

## **Recent advances in seaweed seedling production: a review of eucheumatoids and other valuable seaweeds**

### **ABSTRACT**

Modern seaweed farming relies heavily on seedlings from natural beds or vegetative cuttings from previous harvests. However, this farming method has some disadvantages, such as physiological variation in the seed stock and decreased genetic variability, which reduces the growth rate, carrageenan yield, and gel strength of the seaweeds. A new method of seedling production that is sustainable, scalable, and produces a large number of high-quality plantlets is needed to support the seaweed farming industry. Recent use of tissue culture and micropropagation techniques in eucheumatoid seaweed production has yielded promising results in increasing seed supply and growing uniform seedlings in large numbers in a shorter time. Several seaweed species have been successfully cultured and regenerated into new plantlets in laboratories using direct regeneration, callus culture, and protoplast culture. The use of biostimulants and plant growth regulators in culture media increases the seedling quality even further. Seedlings produced by micropropagation grew faster and had better biochemical properties than conventionally cultivated seedlings. Before being transferred to a land-based grow-out system or ocean nets for farming, tissue-cultured seedlings were recommended to undergo an acclimatization process to increase their survival rate. Regular monitoring is needed to prevent disease and pest infestations and grazing by herbivorous fish and turtles during the farming process. The current review discusses recent techniques for producing eucheumatoid and other valuable seaweed farming materials, emphasizing the efficiency of micropropagation and the transition from laboratory culture to cultivation in land-based or open-sea grow-out systems to elucidate optimal conditions for sustainable seaweed production.