

Prophages and phage related sequences in chromosomes of *Sinorhizobium meliloti* isolates native to Aral Sea region

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The abundance of phage related sequences (PRS) was evaluated in *Sinorhizobium meliloti* agriculturally valuable nitrogen fixing symbionts of alfalfa. Sequences related to prophages (pPhs) and genomic islands (GIs) were searched by PHASTER and Islander algorithm, correspondingly. Strains were originally recovered from nodules of wild growing plants from the genus *Medicago* native to Aral Sea region (ICA2-CT-2000-10001). Genomes of AK170 and AK555 were sequenced by NGS and NNGS and assembled by using Unicycler. Sequences data of AK21 and AK83 are from GenBank. In total, the 19 PRS with the length varied from 8.0 to 53.0 kb were detected on chromosomes of the 4 strains. The 5 pPhs and 6 GIs site-specifically integrated in tRNA genes and 8 Phs were revealed. The phylogenetic analysis (Mafft UPGMA) done for PRS revealed two clusters. The cluster-I united sequences the 7 pPhs and the 4 of them were intact and native to *Sinorhizobium* and *Loktanella*. The cluster-II united the 4 groups of PRS sequences: i) GIs and sequence related to incomplete pPh from *Siphoviridae* family identified in distinct strains; ii) GI and pPhs sequences homologues to *Ackermannviridae* and *Ackermannviridae* phage families; iii) homologous sequence related to intact *Myoviridae* phage; iv) GIs and pPhs sequences homologues to phages from *Myoviridae* family. Sequences indentified in GIs were clustered as with each other as with pPhs related to *Ackermannviridae*, *Ackermannviridae* and *Myoviridae*. Function analysis of ORFs (BLASTn, BLASTp) of PRS showed that they are encoding hypothetical proteins and enzyme involved presumably in methylation processes. Thus, sequences of phylogenetically distant phages are abundant in genomes of *S. meliloti* strains. That fact is strongly evident at an important role of PRS in horizontal gene transfer that sharped rhizobia genome evolution. The work was supported by RSF 20-16-00105.

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