Studies on Isolation of Salt-Tolerant Nodulating Bacteria and Improvement of Salt-Tolerance in Host Plant

Akira Yokota

Institute of Molecular and Cellular Biosciences, The University of Tokyo

Summary

Bacteria which form nodules on legume plants belong to the alphaproteobacteria, but some species of genera Ralstonia and Burkholderia belonging to betaproteobacteria are also known. Historically, the rhizobia isolated from genus Lotus was named as Mesorhizobium loti. During the course of isolation of salt-resistant, nodulating bacteria from the root nodules of Lotus japonicus which are grown on seaside area in Chiba Prefecture, we isolated salt-resistant symbiotic rhizobium strains designated as YSUR, TKR and SRHM, and two salt-resistant, non-rhizobial symbiotic strains designated as Ka9123 and Y103A. Based on phenotypic and genotypic studies, the former three strains were found to belong to the genus Mesorhizobium, but the latter two strains were to belong to genus Aminobacter. These strains are able to nodulate both with L. japonicus and Lotus corniculatus.

Nodulation test, sequencings of 16S rRNA gene, recA, nifH and nodA genes were determined. After infection test, strains were re-isolated from the nodules and re-identified based on 16S rRNA gene and nifH gene sequences, physiological and chemotaxonomic characteristics.

According to 16S rRNA gene sequence analyses, strains YSUR, TKR and SRHM were found to fall within the genus Mesorhizobium, but strains Ka9123 and Y103A shows high similarity (99.9%) with the species of genus Aminobacter. Strains YSUR and TKR was considered to be a new species of the genus Mesorhizobium, and the strain SRHM was also belong to another new species of the genus Mesorhizobium. DNA-DNA hybridization study indicate that strains Ka9123 and Y103A showed low level of DNA-DNA relatedness to three Aminobacter species (A. aganoensis, A. niigataensis, and A. ciceronei). The isolates could be distinguished from Aminobacter species based on cellular fatty acid profile and phenotypic characteristics. Therefore, these two strains would be a novel species of the genus Aminobacter, for which Aminobacter nodulans sp. nov. is proposed. The positive result for nodulation test, sequencings of nod and nifH genes strongly suggest that these genes could be transferred in the rhizosphere from Mesorhizobium species to these salt-resistant strains.