

Genome Sequence of the Aerobic Bacterium *Bacillus* sp. Strain FJAT-13831

Guohong Liu,^{a,b} Bo Liu,^a Naiquan Lin,^b Weiqi Tang,^c Jianyang Tang,^a and Yingzhi Lin^a

Agricultural Bio-resource Institute, Fujian Academy of Agricultural Sciences, Fuzhou, Fujian, People's Republic of China^a; Biological Control Institute, Fujian Agricultural and Forest University, Fuzhou, Fujian, People's Republic of China^b; and Life Science College, Fujian Agricultural and Forest University, Fuzhou, Fujian, People's Republic of China^c

Bacillus sp. strain FJAT-13831 was isolated from the no. 1 pit soil of Emperor Qin's Terracotta Warriors in Xi'an City, People's Republic of China. The isolate showed a close relationship to the *Bacillus cereus* group. The draft genome sequence of *Bacillus* sp. FJAT-13831 was 4,425,198 bp in size and consisted of 5,567 genes (protein-coding sequences [CDS]) with an average length of 782 bp and a G+C value of 36.36%.

The genus *Bacillus* consists of aerobic, facultatively anaerobic, Gram-positive, spore-forming, or rod-shaped bacteria that are ubiquitous in nature. The species can be found in desert sands (9), hot springs (8), forest soils (2), freshwater (1), marine sediments (5), and an ancient tomb (4). In this paper, *Bacillus* sp. strain FJAT-13831 was isolated from the no. 1 pit soil of Emperor Qin's Terracotta Warriors in the People's Republic of China and incubated on nutrient agar (NA) medium at 30°C under aerobic conditions. Based on the polyphasic taxonomic studies of morphological and physiological tests, 16S rRNA gene and *gyrB* gene sequencing, DNA-DNA relatedness, and fatty acid testing, strain FJAT-13831 was maybe a novel species of the genus *Bacillus*. Therefore, here, we sequenced the genome sequence of FJAT-13831 to confirm whether it was a novel strain of the genus *Bacillus*.

The genome sequence of *Bacillus* sp. FJAT-13831 was determined by a whole-genome shotgun using Illumina Solexa technology with 500-bp and 2,000-bp paired-end sequencing and performed by the Beijing Genomics Institute (BGI; Shenzhen, China). All generated reads were assembled into 88 contigs using SOAPdenovo (7) v1.05.

Open reading frames (ORFs) were predicted using Glimmer 3.02 (3), and rRNA operons were predicted using RNAmmer 1.2 (6). The draft genome sequence of FJAT-13831 consisted of a circular 4,425,198-bp chromosome with a G+C value of 36.36%. The chromosome consisted of 5,567 genes (protein-coding sequences [CDS]) with an average length of 782 bp, and the CDS density was 80.79%.

Prediction of protein-coding genes and assignment of functions were done using the NCBI-NR, COG, and Swiss-Prot databases. The 5,333 CDS annotated can be classified into 2,863 COG categories by NR, and 2,969 CDS can be classified by Swiss-Prot. A total of 66.54% (3,549) of the ORFs were annotatable as known proteins in NR.

Nucleotide sequence accession numbers. This whole-genome shotgun project for *Bacillus* sp. FJAT-13831 has been deposited at DDBJ/EMBL/GenBank under the accession number AKCS00000000. The version described in this paper is the first version, AKCS01000000.

ACKNOWLEDGMENTS

This work was supported by the Agricultural Bio-resource Institute, Fujian Academy of Agricultural Sciences, People's Republic of China. The work was financed by the 948 project (2011-G25) from the Chinese Ministry of Agriculture as well as earlier by the 973 program research project (2011CB111607), the project of agriculture science and technology achievement transformation (2010GB2C400220), and the international cooperation project (2012DFA31120) from the Chinese Ministry of Science and Technology.

REFERENCES

- 1. Baik KS, et al. 2010. *Bacillus rigui* sp. nov., isolated from wetland fresh water. Int. J. Syst. Evol. Microbiol. **60**:2204–2209.
- Chen YG, et al. 2011. Bacillus hunanensis sp. nov., a slightly halophilic bacterium isolated from non-saline forest soil. Antonie Van Leeuwenhoek 99(3):481–488.
- Delcher AL, Bratke KA, Powers EC, Salzberg SL. 2007. Identifying bacterial genes and endosymbiont DNA with Glimmer. Bioinformatics. 23: 673–679.
- Gatson JW, et al. 2006. Bacillus tequilensis sp. nov., isolated from a 2000year-old Mexican shaft-tomb, is closely related to Bacillus subtilis. Int. J. Syst. Evol. Microbiol. 56:1475–1484.
- Jung MY, et al. 2011. Bacillus manliponensis sp. nov., a new member of the Bacillus cereus group isolated from foreshore tidal flat sediment. J. Microbiol. 49(6):1027–1032.
- Lagesen K, et al. 2007. RNAmmer: consistent and rapid annotation of ribosomal RNA genes. Nucleic Acids Res. 35:3100–3108.
- 7. Li R, et al. 2010. De novo assembly of human genomes with massively parallel short read sequencing. Genome Res. 20:265–272.
- 8. Nazina TN, et al. 2004. *Geobacillus gargensis* sp. nov., a novel thermophile from a hot spring, and the reclassification of *Bacillus vulcani* as *Geobacillus vulcani* comb. nov. Int. J. Syst. Evol. Microbiol. 54:2019–2024.
- Zhang L, Wu GL, Wang Y, Dai J, Fang CX. 2011. Bacillus deserti sp. nov., a novel bacterium isolated from the desert of Xinjiang, China. Antonie Van Leeuwenhoek. 99(2):221–229.

Received 23 July 2012 Accepted 24 September 2012 Address correspondence to Bo Liu, liubofaas@163.com. Copyright © 2012, American Society for Microbiology. All Rights Reserved. doi:10.1128/JB.01072-12