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Biodiversity and Screening of Moderately Halophilic Bacteria with Hydrolytic and Antimicrobial Activities from Yuncheng Salt Lake, China

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1 Introduction

Yuncheng Salt Lake is an old lake with a history of more than 5000 years, which locates in the margins of the central plains of China, with an area of about 130 km. It was an important resource of salt for human consumption from early times. Major chemicals in Yuncheng Salt Lake contain NaCl, Na₂SO₄ and MgSO₄ (Gao et al. 2007). In recent years, some halophilic bacteria and archaea were

isolated from Yuncheng Salt Lake, and their genetics and extracellular hydrolytic enzymes were identified (Liu et al. 2009; Li and Yu, 2011; Li et al. 2011). However, biodiversity of this ecosystem has not yet been characterized so far, and thus the potential of producing hydrolytic enzymes or bioactive compounds remains unknown. Therefore, the purpose of this study was to isolate and to investigate the biodiversity of moderately halophilic bacteria from Yuncheng Salt Lake for their

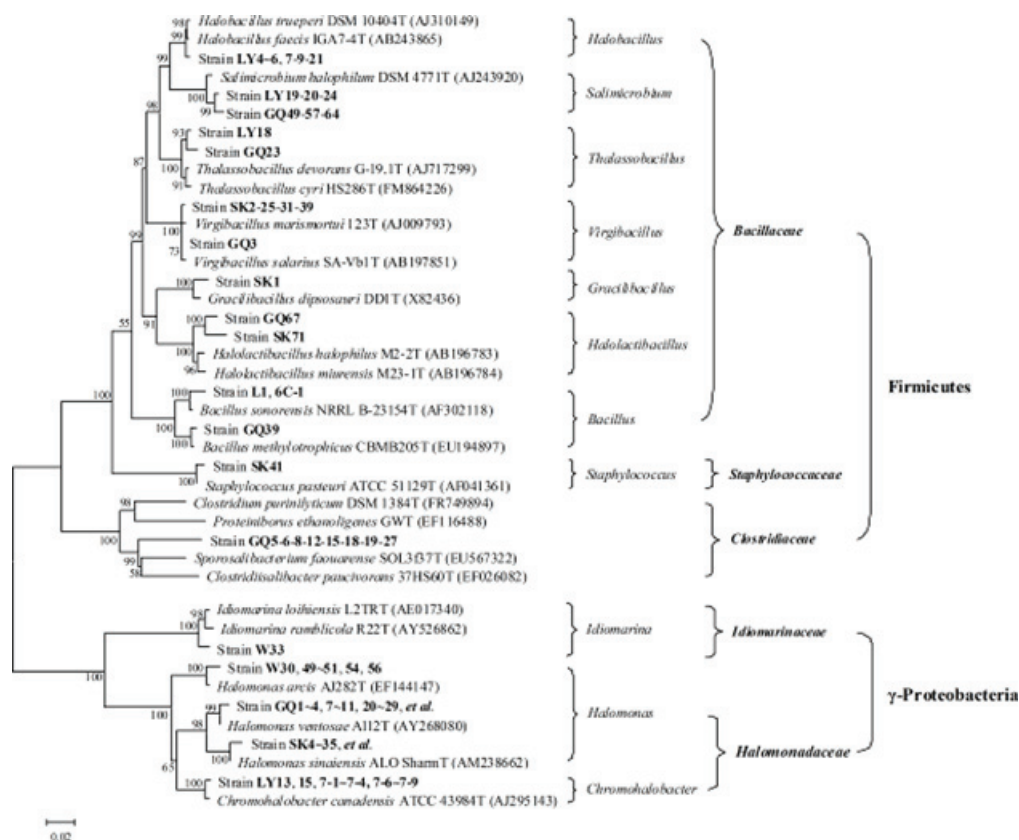


Fig. 1. Phylogenetic tree showing the position of the moderately halophilic isolates, based on the partial 16S rRNA gene sequence comparisons, obtained by the neighbor-joining method.

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phenotypic characteristics and phylogenetic affiliation. In addition, screening of hydrolytic activities and antimicrobial activities among these prokaryotes were also performed.

2 Results

A total of 152 moderately halophilic bacteria were isolated from Yuncheng Salt Lake, China. Phylogenetic analysis based on 16S rRNA gene sequence comparisons revealed that thirty-four strains were related to the phylum *Firmicutes* and belonged to three families, *Bacillaceae*, *Clostridiaceae* and *Staphylococcaceae*. The other strains were identified as members of *Halomonadaceae* and *Idiomarinaceae*, which belonged to the phylum γ -Proteobacteria. Nine novel strains were found, which showed <97% sequence similarity of 16S rRNA gene to other published species (Fig. 1).

These halophilic isolates exhibited various extracellular hydrolytic activities. A total of 74, 15, 70, 18, 23 and 3 strains were found to produce extracellular amylase, protease, lipase, cellulase, pectinase and DNAase, respectively. Most hydrolyses producers were members of the genus *Halomonas*. Combined hydrolytic activities were shown by some strains. Screening of antimicrobial activity indicated that 3, 6, 15, 12, 15 and 16 of halophilic isolates could inhibit *Staphylococcus aureus*, *Escherichia coli*, *Candida albicans*, *Fusarium moniliforme*, *Fusarium semitectum* and *Fusarium oxysporum*, respectively. Results from the present study indicated that the

moderately halophilic bacteria from Yuncheng Salt Lake may be promising sources of novel biocatalysts or bioactive compounds for biotechnological applications.

Key words: Biodiversity, moderately halophilic bacteria, Hydrolyses, antimicrobial activity

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