An essential role of the *rel* gene in aerobic nitrogen fixation by *Anabaena sp. PCC 7120*, a heterocyst forming filamentous cyanobacterium

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Stringent response defines a regulatory effect exerted by alarmone (p)ppGpp accumulation as a mechanism to survive starvation and a variety of harsh environmental conditions. A failure to disrupt the *rel* gene in two unrelated strains of cyanobacteria has led to an opinion that in cyanobacteria this gene is essential. However, inactivation by single recombination producing a truncated and presumably partially functional version of *rel* (*all1549*) in *Anabaena sp. PCC 7120* was claimed to result in the failure to differentiate heterocysts specialized cells that perform aerobic nitrogen fixation. Contrary to these results, we isolated fully segregated double recombinants with *rel* gene inactivated by the Ω cassette insertion which produced morphologically normal heterocysts but failed to grow diazotrophically (Fox- phenotype). Initial mutant clones were very sick, had altered pigmentation and died rapidly in the stationary phase (Dsp phenotype) but repeated sub-culturing resulted in gradual improvement of growth and restoration of normal pigmentation. We found an identical compensatory mutation in the *rpoB* (*alr1594*) gene encoding RNA polymerase beta subunit in several independent original mutants with improved growth characteristics. However, this mutation did not restore stationary phase survival or diazotrophic growth, while the *rel* gene supplied on autonomously replicating plasmid restored the wild-type phenotype. Currently we are trying to elucidate the nature of the Fox- and Dsp phenotypes caused by *rel* disruption.

Biography

Grigorii Gladkov is currently a PhD student working at the Laboratory of Rhizospheric Microflora in All-Russia Research Institute for Agricultural Microbiology under the supervision of Dr. I. Ya. Khudyakov. He has received his Master’s degree in Microbiology from the Saint-Petersburg State University. His main interests are cyanobacteria genetics and biotechnology, focusing in cyanobacteria heterocyst differentiation.

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