



Comparison of two cultivation methods for domesticating wild red algal euchematoids for use in the seaweed industry

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Abstract

Euchematoid cultivation is an important alternative livelihood for small-scale farmers in coastal areas in east Malaysia. Over the last 50 years, the same clones of the red euchematoid *Kappaphycus alvarezii* and *Kappaphycus striatus* have been vegetatively propagated for cultivation resulting in low genetic diversity. This has made the cultivars more vulnerable to pests and diseases, which has been further exacerbated by climate change. There is an urgent need, therefore, to develop new cultivars that are resilient to pests and diseases, as well as environmental change. In this study, wild euchematoids were collected from four regions in Semporna, East Malaysia: Kerindingan, Sibuhun, Sebangkat and Omadal. These euchematoids were then grown at a commercial seaweed farm in Silungun, Semporna using two methods: i) tie-tie and ii) basket net for 60 days and their performance was evaluated based on growth and survival rates. A higher mean specific growth rate (SGR) was recorded by wild-collected *Kappaphycus* spp. ($2.15 \pm 1.90\% \text{ day}^{-1}$) and *Eucheuma denticulatum* ($2.83 \pm 3.27\% \text{ day}^{-1}$) when tie-tie was used. However, survival of the wild-collected euchematoids was better with the basket net, which led to a reduction in grazing and prevented detachment from culture lines. Of 212 original individuals, 72 survived throughout the study, despite the prevalence of pests and ice-ice disease. Of these, 46.15% *Kappaphycus* spp. and 50.75% *E. denticulatum* survived when cultivated using the basket net and 17.20% *Kappaphycus* spp. and 30.77% *E. denticulatum* survived when cultivated using tie-tie. The mean SGR and survival rate were significantly correlated with temperature, salinity, pH, current velocity and rainfall ($p < 0.05$). The surviving wild-collected *Kappaphycus* spp. and *E. denticulatum* have the potential to be developed into new cultivars for possible commercial use.

Keywords Basket net · *Eucheuma* · Growth · *Kappaphycus* · Rhodophyta · Survival · Tie-tie

Introduction

Seaweeds are widely used in food and non-food industries, such as food additives, animal feeds, pharmaceuticals, nutraceuticals, cosmetics, textiles, biofertilizers, bio-packaging and biofuel (McHugh 2003; FAO 2018; Cai et al. 2021). Malaysia is the world's third largest producer of euchematoid seaweeds, including the red carrageenophytes *Kappaphycus* spp. and *Eucheuma* spp., after Indonesia and the Philippines (Cai et al. 2021). *Kappaphycus* and *Eucheuma* species are widely cultivated on the east coast of Sabah, which has a suitable ecosystem, including long coastlines, an extensive continental shelf and clean water (Sade et al. 2006; FAO 2018; Tan et al. 2022a).

The production of euchematoids in Malaysia is inconsistent and has faced a decreasing trend from 2012 to 2021 (DOFM 2022). Low quality of seedlings, difficulties in

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