Genome Announcements

Draft genome sequences of five Pseudomonas syringae pv. actinidifoliorum strains isolated in France

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Abstract

Pseudomonas syringae pv. actinidifoliorum causes necrotic spots on the leaves of Actinidia delicosa and Actinidia chinensis. P. syringae pv. actinidifoliorum has been detected in New Zealand, Australia, France and Spain. Four lineages were previously identified within the P. syringae pv. actinidifoliorum species group. Here, we report the draft genome sequences of five strains of P. syringae pv. actinidifoliorum representative of lineages 1, 2 and 4, isolated in France. The whole genomes of strains isolated in New Zealand, representative of P. syringae pv. actinidifoliorum lineages 1 and 3, were previously sequenced. The availability of supplementary P. syringae pv. actinidifoliorum genome sequences will be useful for developing molecular tools for pathogen detection and for performing comparative genomic analyses to study the relationship between P. syringae pv. actinidifoliorum and other kiwifruit pathogens, such as P. syringae pv. actinidiae.

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Introduction

The Pseudomonas syringae species group comprises plant-pathogenic bacteria with a vast host range. The multiple strains of this species cause diseases on more than 180 plant species.1 P. syringae is divided into 8 genomospecies2,3 and 13 phylogroups.4 P. syringae is further divided into more than 50 pathovars, according to the disease that the strain causes on plants. Two pathovars have been described for kiwifruit: P. syringae pv. actinidiae,5 which causes bacterial canker on kiwifruit, and P. syringae pv. actinidifoliorum6–8), which causes bacterial spots on kiwifruit. Both P. syringae pv. actinidiae and P. syringae pv. actinidifoliorum are classified into phylogroup 1 and genomospecies 3. Phylogenetic analysis conducted by MLSA has classified P. syringae pv. actinidifoliorum strains isolated in Australia, New Zealand and France into four different lineages.7 Strain genomes belonging to lineages 1 and 3...
of P. syringae pv. actinidifoliorum (CFBP 7812 and CFBP 7951, respectively), isolated in New Zealand, were sequenced.\textsuperscript{3,10} Here, we briefly describe the genome sequencing of five P. syringae pv. actinidifoliorum strains representing three different lineages, lineage 1 (CFBP8161 and CFBP1810), lineage 2 (CFBP8043) and lineage 4 (CFBP8039 and CFBP1610), to provide genome sequences for at least one strain of each MLVA lineage described to date.

DNA Libraries were constructed from extracted DNA using the Nextera XT DNA Sample Preparation Kit with average insert sizes of 1200bp. The sequencing was performed on an Illumina Hi-Seq 2500 platform (Genoscreen, Lille, France) using a TruSeq Rapid SBS kit and a TrueSeq Rapid paired-end cluster kit v3. The assembly statistics for each genome are reported in Table 1. Reads were assembled in contigs using SOAPdenovo 1.05\textsuperscript{13} and Velvet.\textsuperscript{12} Annotation was performed using EuGene-P (v0.3).\textsuperscript{13} The number of features for each genome are reported in Table 1. Analysis of the five genomes showed that an intact plage was present in the lineage 1 strains only. In all five genomes, in silico analysis confirmed the presence of only one Type III secretion system (hop1 type). All specific effector genes (hopO1, hopT1, hopS1, hopAB3, hopF1, hopE1, hopAF1-2) of P. syringae pv. actinidifoliorum that were previously reported by McCann et al.\textsuperscript{10} were present in all 5 genome sequences. No ICE (Integrative and Conjugative Element) was identified in the genome sequences of P. syringae pv. actinidifoliorum, unlike in P. syringae pv. actinidiae.\textsuperscript{3,10,14} Regarding nucleotide sequence accession numbers, the genome sequences have been deposited at GenBank under the accession numbers listed in Table 1.

**Table 1 – Genome characteristics.**

<table>
<thead>
<tr>
<th>Strain code</th>
<th>Lineage</th>
<th>Accession no.</th>
<th>Genome size (Mb)</th>
<th>No. of contigs</th>
<th>N50 (bp)</th>
<th>No. of protein coding genes</th>
<th>G+C content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFBP8161</td>
<td>1</td>
<td>LJFJ0.000000000</td>
<td>6.24</td>
<td>206</td>
<td>111,837</td>
<td>5775</td>
<td>58.72</td>
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<tr>
<td>CFBP8180</td>
<td>1</td>
<td>LJFN0.000000000</td>
<td>6.26</td>
<td>256</td>
<td>98,002</td>
<td>5833</td>
<td>58.69</td>
</tr>
<tr>
<td>CFBP8043</td>
<td>2</td>
<td>LJFM0.000000000</td>
<td>6.05</td>
<td>176</td>
<td>132,698</td>
<td>5630</td>
<td>58.80</td>
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<tr>
<td>CFBP8039</td>
<td>4</td>
<td>LJMO0.000000000</td>
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<td>116,909</td>
<td>5700</td>
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<tr>
<td>CFBP1610</td>
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<td>LJLI0.000000000</td>
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<td>113,613</td>
<td>5679</td>
<td>58.76</td>
</tr>
</tbody>
</table>

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