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Food Systems and Climate

Heterotrophic growth of *Galdieria sulphuraria* on residues from aquaculture and fish processing industries

CLIMAQUA

Establishing an innovative and transnational feed production approach for reduced climate impact of the aquaculture sector and future food supply

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Project thoughts

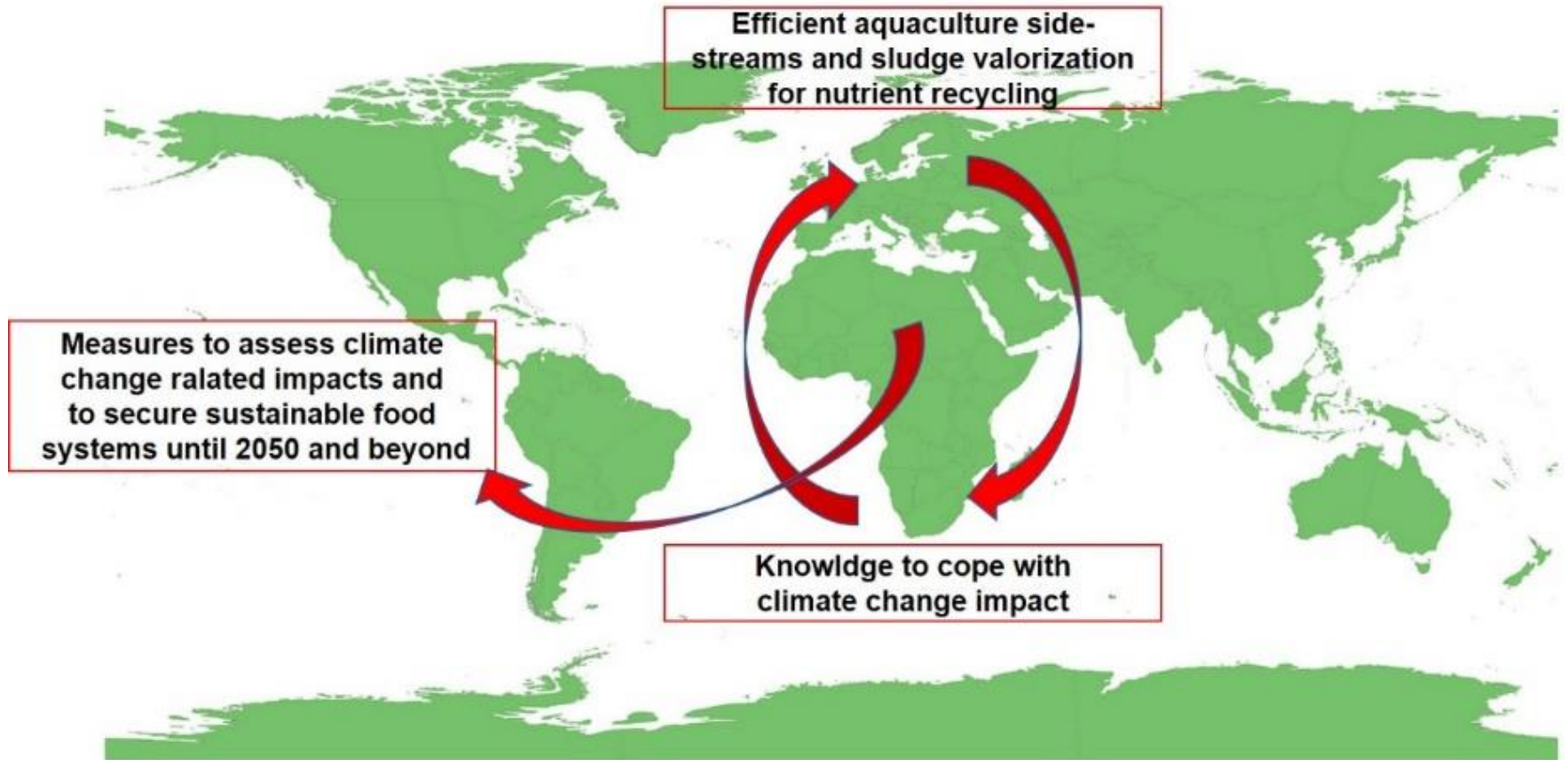


Fig. 1. Transnational Collaboration in CLIMAQUA.

Goals

Technological aspects lead to solutions with a low CO₂ footprint

1. Production of aquaculture feed that is efficient
Feed utilization and a beneficial reduction in environmental pollution are ensured,
2. Utilization of aquaculture side streams (e.g. mud, fish carcasses) as raw materials for the production of *Galdieria sulphuraria* and finally to feed production,
3. Utilization of aquaculture plant wastewater rich in nitrogen and phosphorus as nutrient sources for *Galdieria biomass production sulphuraria* and finally for feed production,
4. Designing environmentally friendly feed production instead of using resources as well
5. Implement decentralized fish feed production, including on-site processing and minimal transportation.

Non-technological aspects leading to changes in supply chains and food system resilience

6. Assessment of the socio-economic impacts and consequences of climate change on aquaculture in Africa and Europe,
7. Minimizing the interactions of climate change on food systems through climate-adapted production of feed and fish,
8. Development of resilient food systems taking into account changing food needs through needs-oriented aquaculture,
9. Decoupling agriculture from aquaculture by replacing agricultural feed with *Galdieria sulphuraria* and possibly residue-based feed and finally the reduction of greenhouse gas emissions from agriculture as well
10. Exchange and knowledge transfer to other regions worldwide.

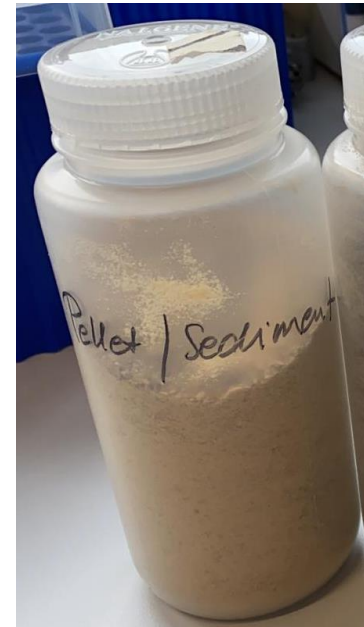
Project thoughts



Activities



Wastewater from fish processing



Solids after
hydrolysis of fish
residues



Mud

Activities

Table 1. Composition of the substrates used.

Substrate	Protein (%)	Carbohydrates (%)	Fat (%)	Ash (%)
Solid after hydrolysis	65.5	-	11.6	2.1
Mud	29.2	19.9	9.1	21.8

Table 2. Composition of the wastewater (FAN = free amino nitrogen).

Nitrate (mg/L)	NH ₃ / NH ₄ ⁺ (mg/L)	FAN (mg/L)
12.5	0.8	0.1



Abwasser aus der Fischverarbeitung



Feststoffe nach der Hydrolyse von Fischreststoffen



Schlamm


Activities



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Growth and phycocyanin synthesis in the heterotrophic microalga *Galdieria sulphuraria* on substrates made of food waste from restaurants and bakeries

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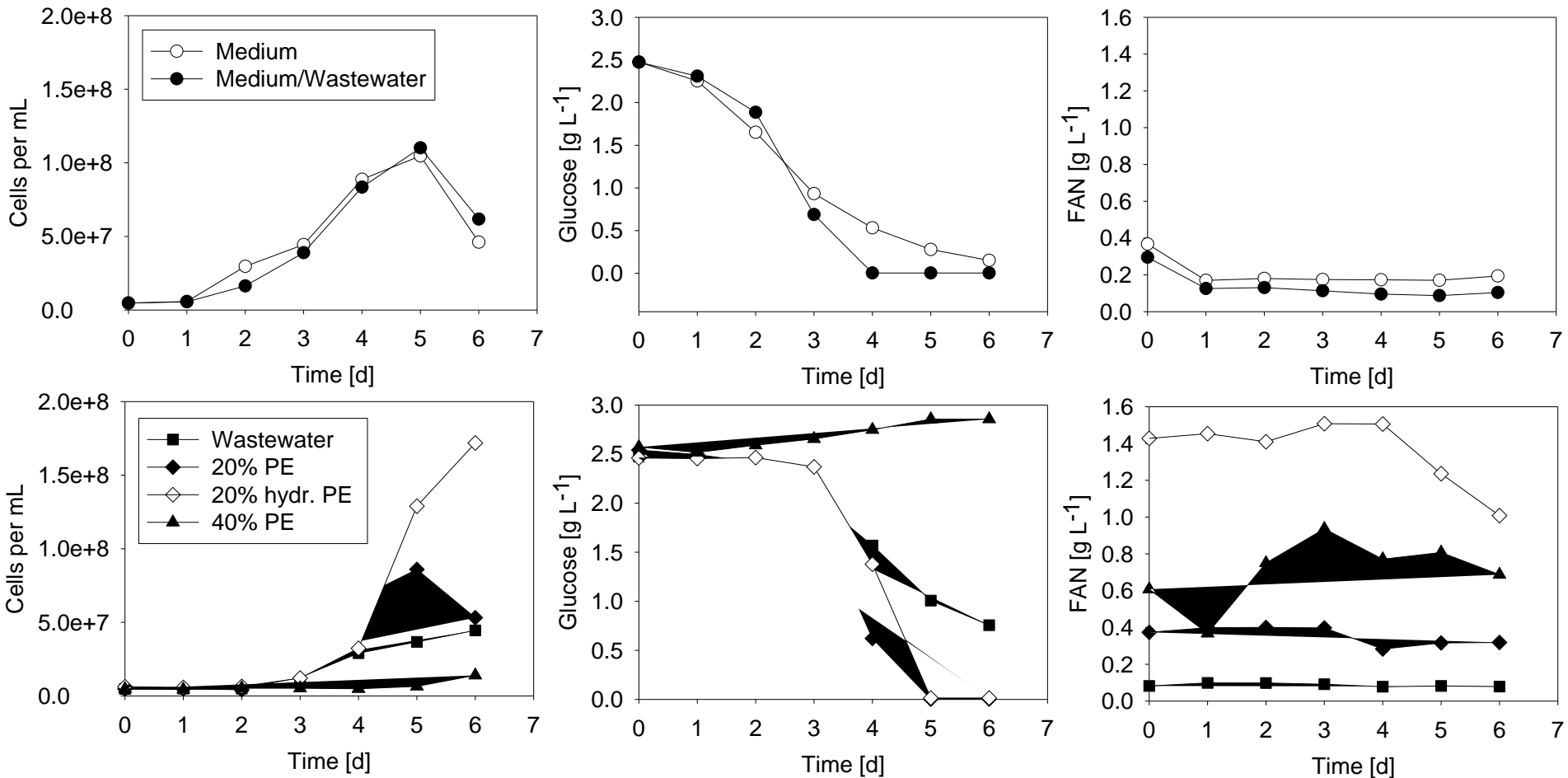
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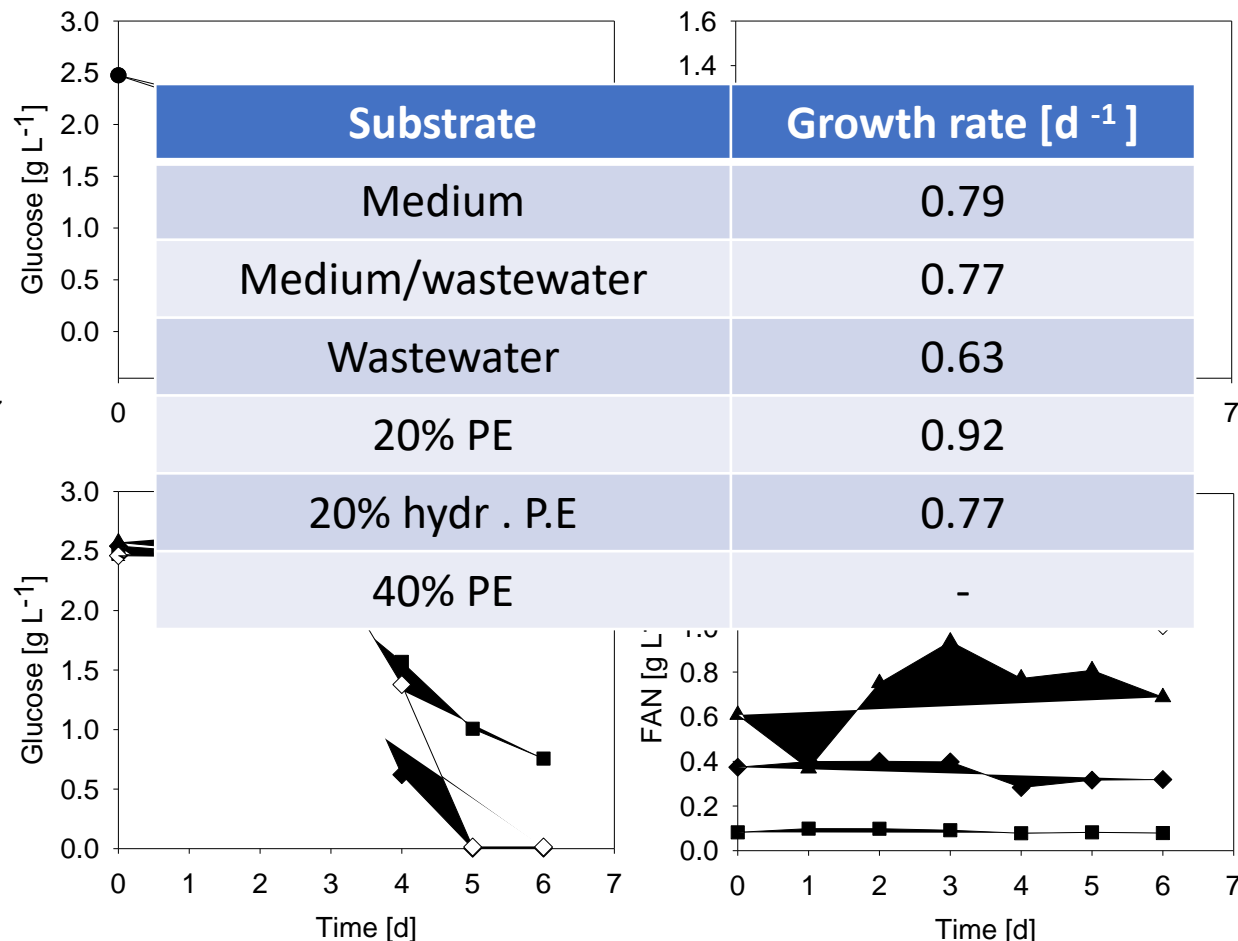
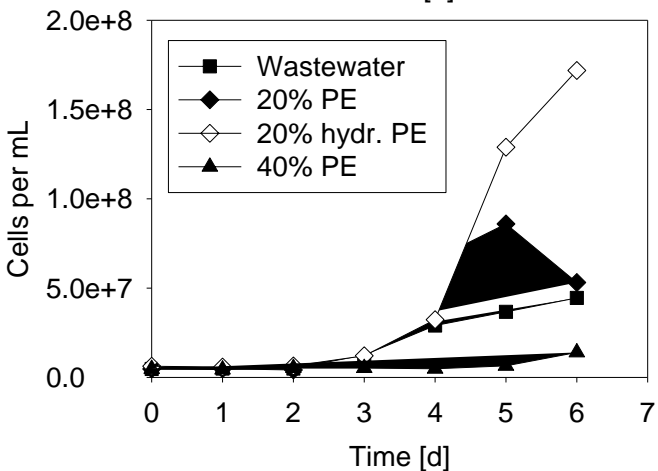
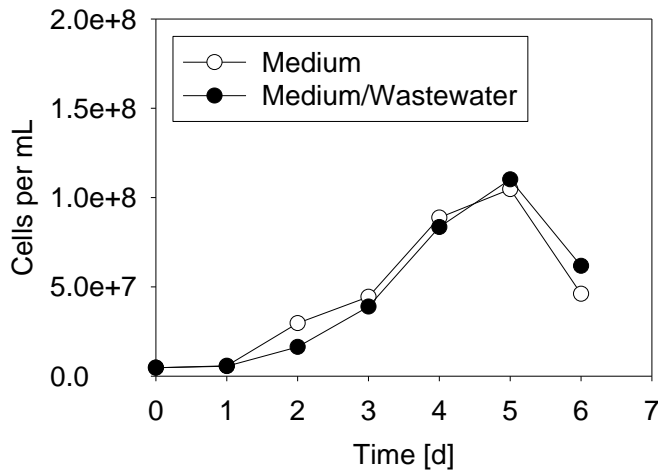
Activities

The cultivation of *Galdieria sulphuraria*



Activities

The cultivation of *Galdieria sulphuraria*



Bioreactor



Summary

- The utilization of by-products from the aquaculture sector must be kept in mind.
- And there are some interesting materials available for production of heterotrophic microalgae.
- The topic of feed production from by-products and that, so to speak constant recycling of nutrients must also be viewed critically.
- But is everything really more climate-friendly now?



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