

Optimization of culture conditions for the direct regeneration of *Kappaphycus alvarezii* (Rhodophyta, Solieriaceae)

Abstract

Cultivation of seaweeds on a commercial scale requires a large number of propagules with desirable phenotypic traits which include high growth rates and resistance to diseases. Seaweed micropropagation can be considered as one of the best methods to provide a large amount of seedlings for commercial cultivation. This study was carried out to optimize the parameters known to affect the growth of *Kappaphycus alvarezii* in vitro and subsequently improve the production of seedlings through micropropagation. Suitability of media, concentration of phytohormones, types and concentration of fertilizers, culture density, light intensity, interval of aeration activity, salinity, and pH were found to be critical factors for the growth of *K. alvarezii*. The optimum condition for direct regeneration of *K. alvarezii* in a culture vessel was found to be cultivation of explants in Provasoli's enriched seawater (PES) media supplemented with 2.5 mg L⁻¹ 6-benzylaminopurine (BAP), 1.0 mg L⁻¹ indole-3-acetic acid (IAA), and 3.0 mg L⁻¹ natural seaweed extract (NSE) with culture density of 0.4 % w/v, under light intensity of 75 $\mu\text{mol photons m}^{-2} \text{ s}^{-1}$, continuous aeration of 30.0 L h⁻¹, salinity of 30.0 ppt, and pH 7.5. An airlift photobioreactor was constructed for the mass propagation of *K. alvarezii* explants with optimum culture conditions obtained from the study. The optimum growth rates of the *K. alvarezii* explants in culture vessels (5.5 % day⁻¹) and photobioreactor (6.5 % day⁻¹) were found to be higher than the growth rate observed in field trials in the open sea (3.5 % day⁻¹). The information compiled during the course of this study will be of utility to commercial seaweed cultivators.