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In vitro efficiency of solubilizing of different types of phosphate by bacteria isolated from a paddy grown Alfisol in the dry zone of Sri Lanka

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Abstract

This study evaluated the *in vitro* efficiency of solubilizing different types of phosphate by bacteria isolated from the rhizosphere of rice at harvesting stage and cultivated in an Alfisol in Maha Illuppallama, dry zone of Sri Lanka. Soil suspensions were initially plated on Pikovskaya's (PVK) medium to screen phosphorous solubilizing bacteria (PSB). Thirty-two morphologically different bacterial colonies developed on PVK medium were inoculated to PVK, National Botanical Research Institute's phosphate (NBRIP-$Ca_3(PO_4)_2$) growth medium and Soy Lecithin media to quantify their phosphate solubilizing indices (SI). Among the 32 isolates, 10, 16 and 9 developed halos on PVK, NBRIP-$Ca_3(PO_4)_2$ and Soy Lecithin media, respectively. The SI values of the 10 isolates on PVK medium ranged from 2.37-4.14 and it ranged from 0.05-3.35 on NBRIP medium for the 16 isolates. SI values of the 9 isolates on Soy Lecithin medium ranged between 7.97-21. All the isolates that solubilized soy lecithin produced clear zones on PVK and NBRIP-$Ca_3(PO_4)_2$ media, indicating the broad-spectrum ability of those isolates to solubilize both inorganic and organic phosphorous. Cultures of LL, JJ, P, Y, A, M, U, X, D, L, O and N solubilized Eppawala rock phosphate (ERP) by increasing the phosphorous concentration in the growth medium from 0.19 to 0.33 mg/L compared to 0.01 mg/L in un-inoculated control. The isolate M, O, N, U, Y, X, A solubilized both organic and inorganic phosphorous forms including ERP. Compatibility of potential phosphorous solubilizers was tested to select candidates to be used in a consortium. Results of the incompatibility test revealed that the isolate A and LL and I are incompatible as well as the isolate M and X. Findings of the present study demonstrated the possibility of combining a large number of bacterial isolates for solubilizing organic and inorganic phosphorous and ERP. Isolate X and A can be excluded from the group of potential candidates as they showed incompatibility at in vitro with the isolates M and LL, respectively which are high performers in solubilizing organic, inorganic phosphorus and ERP. Therefore, isolates LL, M, N, O, U and Y could be included to form a consortium.

Keywords: Bacterial consortia, ERP, Organic phosphorus, PSB, Phosphate solubilizing index

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