

Título: DESCRIPTION OF AN ALTERNATIVE NITROGENASE GENE CLUSTER IN *Fischerella* sp. CENA161

Autores: SOUZA, B.C.E. ¹, HECK, K. ¹, ALVARENGA, D.O. ², VARANI, A.M. ³, FIORE, M.F. ²

Instituição: ¹ USP - Esalq – Universidade de São Paulo / Escola Superior de Agricultura “Luiz de Queiroz”(Av. Pádua Dias, 11 - Cx. Postal 9 - Piracicaba - SP), ² USP - CENA – Universidade de São Paulo / Centro de Energia Nuclear na Agricultura (Av. Centenário, nº 303, Caixa Postal 96 -Piracicaba – SP) ³ UNESP - Universidade Estadual Paulista Julio de Mesquita Filho / Faculdade de Ciências Agrárias e Veterinárias (Via de Acesso Prof. Paulo Donato Castellane s/n, Vila Industrial, Jaboticabal - SP)

Resumo:

Cyanobacteria are oxygenic photosynthetic microorganisms belonging to the Bacteria domain, and have a worldwide distribution. Some cyanobacteria are capable of photosynthesis and biological nitrogen fixation (BNF), two of the most important processes in nature, simultaneously. Among these bacteria, organisms belonging to the Nostocales order are capable of differentiating nitrogen-fixation specialized cells called heterocytes, creating a spatial separation between photosynthesis and BFN. The genus *Fischerella*, classified in the Nostocales order (Hapalosiphonaceae family), was reported as a producer of several bioactive molecules with potential toxicological and biotechnological applications, as well as being able to fix nitrogen. Strain *Fischerella* sp. CENA 161 was isolated from a fresh water spring at Capuava Farm, Piracicaba-SP, and since then kept in laboratory under culture conditions. This study aimed to identify and annotate the genes involved in biological nitrogen fixation in the genome of *Fischerella* sp. CENA 161. For this purpose, the strain was grown in ASM-1 medium at constant 25 ± 1 °C and controlled conditions of light irradiation. Genomic DNA was extracted, and a paired library for genome sequencing in MiSeq (Illumina) was prepared. The reads obtained were screened and used by the SPAdes 3.5.0 genome assembly software. The search for nitrogen fixation related genes was performed using Prokka-1.8 for automatic annotation, Artemis 15.0.0 and BLAST for manual annotation, and the sequences were compared to NCBI databases. Analyses have identified 22 genes distributed in two gene clusters related to the production of conventional Mo-nitrogenase, dependent on Molybdenum. In addition to these genes, nine additional genes, including structural genes cluster, carriers and regulators, have been found and related to the synthesis and functioning of the alternative V-nitrogenase, dependent on Vanadium. This is the first report of an alternative nitrogenase gene cluster found in a Brazilian cyanobacterium.

Palavras-chaves: cyanobacteria, genomics, biological nitrogen fixation,

Agências de Fomento: FAPESP, UEFS