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Enhancement of nodulation by some arid climate strains of Rhizobium leguminosarum biovar trifolii using protoplast fusion

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Abstract
Fourteen randomly clover indigenous nodulated Rhizobium strains were isolated from different locations in Saudi Arabia. They were identified as different strains of the genus Rhizobium leguminosarum biovar trifolii and characterized for their intrinsic antibiotic resistance against a range of antibiotics, nodulation capability and plasmid profiles. Results revealed the presence of high molecular weight plasmids (megaplasmids) in all the selected strains. Based on the ability for nodulation production, two weak strains (RtI1 and RtI2) and one efficient strain (RtA1) were selected for protoplast fusion and the numbers of nodules produced by the intra-specific protoplast fusion strains were investigated. Results clearly confirmed the effective role of the protoplast fusion in enhancing both nodulation production capacity of Rhizobium species and their range of antibiotic resistance. Protoplast fusion of the local Rhizobium species resulted in 1.93- to 5.67-fold increase in nodulation number compared to their parental strains, which was considered an excellent result concerning agricultural practices, especially the formation of nitrogen-fixing root nodules on legume crop plants. Protoplast fusion also produced fusants with a wide range of antibiotic resistance, another advantage added to the new strains against environmental stresses. In conclusion, protoplast fusion proved its efficiency as a tool for constructing a second generation of Rhizobia with much better characteristics for efficient applications in arid land. © 2008 Springer Science+Business Media B.V.

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Antibiotic resistance; Clover; Curing; Genes; Nodulation; Plasmids; Protoplast fusion; Rhizobium; Root nodulating bacteria

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