Isolation and Characterization of Plant Growth Promoting Bacteria From Olive Tree Cultivated Under Desert Farming in Saudi Arabia

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Global warming and the rapidly growing world population are among the most serious issues that threaten global food security. A new approach to support plant productivity is through exploiting beneficial microorganisms associated with plants. These support essential physiological functions, in particular, the ability to induce tolerance to stresses. Thus, plants growing in the dry soils of Saudi Arabia can represent a valuable source for new microbial biofertilizers and biopromoters. In this work, a novel potential plant growth-promoting (PGP) bacteria associated with the root system of olive trees Olea europea L., were characterized. They were cultivated under desert farming in the Al-Jouf region of Saudi Arabia. In the laboratory, rhizospheric and endophytic bacteria were isolated and purified. A subgroup of the bacterial strains were chosen for further characterization in vitro by simulating different types of stress and PGP activities via different growth medium (3 technical replicates per medium). Wheat plants with the inoculated bacterial strains were experimentally exposed to a prolonged drought of 7 days with 45 plants per bacterial strain. The bacteria showed multiple PGP traits, including the production of exopolysaccharides and auxin capable of increasing soil water retention and promoting root growth, respectively. Such PGP traits resulted also in the protection of wheat plants. A bacterium was found that promoted plant fresh biomass by 68% and dry biomass by 94%. These results confirmed that plants cultivated in arid ecosystems may represent an important reservoir of nature-based solutions for developing sustainable desert farming in Saudi Arabia and arid countries.

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Second Award of $2,000