

Research

Evaluation of effectiveness on-farm biosecurity measure practices to the productivity of *Eucheuma denticulatum* at Nain Island, Indonesia

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Abstract

This study aimed to assess the effectiveness of on-farm biosecurity measures in *Eucheuma denticulatum* seaweed farm, focusing on risks detection, measurement, and control. After six months of field observation, it was found that the incidence of ice-ice disease (IID) in *E. denticulatum* was influenced by the presence of epiphyte-biofilm and thallus wounds. The warm seawater temperatures and low salinity were identified as factors contributing to the susceptibility of the cultivated *E. denticulatum*. A total of 33 kg of macroalgae-epiphytes were found covering the seaweed thallus and ropes at a farm which on-farm biosecurity measure was absent, leading to 20% reduction in farm productivity. Macroalgae-epiphyte *Cladophora* sp. has become a major epiphytic pest in the Nain Island farm that limited the growth rate up to 62% at the reference farm. Detection measured for on-farm showed that appearance of infected thalli is not always identified with pale or bleached thalli, but wounds and fewer branches of thalli attributed to an unhealthy crop. The efficacy of the on-farm biosecurity concept including removing the epiphytes and the infected crops in seaweed farm was confirmed to improve crop health and support growth performance of an average of $5.33 \pm 0.9\% \text{ d}^{-1}$. The on-farm biosecurity measure practices were helped to reduce the effects of diseases by up to 83% in treatment farms. With these results, on-farm biosecurity measures became an adaptive mitigation strategy for dealing with unfavorable environmental factors for tropical eucheumatoid aquaculture.

Keywords Biosecurity · *Eucheuma denticulatum* · Farm management · Health management · Seaweed aquaculture

1 Introduction

Recently, the cultivation of seaweed has been turned as a lucrative business involving human employment and financial investments. The increasing enthusiasm and creativity in developing seaweed-based products for environmental management campaign has driven positive change to seaweed industry in recent years including the eucheumatoid industry. The eucheumatoid aquaculture industry has rapidly grown and expanded its range of product applications, initially focused only on food products such as carrageenan [7], and now venturing into the production of various nature-biobased products such as bioplastics [20, 55], biofertilizers [16, 18], and biofuels [51]. With all the attention, investments have been made to develop a robust industry from the upstream to downstream level in the eucheumatoid producing countries such as Indonesia. Production of eucheumatoid seaweed in Indonesia has shown a decline in trend of about 20% from 2015 to 2022 [13]. The main reason for this challenge was the quality of the seedlings. Seaweed's growth

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