

Recombinant form of Sinorhizobium phage AP16 isolated from mountain region of Caucasus

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Bacteriophages (Bph) are widespread in soils and are characterized by a high diversity. In the case of agriculturally valuable rhizobia species, only a small number of Bph were sequenced. The Bph AP16 was isolated from soil sample from Caucasus according to Barnet method. It's lytic activity tested on 50 *Sinorhizobium meliloti* isolates native to the same region revealed that a third part of strains was lysed. Pure phage culture was obtained by phage lysate passaging on *S. meliloti* L5-30 by Adams method. Bph DNA was isolated by GeneJet Viral DNA and RNA Purification kit (Thermo Fisher Scientific, USA). The AP16 genome was sequenced by NGS methods (MiSeq, Illumina), assembled (SPAdes, Flye, Racon and Medaka modules, Pilon), annotated by Prokka. The AP16 was characterized as dsDNA phage from *Siphoviridae* family which genome was 61.0 kb and the GC content was 59.22%. Genome of the AP16 encoded all typical virion elements portal complex according to PHASTER. Portal protein 26 (P26) of 430 aa was homologues of P26 (pdb4ZJN) of thermostable Bph G20C of *Thermus thermophilus*. The amino acid sequences analysis revealed ORF homologous to *Escherichia* phage ECD7 and 16 ORFs homologous to different *Caudovirales* phages. Besides those there are 15 ORFs homologous to bacteria from *Rhizobiaceae* family. Sequences homologous to the AP16 were searched in genomes of 12 *S. meliloti* isolates from the lab collection. One intact prophage phiK7-6 with a size of 40.2 kb harbored 3304 bp homologous to the AP16 was identified in the strain K7-6 (Identity = 85.65%, Cover = 12%, Evalue = 0.0). The phiK7-6 contained 43 ORFs encoding integrase, head, capsid and portal protein. Thus, intact prophage homologous to recombinant Bph AP16 harboring bacterial genes and sequences related to several phage families were revealed. This data strongly evident the significant role of phages in horizontal gene transfer within rhizobia population. This work was financially supported by RSF 20-16-00105.

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