

DETECTION AND ACTIVITY OF SOME GENES OF BACILLIBACTIN SYNTHESIS OPERON IN *BACILLUS VELEZENSIS* STRAINS

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Siderophores are produced by microorganisms, as well as by some plants, as part of a strategy to obtain iron from the environment because of the low amount of iron bioavailable. They are low weight molecules (between 500 and 1500 dalton) with great affinity and selectivity to bind and complex Fe(III). Siderophores convert iron bound to proteins or water-insoluble compounds into an ionic form of Fe³⁺ available to microorganisms (Hider & Kong, 2010). Bacteria belonging to *Bacillus subtilis* group are known for their ability to synthesize many biologically active substances including siderophores (Saxena et al., 2019). The catechol-based siderophores (Ollinger et al., 2006) are the most powerful iron chelators (Perraud et al.) and include bacillibactin. Therefore, the aim of this work was to investigate the presence and activity of bacillibactin biosynthesis genes in strains of *Bacillus velezensis*. In our study we have used two *B. velezensis* strains NUChCC1 and NUChCC2b (the nucleotide sequences deposited in the GenBank with accession numbers MN508954.1 (NUChCC1), MN749356.1 and MN749357.1 (NUChCC2b)). Bacteria were cultivated for 144 hours in MPB medium at 29±2°C. Samples of 24-h and 144-h were taken for RNA isolation. To detect presence and expression of *dhbC* and *dhbF* genes in the bacilli genome PCR and RT-qPCR were performed. Nucleotide sequences of primers to *dhbC* and *dhbF* were selected using Primer3 programs, relative gene expression level was estimated using PowerUp™ SYBR™ Green Master Mix (Applied Biosystems™) and calculated with 2^{-ΔΔCt} method (Livak & Schmittgen, 2001). In the studied strains of *B. velezensis* the ability to produce bacillibactin was established. Comparative analysis of *dhbC* gene expression revealed differences in mRNA abundance between two *B. velezensis* strains. NUChC C2b strain demonstrated the higher transcriptional activity after 24 hours of cultivation compared to NUChC C1 strain but the level of *dhbC* expression was decreasing on 144 hours in NUChC C2b strain while it was still increasing in NUChC C1 strain. Siderophores have diverse properties: iron chelators (more biodegradable than synthetic organic chelating agents) (Saha et al., 2015); promoters of bacterial and plants growth (Guan et al., 2000; Saha et al., 2015); potential biocontrol agents (Saha et al., 2015); biosensors of the presence of Fe (III) in the environment (Saha et al., 2015); high corrosion inhibitors of steel (Javaherdashti & Alasvand, 2019; Little & Mansfeld, 1995; Rajala, 2017); stimulants of the dissimilation of Fe (III) by bacteria (Gavrilov et al., 2012); enhancers of heavy metal bioremediation (Saha et al., 2015). However, it is not

specified whether they can affect biofilms formation by corrosive bacteria, what should be investigated in the future.