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Potato Peel Waste as A Valuable Substrate for Biomass and H_2 Production by Green Algae

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ABSTRACT

Green algae have great potential for waste utilization, as they can efficiently harness sunlight energy, making them promising for large-scale applications in green biotechnology. Potato peel waste (PWW), rich in carbohydrates, organic acids, amino acids, vitamins, and trace elements, presents a promising substrate for sustainable biofuel production. This study aimed to study biomass and hydrogen (H_2) production by green algae *Chlorella vulgaris* Pa-023 and *Parachlorella kessleri* MDC6524, cultivated in PPW-containing media. Culture of green algae (Algae Collection, Microbial Depository Center, NAS, Armenia) were grown under aerobic conditions upon illumination. Cultivation of algae in PWW-containing media resulted in significant increases of biomass yield: 35% for *C. vulgaris* and 60% for *P. kessleri*, compared to control culture grown in Tamiya medium. Moreover, algae cultivated in PWW media also exhibited higher levels of photosynthetic pigments (total carotenoids, chlorophylls *a* and *b*), indicating enhanced photosynthetic activity. The H_2 yields of *C. vulgaris* and *P. kessleri* were 1.7-fold and 3.5-fold higher, respectively, in comparison with culture, cultivated in Tamiya medium, highlighting *P. kessleri* as the more efficient H_2 producer under the tested conditions. The addition of diuron, a specific inhibitor of photosystem II (PS II), led to a 60% inhibition of H_2 yield, indicating a PS II-dependent route of H_2 evolution. These findings demonstrate that PPW is a valuable and cost-effective feedstock for biomass and H_2 production. Using green algae for waste management not only helps reduce waste, but also supports biomass production for green energy generation. This dual benefit enhances algae value, especially in addressing current global environmental challenges.

Keywords: green algae, potato peel waste, hydrogen production, biomass yield

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