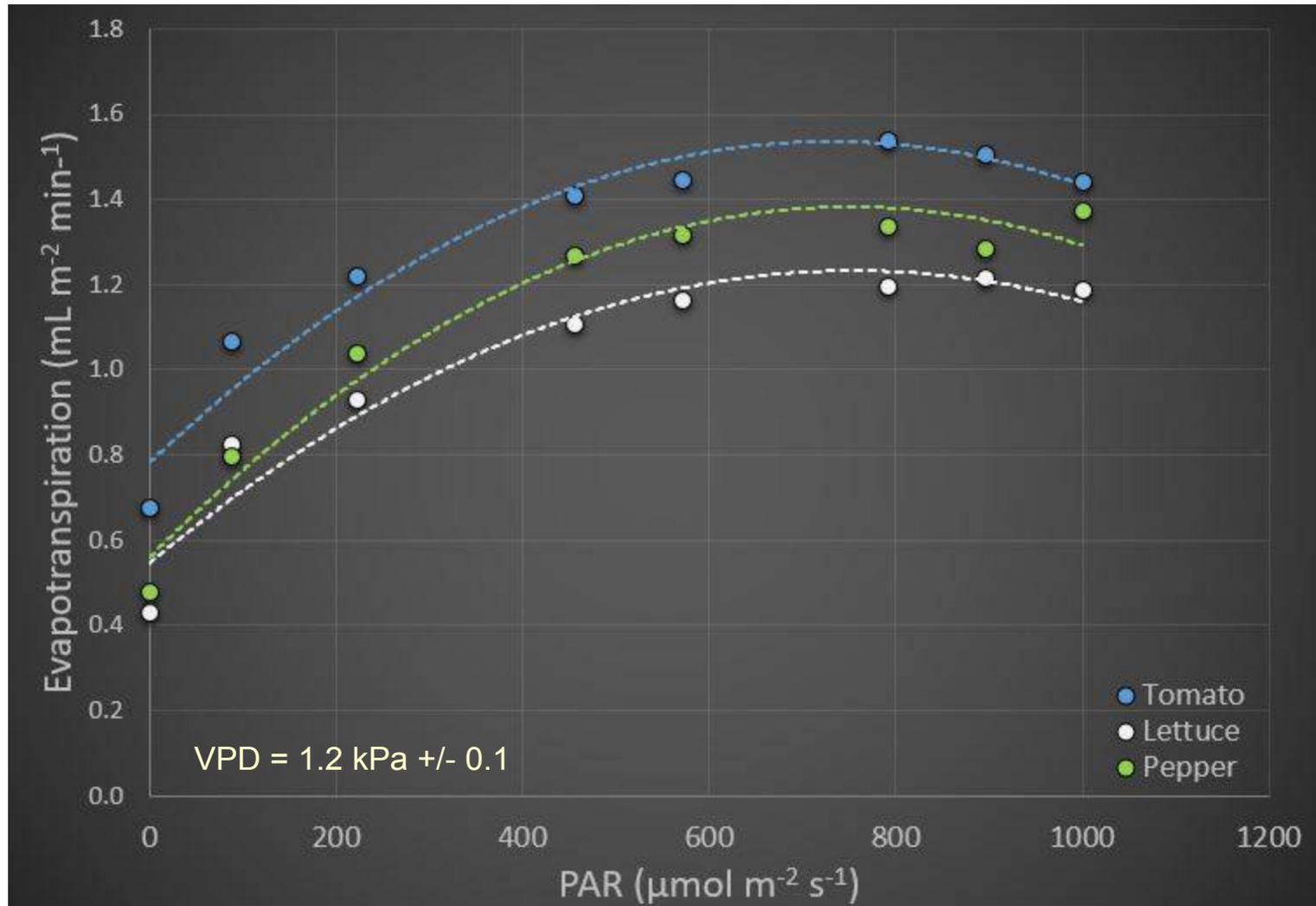


Lactuca sativa CV New Red Fire

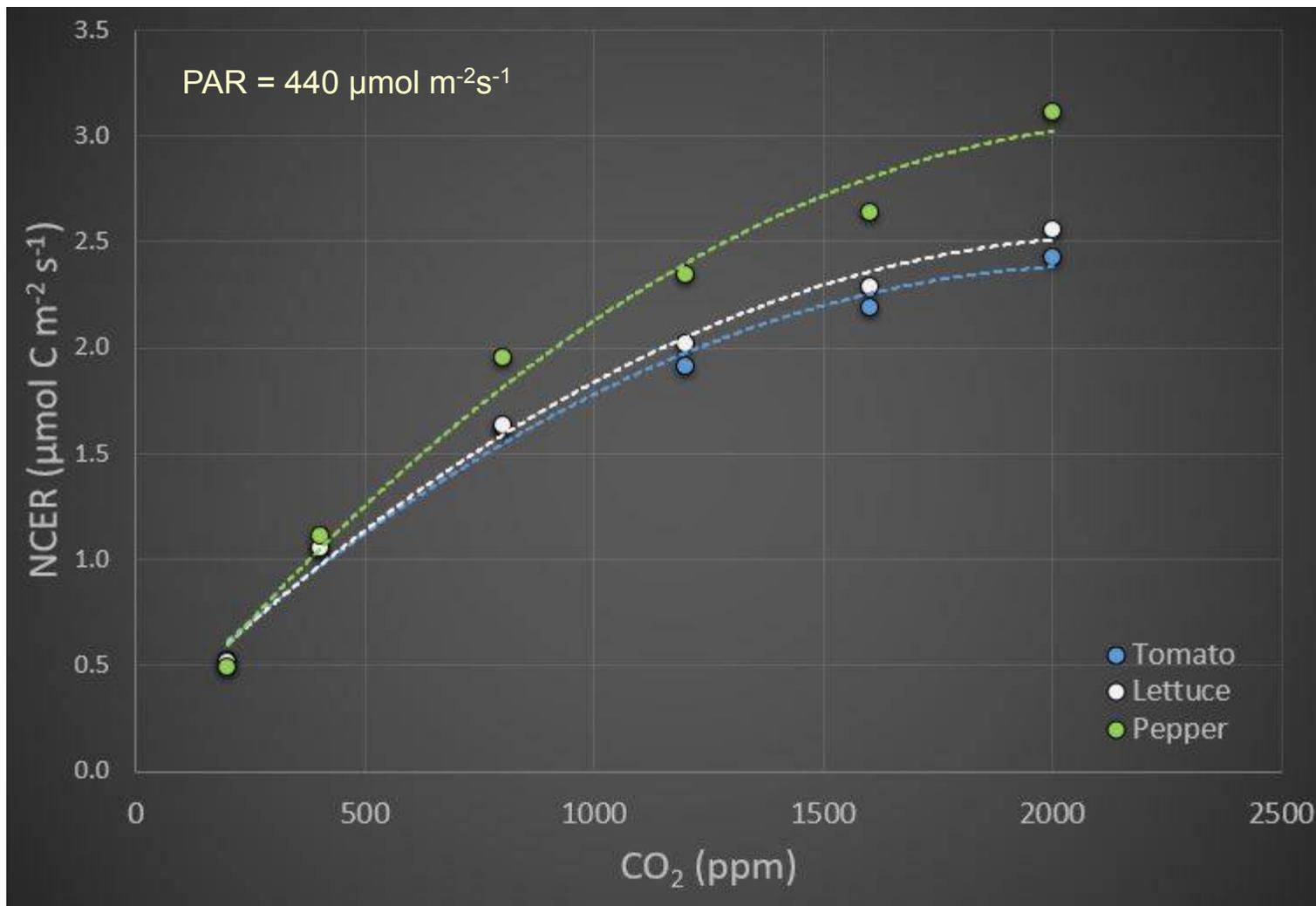
NCER light response



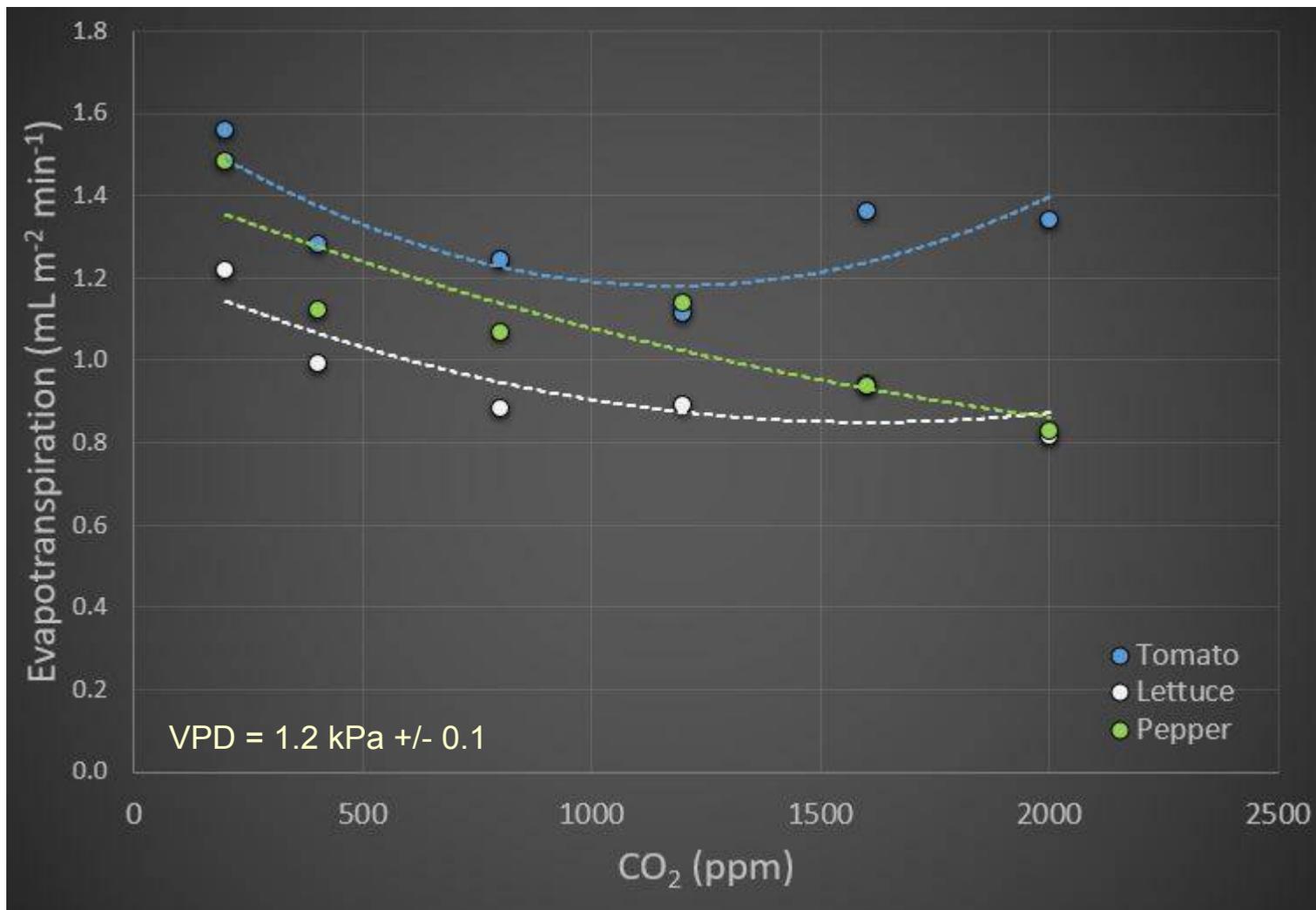
ET light response



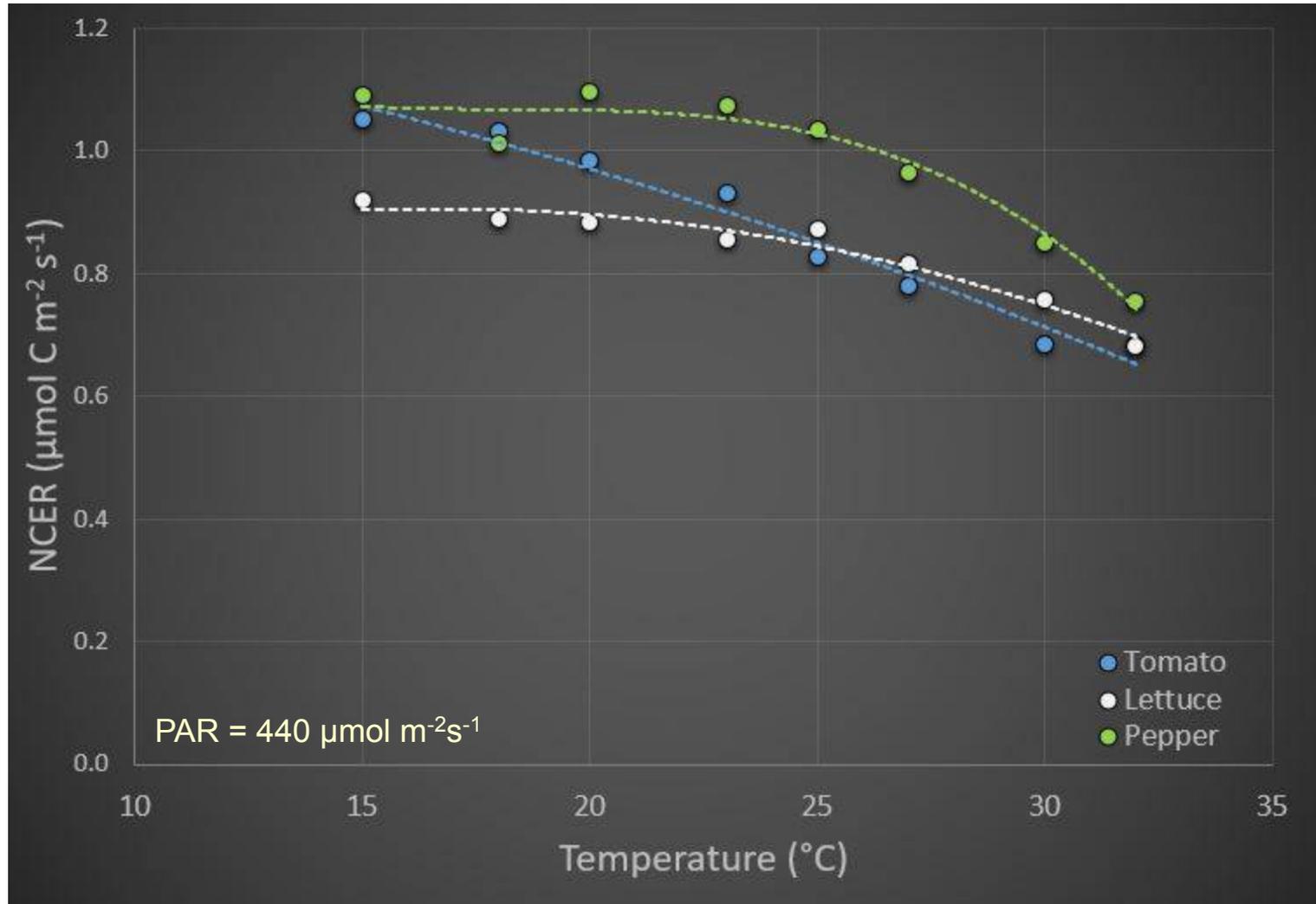
NCER CO2 response



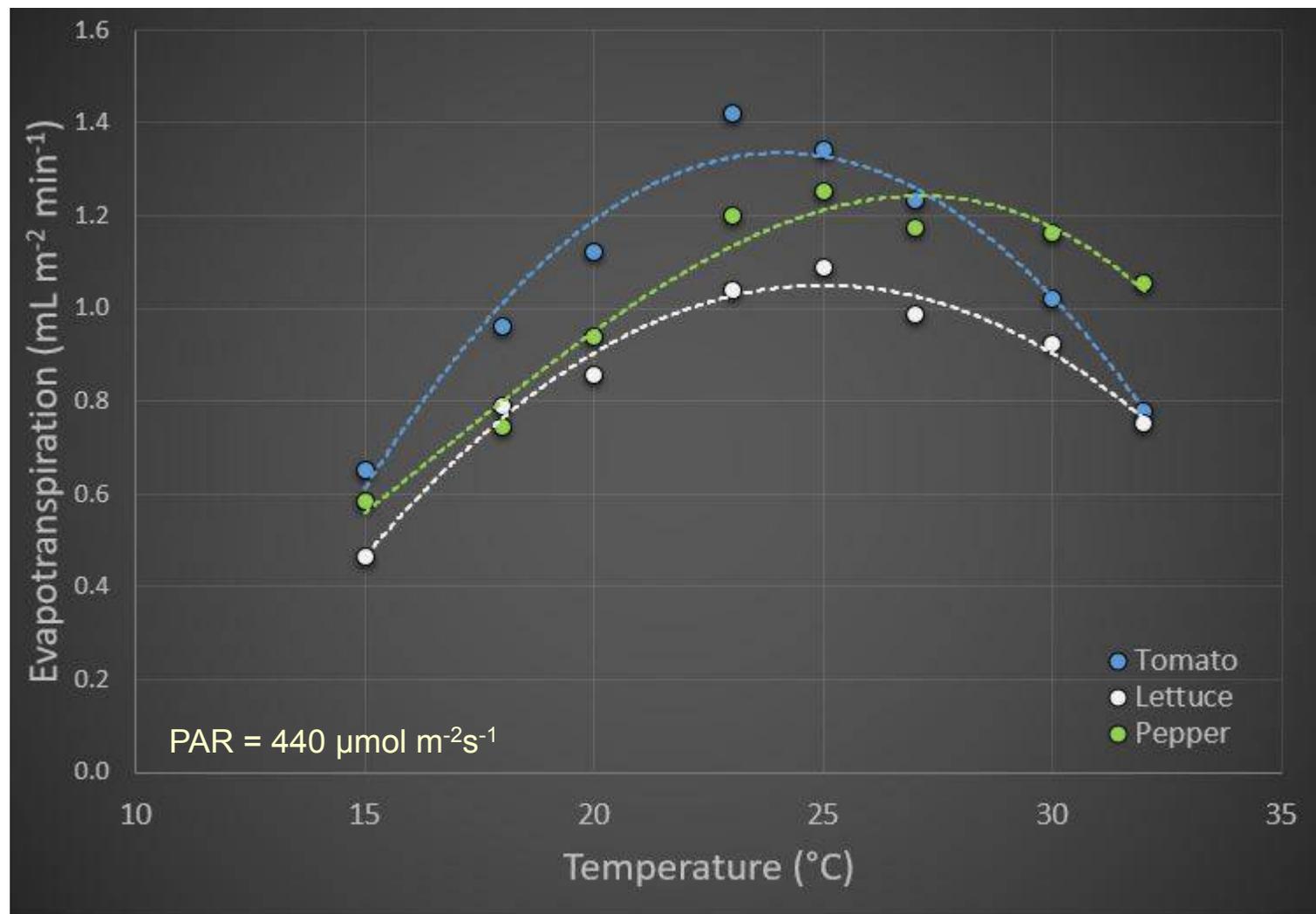
ET CO₂ response



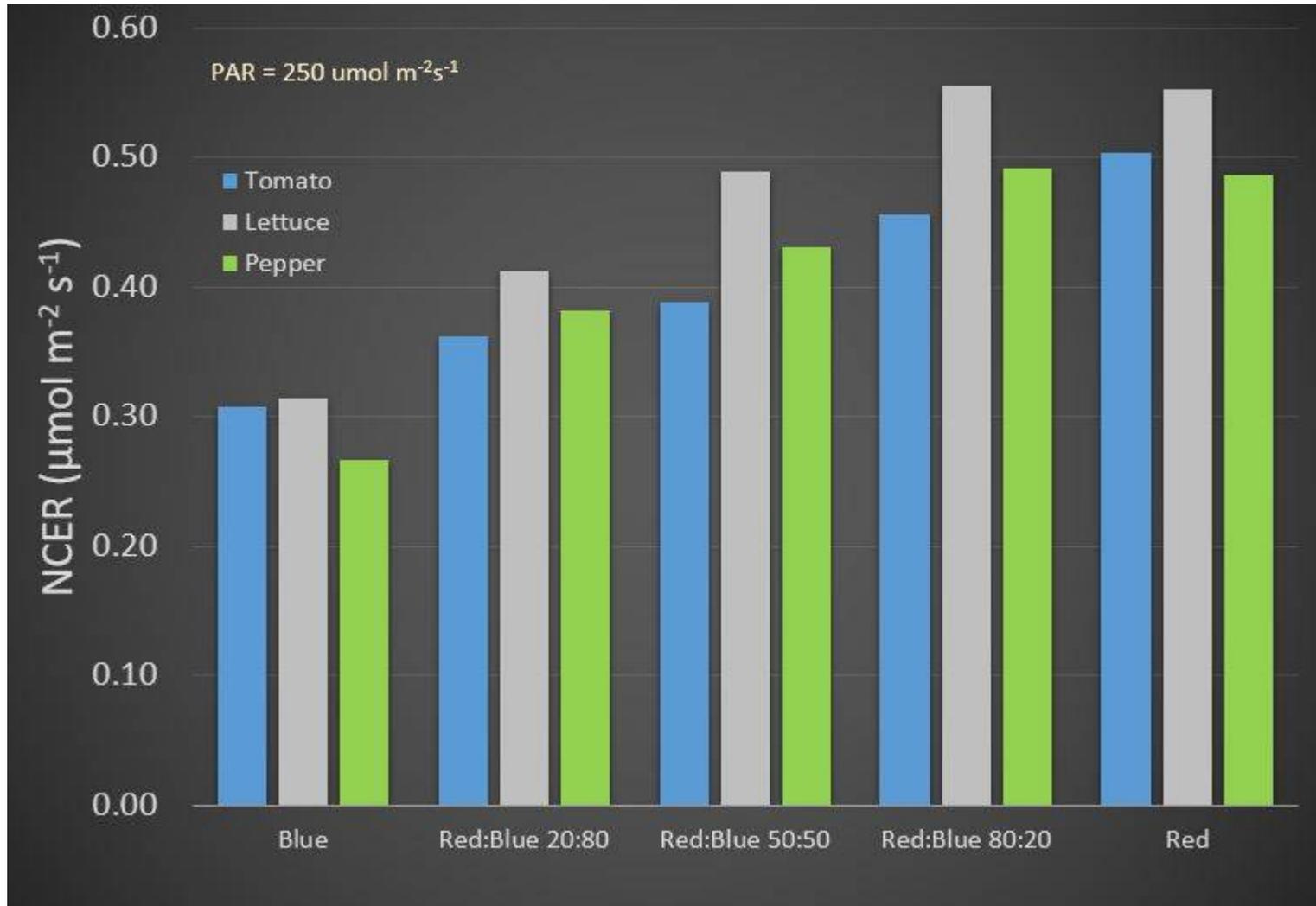
NCER temperature response



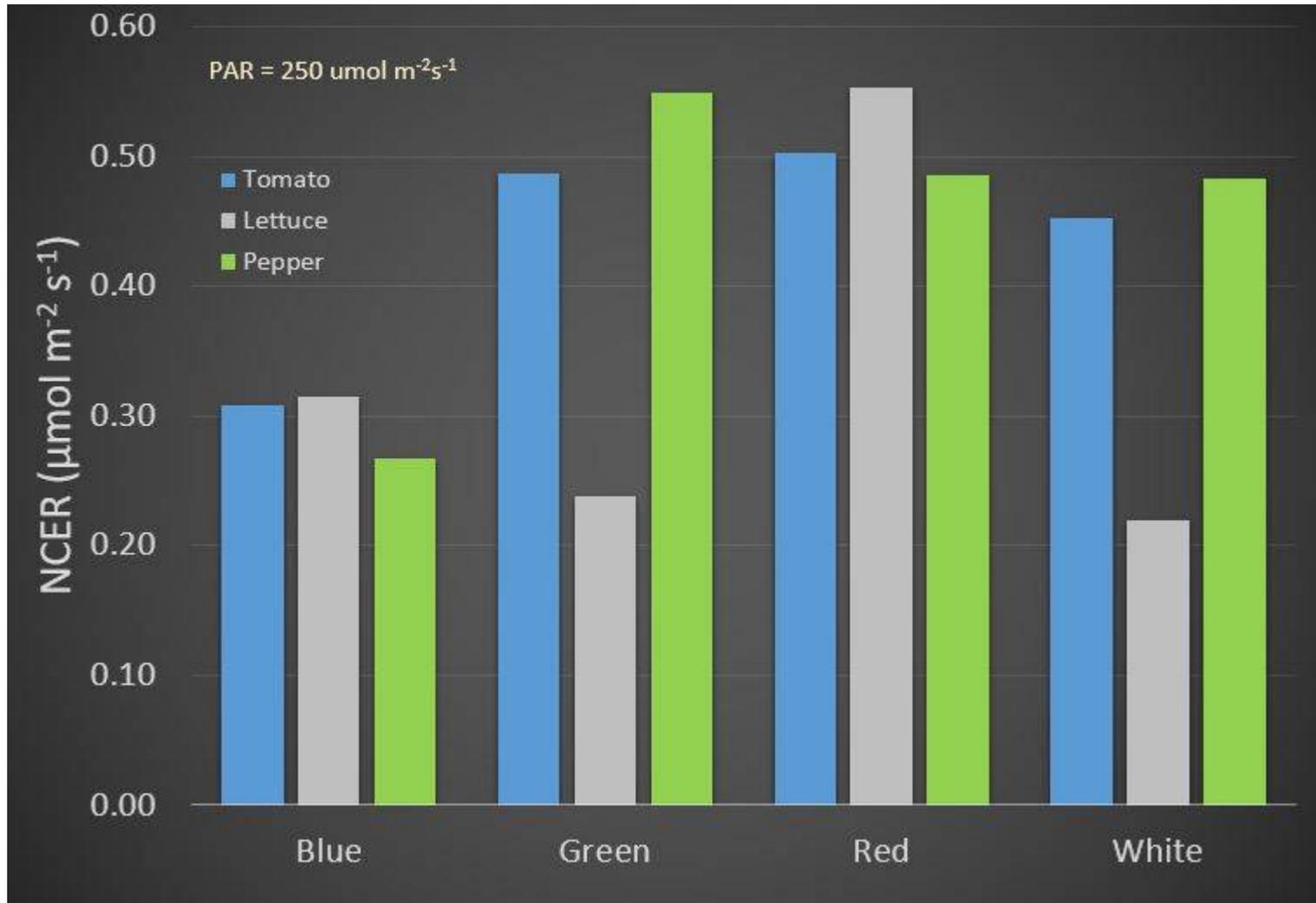
ET temperature response



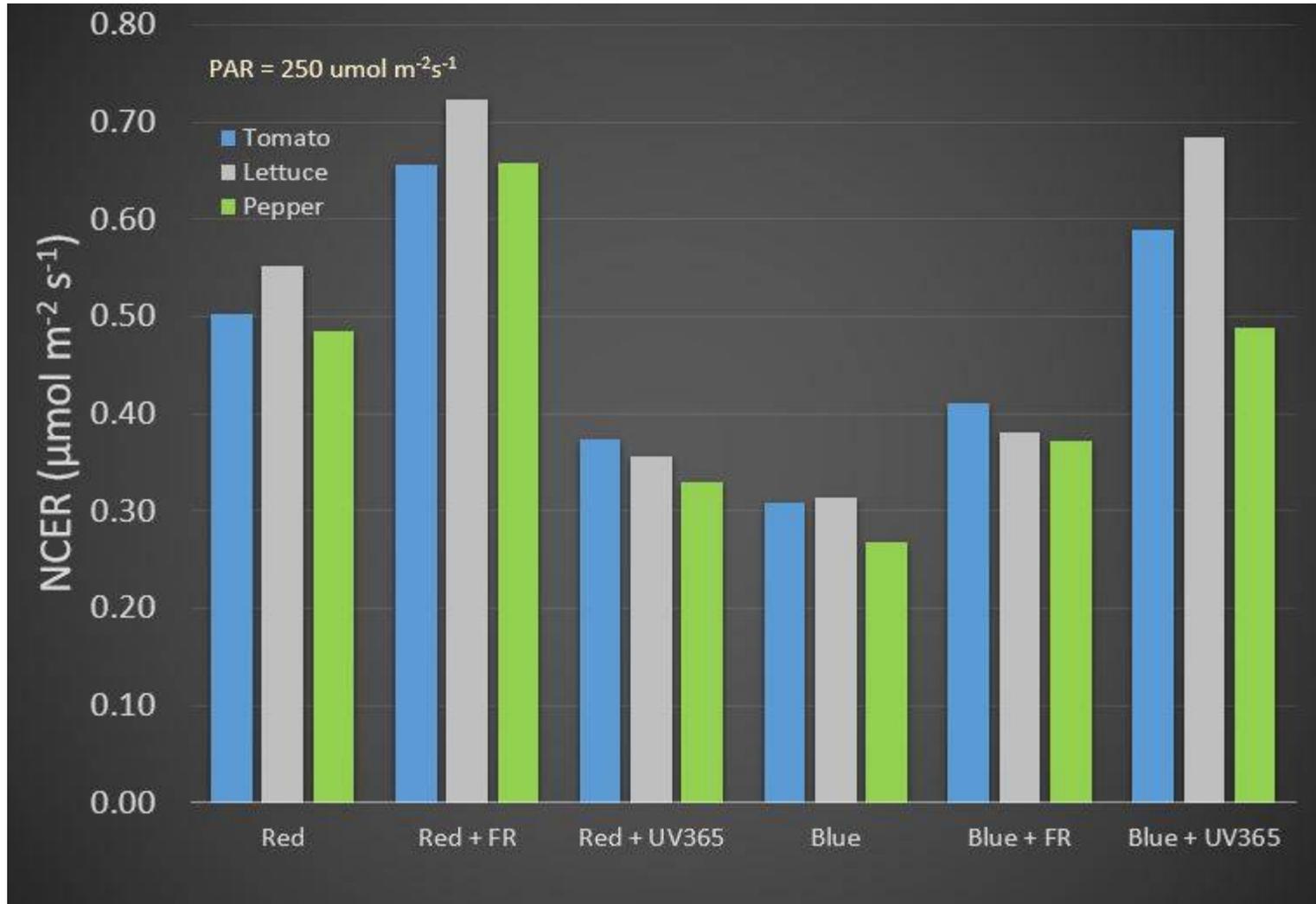
NCER colour response



NCER colour response



NCER colour response



Acknowledgements

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