The Role of PQQ in the Metabolism of *Gluconacetobacter diazotrophicus*

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The bacterium *Gluconacetobacter diazotrophicus* had its genome sequenced and their genes has currently being studied. This organism does nitrogen fixation, produces phytohormones, solubilizing nutrients and is resistant to heavy metals and osmotic stress. A molecule has been shown important in several of these processes: Pyrroloquinoline Quinone (PQQ). In the present work, the metabolic role of this molecule in *G. diazotrophicus* was studied by using defective insertion mutants for *pqqB*, *pqqC* and *pqqE* genes. We evaluated ability of such genotypes to fix nitrogen, solubilize phosphorus and zinc and to resist to stress provoked by PEG and Na$_2$SO$_4$. In silico analysis revealed that *pqq* genes from *G. diazotrophicus* are organized in operon. The product of these genes leads to formation of PQQ which operates as dehydrogenases cofactor. The main one is glucose dehydrogenase, which mediates conversion of glucose to gluconic acid made in the periplasm, generating ATP. This acid is responsible for nutrient solubilization mediated by bacteria, which no longer occurs in these mutants defective for production of PQQ. Our results revealed that, in such mutants, respiration process may be mediated by a second glucose dehydrogenase located in the cytoplasm, independent of PQQ. Nitrogen fixation was blocked in these mutants, since nitrogenase is sensitive to O$_2$ and is also located in the cytoplasm. PQQ acts as antioxidant molecule too. Apparently, under stress, the oxidative burst is intense affecting the resistance of these mutants to PEG and Na$_2$SO$_4$.

Keywords: *Gluconacetobacter diazotrophicus*, Pyrroloquinoline Quinone, nutrient solubilization, abiotic stress, antioxidant.

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