STUDY THE POTENTIAL OF CYANOBACTERIA - *ANABAENA VARIABILIS* A-1 IN BIOHYDROGEN PRODUCTION

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The production of biohydrogen by phototrophic microorganisms is a promising and complex biotechnology that can contribute to reducing greenhouse gas emissions. However, achieving successful biohydrogen production requires identifying active strains with the required characteristics and selecting suitable strategies for improving strains for photobiotechnological hydrogen production. In this study, our aim was to identify promising hydrogen producers among cyanobacteria and understand the mechanisms of this process and the conditions for increasing hydrogen production.

We obtained five new strains of cyanobacteria from different ecosystems and evaluated their potential for hydrogen production. Based on our screening, we identified the cyanobacterium Anabaena variabilis A-1 as having the highest growth rate and biomass yield, which determined its high productivity. We subsequently genetically identified and studied the physiological and biochemical properties of this strain to determine its potential for hydrogen production.

Our results showed that Anabaena variabilis A-1 was characterized by high productivity, nitrogenase enzyme activity, and hydrogen release, producing 8.67 μmol H2/mg chl/h of hydrogen in the dark. We also found that this strain released hydrogen 3.7 times more in the dark than in the light, and hydrogen production was observed in the first day after anaerobic cultivation. Addition of 50 mmol NaHCO3 + 25 mmol HEPES to this strain increased hydrogen release by 1.1 times.

In conclusion, our study identified Anabaena variabilis A-1 as a promising cyanobacteria strain for biohydrogen production. Its high productivity, nitrogenase enzyme activity, and genetic manipulability make it a suitable model organism for studying various physiological processes and metabolic pathways in photosynthetic cells. We recommend further studies to explore the full potential of this strain for future biohydrogen production.