Optimising Hatchery Conditions for *Palmaria Palmata*: Experimental Knowledge Transfer Study to Advance Seeding Techniques in Tanzania

GRÓ · FTP Fisheries Training Programme

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INTRODUCTION

- Hatchery-based seeding of macroalgae offers a promising approach for producing high-quality seedlings, however, limited understanding of optimal environmental conditions hinders its broader adoption in Tanzania.
- The study aims to examine the effects of various environmental conditions on *Palmaria palmata* spore release and gametophyte development.

METHODOLOGY

- *P. palmata* fronds with fertile tetraspores were collected from Vatnsleysuvík, Iceland, then prepared and stored under 4°C and 7°C (Fig 1).
- The experiments examined the effects of incubation duration, water agitation (0 vs. 3 L min^{-1}), temperature difference, and exposure duration (1, 3, 5 hrs) on spore release.
- Samples were incubated at 4°C and 7°C, and spores identified and counted microscopically. Germling development was monitored weekly (Fig 2).

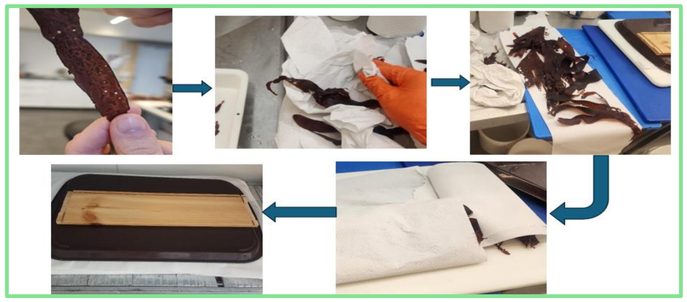


Figure 1: Preparation of tissue sample flow diagram for incubation at 4°C.

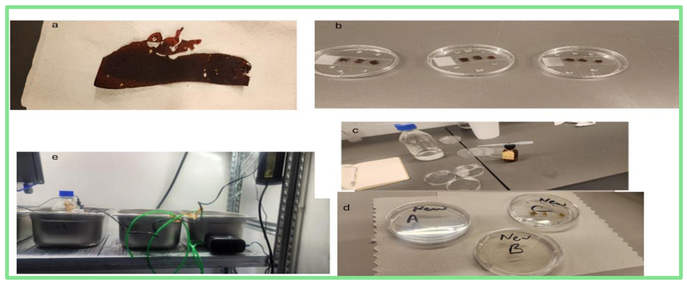
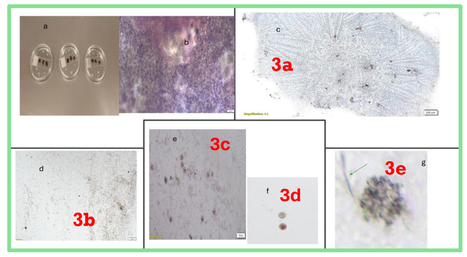


Figure 2: Spore release and germination in the laboratory at 4°C.

RESULTS

- Spore release began at day 7 for sori stored at 7°C (5,000–10,000 spores gFW^{-1})(3a) and at day 3 for those stored at 4°C (33,000 spores gFW^{-1})(3f)
- Gametophyte development was minimal(3b,d&g), female sporophyte observed at day 15 (3e), high spore mortality due to bacteria growth (3c).



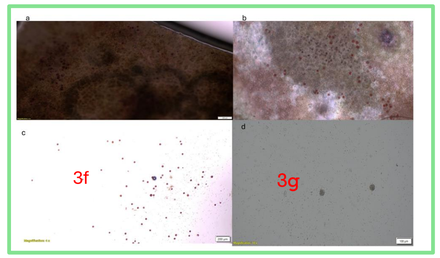


Figure 3: Spore release and in vitro gametophytic germling development of *P. palmata*.

- Spore yield increased with longer incubation 1,302 spores gFW^{-1} (0–3 days), 2,627 spores gFW^{-1} (3–6 days) and 33,019 spores gFW^{-1} (6–9 days) (Fig 4). This happened due to the maturation and ripening of the sporangia (Schmedes & Niels, 2020).

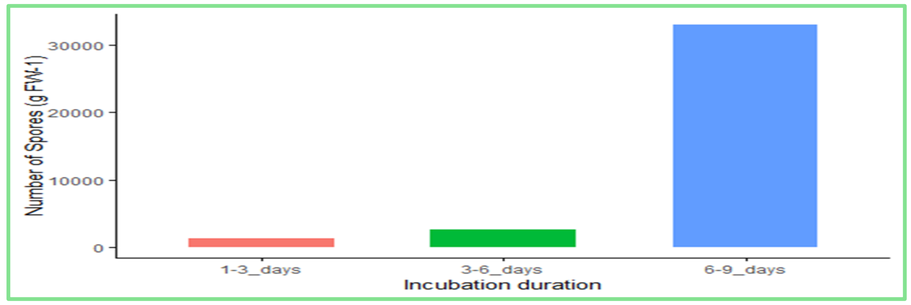


Figure 4: Effect of incubation duration (days) on spore release in gram per fresh weighed plant tissue material (gFW-1).

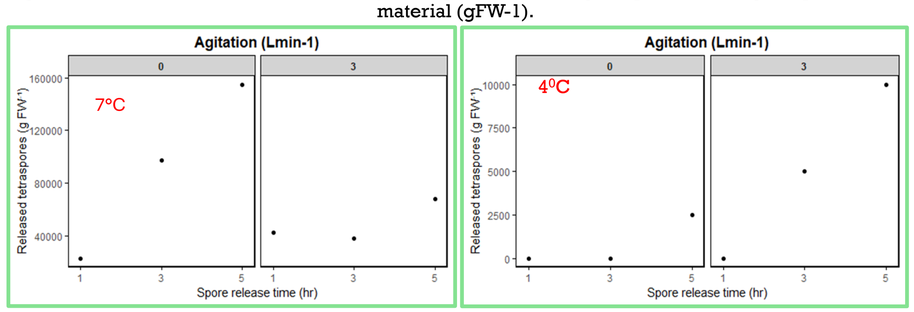


Figure 5: Effect of *P. palmata* spore yield with level of water agitation at 7°C and 4°C as a function of spore release time (1, 3 and 5hr) and level of water agitation (0Lmin−1 and 3Lmin−1). Data are presented as mean (n=2).

DISCUSSION

- Peak release occurred at 5 hours. At 7°C, calm water yielded 155,000 spores gFW^{-1} while agitated water 67,906 spores gFW^{-1}. At 4°C spore yield dropped to 10,000 spores per gFW^{-1} (agitated) and 2,500 spores per gFW^{-1} in calm conditions (Fig 5).
- This pattern confirms time-dependent release, consistent with findings by Schmedes, Nielsen & Peterse (2019).

CONCLUSION

- Results showed a significant positive relationship between sori storage, incubation temperature and water agitation in both spore release and gametophyte development.
- These findings offer valuable insights for seeding improvements in Tanzania through the development of hatchery production protocols.

LESSONS LEARNED AND PRACTICAL IMPLICATIONS FOR TANZANIA

Shared biological processes in seaweed reproduction offer opportunities to apply these results across different species and climates. The following context can be applied to Tanzania:

- Carefully identify and test the ideal cultivation temperatures for local species.
- Monitor sori development and reproductive readiness.
- Explore how water agitation through aeration or flow tanks can be adjusted.
- Collection of healthy and good quality parent material
- Substrate for attachments, bacterial growth, and different photoperiods require localised refinement of protocols.

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