

# Bioprocess procedures to increase bio hydrogen generation from green growth

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## Description

Algae, often overlooked and underappreciated, hold immense potential for addressing critical environmental challenges and driving sustainable solutions across various industries. These simple organisms, found in diverse aquatic environments, have captured the attention of scientists, researchers, and entrepreneurs worldwide. With their remarkable adaptability and rich biochemical composition, algae offer a promising path towards a greener future. This article explores the fascinating world of algae, shedding light on their ecological importance, diverse applications, and the cutting-edge research being conducted to harness their untapped potential. Algae, often referred to as "nature's hidden gem," are a diverse group of photosynthetic organisms that range from microscopic single-celled organisms to large, multicellular seaweeds. They inhabit a wide array of environments, from freshwater ponds to oceans, and even extreme habitats like deserts and Polar Regions. Algae play a vital role in the Earth's ecosystems by producing approximately 50% of the planet's oxygen through photosynthesis, a process that converts sunlight into energy. Furthermore, they serve as a primary food source for numerous aquatic organisms, forming the foundation of aquatic food chains. One of the most remarkable aspects of algae is their incredible ability to synthesize valuable compounds through photosynthesis. Algae are known to produce a wide range of bioactive substances such as pigments, proteins, lipids, and carbohydrates. Some algae species, like *Spirulina* and *Chlorella*, are cultivated for their high protein content and are used as dietary supplements. Additionally, microalgae are being explored as a potential source for biofuels due to their high lipid content, which can be converted into biodiesel or biogas. Algae demonstrate exceptional capabilities for environmental remediation. They can effectively remove excess nutrients, heavy metals, and pollutants from water bodies through a process called bioremediation. Algae absorb these harmful substances, purifying the water and improving its quality. This quality

makes them a valuable tool for wastewater treatment and restoration of contaminated ecosystems. Furthermore, the cultivation of algae for bioremediation purposes offers a sustainable and cost-effective solution for tackling environmental pollution. The increasing concentration of carbon dioxide (CO<sub>2</sub>) in the atmosphere is a significant contributor to climate change. Algae have the potential to mitigate this issue by acting as natural carbon sinks. Through photosynthesis, algae absorb CO<sub>2</sub> and convert it into organic matter, locking away carbon in their biomass. Algae cultivation systems can be implemented on a large scale to sequester substantial amounts of carbon dioxide, helping to reduce greenhouse gas emissions and combat climate change. As the global population continues to grow, finding sustainable food sources becomes increasingly crucial. Algae offer a sustainable and nutrient-rich solution to address this challenge. Certain species of algae, such as seaweed, are already consumed as food in many cultures worldwide. Algae-based food products have gained popularity due to their high nutritional value, low environmental impact, and potential for large-scale cultivation. Moreover, algae cultivation requires fewer resources compared to traditional agriculture, making it a promising option for sustainable food production.

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## Conflict of interest

The author declares there is no conflict of interest in publishing this article.

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