Characterization of hyicin 3682, a bacteriocin with potential applications against food pathogens

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Staphylococcins are bacteriocins produced by strains belonging to the genus Staphylococcus, and these small peptides may be useful as food preservatives. Foodborne pathogens are responsible for considerable mortality and loss of productivity and control in the food industry. Hyicin 3682, a staphylococcin produced by Staphylococcus hyicus 3682, is active against strains of foodborne pathogens such as Bacillus cereus, Listeria monocytogenes, Staphylococcus aureus, and the spoilage bacteria Clavibacter michiganensis. Its production in BHI medium achieved a maximum of production (6,400 AU/ml) after 24 h of growth at 37 ºC. After purification and mass spectrometry analysis, hyicin 3682 proved to be a cationic, small antimicrobial peptide with a molecular mass of 2,139 Da. A partial sensitivity to proteolytic enzymes, resistance to low pH values and to heating at 65 ºC was also observed. Plasmid profile revealed a single plasmid form of ~ 54 kb, named pRJ110, similar to pTü32, which codes for epidermin production. Experiments concerning the cure of this plasmid form are in progress in order to elucidate if it codes for hyicin 3682 production. PCR experiments performed, with genomic DNA, detected a weak amplicon for the epidermin encoding-gene epiA and a strong one for Bsa (bsaA2 gene). Therefore, hyicin 3682 is a lantibiotic related, but not identical, to both epidermin and Bsa. Cloning experiments and sequencing of the PCR product obtained with specific primers for the bsaA2 gene were performed in order to compare the sequences of the amplicon derived from the genomic DNA of S. hyicus 3682 with the bsaA2 original gene sequence. The amplicon obtained was ligated to the vector pGEM-T Easy *, transformed into Escherichia coli DH5α and subsequently sequenced using the primers M13F and M13R. A sequence of 29 amino acids could be obtained from in silico analysis of the sequence analysed. The alignment of this peptide with some variants of Bsa was performed with the program ClustalW and revealed that the obtained sequence presented: 82% similarity with the peptide encoded by S. aureus COL 1881, 82% similarity with the peptide encoded by S. aureus USA300, and 69% similarity with the peptide encoded by S. aureus RF122. Cloning experiments and sequencing of the PCR product obtained with the specific primers for the epiA gene are also in progress. Taken together, these results suggest a potential application of hyicin 3682 as a biopreservative in food.

Keywords Hyicin 3682; bacteriocin; food preservation.