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Co-synergism of Rhizospheric and Endophytic Bacteria Influence the Plants Growth Promoting Desired Characteristics in Soybean

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[Introduction]

In today's modern era, the methods for a robust increase in agriculture productivity required to be re-examined, because some of the existing conventional approaches have a negative impact on our natural environment. Therefore, the quest for an urgent and handy alternatives are in the queue. Recently, the use of plant growth promoting bacteria (PGPB) for the improvement of plant-growth and sustainable crop production proved to be an attractive and widely accepted practice in intensive agriculture all over the world. Thus, in the present research, we investigated the role of plant growth-promoting-bacteria (rhizospheric and endophytic) on the growth characteristics of soybean. Additionally, the fluctuations in levels of endogenous phytohormones in response to plant-growth-promoting bacterial inoculation were also evaluated.

[Materials and methods]

We isolated and identified endophytic and rhizospheric bacteria from *Artemisia princeps* Pamp.; *Chenopodium ficifolium* Smith.; *Oenothera biennis* L. and *Echinochloa crus-galli* (L.) Beauv) inhabiting sand dunes at Pohang beach, Korea. The isolates were successively evaluated for producing indol-3-acetic acid (IAA), siderophores, phosphate solubilization, organic acid production, bioactive and inactive gibberellins.

[Results and discussion]

A total of 126 rhizospheric and 58 endophytic bacteria were screened. The rhizospheric bacteria *A. woluwensis* produce highest amount ($4.7\pm0.7\mu gmL^{-1}$) of IAA. Similarly, endophytic strains *M. oxydans*, *A. aurescens*, and *Enterobacter* sp. produced IAA ranged from (2.3 ± 0.06-$2.7\pm0.7\mu g\ mL^{-1}$). Furthermore, both active and non-active GA's were detected in the culture filtrates of these isolates range from 0.023-12.32ng/mL and previous several PGPB were reported that produce IAA and different bioactive and un-active Gas and enhance crops growth and productivity. The CF of selected bacteria also revealed the presence of different organic acids. In growth promotion potential, the bacterial inoculation significantly increased the growth attributes of both Waito-C and Dongjin rice. Similarly, a significant increase was observed in the endogenous phytohormones levels of soybean which enhanced the growth and biomass of the test plants. Previous report showed bacterial treatments promoted the crops growth. On the other hand, host endogenous jasmonic acid level was significantly reduced in soybean plants. This study demonstrates that plant growth-promotion activity of the strains can offer an important contribution to increasing environmental sustainability in agriculture.

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