UNIVERSITY OF GDAŃSK

aqua VIP

Interreg South Baltic

EUROPEAN UNION

European Regional Development Fund

Aquaponic experiment with *Litopenaeus vannamei* and macroalgae

Aleksandra Zgrundo
University of Gdańsk, Institute of Oceanography
aleksandra.zgrundo@ug.edu.pl

Experimental design

Use of algae as a water purification element in RAS

microbial beds → „algal filters" with microbiomes

- algae scrubber
- macroalga

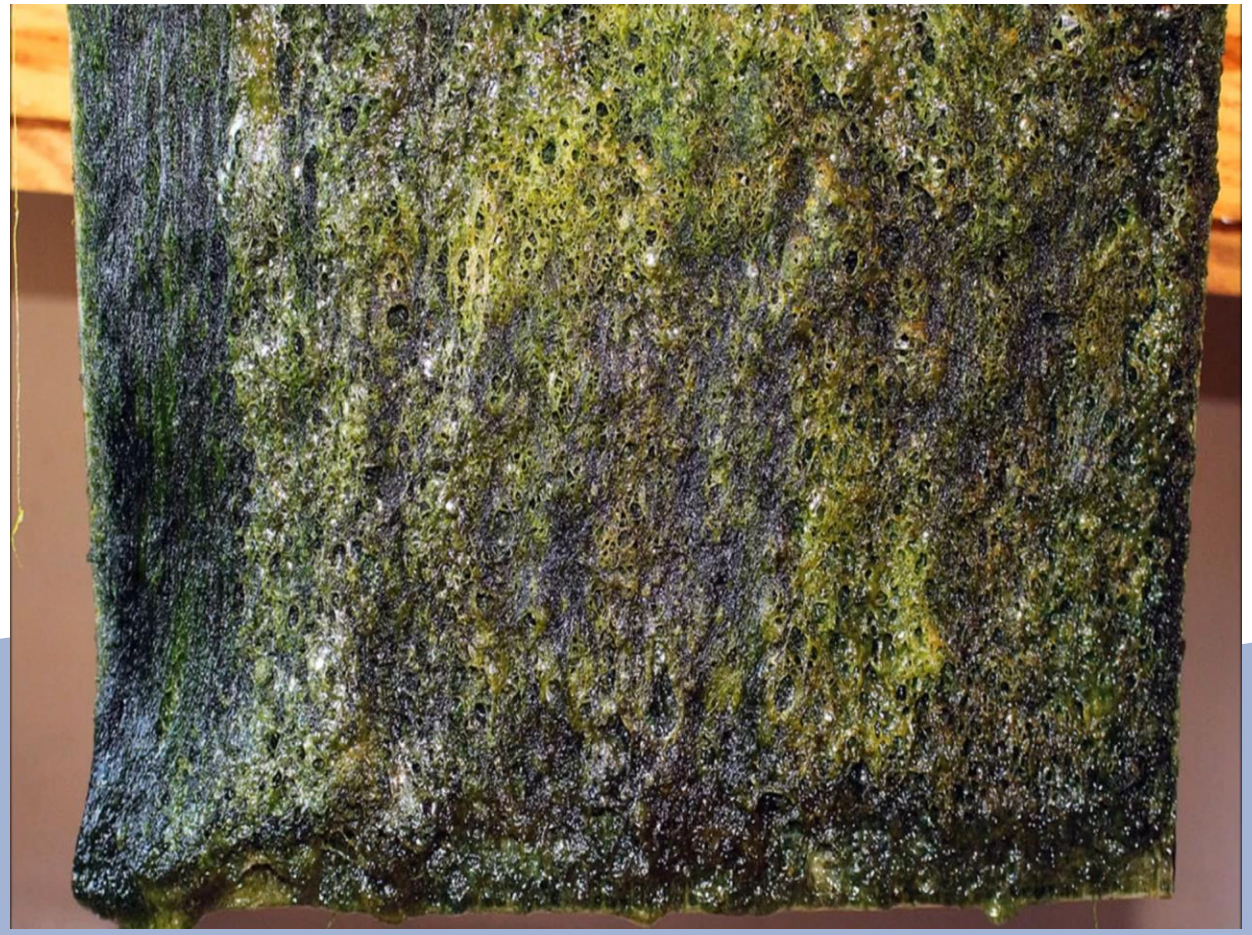
Experimental design

European Regional Development Fund

Use of algae as a water purification element in RAS

Experimental design

Version 1.0.0 – algae scrubber idea



Introduction film:

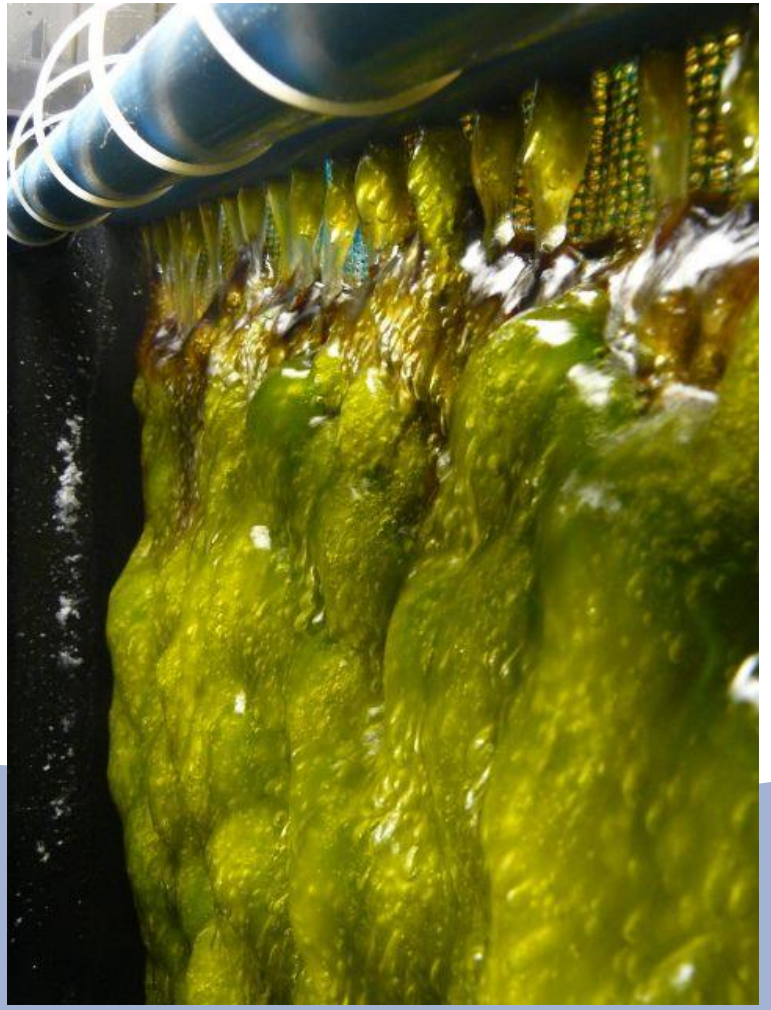
By HalfMan HalfCichlid

https://www.youtube.com/watch?v=u4qOKGmECbs

Experimental design

Questions:

- Is it possible to grow anything from anything?
- How to support the growth of algae scrubber in RAS? To what extend?



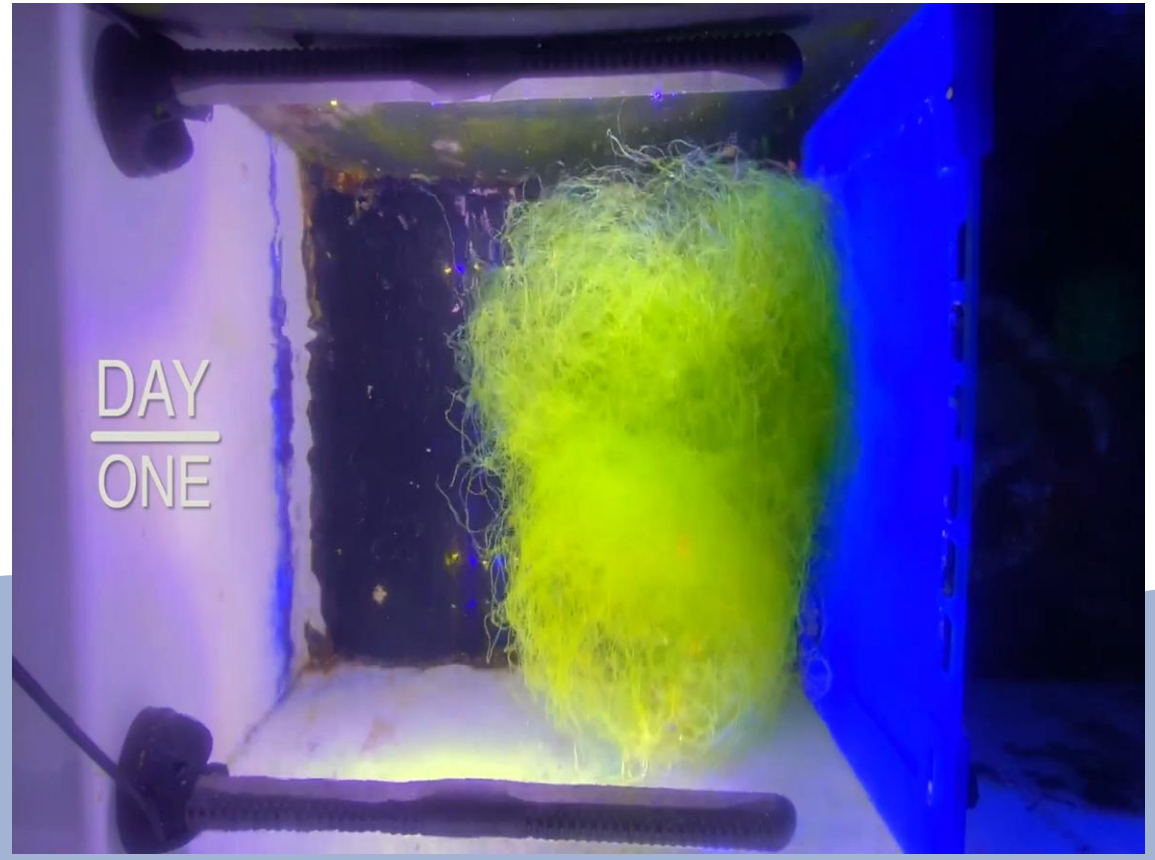
https://pl.pinterest.com/pin/410531322254405697/

Experimental design

Version 2.0.0 – macroalga *Chaetomorpha* sp.

Experimental design

Version 2.0.0 – macroalga *Chaetomorpha* sp.



Introduction film:

By Reef Builders

https://www.youtube.com/watch?v=pc8WajsLjMA

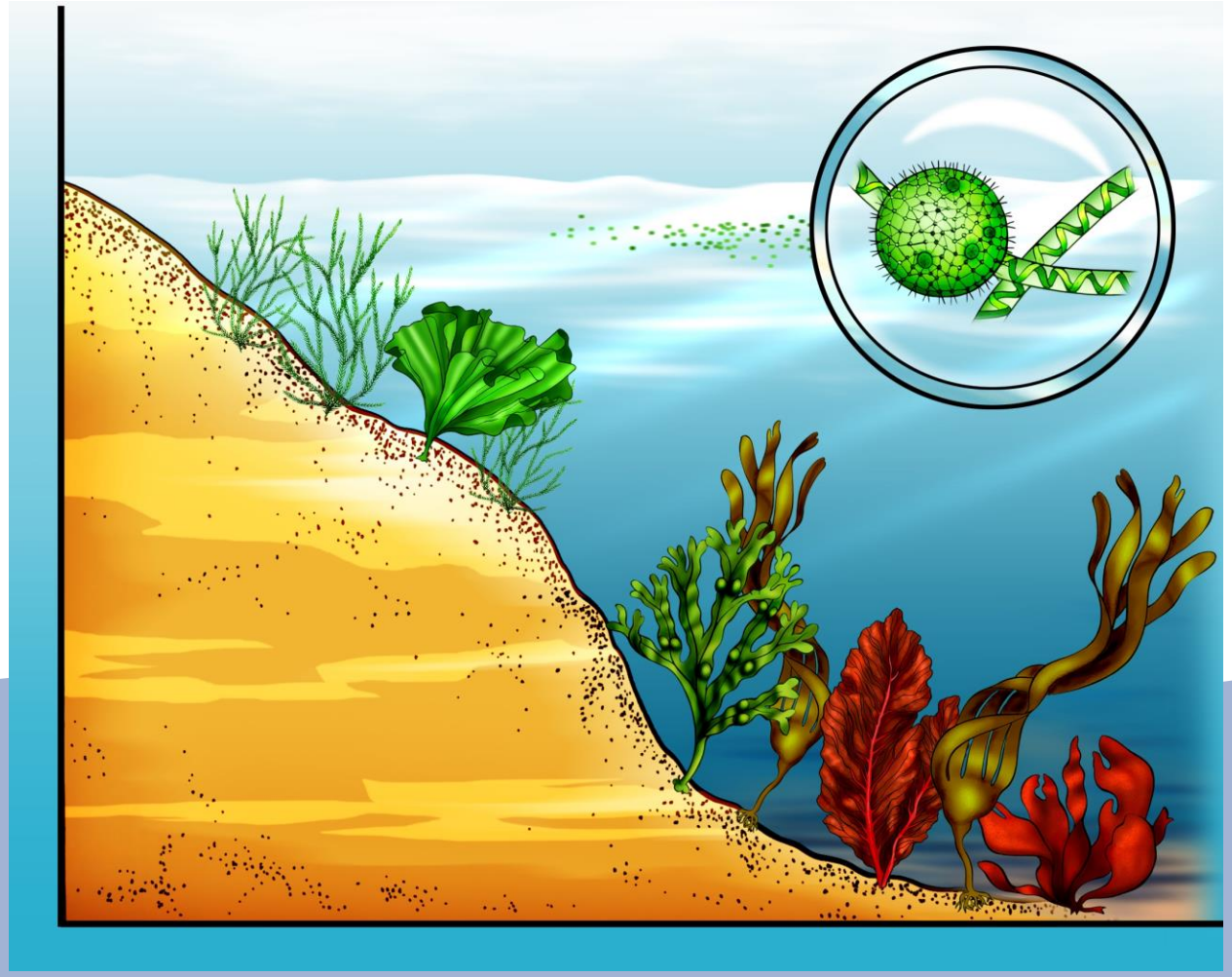
Experimental design

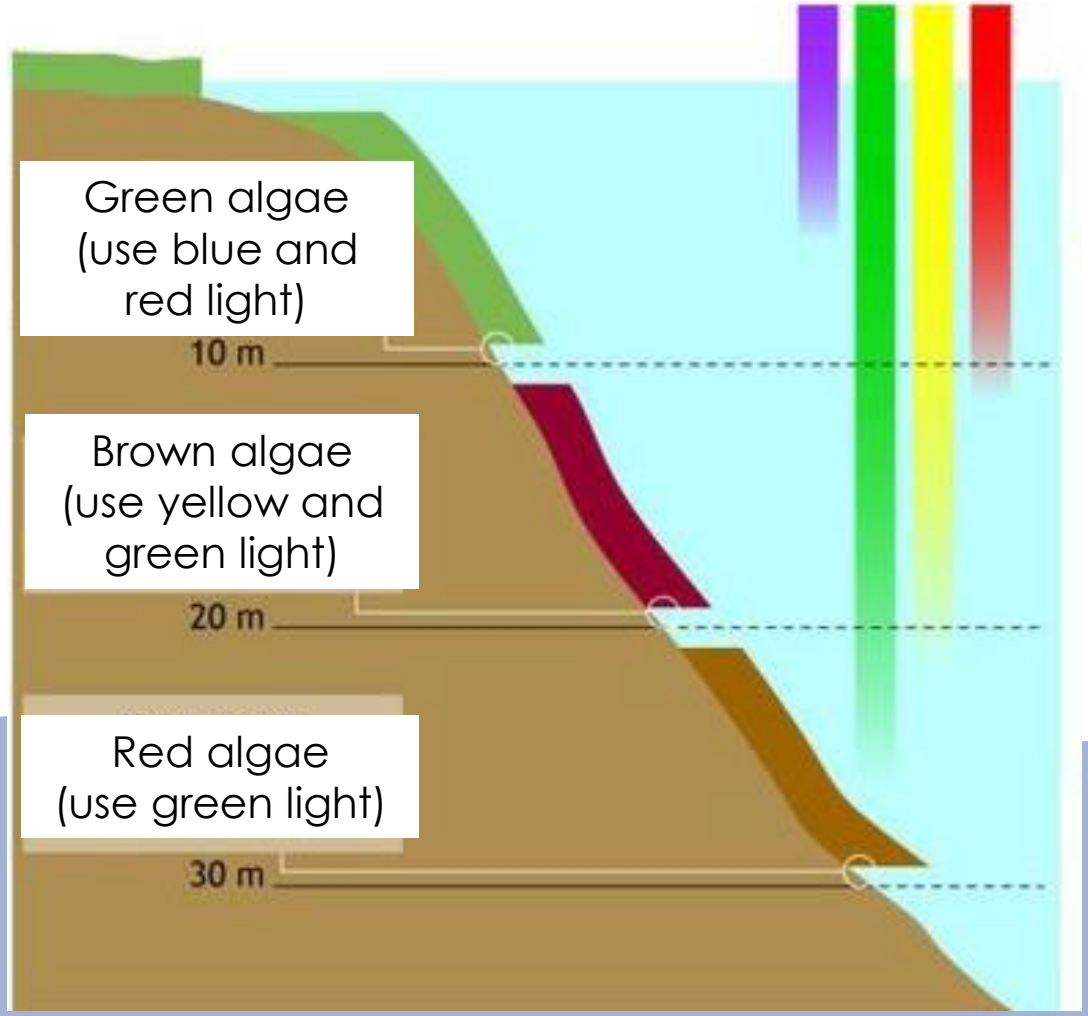
Questions:

- What kind of supplementation will be needed?
- If Version 1.0.0 fails is it possible to create Version 1.1.0 on the basis of *Chaetomorpha* sp?
- How to supply light?

Emerging ideas – light

zonation in seas





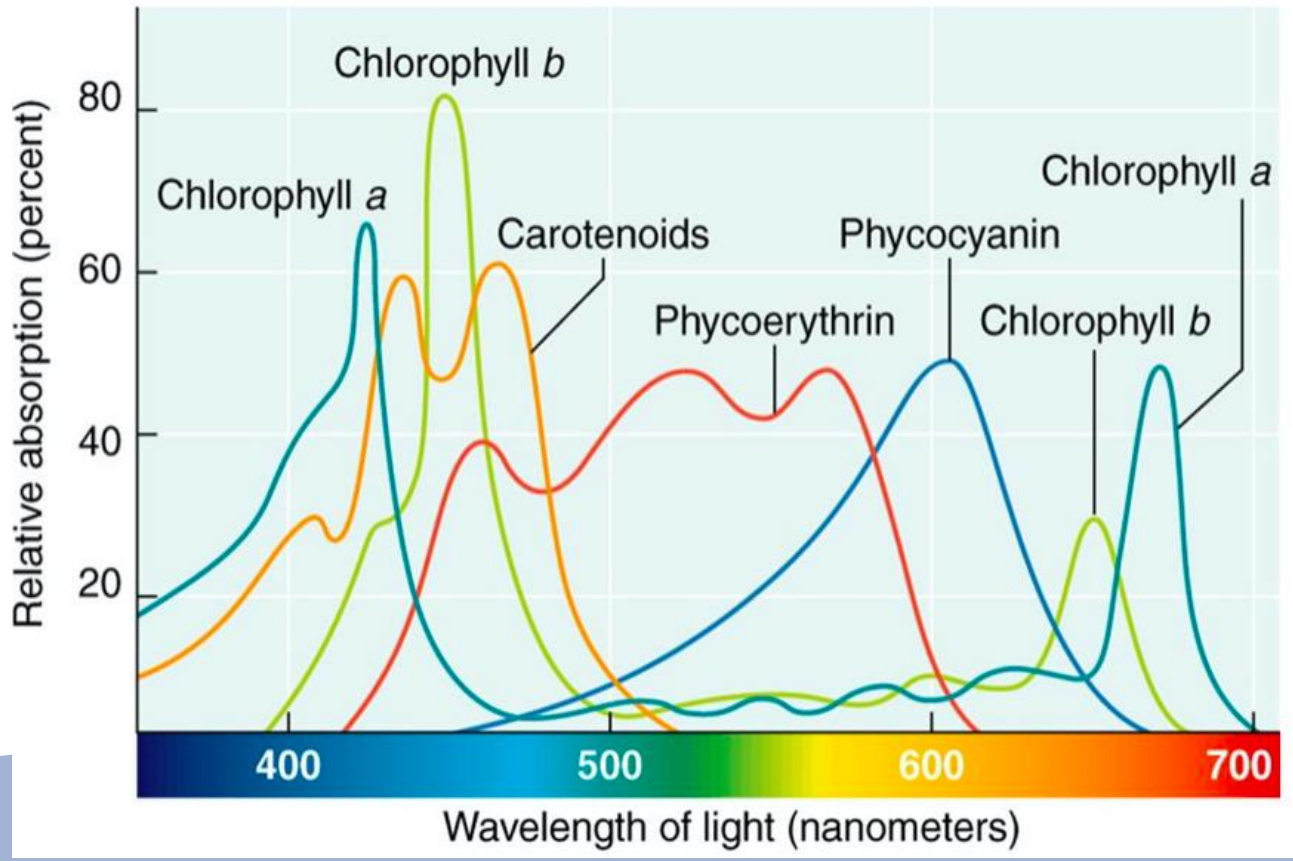
Emerging ideas

Natural light spectrum

Green algae: chlorophyll a and b, beta-carotene (a yellow pigment), xanthophylls (yellowish or brownish pigments).

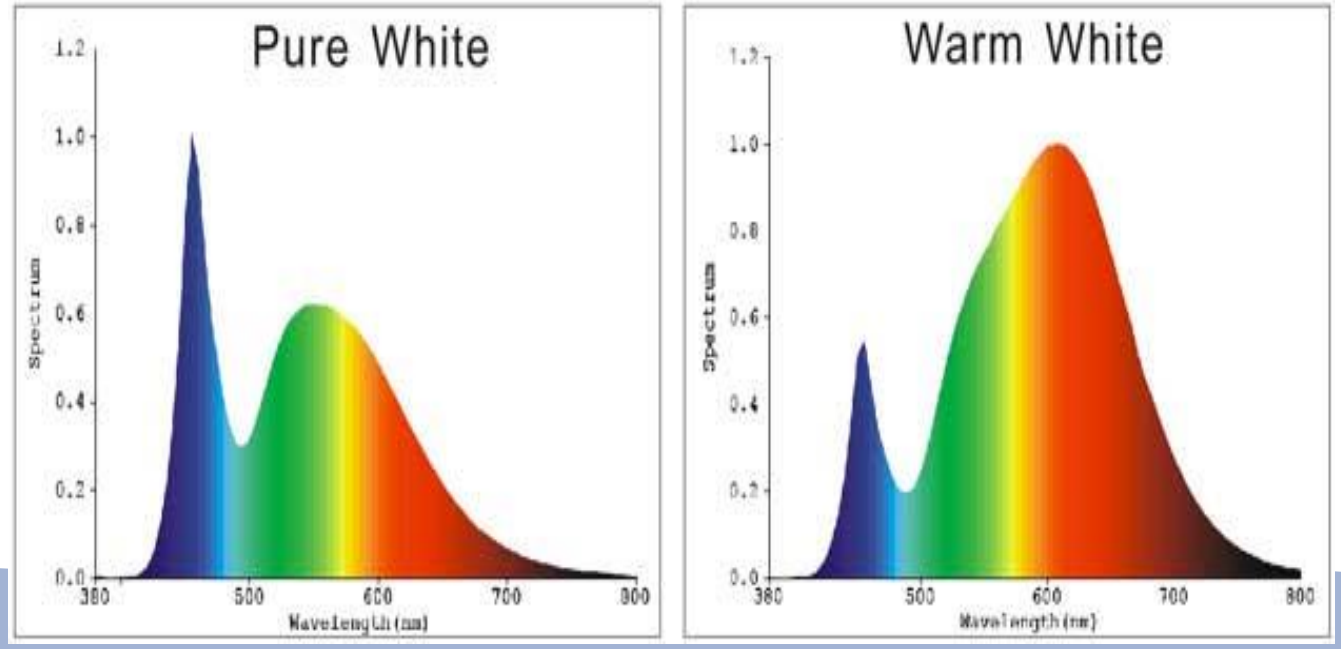
Brown algae: xanthophyll pigment fucoxanthin (450 to 540 nm), chlorophyll a and c (there is no Chlorophyll b), beta-carotene and other xanthophylls.

Red algae: phycoerythrin and phycocyanin, chlorophyll a (no Chlorophyll b), beta-carotene and a number of unique xanthophylls.



Emerging ideas

LED-based lighting systems



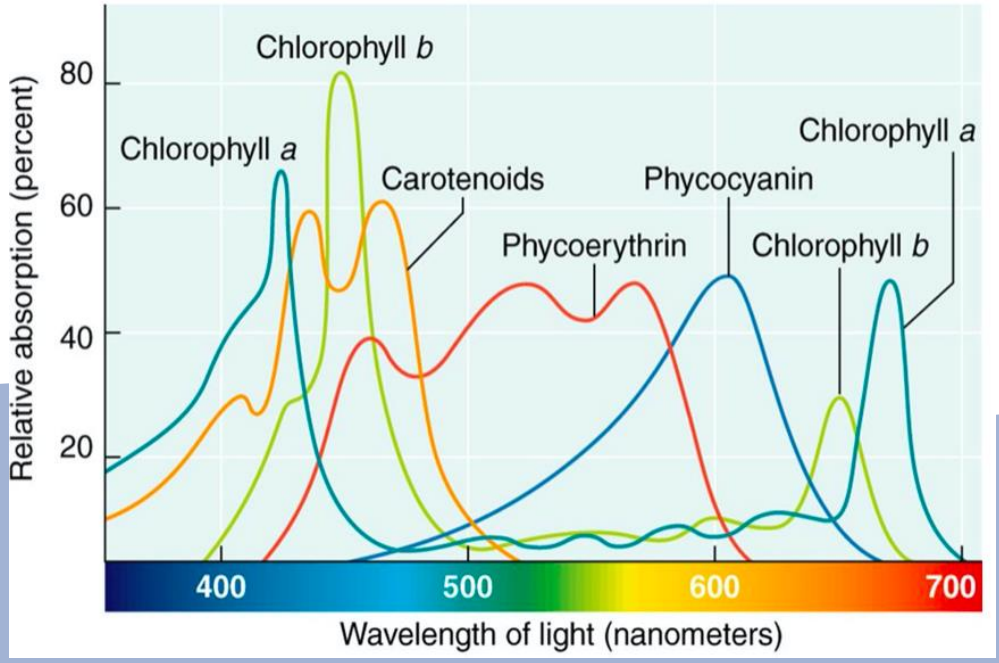
LED light spectrum

aqua VIP
Interreg South Baltic
EUROPEAN UNION
European Regional Development Fund

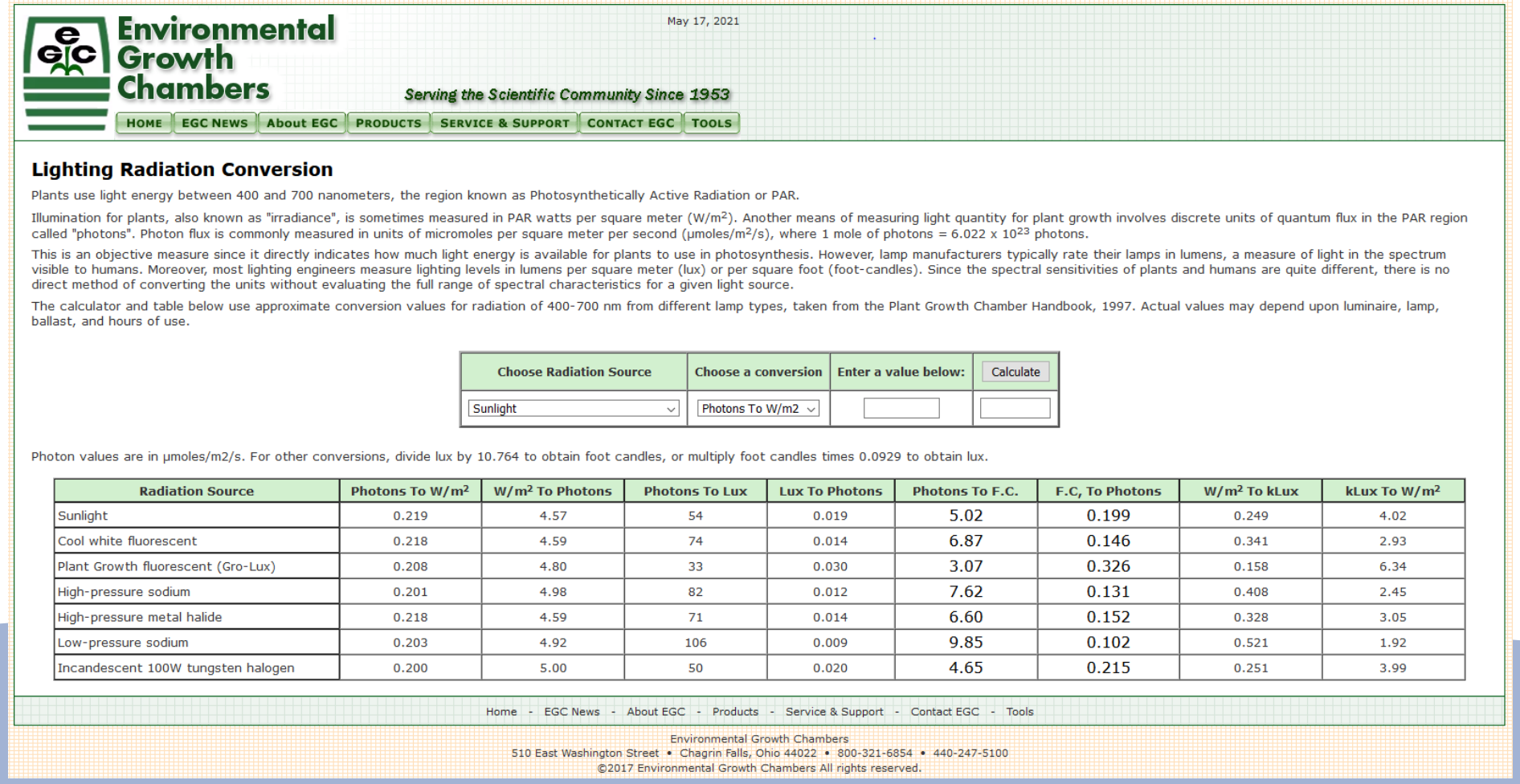
GrowStar UFO 150W LED

12 Band Full Spectrum with CREE COB, UV&IR

Superior Full Spectrum:Red(650-660nm, 620-630nm), **Orange**(600-610nm), **Blue**(430-440nm, 450-460nm, 460-470nm), **UV**(380-400nm), **IR**(740-760nm), **White**(4000-4500K, 6000-6500K), **Cree COB**(3000K).



Emerging ideas



Environmental Growth Chambers

May 17, 2021

Serving the Scientific Community Since 1953

HOME | EGC NEWS | About EGC | PRODUCTS | SERVICE & SUPPORT | CONTACT EGC | TOOLS

Lighting Radiation Conversion

Plants use light energy between 400 and 700 nanometers, the region known as Photosynthetically Active Radiation or PAR.

Illumination for plants, also known as "irradiance", is sometimes measured in PAR watts per square meter (W/m^2). Another means of measuring light quantity for plant growth involves discrete units of quantum flux in the PAR region called "photons". Photon flux is commonly measured in units of micromoles per square meter per second ($\mu moles/m^2/s$), where 1 mole of photons = 6.022×10^{23} photons.

This is an objective measure since it directly indicates how much light energy is available for plants to use in photosynthesis. However, lamp manufacturers typically rate their lamps in lumens, a measure of light in the spectrum visible to humans. Moreover, most lighting engineers measure lighting levels in lumens per square meter (lux) or per square foot (foot-candles). Since the spectral sensitivities of plants and humans are quite different, there is no direct method of converting the units without evaluating the full range of spectral characteristics for a given light source.

The calculator and table below use approximate conversion values for radiation of 400-700 nm from different lamp types, taken from the Plant Growth Chamber Handbook, 1997. Actual values may depend upon luminaire, lamp, ballast, and hours of use.

Choose Radiation Source	Choose a conversion	Enter a value below:	Calculate
Sunlight	Photons To W/m2		

Photon values are in µmoles/m2/s. For other conversions, divide lux by 10.764 to obtain foot candles, or multiply foot candles times 0.0929 to obtain lux.

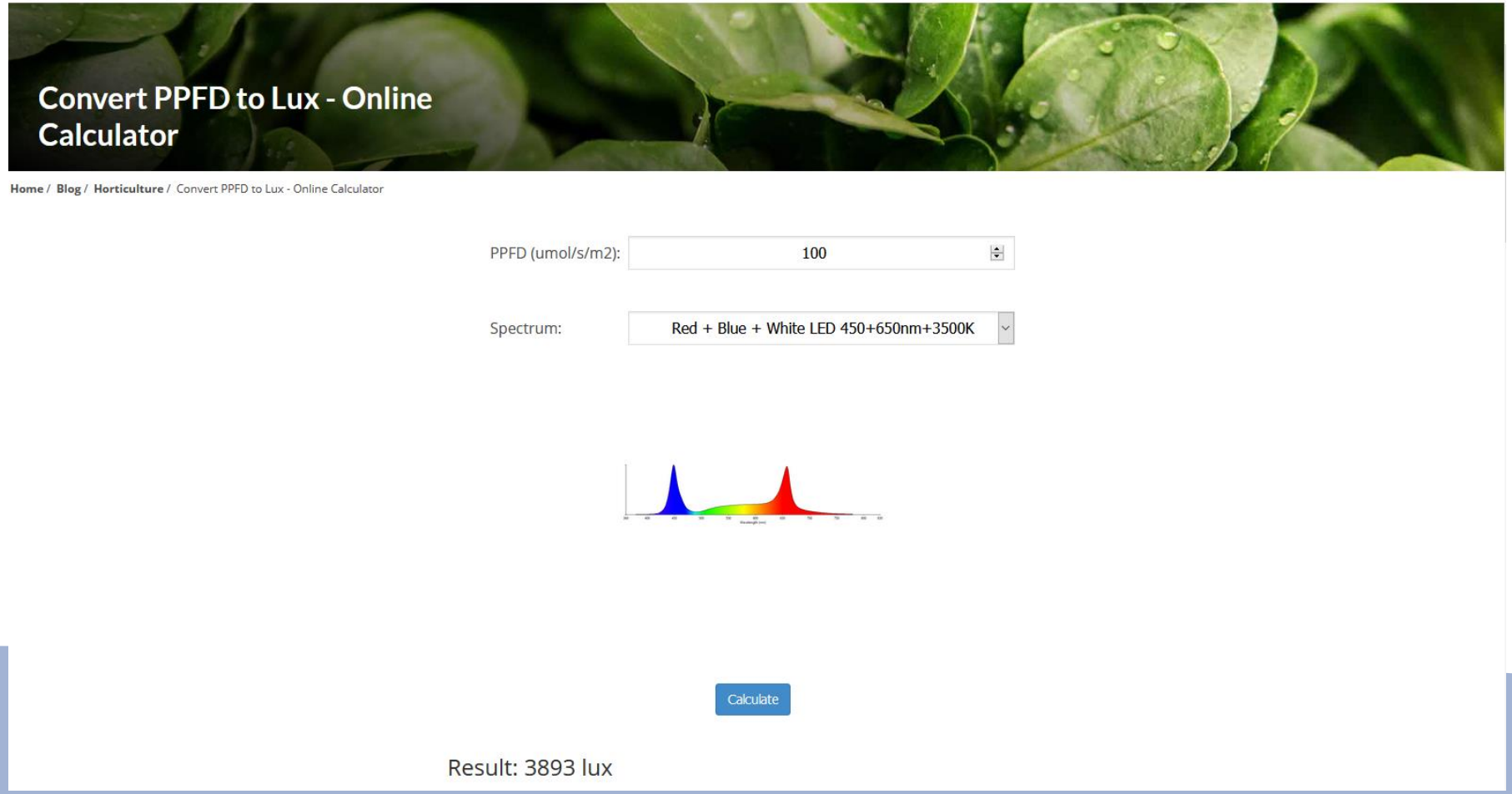
Radiation Source	Photons To W/m^2	W/m^2 To Photons	Photons To Lux	Lux To Photons	Photons To F.C.	F.C, To Photons	W/m^2 To kLux	kLux To W/m^2
Sunlight	0.219	4.57	54	0.019	5.02	0.199	0.249	4.02
Cool white fluorescent	0.218	4.59	74	0.014	6.87	0.146	0.341	2.93
Plant Growth fluorescent (Gro-Lux)	0.208	4.80	33	0.030	3.07	0.326	0.158	6.34
High-pressure sodium	0.201	4.98	82	0.012	7.62	0.131	0.408	2.45
High-pressure metal halide	0.218	4.59	71	0.014	6.60	0.152	0.328	3.05
Low-pressure sodium	0.203	4.92	106	0.009	9.85	0.102	0.521	1.92
Incandescent 100W tungsten halogen	0.200	5.00	50	0.020	4.65	0.215	0.251	3.99

Home - EGC News - About EGC - Products - Service & Support - Contact EGC - Tools

Environmental Growth Chambers
510 East Washington Street • Chagrin Falls, Ohio 44022 • 800-321-6854 • 440-247-5100

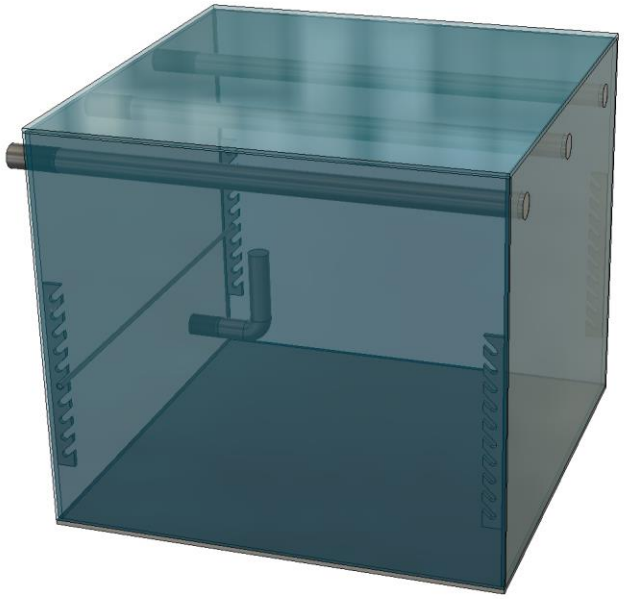
http://www.egc.com/useful_info_lighting.php

Emerging ideas



https://www.waveformlighting.com/horticulture/convert-ppfd-to-lux-online-calculator

Emerging ideas



Emerging ideas

Many thanks to

Olgierd Bogusławski, Karolina (Daniel) Czmajduch, Hanna Gawrysiak,
Bartosz Blum, Anna Dziubińska, Hanna Łądkowska, Halina Rzemykowska & Jakub Zdroik

Thank you!

aleksandra.zgrundo@ug.edu.pl