Plant characterization using LEDs and advanced sealed environment technology

Mike Dixon[1], Michael Stasiak[1], Reg Quiring[2], Dave Hawley[1], Per Lysaa[3]

[1]University of Guelph, Guelph, ON Canada
[2]Conviron, Winnipeg, MB Canada
[3]Intravision Light Systems Inc., Oslo, Norway

Flowers Canada ON, 2017 Research Conference

February 1st, 2017

CESRF intravision light systems Inc. CONVIRON®

Guelph BlueBox sealed environment systems

CESRF

intravision light systems Inc.

CONVIRON®

CONVIRON®

A1000

One Chamber
Multiple Applications

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

CESRF

intravision
light systems Inc.

CONVIRON®

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 (PS1000 now)

- 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

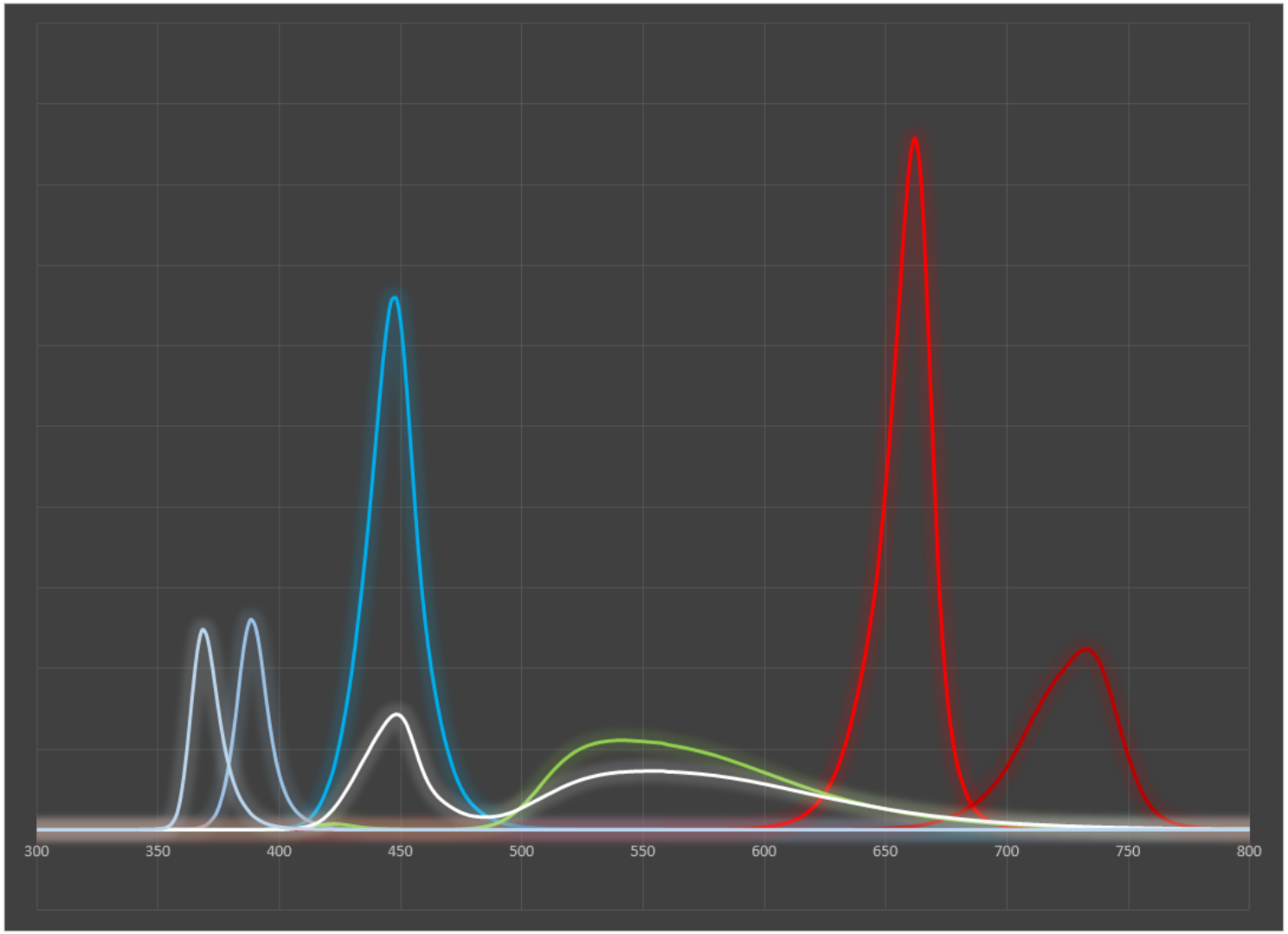
Control

- 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



Preliminary Testing

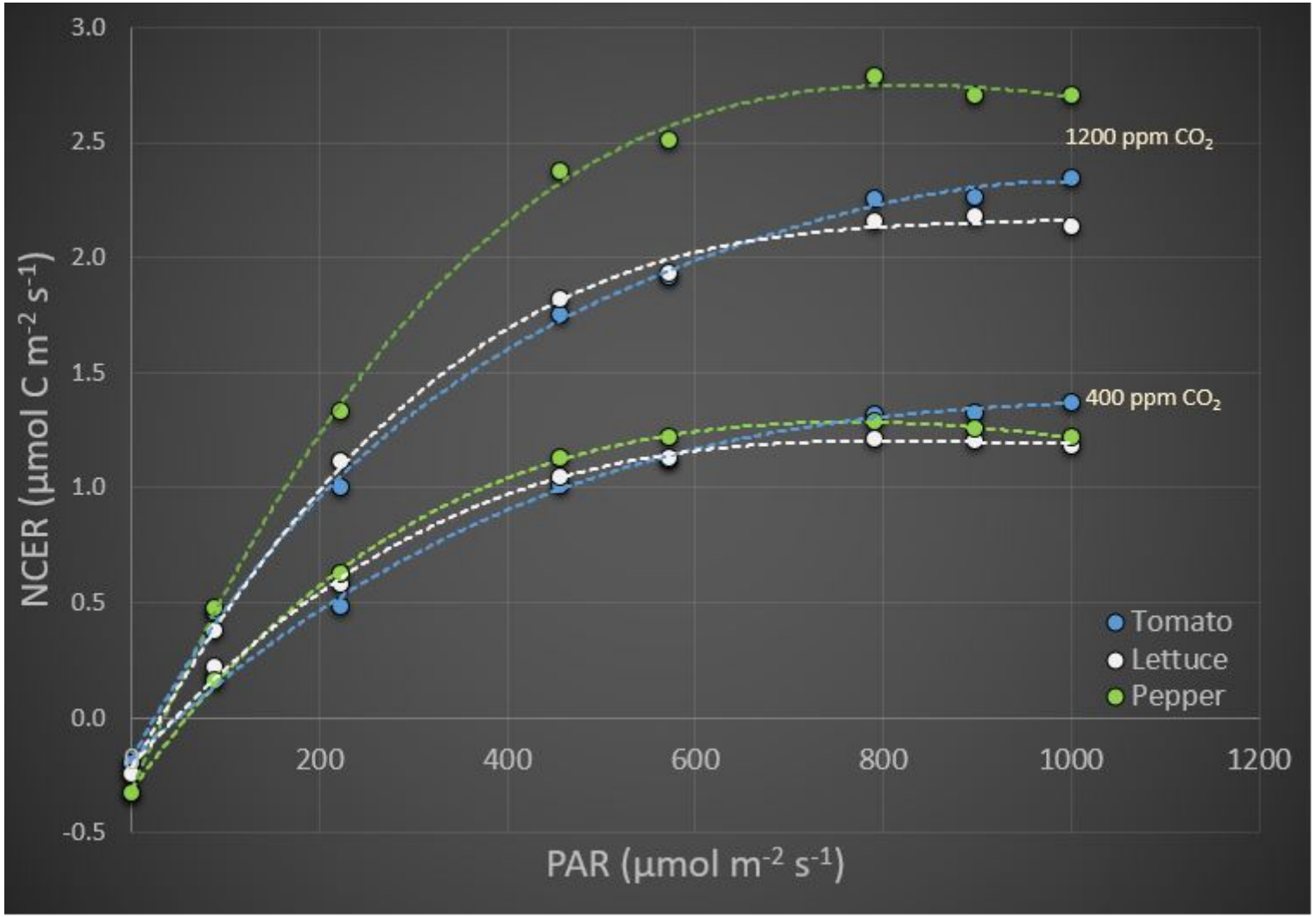
Preliminary testing with a variety of plant species including:

Capsicum annuum CV Mini Bell Red

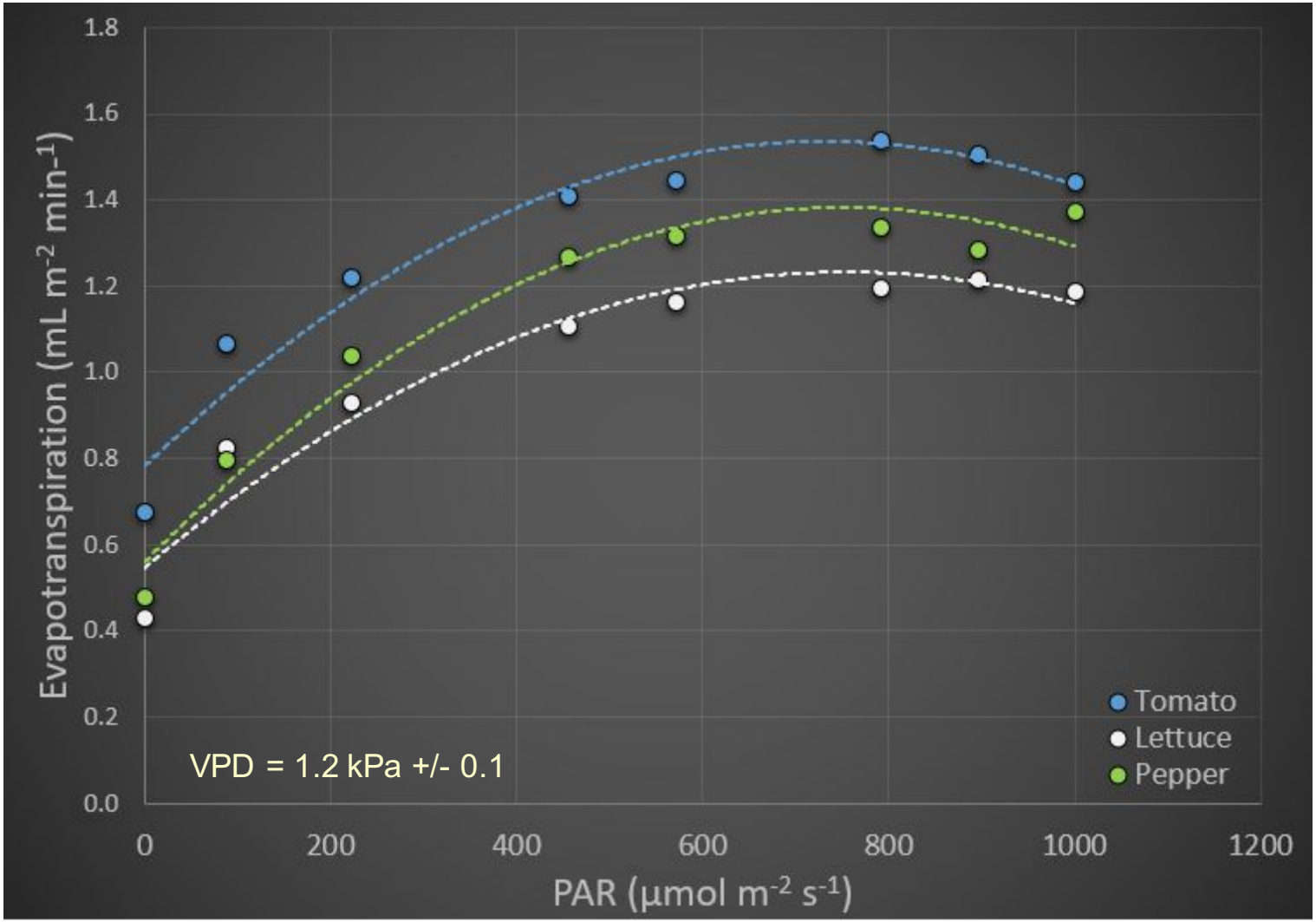
Solanum lycopersicum CV Red Robin

Lactuca sativa CV New Red Fire

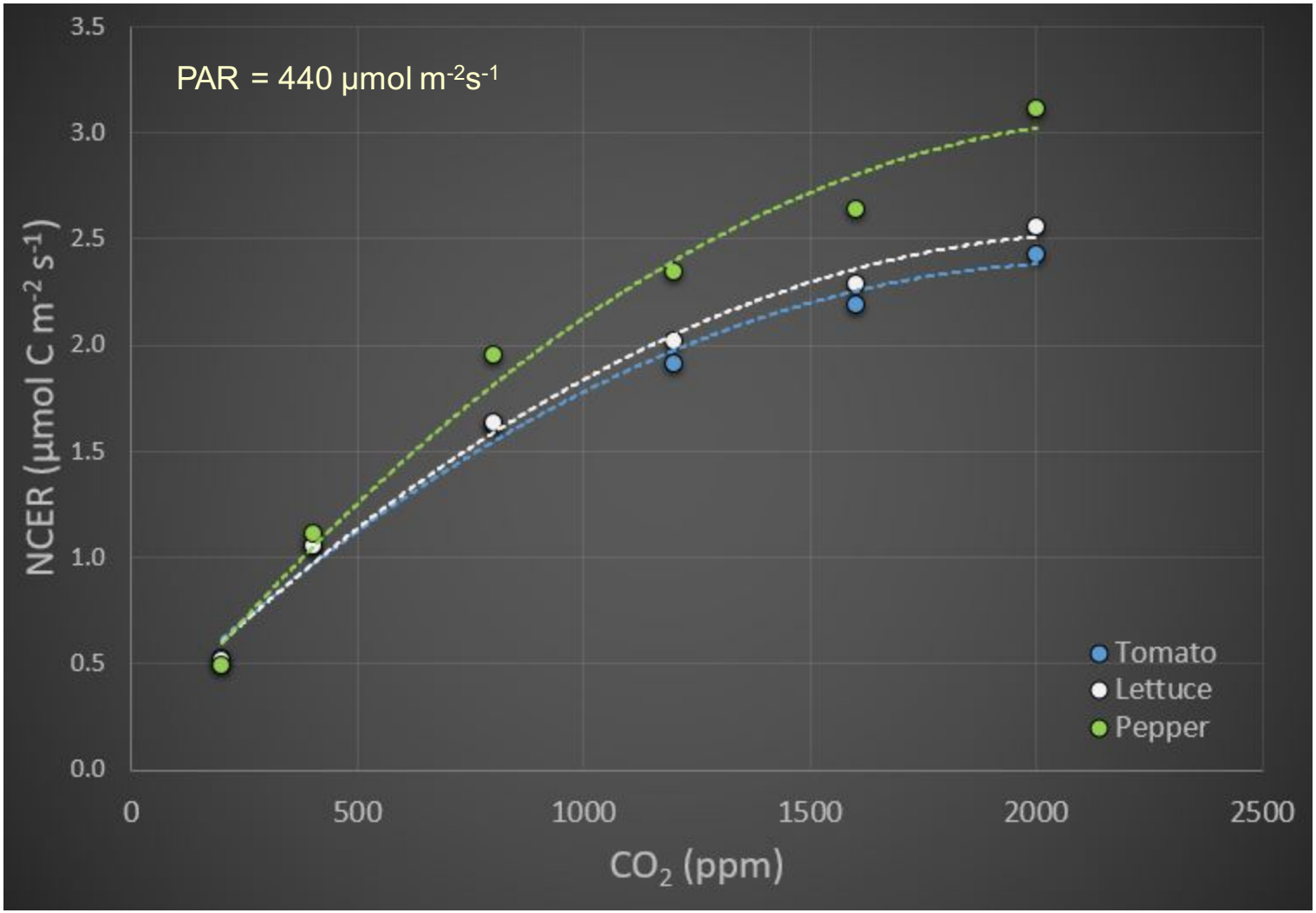
NCER light response



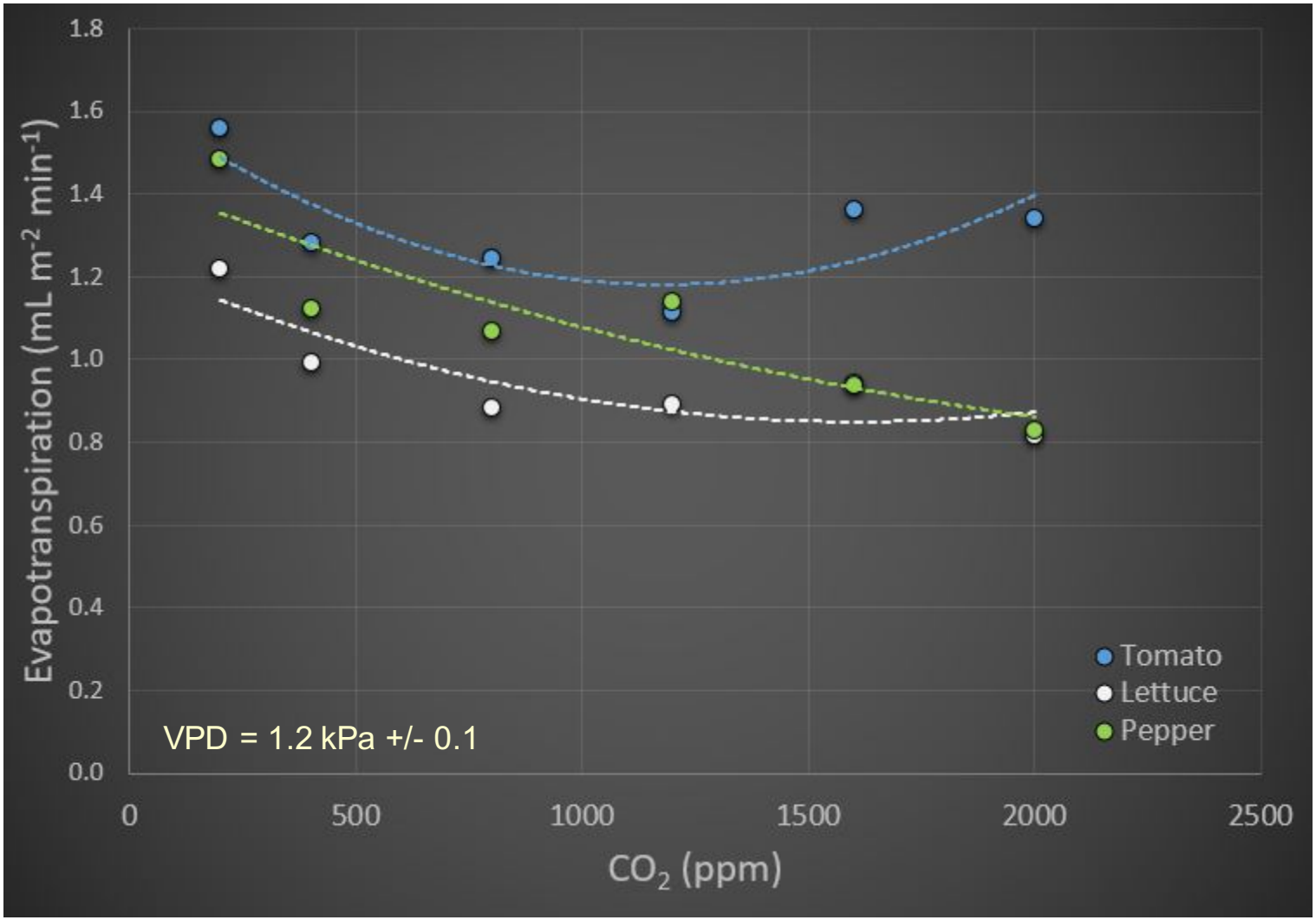
ET light response



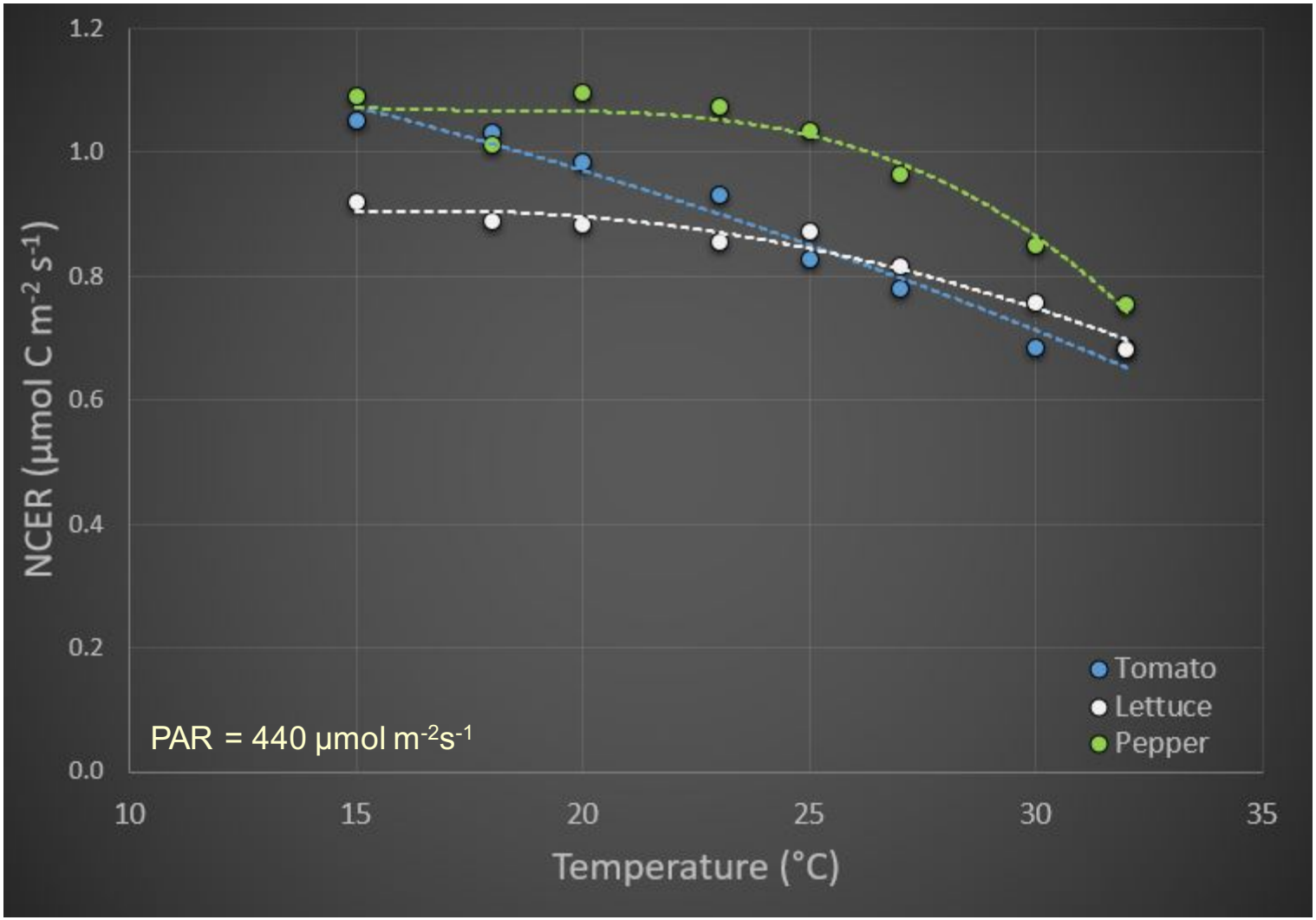
NCER CO2 response



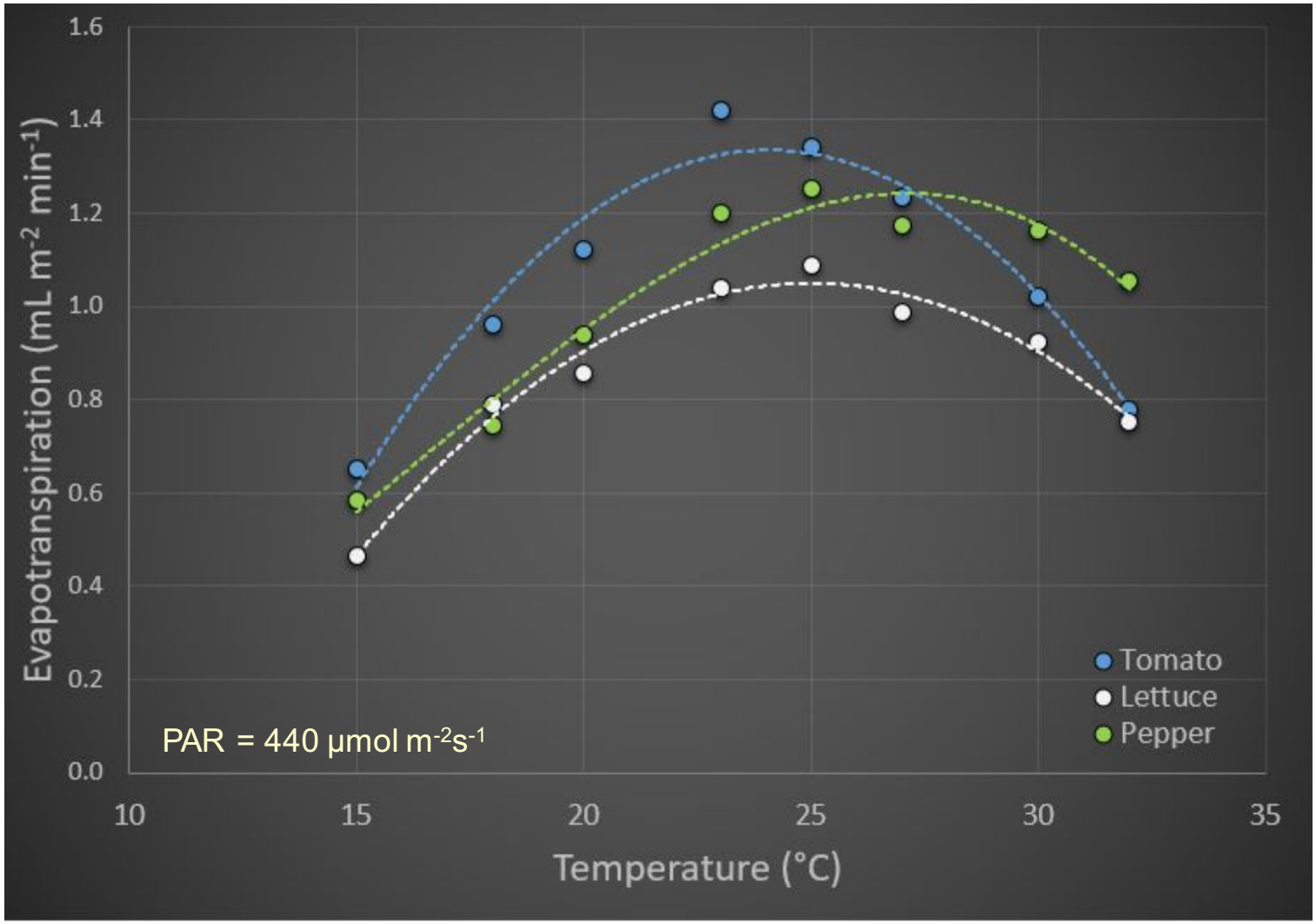
ET CO2 response



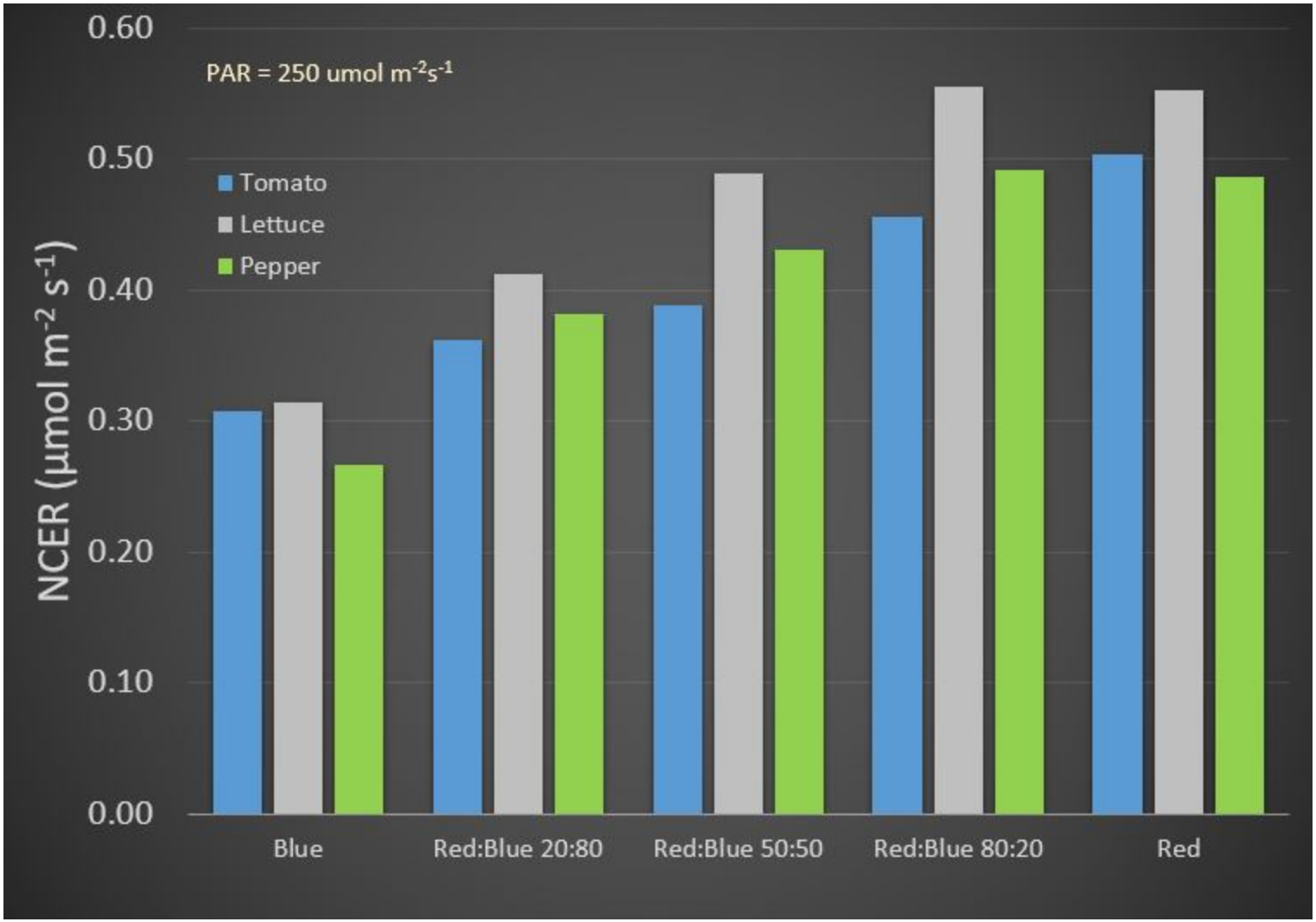
NCER temperature response



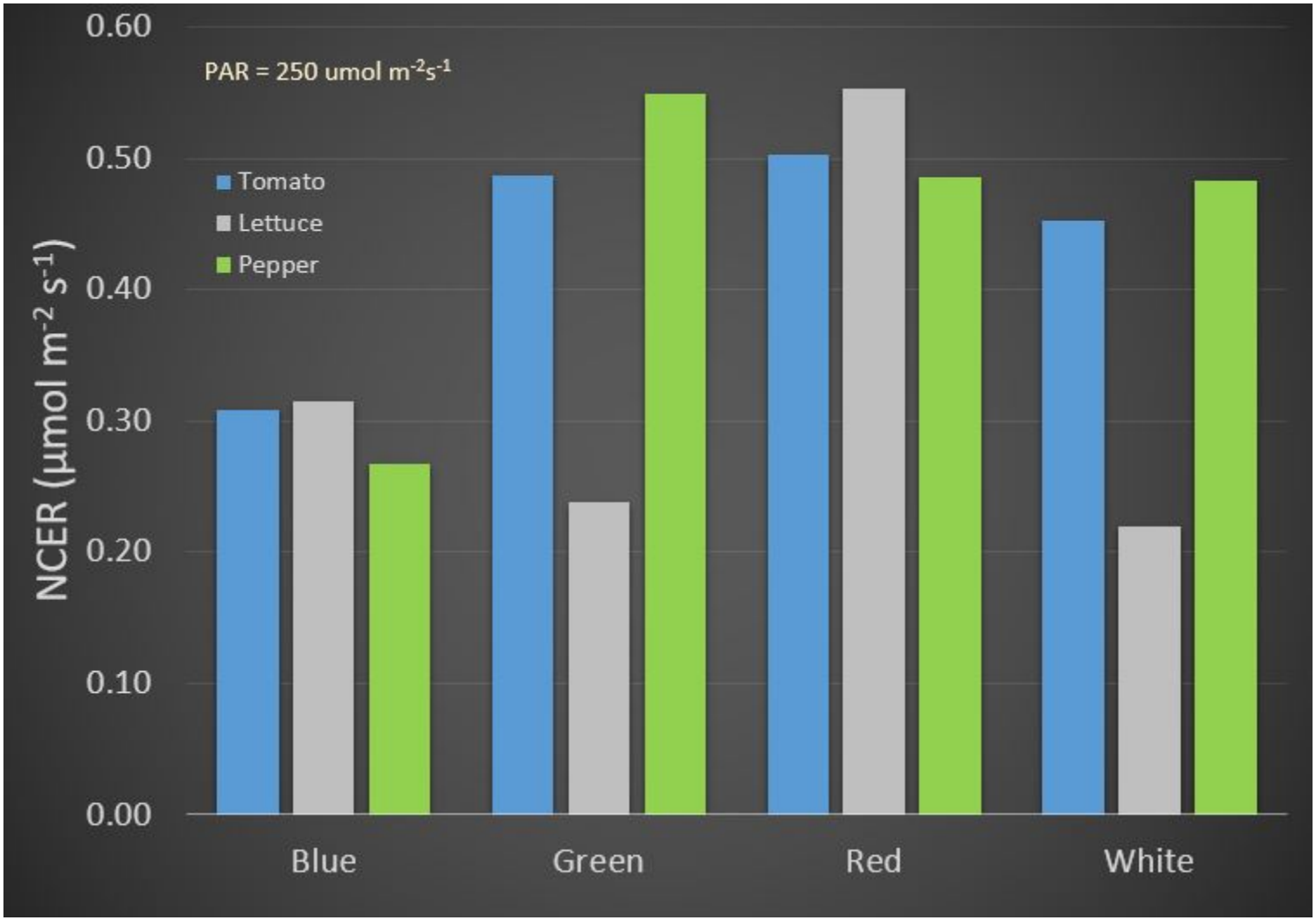
ET temperature response



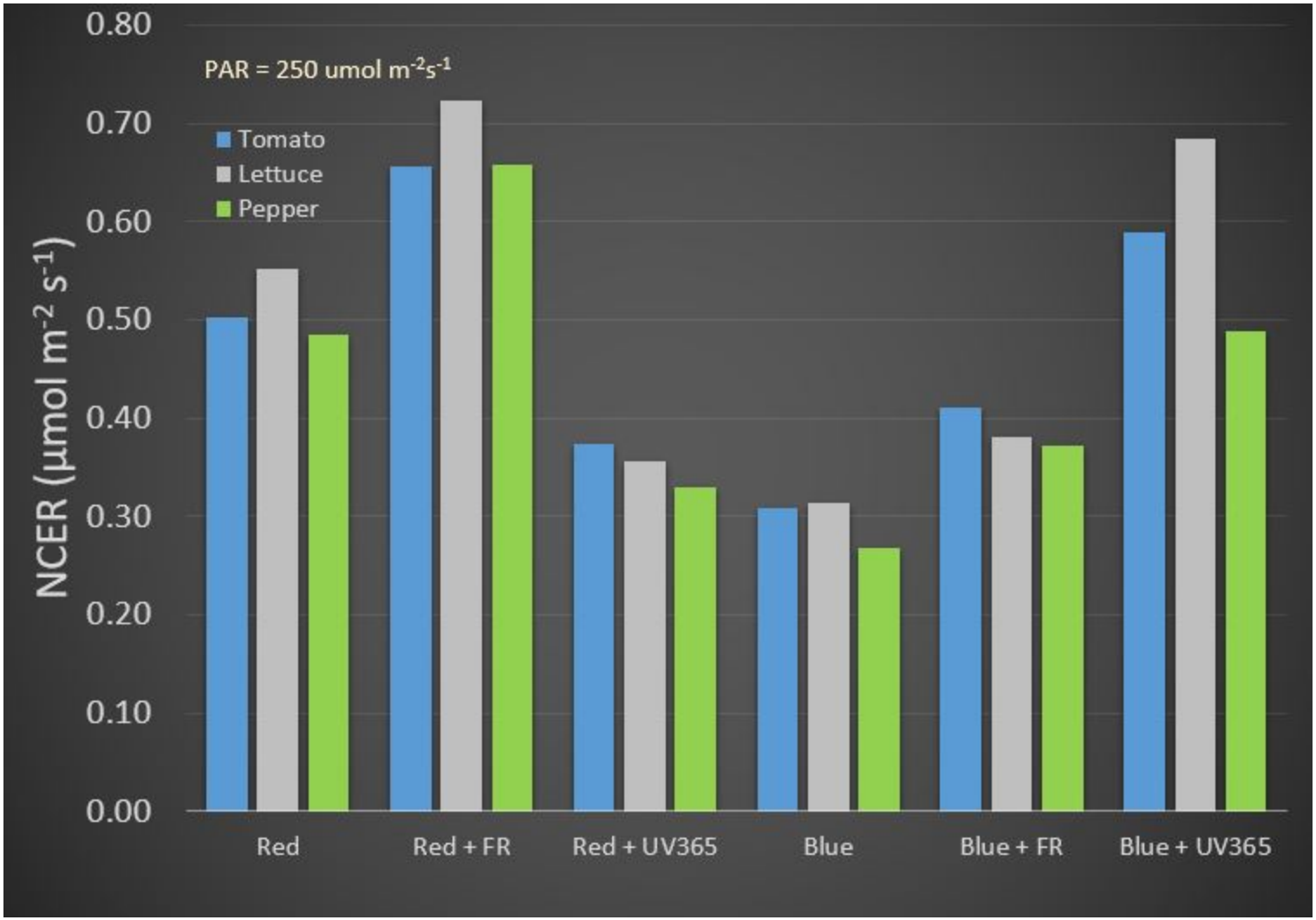
NCER colour response

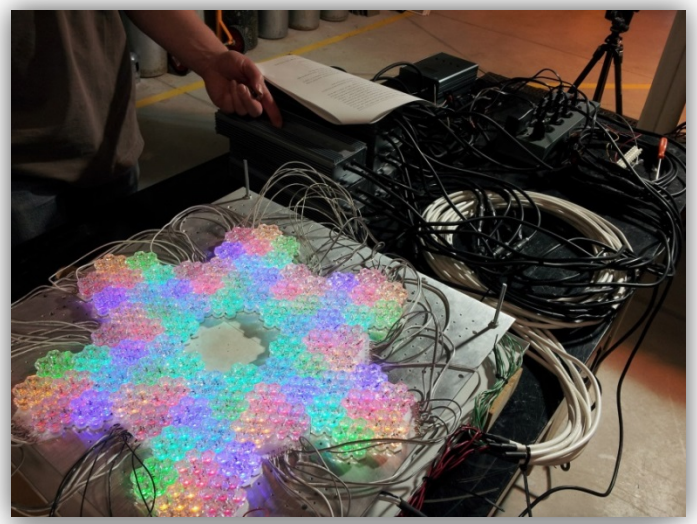


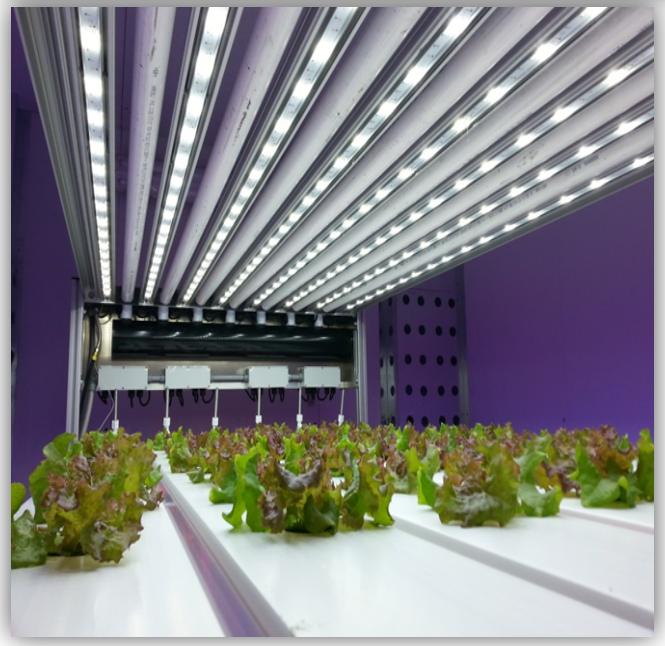
NCER colour response



NCER colour response







CESRF

intravision
light systems Inc.

CONVIRON


WHITE
RED
BLUE

Acknowledgements

This project is a research collaboration between the CESRF/UGuelph, CONVIRON and Intravision Light Systems Inc.

Funding support is provided by ABcann Medicinals Inc. and the Natural Sciences and Engineering Research Council (NSERC-IPS).

CESRF intravision light systems Inc. CONVIRON