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Solubilization of Purulia Rock Phosphate Through Organic Acid Loaded Nanoclay Polymer Composite and Phosphate Solubilizing Bacteria and its Effectiveness as P-fertilizer to Wheat

Trisha Roy, D.R. Biswas*, S.C. Datta, B.S. Dwivedi, Lata[1], K.K. Bandyopadhyay[2], Abhijit Sarkar, B.K. Agarwal[3] and D.K. Shahi[3]

Division of Soil Science and Agricultural Chemistry,
ICAR-Indian Agricultural Research Institute, New Delhi, 110 012

Rock phosphate (RP) reserves across the globe stand out to be a major non-renewable resource and the cost of phosphatic fertilizers is shooting up causing a burden on the farmers. This study was undertaken with the purpose of developing a strategy to solubilize low-grade RP from Purulia district of West Bengal, India through organic acids loaded nanoclay polymer composites (NCPC) and phosphate solubilizing bacteria (PSB) and to see their effectiveness as P source against commercial diammonium phosphate (DAP) using wheat as the test crop. Oxalic acid and citric acid were loaded @ 2% (w/w) in NCPC (2-mm sieved) having 10% clay (NCPC-OA and NCPC-CA). Organic acid loaded NCPC (2 g kg^{-1} soil) containing 40 mg acid kg^{-1} soil was mixed with powdered RP (100 mesh size) at three rates of P (0, 50 and 100 mg P kg^{-1} soil) with and without inoculation of PSB (*Pseudomonas striata*) and tested as source of P to wheat in a greenhouse experiment. An absolute control (without fertilizer material) and a standard P-fertilizer (DAP @ 50 mg P kg^{-1} soil) were also included for comparison. Results revealed that Purulia RP along with oxalic acid loaded NCPC and PSB inoculation performed significantly better than other treatments in terms of yield of wheat, P uptake and available P in soil. All the P fractions in soil showed an increasing trend due to application of Purulia RP along with organic acid loaded NCPC and PSB. The Fe-P fraction was more dominant in soil compared to other fractions. However, the Ca-P fraction showed a higher value with the increase in levels of P application. The oxalic acid loaded NCPC performed better in most of the cases compared to citric acid loaded NCPC and proved to be a more efficient solubilizer of P from RP. This study could help to utilize Purulia RP as a P source for wheat, with the interventions of organic acids and PSB and reduce the dependence on commercial fertilizers like DAP.