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Innovations in Microbiology and Biotechnology
Vol. 1

Investigating of the Relationships between Non-Culturability and Nisin Production of *Lactococcus lactis*

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We studied formation of non-culturable forms of three bacteriocin (nisin) producing strains of *Lactococcus lactis* subsp. *lactis*: MSU, 729 and F-116 under carbohydrate starvation stress. Two different types of inoculum were applied: A) unwashed cells with culture liquid, B) cells washed twice with normal 0,9% saline. Resulting total numbers of cells were $0.6 \cdot 10^8$ cells/ml for both types of inoculum. Population obtained using type A inoculum demonstrated active growth phase within first 1-5 days of incubation (up to $2.4 \cdot 10^9$ cells/ml) while those obtained using type B inoculum did not grow within that period. Type B population of strain MSU showed phenotypic dissociation that

resulted in appearance of micro colonies. After that, we observed active growth phase (up to 5.2×10^9 cells/ml). Type B cultures of strains 729 and F-116 did not grow during the whole experiment. It was shown that type A population shifted into non-culturability faster than type B. This is due to differences in metabolic strategies and stress sensitivity of these types of population. After 1 year of incubation (383 days) culturability decreased by 3 orders of magnitude for type B (5 orders for type B population of strain MSU) and by 6 orders of magnitude for type A population. We also observed considerable reduction of cell size for type A population of strains 729 and F-116. Studies of bacteriocin activity showed that in type B population cells were up to 78 times more productive compared to those of type A cultures. This phenomenon can be explained by differences in survival strategies of population that use antibacterial potential of bacteriocins for their benefit.

Keywords: Lactococcus lactis; nonculturable; nisin; bacteriocin; activity