Genome Announcements

Draft genome sequence of Paraburkholderia tropica Ppe8 strain, a sugarcane endophytic diazotrophic bacterium

Paula Renata Alves da Silva a, Jean Luiz Simões-Araújo a, Márcia Soares Vidal a, Leonardo Magalhães Cruz b, Emanuel Maltempi de Souza b, José Ivo Baldani a,a

a Embrapa Agrobiologia, Seropédica, RJ, Brazil
b Universidade Federal do Paraná – UFPR, Curitiba, PR, Brazil

Article history:
Received 24 March 2017
Accepted 26 July 2017
Available online 18 October 2017
Associate Editor: Jerri Zilli

Keywords:
Diazotrophic
Next generation sequencing
Nitrogen-fixing
Secretion system

ABSTRACT

Paraburkholderia tropica (syn Burkholderia tropica) are nitrogen-fixing bacteria commonly found in sugarcane. The Paraburkholderia tropica strain Ppe8 is part of the sugarcane inoculant consortium that has a beneficial effect on yield. Here, we report a draft genome sequence of this strain elucidating the mechanisms involved in its interaction mainly with Poaceae. A genome size of approximately 8.75 Mb containing 7844 protein coding genes distributed in 526 subsystems was de novo assembled with ABySS and annotated by RAST. Genes related to the nitrogen fixation process, the secretion systems (I, II, III, IV, and VI), and related to a variety of metabolic traits, such as metabolism of carbohydrates, amino acids, vitamins, and proteins, were detected, suggesting a broad metabolic capacity and possible adaptation to plant association.

© 2017 Sociedade Brasileira de Microbiologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Genome announcement

The genus Burkholderia contains 96 species and was recently divided due to the creation of a new genus named Paraburkholderia.1,2 This new genus is composed of 46 species isolated mainly from rhizosphere soil and plant tissues1,2 and includes the older nitrogen-fixing species, B. tropica, B. unamæ, and B. silvatlantica, which are all associated with non-legume plants.3–5

Paraburkholderia tropica (basonym: Burkholderia tropica) was first isolated from the sugarcane stem. In addition to nitrogen fixation, it is capable of promoting plant growth and acts as a biological control agent. P. tropica strain Ppe8 is part of the sugarcane consortium inoculant, developed by The Brazilian Agricultural Research Corporation (Embrapa), which promotes sugarcane yield increments in the field.6–9 Due to its agronomical importance and biotechnological potential, the genome of P. tropica strain Ppe8 was sequenced to identify genes potentially associated with these beneficial characteristics.

The P. tropica strain Ppe8 (BR11366) was provided by the Johanna Döbereiner Biological Resource Center (CRB-JD) at Embrapa Agrobiologia. Genomic DNA was prepared from an
overnight (18 h) culture of P. tropica Ppe8 grown in JM1 liquid medium using the Wizard® Genomic DNA Purification Kit (Promega, USA). The genome sequence of Ppe8 was performed by Macrogen Company (South Korea) using the 100 bp paired-end library in Illumina MiSeq platform. It generated 1,845,481,494 bases (1.8 Gb) of sequence data with an average genome coverage of 208X. The reads were trimmed using FASTX-Toolkit (http://hannonlab.cshl.edu/fastx_toolkit) and only bases with a quality above 20 (Q20) were used to assemble the genome. The ABySS software version 1.9.10 was used for de novo assembly and contigs shorter than 200 bp were eliminated. Annotation and identification of metabolic pathways for the draft genome was performed using the RAST version 2.0 server.  

The genome has approximately 8.75 Mb and contains 7844 Coding DNA Sequences (CDSs) distributed across 526 subsystems (functional metabolic pathway or cellular structure of a set of homologous genes in different genomes), G+C content of 64.7 (%) and 78 RNAs, including rRNAs, tRNAs and ncRNA. The most abundant subsystem was “amino acids and derivative” (789 genes), followed by “carbohydrates” (764 genes), “cofactors, vitamins, prosthetic groups, and pigments” (409 genes), “fatty acids, lipids, and isoprenoids” (334 genes), and “metabolism of proteins” (314 genes). The regulation of nitrogen metabolism is quite diverse with 56 genes involved in several processes, such as, allantoin utilization (6), nitrosative stress (3), amidase clustered with ura and nitrile hydratase functions (2), nitrate and nitrite ammonification (21), ammonia assimilation (18), nitrilase (2), and denitrification (4). In addition, the structural organization of 20 genes related to nitrogen fixation (nif genes) was very similar to other nitrogen-fixing Paraburkholderia species, such as P. kuriensis. Furthermore, 264 genes related to membrane transport, including different secretion systems such as type I (hlyD and tolC genes), II (ORFs _638_, _4162 and others genes), III (epaP, epaO, hrpB2, sctV, sctS, sctL, sctU, sctC, sctD, and others), IV (virF), and VI (lip2 and hsiJ2 genes), which are involved in fiber secretion system, type IV pilus, and conjugative transfer, were identified. ABC transporters, cation transporters, and uni-, sym-, and anti-protons systems were also detected, suggesting that the bacteria have a broad capacity to transport different molecules.

The assembled contigs were deposited in the DDBJ/ENA/GenBank and published with the accession number M5D20000000000.1; BioSample: SAMN06166932. The version described in this paper is the first version of the genome sequence deposited.

Conflicts of interest

The authors declare no conflict of interest.

Acknowledgments

This work was partially funded by the projects CNPq/INCT-FBN (no. 573828/2008-3), CNPq–Universal (no. 476254/2013-2), FAPERJ–CNE (no. E26/102.312/2013), and Embrapa (no. 02.13.08.006.00.03.001). Paula Renata Alves da Silva was supported by fellowship from CAPES/EMBRAPA while Jean Luiz Simões-Araújo (no. 309170/2013-3) and José Ivo Baldani (no. 304750/2013) received fellowships from CNPq.

REFERENCES


