DPS Proteins Impact on Oxidative Stress Response in Nitrogen Fixing Cyanobacterium *Nostoc punctiforme* ATCC29133

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Cyanobacteria are microorganism with a broad biotechnological application. Among advantages which make them attractive for scientists are ability to grow fully autotrophic, taking all necessary compounds to sustain their life from air, water and the sun light. Such simple growth requirements make their biotechnological application cost effective. Other advantages of cyanobacteria include their relatively fast growth in comparison to other phototrophic organisms such as algae and plants. Additionally, the simple organization of genetic apparatus gives an ability to do all necessary genetic manipulation more easily than on complex eukaryotic organisms.

The ability of cyanobacteria to produce biofuels attracts more and more attention of researchers against a background of growing necessity to find an ecological and cheep substitution to natural gas and oil. From this perspective possibility to harness cyanobacteria for hydrogen production may give us an ecologically clean source of energy, since the only product of hydrogen combustion is water and no pollutants such as carbon oxides are produced.

Though, different strains of cyanobacteria created via methods of genetic engineering are able to evolve hydrogen, the amount of the hydrogen is insufficient for their industrial use. The sensitivity of the main hydrogen synthesizing enzyme to oxidation has been determined to be one of the critical factors for further development of the technology. The photosynthetic ability of the cyanobacteria has its side effect—a production of reactive oxygen species (ROS) inside the cells. Though, cyanobacteria can withstand this negative effect it decreases their efficiency as hydrogen producents.

From this point of view oxidation stress and mechanism which help to level its negative consequences becomes an important subject for scientific research. In my present work I addressed the role of DPS proteins in oxidative stress response. These proteins take an important role in iron metabolism of cyanobacteria but also they possess an ability to scavenge ROS and convert them into harmless substance.

This study showed that three DPS proteins: Npun_F3730, Npun_F6212, and Npun_R5799 play an important role in cell resistance to the oxidative stress. The strains where the genes of these proteins were deactivated were unable to withstand the oxidative stress conditions for a long time. Contrastingly, the study showed that overproduction of these proteins did not confer increased tolerance to oxidative stress as it was expected. However, they were able to withstand high iron concentration which is detrimental for the cyanobacteria.

Further studies are needed to understand the complex mechanism of cyanobacterial response to oxidative stress of different origins. Careful selection of genetic engineering tools and combination of different biotechnological approaches may thus bring a success to the cause of creating an industrial strain of hydrogen producing cyanobacterium.

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