OPEN ACCESS Freely available online

Applied Microbiology: Open Access

ISSN: 2471-9315

Commentary

Bio-Flocculation in Microalgae can be created by Co-Culturing Microalgae

Morris Uchida*

Department of Pathology, University of New South Wales, Sydney, Australia

DESCRIPTION

Microalgae are a prospective source of carbon-neutral food and animal feed, but their inherent features make separation from the medium difficult. Fungi aided microalgae harvesting is a new microalgae harvesting method. Unfortunately, the majority of the funguses described are inedible or even deadly, rendering collected microalgae unfit for human or animal consumption. The performance of the edible fungus *Ganoderma lucidum* on bio-flocculating microalgae *Chlorella vulgaris* was thoroughly observed in this analysis. By adjusting the fungus growth and fungi-microalgae flocculation conditions, the best harvesting efficiency of 39.7% was obtained when the fungal culture agitation rate was 50 rpm and 40 mg/ml of fungi pellet (wet weight) was employed at pH 9, mixing speed 100 rpm, and 23°C.

Ganoderma lucidum was discovered that mycelial shape, rather than surface charge neutralization, is important in fungi-microalgae association. After flocculation, the copolymer's lipid content dropped, but fungal-microalgal interactions increased polysaccharide content. In addition, the cost of employing *Ganoderma lucidum* as a bio-flocculant was calculated and its economic viability was explored. Study findings established an evidence-based threshold for the efficiency of edible fungal bio-flocculating microalgae, pointing to fungi cultivation costs and biomass added value as future improvement priorities. Human civilization is seeing an increase in demand for food, fibre, and fuel with smaller carbon footprints, and biomass derived from microalgae is a viable resource to address these demands. Because of their capacity to convert solar energy, quick growth, and high yield of fatty and protein contents, microalgae are used in biofuel, animal feed, food production, and CO_2 sequestration. It is often assumed that microalgae grow 10-50 times quicker than terrestrial plants and fix more CO_2. Unlike biofuel crops, a variety of microalgae strains may be cultivated in seawater without competing for arable land or in wastewater to recycle nutrients and water resources. Additionally, secondary metabolites of microalgae, such as omega-3 fatty acids, carotenoids, and phycobiliproteins, have many nutraceutical properties, including antioxidant, anti-inflammatory, and anti-obesity properties, making microalgae a promising alternative in human diet and animal feed. Harvesting is an important step in exploiting biomass from microalgae. Nevertheless, numerous properties of microalgae make this process difficult, such as poor cell concentration dispersion, small cell volume (30 m in diameter), intercellular electrostatic repulsion, and rapid development rate.

Microalgae biomass is now harvested primarily using physical, electrical, chemical, and biological processes (such as auto-aggregation, bacteria flocculants, and fungal flocculants), and each harvesting approach has distinct advantages and disadvantages. Harvesting techniques, such as centrifugation and filtering, can account for 20-30% of the entire production cost of microalgae biomass on an industrial scale, and the energy input during harvesting largely balances the carbon sequestration by microalgae growth. To fully realize the potential of microalgae biomass, there is an urgent need to design an energy-efficient process. as well as a low-cost gathering technique.

Bio-flocculation is a natural occurrence caused by intercellular polymers. Bio-flocculation can be produced in microalgae by co-culturing microalgae with chosen microbial partners such as bacteria and fungi. Lichen is a naturally occurring symbiotic system composed of fungus and phytoplankton (*cyanobacteria* or algae). Sugars and other nutrients generated by microalgae during photosynthesis aid fungus development and fungi in turn reward microalgae with a moist atmosphere and easy access to mineral nutrients.

When co-cultivated, filamentous fungus immobilize microalgae *via* mycelium interaction and cause microalgae pelletization. Large surface area, high mechanical stability and mass transfer performance, and better cell culture performance characterize fungi-microalgae particles. Furthermore, the big quantity of the fungi-microalgae Pellets (>1 mm in average width) allow for easy filtration of biomass, which can greatly lower the practical cost of microalgae gathering. As a result, co-culture of microalgae and filamentous fungi is a potential strategy for economical microalgae harvesting. Nonetheless, the filamentous fungi used in several microalgae-harvesting experiments are inedible and may create toxic compounds such as aflatoxin, a carcinogen made by *Aspergillus flavus* and other prevalent fungi (such as *Penicillium*). As a result, microalgae flocculated by these funguses are not fit for human or animal sustenance. This issue can be addressed by

Correspondence to: Morris Uchida, Department of Pathology, University of New South Wales, Sydney, Australia, E-mail: morriseveda@unid.edu.au

Received: 18-Jan-2023, Manuscript No. AMOA-23-23149; **Editor Assigned:** 20-Jan-2023, Pre QC No. AMOA-23-23149 (PQ); **Reviewed:** 07-Feb-2023, QC No. AMOA-23-23149; **Revised:** 16-Feb-2023, Manuscript No. AMOA-23-23149 (R); **Published:** 24-Feb-2023. DOI: 10.35284/2471-9315.23.9.249

Citation: Uchida M (2023) Bio-Flocculation in Microalgae can be created by Co-Culturing Microalgae. Appli Microbiol Open Access. 9:249.

harvesting microalgae with edible fungi, and the final product is non-toxic and can be used as a useful commodity such as feed, health care products, and medications.

However, edible fungus has drawbacks in flocculating microalgae, such as poor growth rate and transition between various morphological forms. Edible mushrooms also require a greater initial investment, whereas inedible fungus can be grown in inferior environments such as wastewater. In an earlier research, *Chlorella vulgaris* and *Ganoderma lucidum* were used in a symbiotic system with an endophytic bacterium (S395-2) to purify and improve biogas and biogas slurry. Optimizations on co-cultivation and growth factors on comparable *Chlorella vulgaris-Ganoderma lucidum* systems have been conducted; however, the particular efficacy and process of *Ganoderma lucidum* as a flocculant for harvesting microalgae have not been explained. The link between the growth state and the flocculation efficacy of the edible fungus *Ganoderma lucidum* was investigated using the gathering target microalgae *Chlorella* and *Ganoderma lucidum*, a tasty fungus, was used to flocculate microalgae *Chlorella* under various circumstances.

The impact of various factors on harvesting efficiency (growth state, pH, temperature, and agitation) was examined, and a cost study was conducted to assess this method for harvesting microalgae. Lastly, mycelial adsorption, electrostatic interactions, surface functional groups, and metabolic chemicals were studied in the bio-flocculation process between *Ganoderma lucidum* and *Chlorella* sp. The analysis offered new perspectives on the interaction of *Ganoderma lucidum* and microalgae, and the feasibility and limitations of fungi-based microalgae bio-flocculation were thoroughly addressed.