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Crop Genotype and Inoculum Density Influences Plant Growth and Endophytic Colonization Potential of Plant Growth-Promoting Bacterium Burkholderia phytofirmans PsJN

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Abstract : Most bacterial endophytes originate from the soil and enter plants via the roots followed by further spread through the inner tissues. The mechanisms allowing bacteria to colonize plants endophytically are still poorly understood for most bacterial and plant species. Specific bacterial functions are required for plant colonization, but also the plant itself is a determining factor as bacterial ability to establish endophytic populations is very often dependent on the plant genotype (cultivar) and inoculums density. The effect of inoculum density (107, 108, 109 CFU mL-1) of Burkholderia phytofirmans strain PsJN was evaluated on growth and endophytic colonization of different maize and potato cultivars under axenic and natural soil conditions. PsJN inoculation significantly increased maize seedling growth and tuber yield of potato at all inoculum density compared to uninoculated control. Under axenic condition, PsJN inoculation (108 CFU mL-1) significantly improved the germination, root/shoot length and biomass up to 62, 115, 98 and 135% of maize seedling compared to uninoculated control. In case of potato, PsJN inoculation (109 CFU mL-1) showed maximum response and significantly increased root/shoot biomass and tuber yield under natural soil condition. We confirmed that PsJN is able to colonize the rhizosphere, roots and shoots of maize and potato cultivars. The endophytic colonization increased linearly with increasing inoculum density (within a range of 8 x 104 – 3 x 107 CFU mL-1) and were highest for maize (Morignon) and potato (Romina) as compared to other cultivars. Efficient colonization of cv. Morignon and Romina by strain PsJN indicates the specific cultivar colonizing capacity of the bacteria. The findings of the study indicate the non-significant relationship between colonization and plant growth promotion in maize under axenic conditions. However, the inoculum level (109 CFU mL-1) that promoted colonization of rhizosphere and plant interior (endophytic) also best promoted growth and tuber yield of potato under natural soil conditions.

Keywords : crop genotype, inoculum density, Burkholderia phytofirmans PsJN, colonization, growth, potato
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