

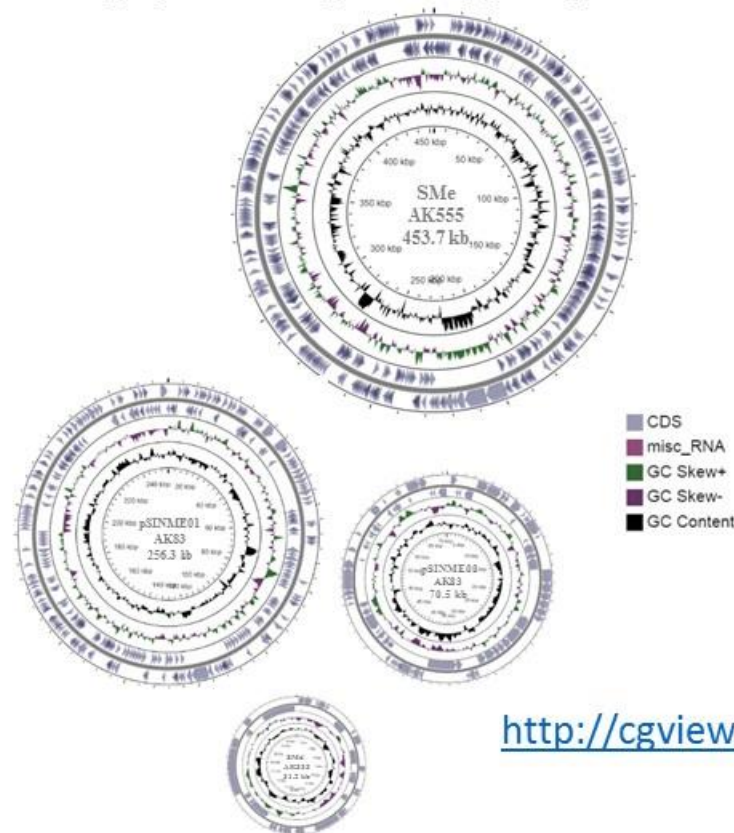
Cryptic Plasmids of Alfalfa Root Nodule Bacteria – Structural and Functional Diversity

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The aim of this work was the comparative analysis of cryptic plasmids which were obtained as a result of genome-wide sequencing of symbiotically active strains *Sinorhizobium meliloti* AK555 (this work) and AK83 (data from GenBank) both were recovered from nodules of alfalfa plants adapted to salinized area of the Aral Sea region

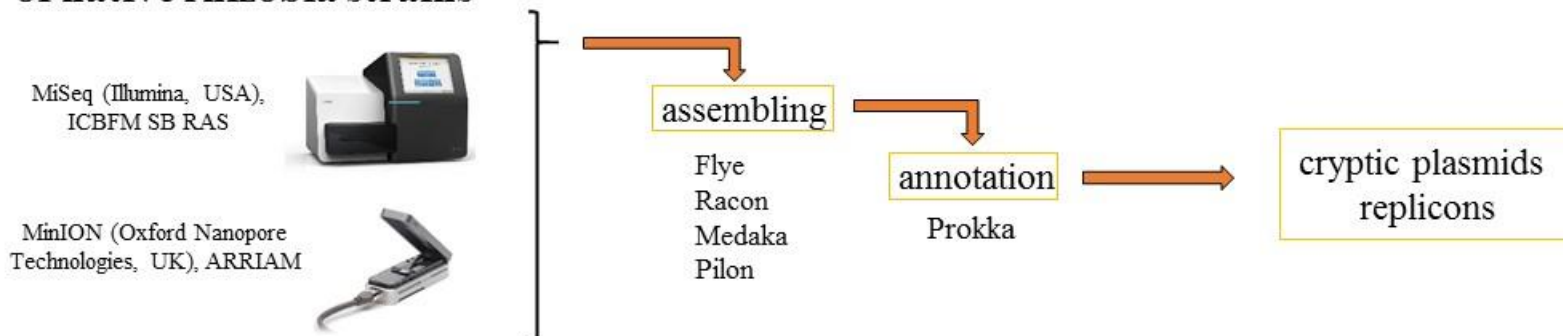


physical maps of cryptic plasmids

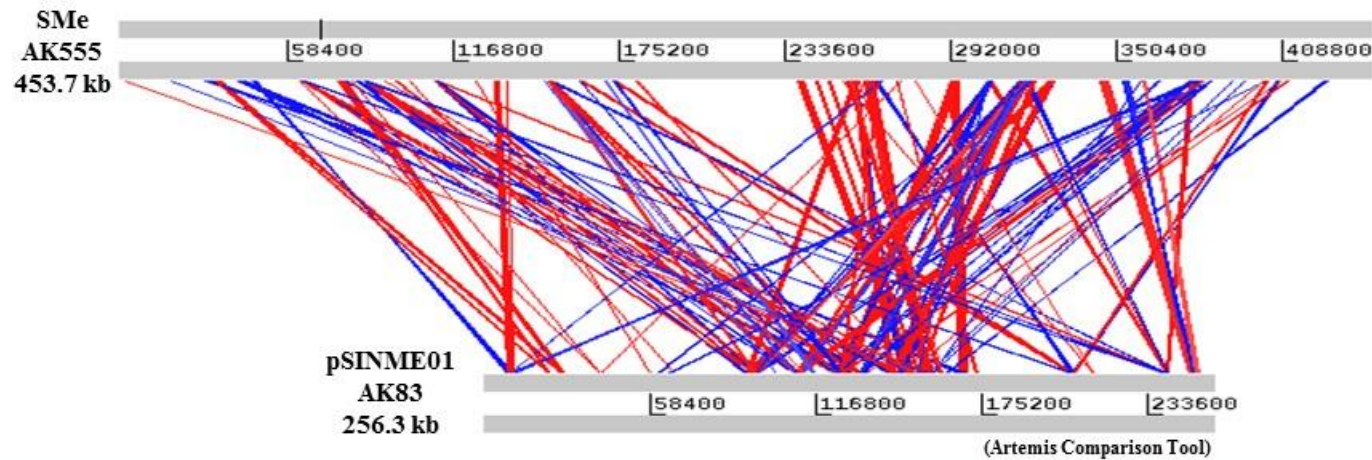


<http://cgview.ca/>

scheme of the analysis of cryptic plasmids of native rhizobia strains



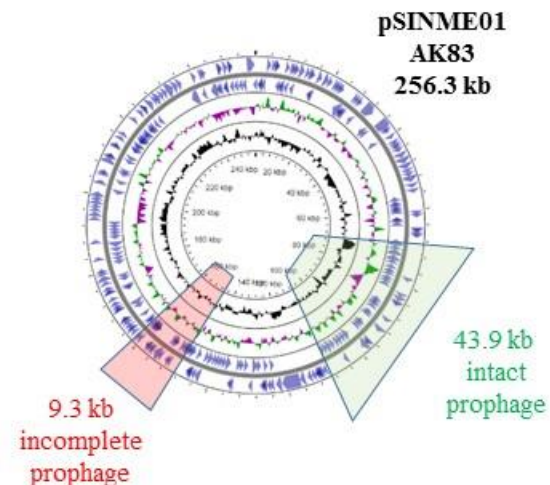
The analysis of nucleotide sequences of cryptic plasmids of *Sinorhizobium meliloti*



The sequence analysis of cryptic plasmids revealed that no homology between two plasmids SMe and pSINME01 of the both strains (see picture above) was revealed, while between SMD of the AK555 and pSINME02 of the AK83 was found 92% of homology

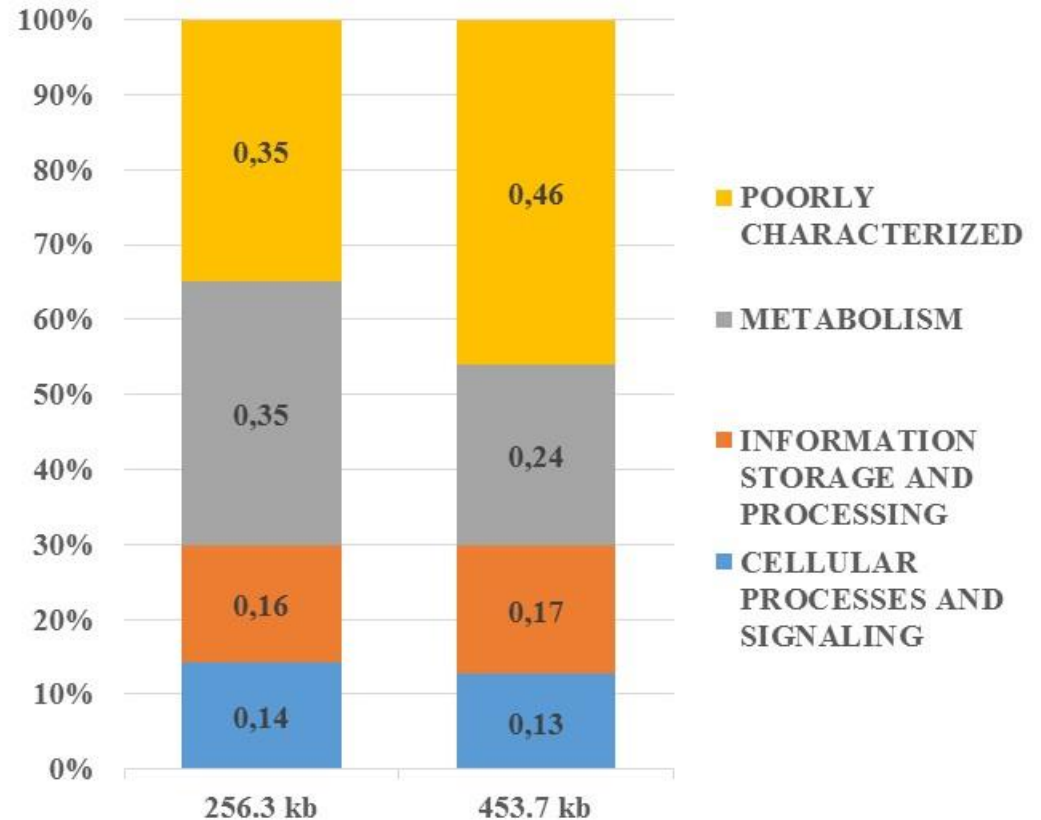
Prophage sequences of different length were detected on plasmids SMe and SINME01 by using PHASTER (<https://phaster.ca/>). The figure on the right shows those regions of the plasmid pSINME01, one of which (43.9 kb) was characterized as intact prophage, and another one (9.3 kb) as incomplete prophage.

The analysis of protein-encoding sequences (ORFs) of phages revealed that some of them were homologues to sequences of phages from *Siphoviridae*, *Myoviridae* and *Podoviridae* families.



The analysis of ORFs of cryptic plasmids of *Sinorhizobium meliloti*

More than a half of ORFs of each examined replicons were characterized by COGs. In the result, all ORFs were allocated into 4 functional groups: cellular processes and signaling, information storage and processing, metabolism and poorly characterized. ORFs related to metabolism were detected on SMe, pSINME02, pSINME01, but that was not a case for the SMD. The figure shows the occurrence of functional groups of COGs on the two cryptic plasmids of the two genetically unrelated *S. meliloti* strains.



Summarizing: cryptic plasmids of *S. meliloti* are enriched with ORFs related to vital metabolic processes and harbored phage related sequences. Homologous sequences revealed between some cryptic plasmids of genetically unrelated strains evident that these plasmids are participating in horizontal gene transfer. Thus nonsymbiotic plasmids of *S. meliloti* are essential elements for rhizobia fitness

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