



BREEDING AND PROPAGATING *S.LATISSIMA* AND *P.PALMATA*

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24-03-2021

MacroCascade Final Conference





Hortimare

Core business:

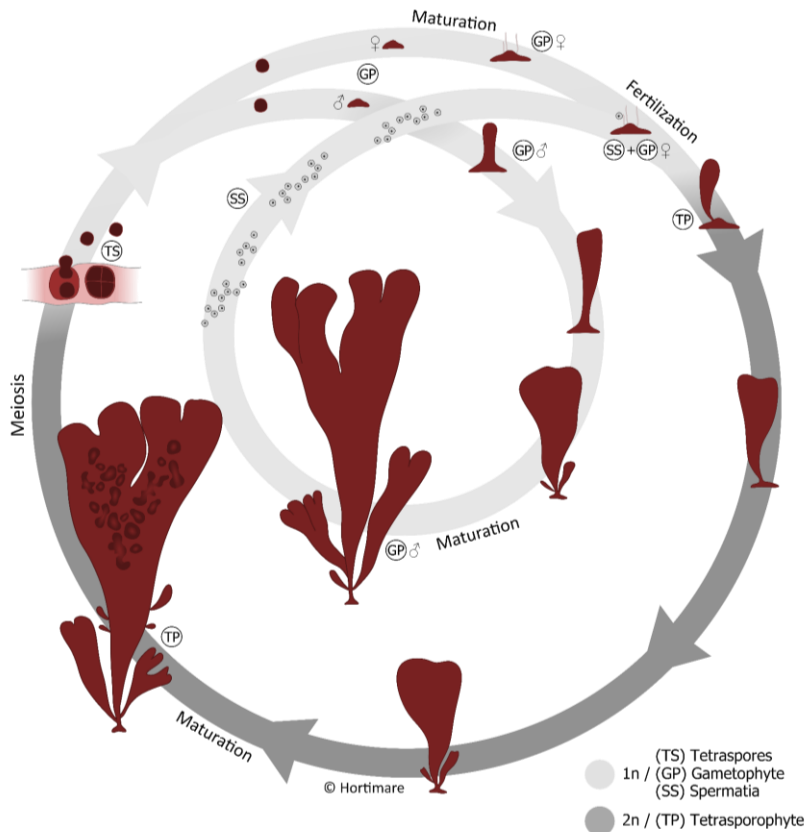
Breeding and propagating seaweed

Providing high quality starting material

Consultancy



The life cycle of *Palmaria palmata* ...it's complicated



No “seed” or microscopic vegetative stage

Identical looking sporophyte and male gametophyte

Male gametophytes need extra 1-year “loop” to fertilize females of next generation

Spore induction takes long (min. 2-3 months)

Work progression *P. palmata*

1. Optimization of cultivation conditions

(healthy starting material and enabling the testing necessary for step two)

Cultivation tanks

Condition experiment series

2. Physical and chemical cleaning techniques

NaOCl (concentration and exposure)

Cutting and healing times

3. Manipulation of growth and/or reproduction

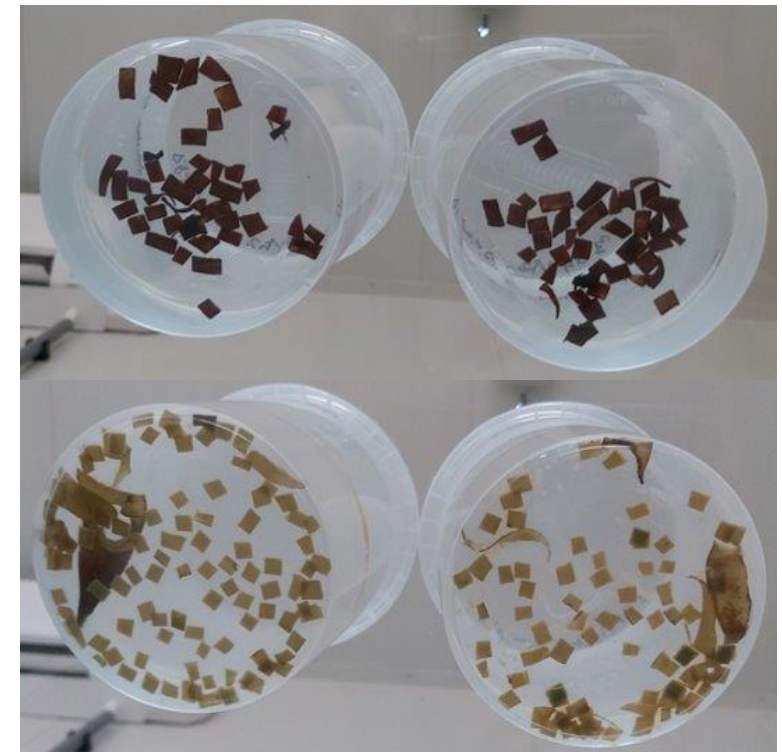
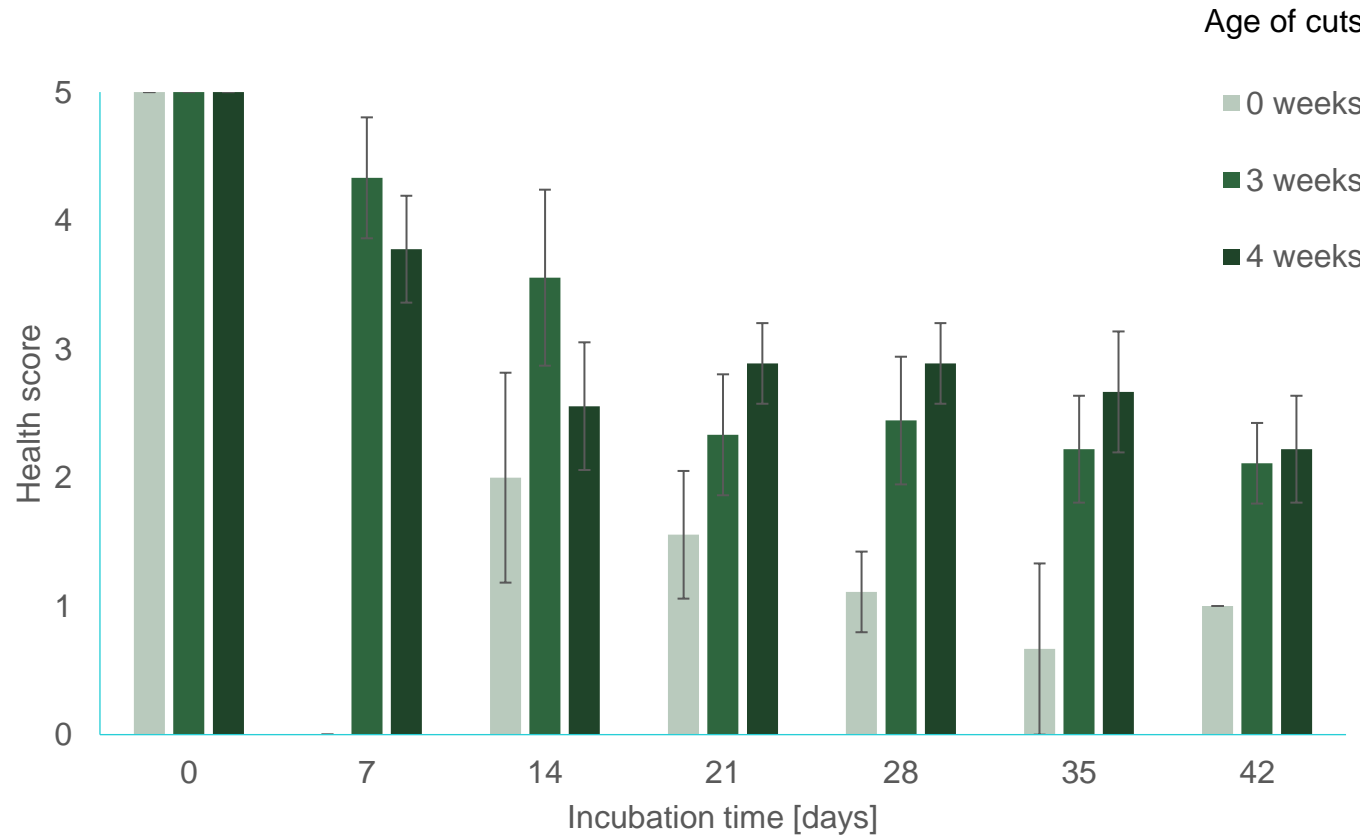
(via modification of cultivation conditions and/or medium additives)

Hormone addition



Fresh cut = high stress susceptibility

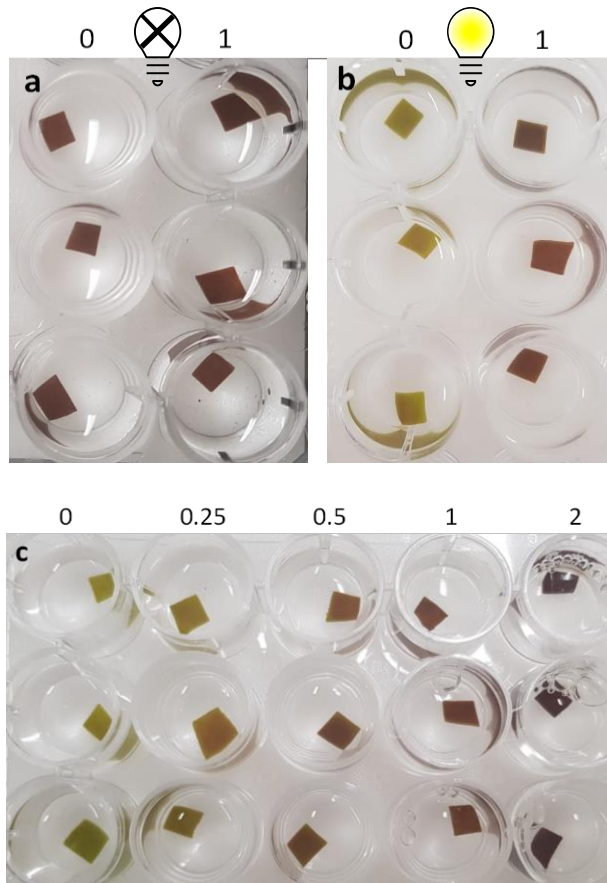
Cotrol conditions - cut age



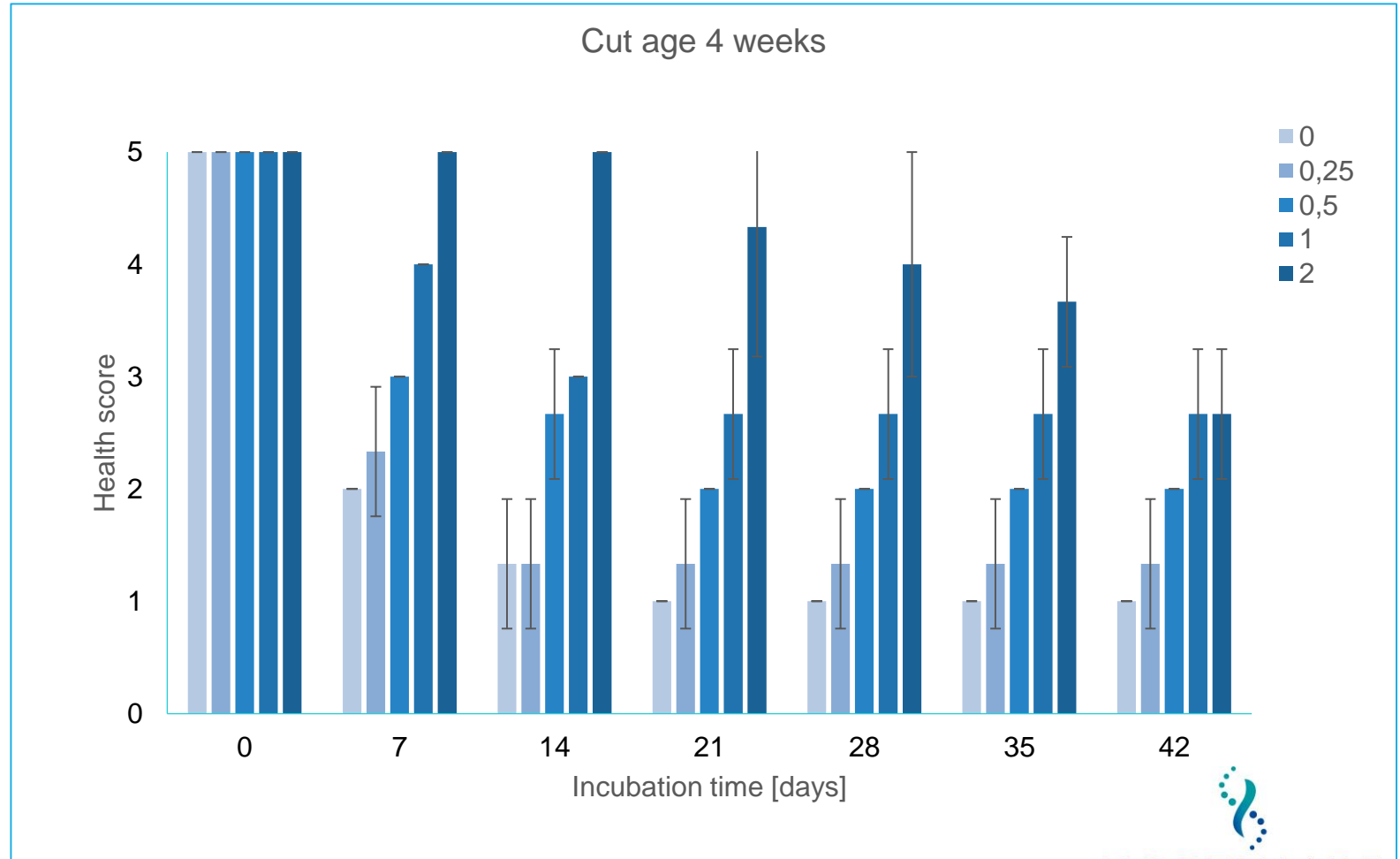
Three-week old cuts (top) and fresh cuts (bottom) of *P. palmata*, with f/2 + GeO₂ (left) and f/2 (right), one week after exposure to -6°C for 12h.

Key factor nutrients

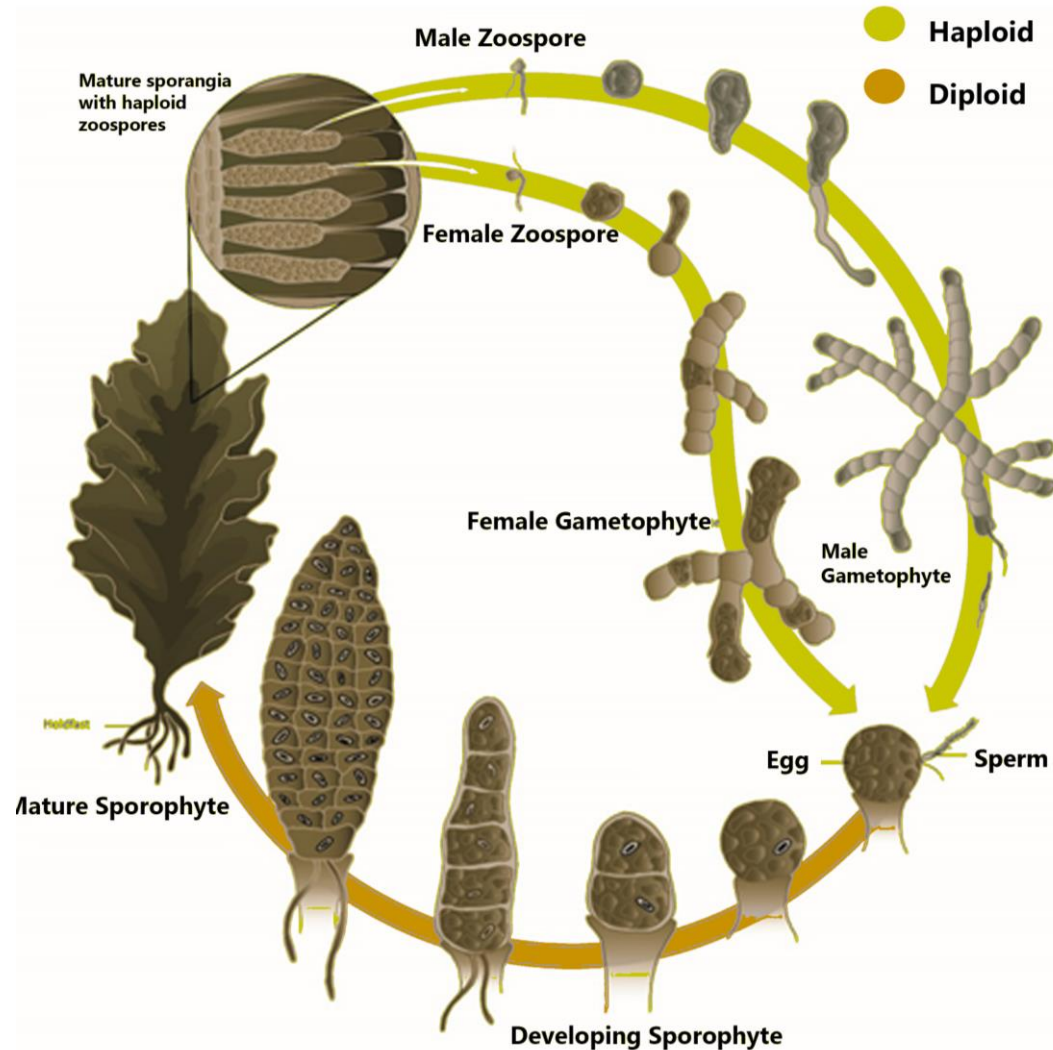
f/2 addition
[ml/L pSW]



Sporophyte cuts of *P. palmata* (4-week pre-incubation) on day 28, columns are replicates. a), b) and c) are 0, 45 and 35 $\mu\text{mol photons m}^{-2}\text{s}^{-1}$ irradiance, respectively.



The life cycle of *Saccharina latissima* ...much better!



Male and female gametophytes

Vegetatively growing gametophytes

Sporophytes produce millions of spores

From spore to sporophyte varies between 1 month to several years. Depending on your wants and needs

Wildtype V Hybrid



♂

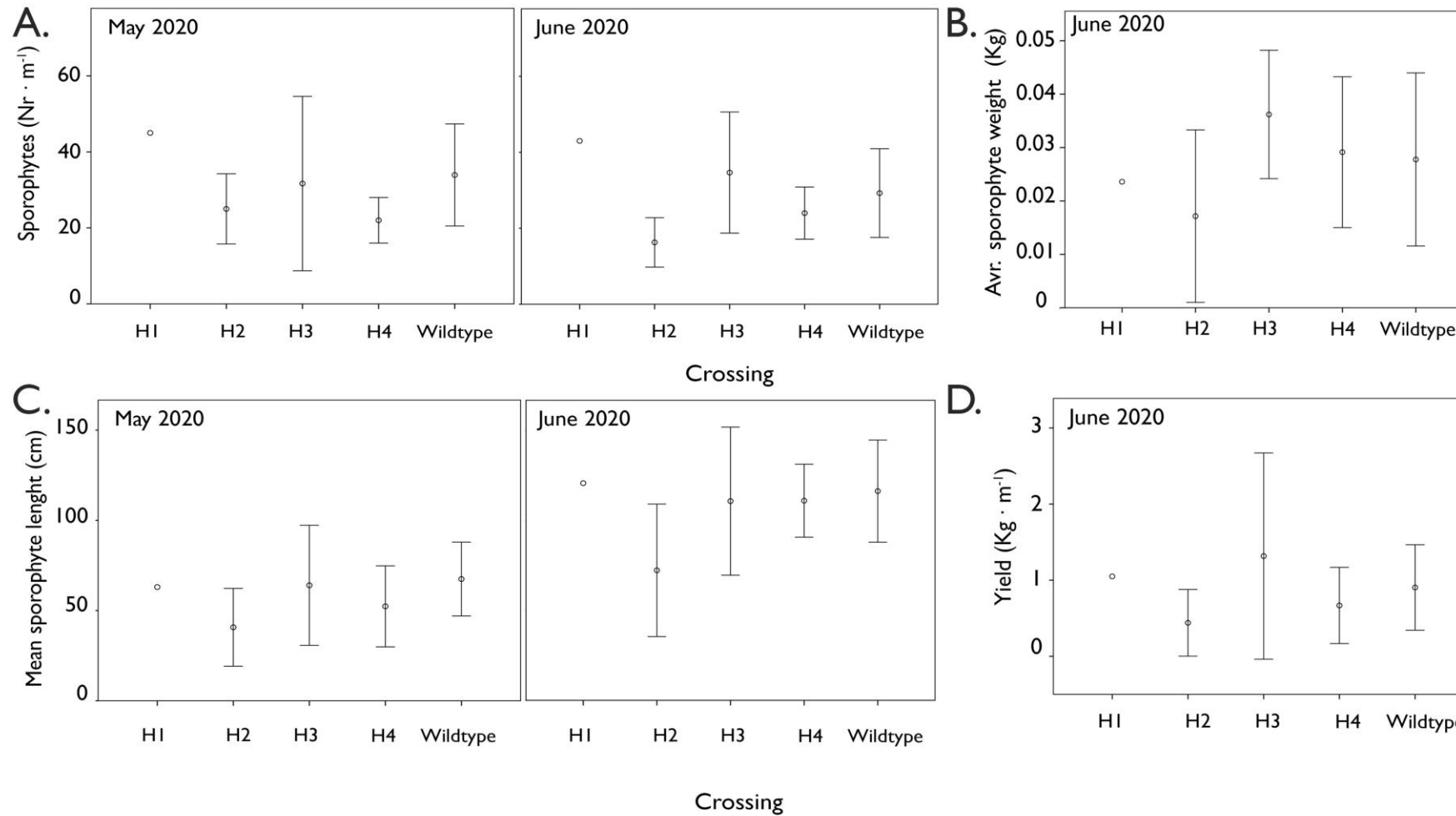


F1

Season 2019/2020 harvest results

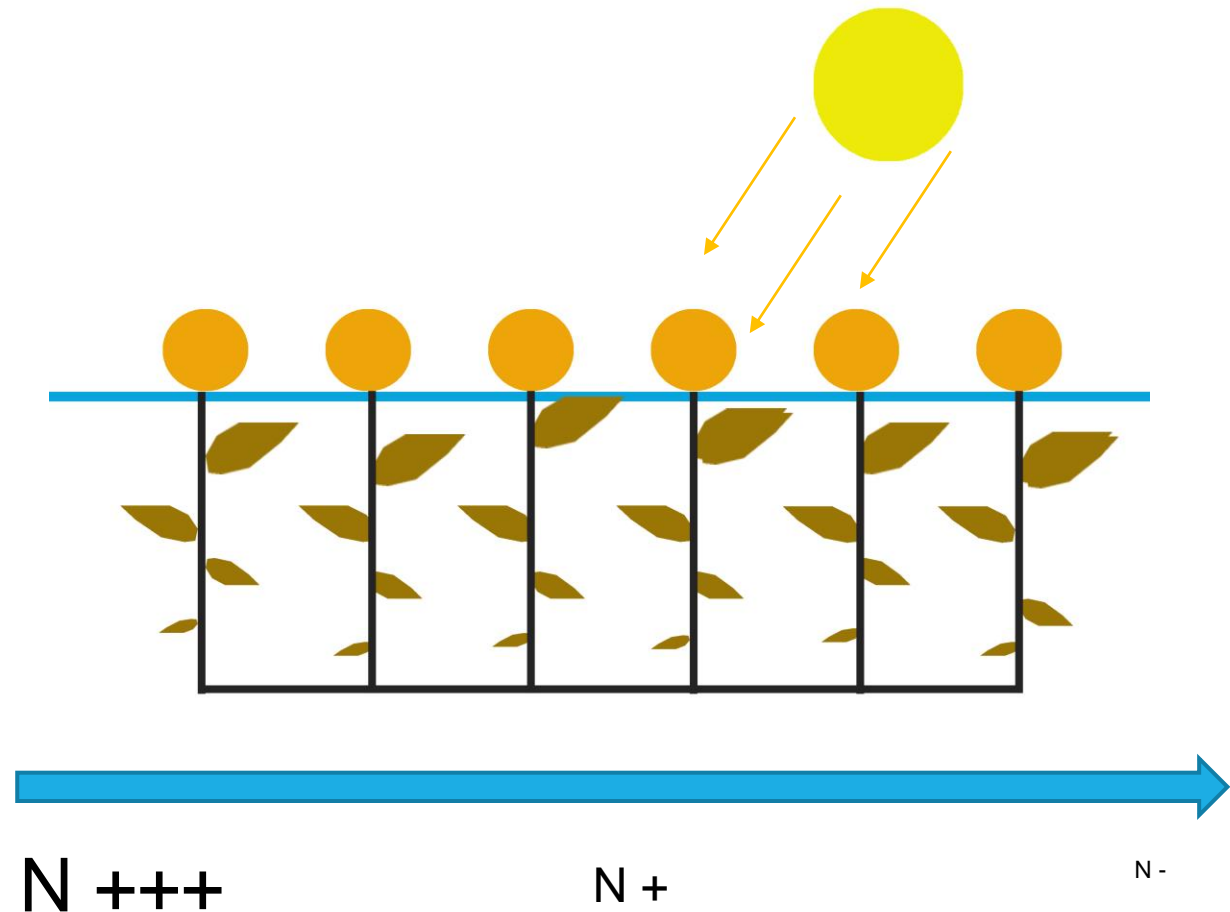
Deployment line	Label	Length/m (cm)	Weight · m ⁻¹ (kg)	# sporophytes · m ⁻¹	Average weight per sporophyte	#sporeling · m ⁻¹	% attachment
31	H3	157.63	2.88	58	0.0500	4000	1.44
25	Wildtype	157.08	2.25	48	0.0466	3000	1.61
23	Wildtype	147.08	1.76	28	0.0641	2000	1.38
6	H4	141.25	1.65	30	0.0555	2000	1.49
2	Wildtype	149.38	1.38	26	0.0539	4000	0.64

Hybrid 3 (gametophyte 026 – 002) outperformed wildtypes by 28% in yield (Kg · m⁻¹)



External factors influencing growth

- Farm type
- Farm location
- Seeding technique
- Seeding density
- Weather conditions



Take-aways *P. palmata*

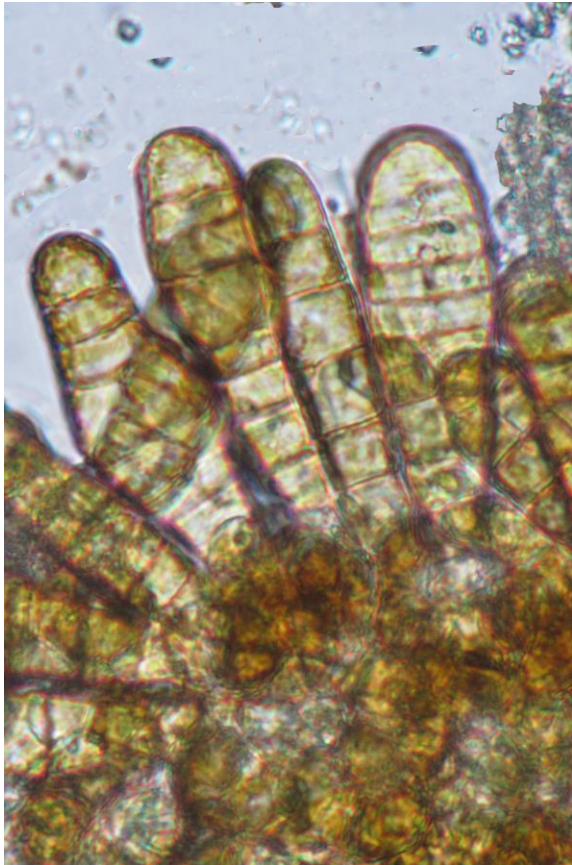


- Handling and health have tremendous impact on success
- Nutrients are main health driver
- Other factors (salinity, light, movement) were less impactful
- Properly sealed cuts are resilient and could be used for harsher, more effective cleaning procedures
- Ploidy can be determined now

Bonus: male gametophytes stored dormant for one year were successfully “revived” and continue to grow out and increase in biomass

- promising option to fix the lack of seed stage

Take-aways *S.latissima*



- Hybrid development and deployment was carried out successfully during the project
- No hybrid underperformed from the average wildtype
- Hybrid 3 (026 -002) outperformed the best yielding wildtype by 28%
- “common garden” optimization will be next challenge
 - Reproducibility
 - Predictability
 - Uniformity



Acknowledgement



This presentation is part of the Macro Cascade project.
This project has received funding from the European
Union's Horizon 2020 Bio-Based Industries Joint
Undertaking (BBI JU) under grant agreement No 720755

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