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ANTHYLLIS RHIZOBIA INTERACTION IN SOILS HAVING DIFFERENT LEVELS OF HEAVY METALS

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Phytostabilization of mine-soils enriched with heavy metals needs efficient biological nitrogen fixation to restore ecological processes and ecosystem. To understand how legume symbionts are affected by human-driven disturbances related to mine activities, we evaluated the distribution of rhizobia populations along a heavy metal gradient. We focused on the nitrogen-fixing rhizobia (Mesorhizobium sp.) associated to Anthyllis vulneraria previously identified as a highly adapted symbiotic system growing at one French mine. The ability of strains to tolerate heavy metals was tested phenotypically and characterized genetically using a metal-tolerance marker. The rhizobial genetic structure was analyzed using taxonomic and symbiotic markers. Mine soils contained the majority of metal-tolerant isolates that mainly belonged to the species Mesorhizobium metallidurans whose presence was strictly related to heavily contaminated soils. By contrast, unpolluted soils were dominated by metal-sensitive isolates belonging to several new Mesorhizobium species, whereas mine-border soils contained both the metal-tolerant and sensitive isolates. The symbiotic phylogeny revealed a distribution of Anthyllis rhizobia that clustered into two symbiovars (one related to Anthyllis and the other to Lotus) and that shared similar geographic distributions of Anthyllis and Lotus plants respectively. The Anthyllis/rhizobia symbiotic pattern was independent from those of metal tolerance and rhizobial speciation. In conclusion, each site shows a specific signature of Anthyllis-nodulating rhizobiaassemblages revealing different Anthyllis/rhizobia interactions in the soil. This work indicates that A. vulneraria can be nodulated by several rhizobial species and symbiovars according to their geographic location suggesting the extension of the symbiotic relationship of Anthyllis rhizobia to another legume Lotus that could be an interesting materiel in phytostabilization strategies.