



PHOTOSYNTHESIS IN STRAWBERRY AND RASPBERRY PLANTS UNDER DIFFERENT COLOUR NETS

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Task 2.2 Ensuring profitable berry production in changing climate

Sub-task 2.2.1

Developing technology to control temperature stress in berry plant

a) Summer production of berries in Southern–Central European areas will suffer from **increased temperatures**. These effects can be controlled by applying different shadowing techniques that reduce temperature. However, these treatments also negatively affect the intensity and quality of light. Best shadowing methodology is determined with strawberry and raspberry cultivars (selected in WP1) and with new selections of cooperating SME. The study includes the measurement of the light response curves of single leaves and of the entire plant canopies at different temperature (P1, P13).

Nets for crop protection

Protection (hail, birds, insects)

Environment modification (microclimate):

- Shadowing (light quantity)
- Modification of filtering light spectrum and scattering (light quality)
- Temperature mitigation



Traditional nets

Light: - 20%

Absorption of light
important for
photosynthesis

Black



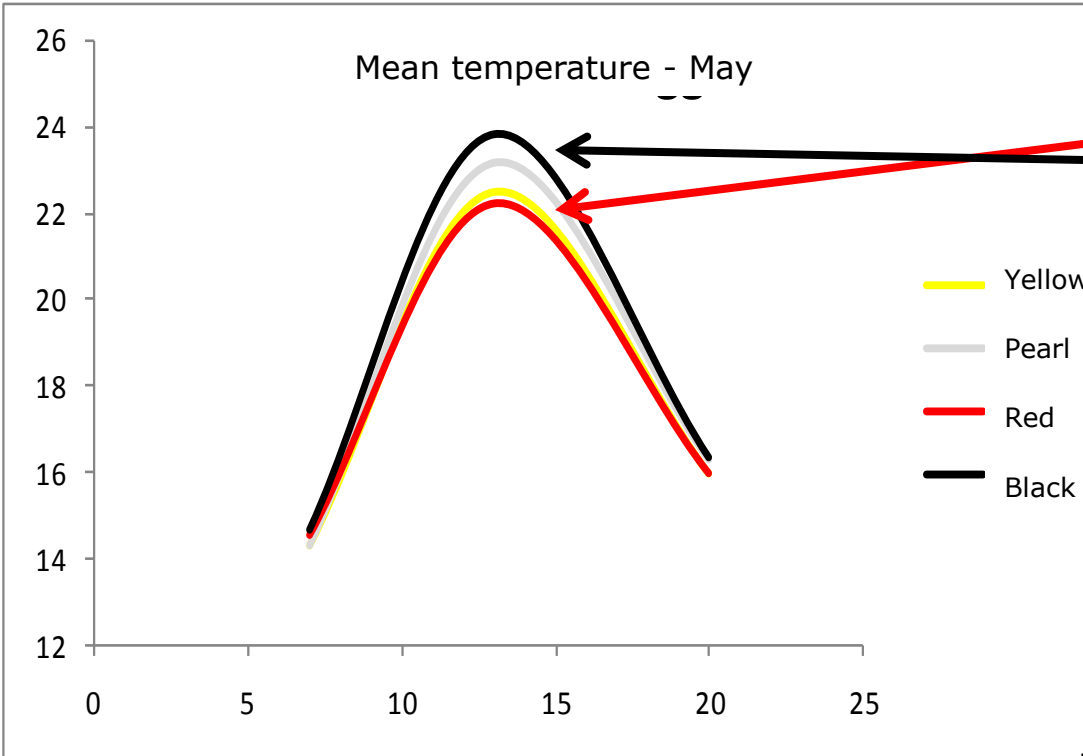
- 6%

White

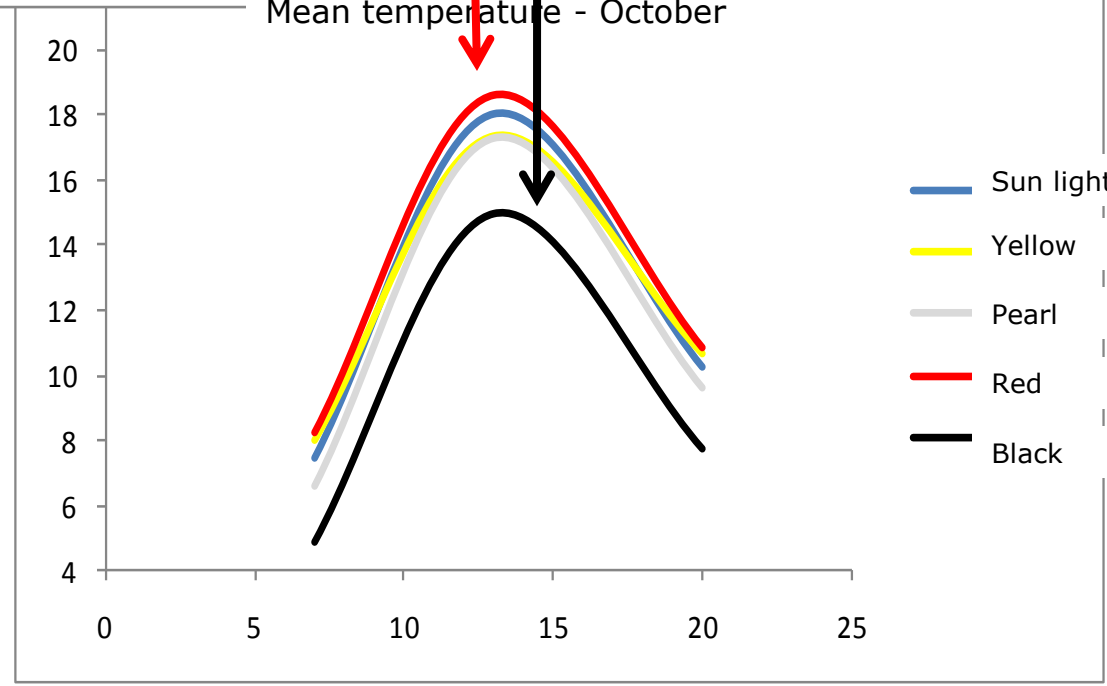


Color nets

Photoselective effects



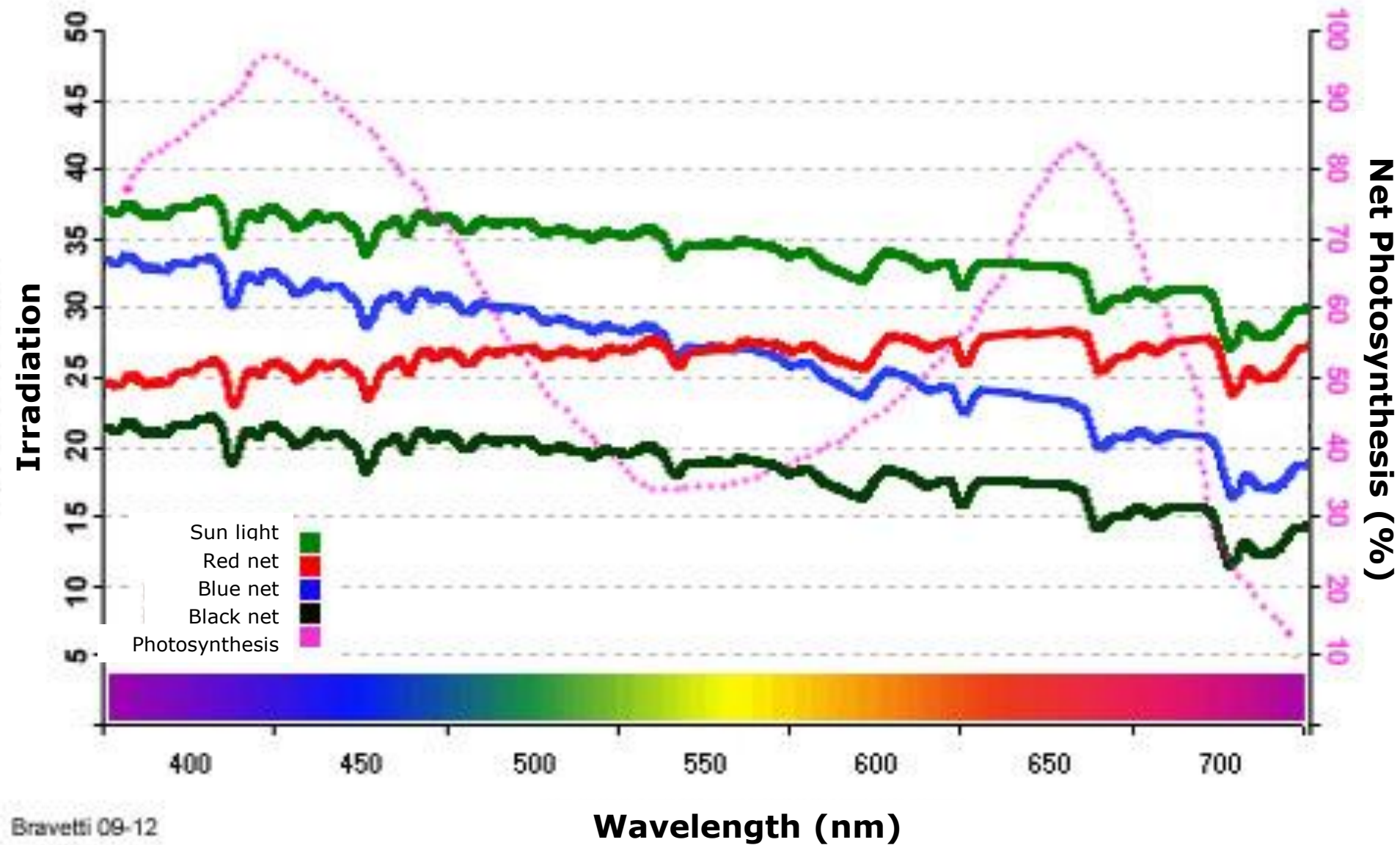
Mean temperature - October



Spring: warmer under
black net

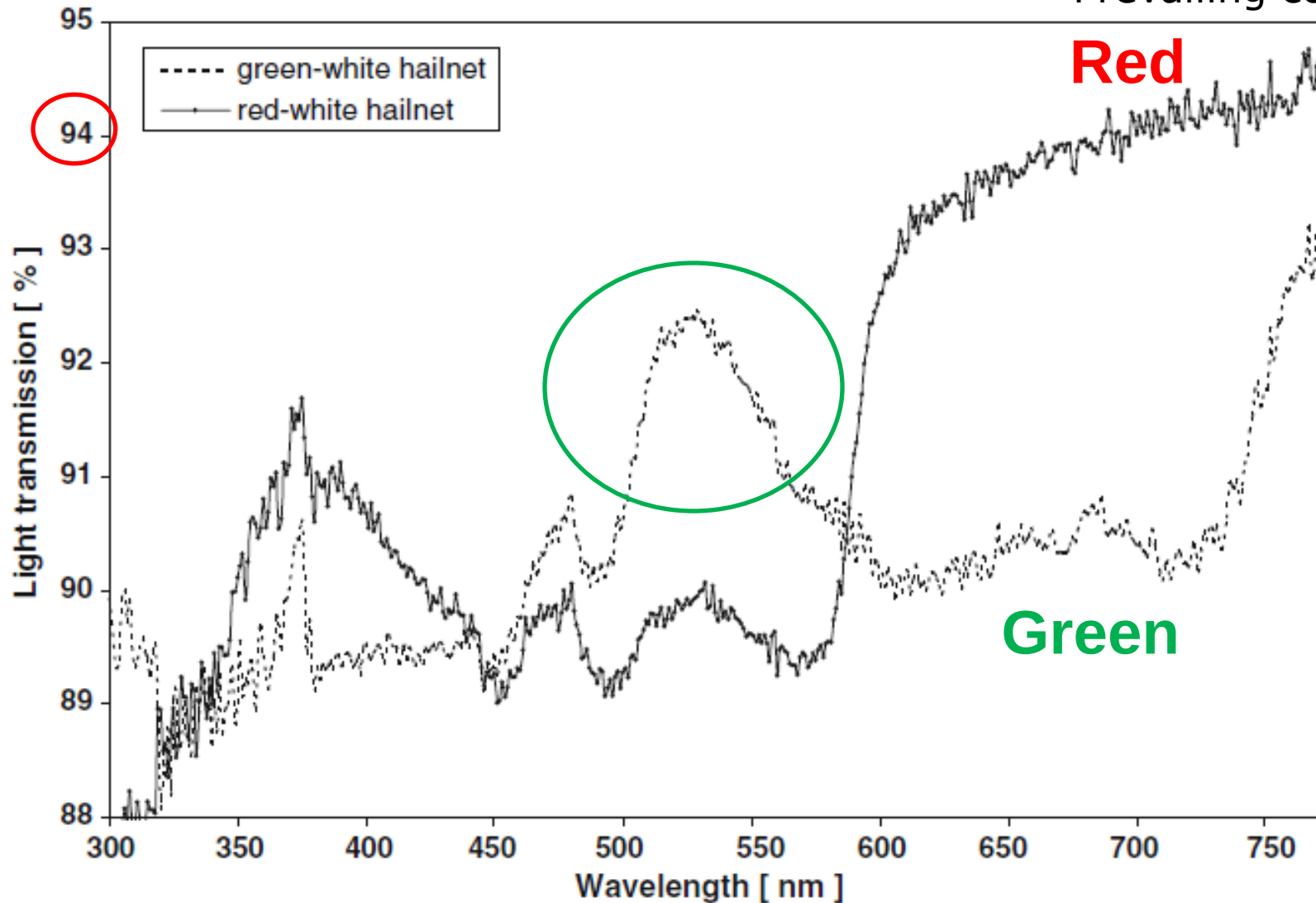
Autumn: warmer under
red net

Photoselective effects



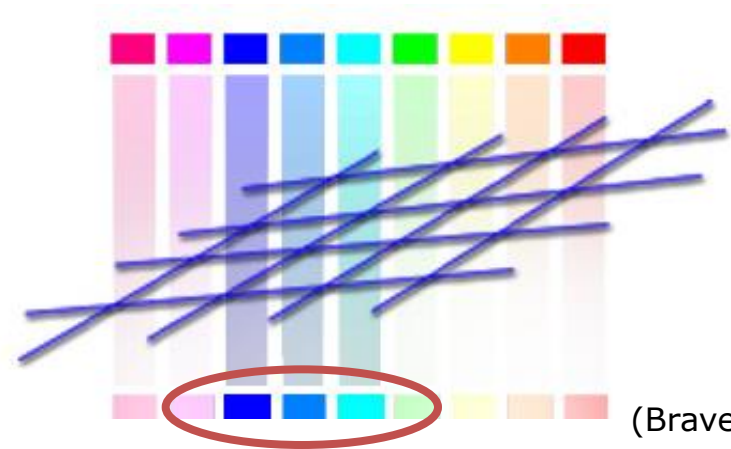
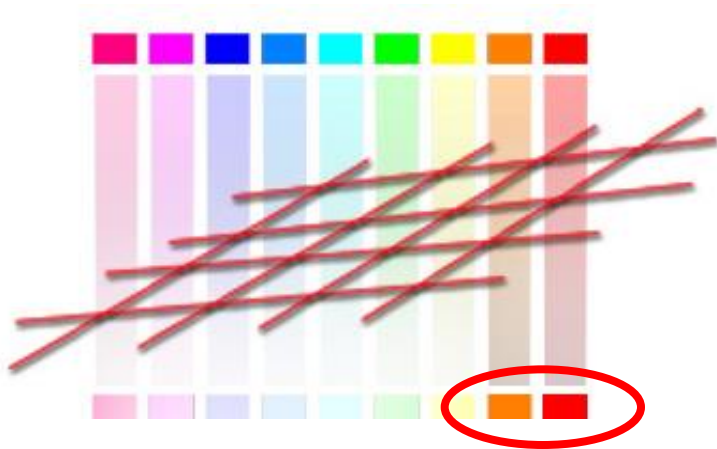
Specific light filtration

Prevailing color



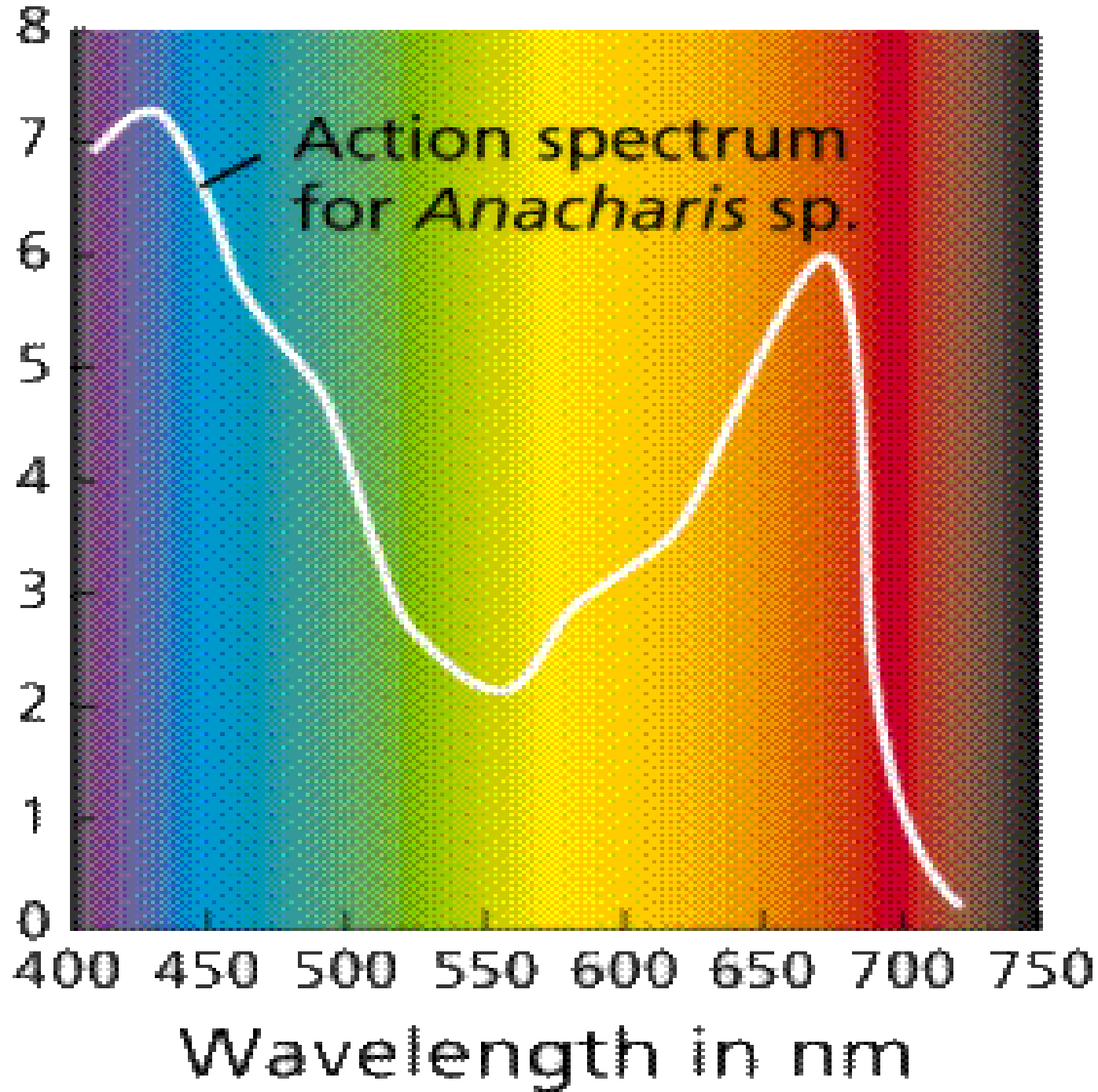
Light spectra (400–800 nm) transmitted by green and red hailnets (Solomakhin and Blanke, 2008).

Specific light filtration



(Bravetti, 2012)

Relative rate of
photosynthesis



Light quality modification at same shading factor

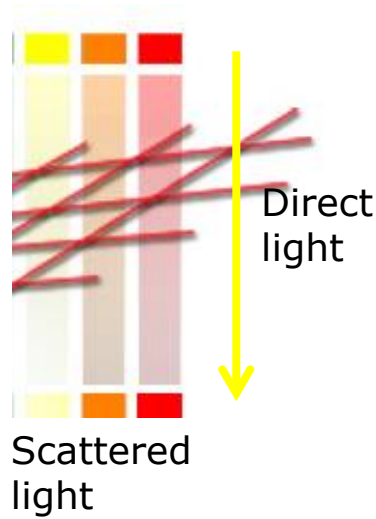
Net	Absorption	Transmittance	Scattering
Blue	UV+Y+R+FR	B+G	++
Red	UV+B+G	R+FR	++
Yellow	UV+B	G+Y+R+FR	++
White	UV	B+G+Y+R+FR	++
Pearl	UV	B+G+Y+R+FR	+++
Grey	all (+IR)	-	+
Black	all	-	0

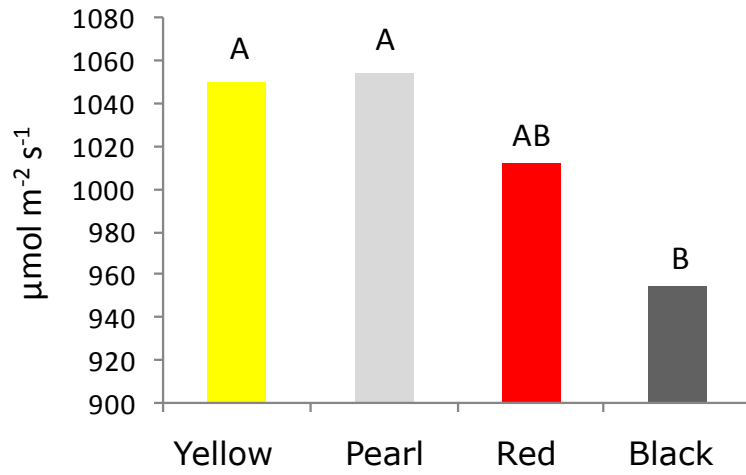
Shahak et al., 2004

Angle of incidence of the light affects scattering ability

Light composition under the net

Modification in
B/R ratio
R/FR ratio
↓
Photomorphogenic effects

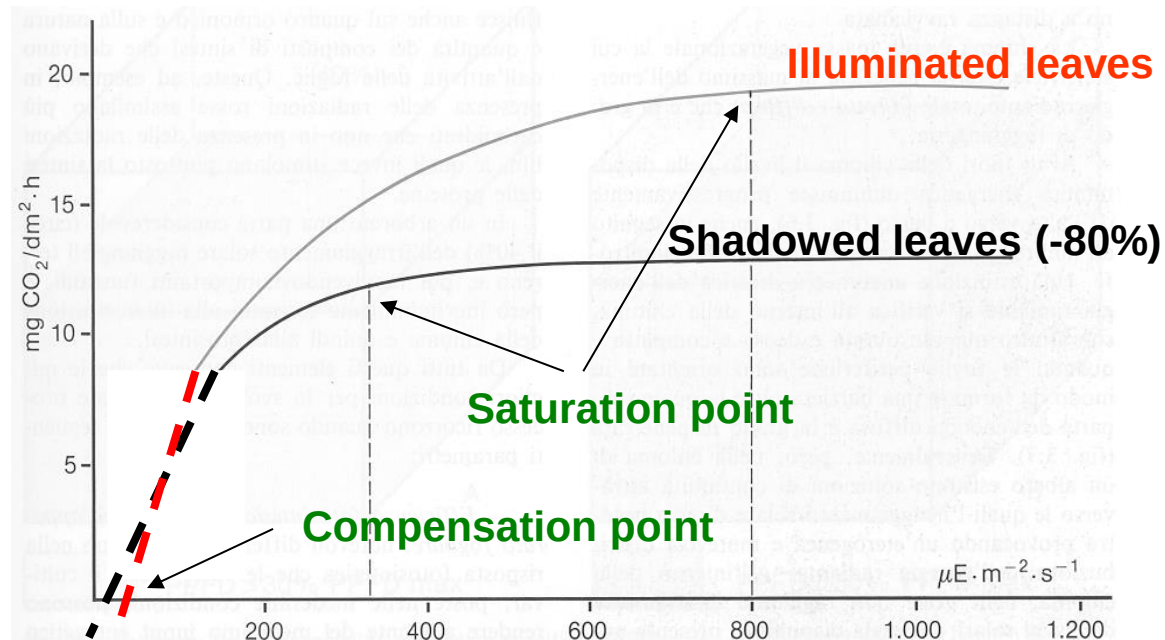




Light saturation curve (apple)

Shadowed leaves
saturate earlier but are
more efficient with low
light intensity

(modified from Baldini, 1986)



LIGHT SATURATION CURVE IN STRAWBERRY PLANTS UNDER DIFFERENT COLOUR NETS

Materials and methods

- Central Italy (Ancona)
- Cultivar: Capri
- Pots: 2.5 liter
- Substrate: Peat + coco mix (pit and fiber)
- Transplanting: 16/04/2013
- Air conditioned glasshouse



The nets

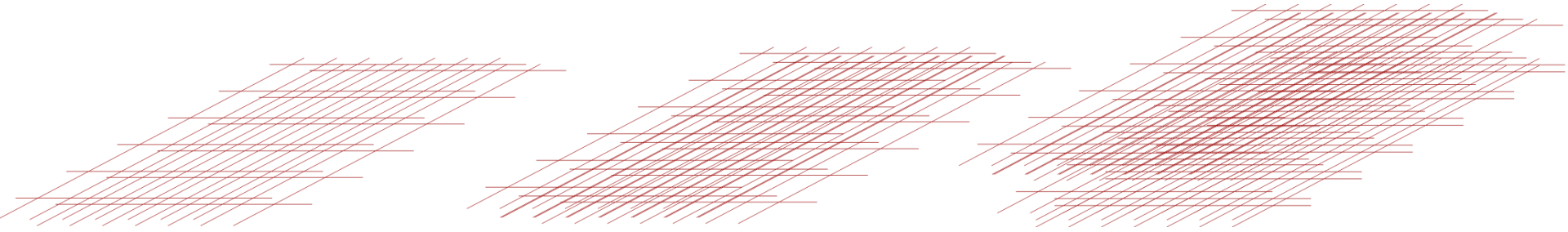
Agritenax Iridium nets

HDPE

special pigments

Color	Red	Pearl	Yellow	Grey	Blue	Black
Shadowing) ±	9%	7%	4%	19%	15%	19%
Weaving	a giro inglese					
Weight	gr/m ² ± 60					
Mesh size	mm 2,5 x 6					

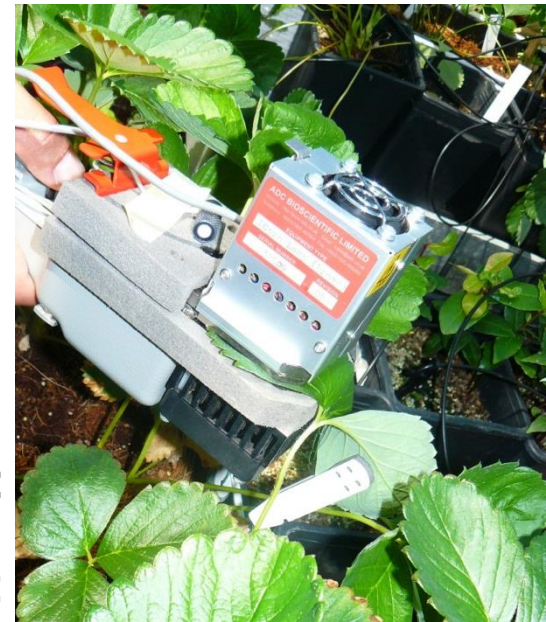
Summer: light response curve at increasing no. of layers of coloured net



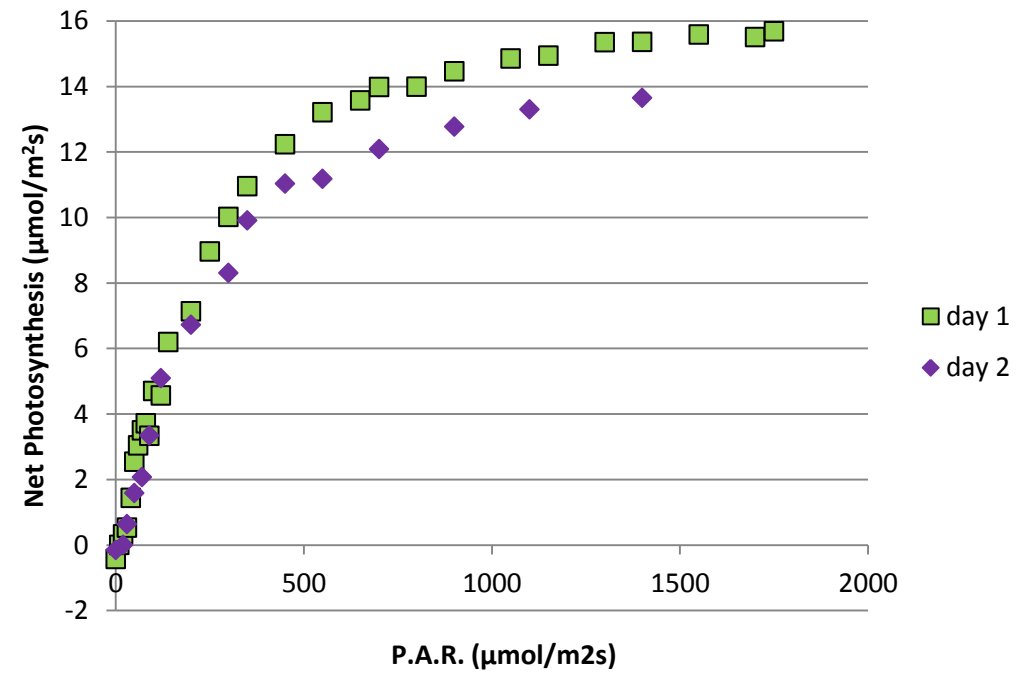
Yellow	Pearl	Red	Blue	Grey	Black
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light response
curve at
increasing
artificial light

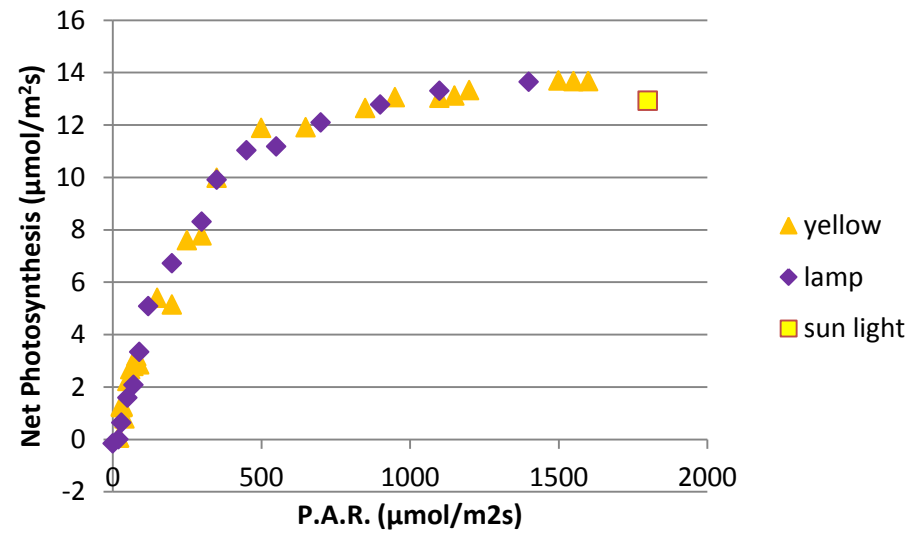
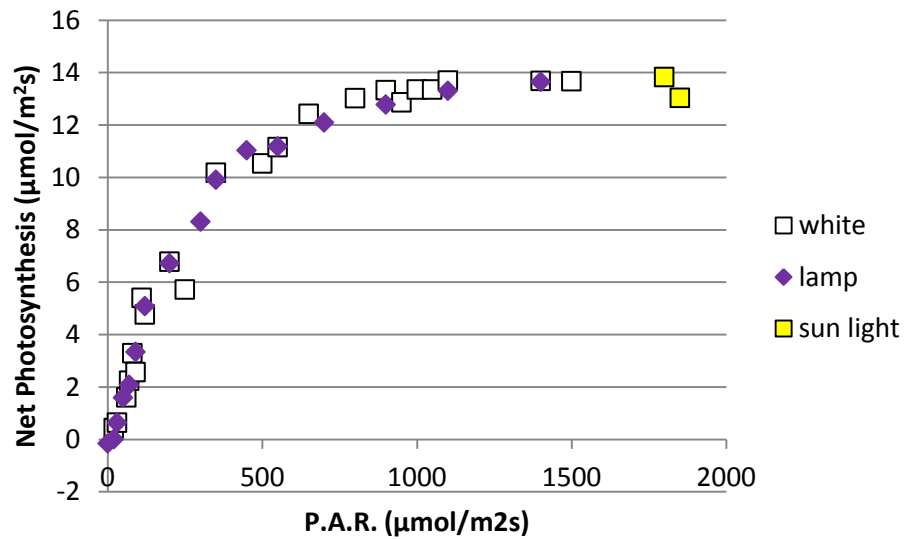
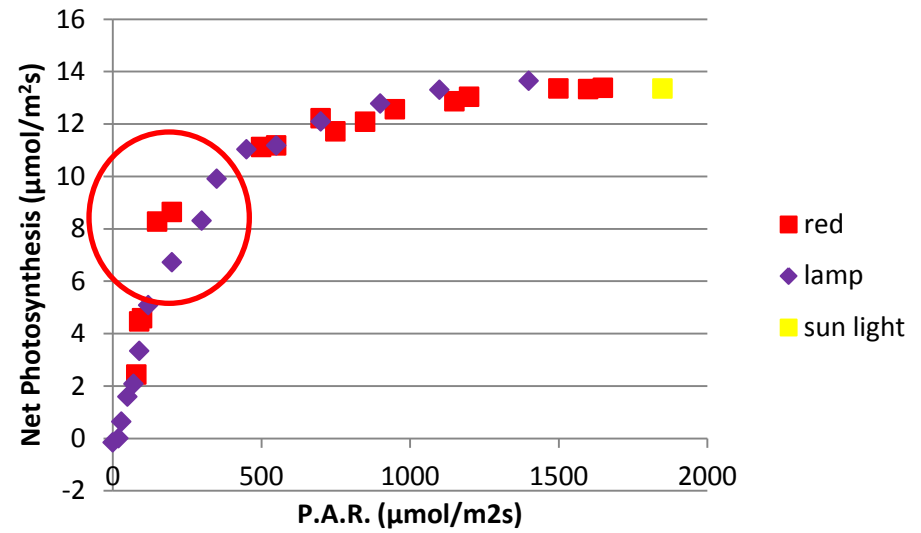
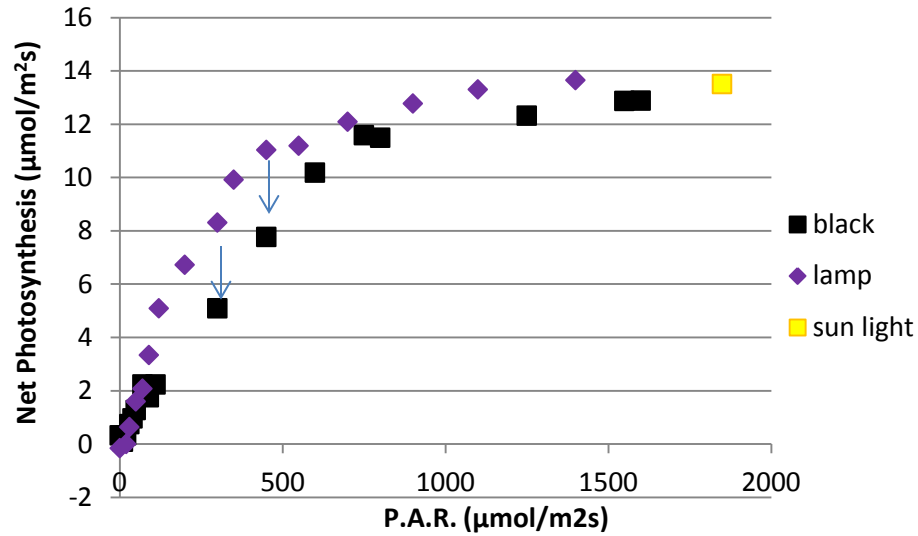


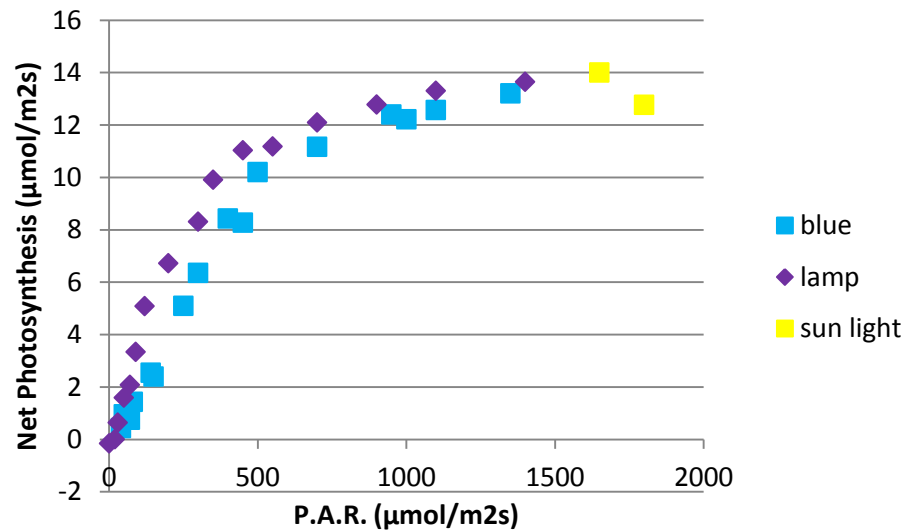
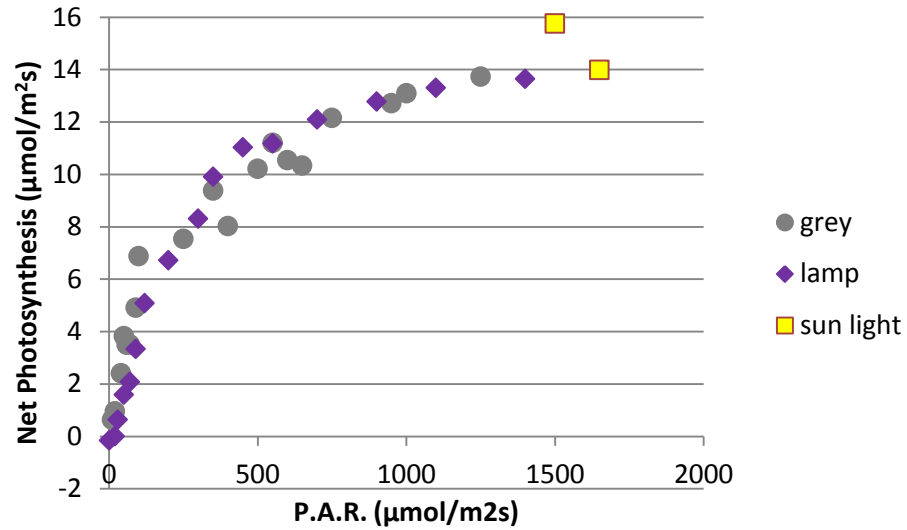
Results



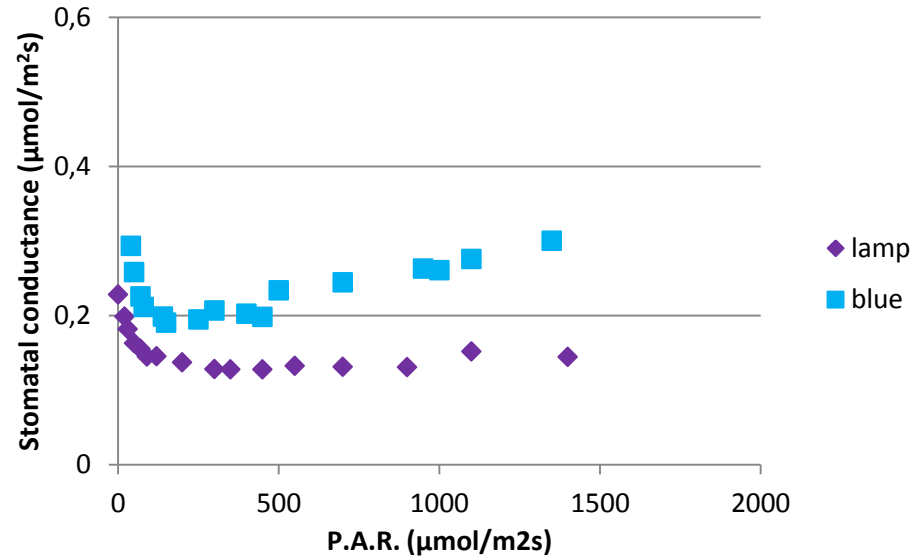
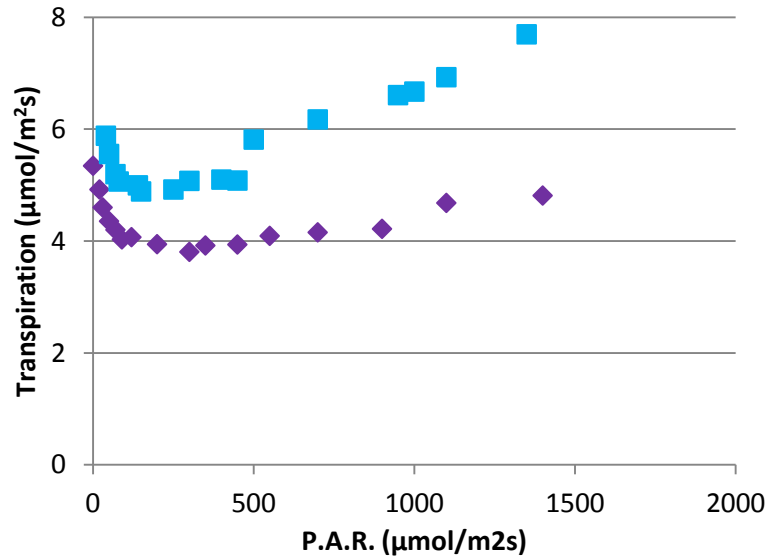
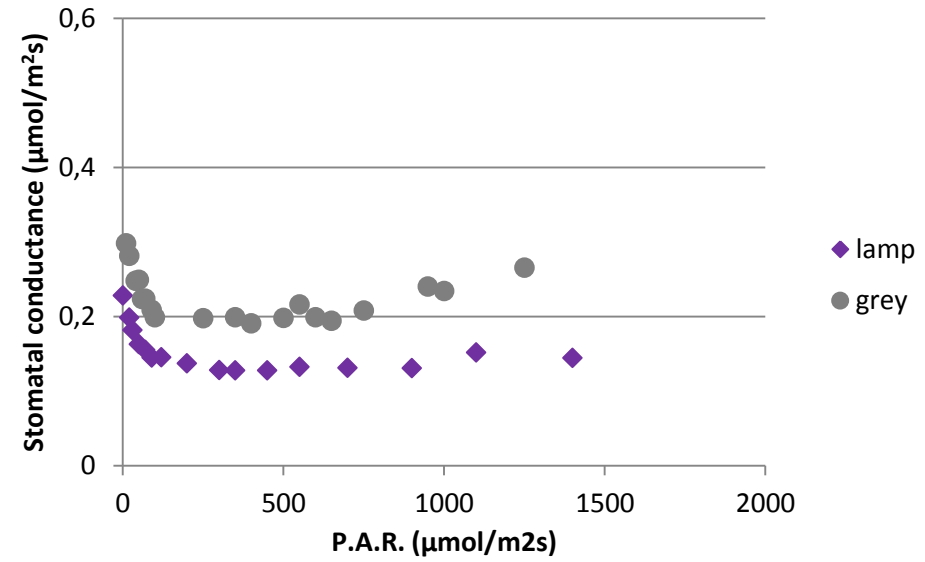
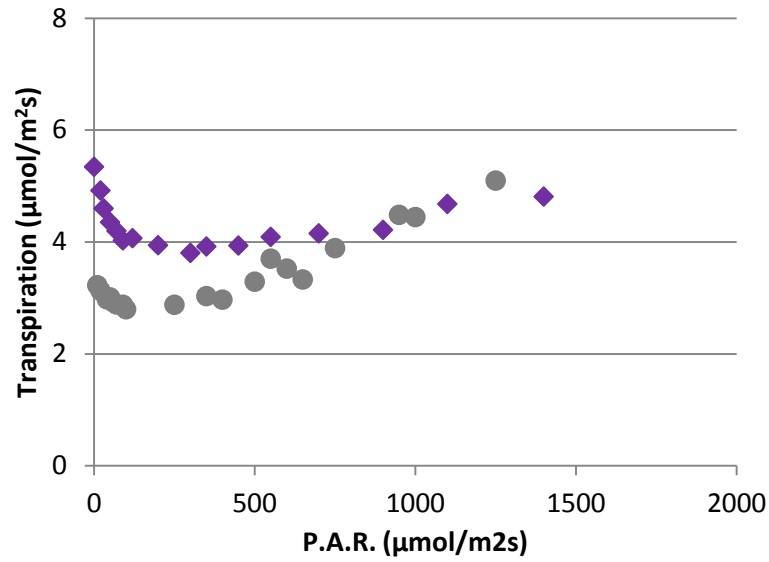
Day 2

Results





Results



LIGHT SATURATION CURVE IN RASPBERRY PLANTS UNDER DIFFERENT COLOUR NETS

Materials and methods

- North Italy (Trentino Region)
- Cultivar: Tulameen
- Longcane
- Soilless culture
- Pot 1.5 liter
- Substrate: Peat
- EC:1600 $\mu\text{mol}/\text{m}/\text{s}$



Transplanting: 27 April

Materials and methods

Covering with nets: 03 June (Tenax Iridium nets)

Yellow



Pearl



Red



Blue

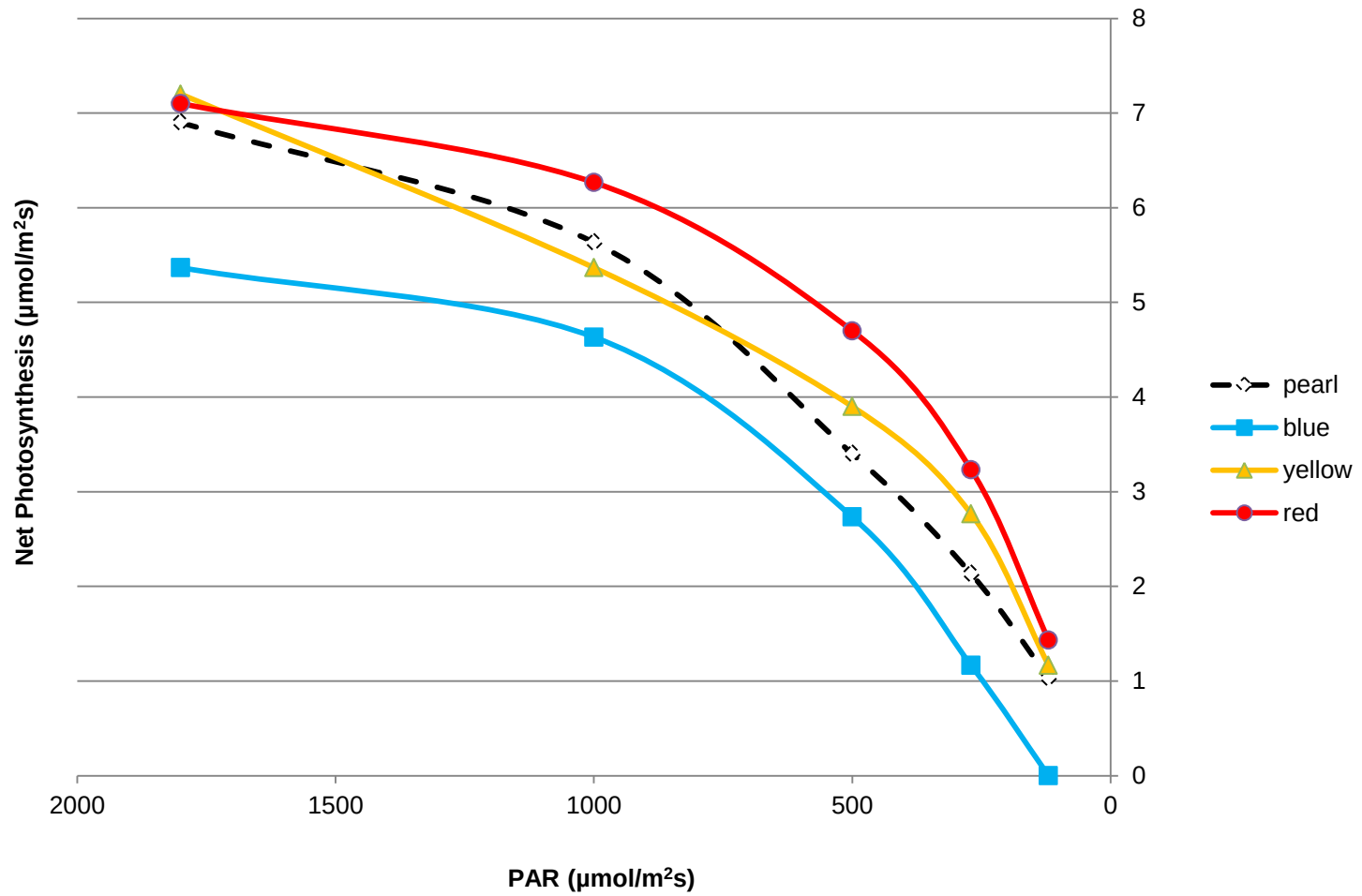


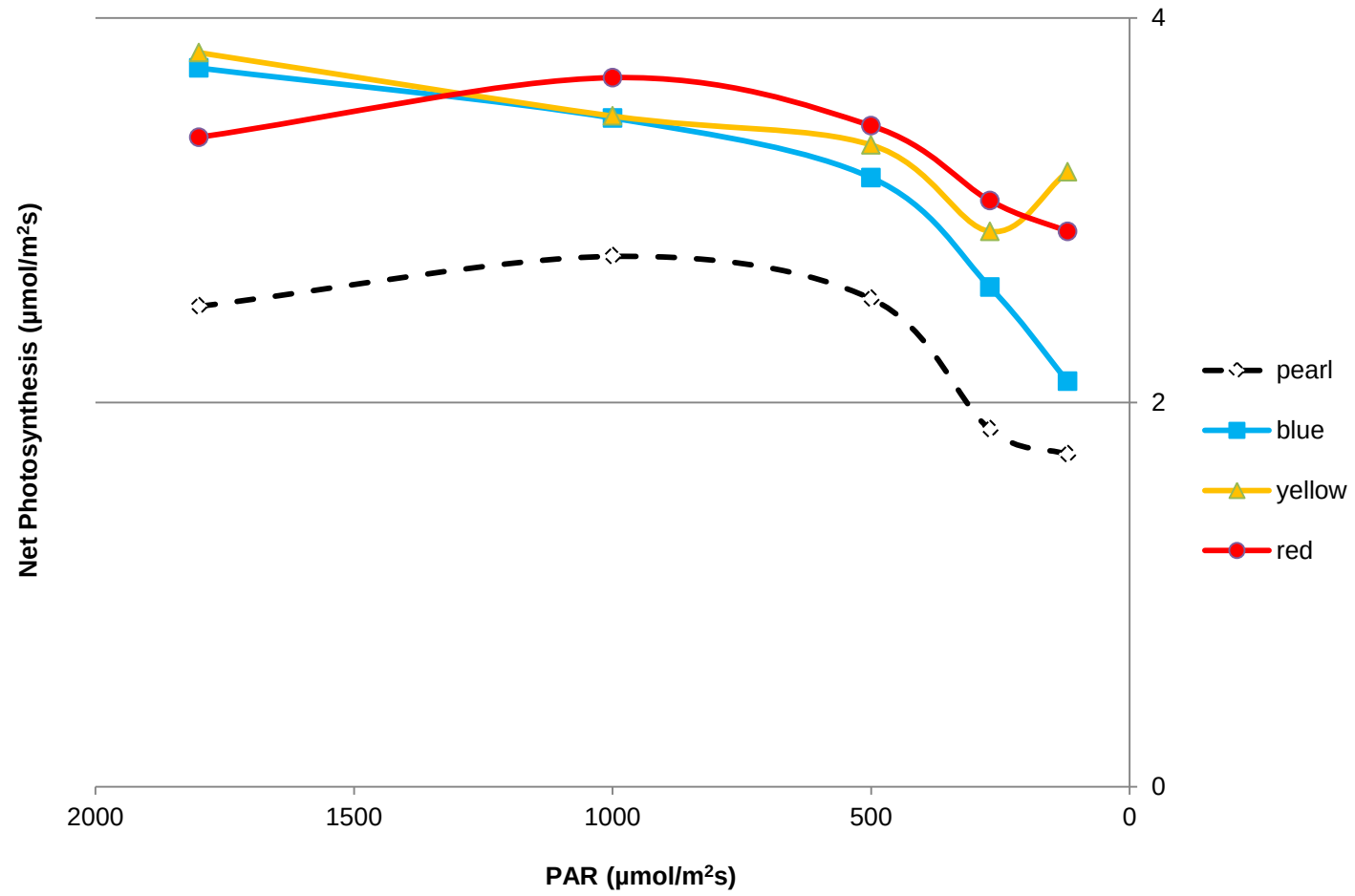
Nets removal: 31 August



**September:
light response curve at decreasing no. of layers of colored net**







- Combination of protective effects and photoselective effects
- Red net
 - Efficient in low light environments
- Blue net
 - Useful in high light environments



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