Genome and metabolites analysis reveal insights into control of foodborne pathogens in fresh-cut fruits by *Lactobacillus pentosus* MS031 isolated from Chinese Sichuan Paocai

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Abstract

The presence of pathogens in fresh-cut fruits represents a risk for the public health since these products generally do not receive any further treatment before consumption. In this study, a *Lactobacillus pentosus* MS031 was isolated from Sichuan Paocai with broad antibacterial activity against foodborne pathogens. Antimicrobial peptides produced by the *L. pentosus* MS031 had broad activity and resistance to heat, but they were sensitive to proteinases and their activity vanished under alkaline condition. Bacteriocin-like substance obtained by pH-absorption related methods showed activity only against *Staphylococcus aureus*. However, cell-absorbed substance and cell-secreted into culture substance had activity against both *S. aureus* and *Escherichia coli*. Foodborne pathogens in fresh-cut fruit mixture were controlled by the metabolites of the *L. pentosus* MS031 that *Listeria monocytogenes* was reduced by 96.3 %, *Salmonella typhi* and *E. coli* were decreased to an undetectable level. The complete genome of the *L. pentosus* MS031 was sequenced using Illumina and MinION nanopore platform with a size of 3,805,216 bp, consisting of one chromosome and eight plasmids. After mining using BAGEL4, two novel bacteriocins, pentocin MS1 and pentocin MS2, were identified. Furthermore, fragments of 5 antimicrobial peptides were identified by LC–MS/MS in the fermentation supernatant. In addition, antimicrobial cyclic dipeptides and small compounds were identified in the antimicrobial metabolites. The results indicate antimicrobial metabolites of the *L. pentosus* MS031 can control foodborne pathogens in fresh-cut product during subsequent cold storage, which is significant for food industry.