

## Macroalgal–bacterial interactions: Identification and role of thallusin in morphogenesis of the seaweed *Ulva* (Chlorophyta) in Aquaculture System

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**M**acroalgal microbiomes have core functions related to biofilm formation, growth, and morphogenesis of seaweeds. In particular, the growth and development of the sea lettuce *Ulva* spp. (Chlorophyta) depend on bacteria releasing morphogenetic compounds. Under axenic conditions, the macroalgae *Ulva mutabilis* develops a callus-like phenotype with cell wall protrusions. However, co-culturing with *Roseovarius* sp. (MS2) and *Maribacter* sp. (MS6), which produce various stimulatory chemical mediators, completely recovers morphogenesis. This ecological reconstruction forms a tripartite community which can be further studied for its role in cross-kingdom interactions. Hence, our study sought to identify algal growth- and morphogenesis-promoting factors (AGMPFs) capable of phenocopying the activity of *Maribacter* spp. We performed bioassay-guided solid-phase extraction in water samples collected from *U. mutabilis* aquaculture systems. We uncovered novel ecophysiological functions of thallusin, a sesquiterpenoid morphogen, identified for the first time in algal aquaculture. Thallusin, released by *Maribacter* sp., induced rhizoid and cell wall formation. Understanding macroalgal–bacteria interactions permits further elucidation of the evolution of multicellularity and cellular differentiation, and development of new applications in microbiome-mediated aquaculture systems.

### Chlorophyta:

Chlorophyta are adjusted to shallow water, and live

in both freshwater and marine living spaces. 90% of Chlorophyta are freshwater species. Those that live in marine natural surroundings to a great extent possess tropical situations. There are few earthbound species; these generally harp on rocks or trees. A few animal types structure advantageous associations with growths, delivering lichens. There are a couple of cases wherein Chlorophyta have framed harmonious associations with creatures.

### Macroalgae:

Macroalgae is an aggregate term utilized for ocean growth and other benthic (joined to the

base) marine green growth that are commonly noticeable to the unaided eye. Bigger macroalgae are likewise alluded to as ocean growth, in spite of the fact that they are not so much “weeds”. In this report, macroalgae are treated as marine plants since they are photosynthetic (convert daylight into food) and have comparative natural jobs to different plants. Be that as it may, macroalgae contrast from other marine plants, for example, seagrasses and mangroves in that macroalgae need roots, verdant shoots, blossoms, and vascular tissues. They are recognized from microalgae (for example diatoms, phytoplankton, and the zooxanthellae that live in coral tissue), which require a magnifying lens to be watched.