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Biochar and microbial P solubilization

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Phosphorus (P) is a critical macro - element that limits plant growth and productivity. The ability of soil microorganisms to evolve various strategies to mobilize insoluble P to an accessible form offers an alternative for improving P utilization in soil-plant systems without application of commercial P fertilizers based on rock phosphate (RP) chemical processing. As the RP is a finite resource and its scarcity is a theme of economic and political concerns, the efforts of many research groups are focused on other, natural, renewable P sources such as different types of biochar or utilization of low - grade RP. Here, we report the importance of hydroxyapatite, derived from animal bone char (HABO), as a source of plant available phosphate, and the effect of plant-derived biochar (PDB) on the process of P-solubilization. HABO is an excellent P source, with a relatively high content of P, and free of heavy and radioactive metals normally presented in the sedimentary RP. Similarly, PDB is characterized by its high environmentally mild and soil and plant beneficial potential. We present various tested scheme of applications of HABO where it serves as a P - source, cell carrier, and as a part of formulated P - solubilizing biofertilizer product. On the other hand, PDB is shown to accelerate the P - solubilization process rate through a mechanism, which alleviates or fully eliminates fluoride inhibition of microbial organic acid production the latter being responsible for hydroxyapatite dissolution. Understanding the mechanisms of all these processes and the behaviour of the microorganisms involved in conditions of liquid submerged, repeated-batch, and solid - state fermentations or soil - plant systems employing free and immobilized cells is an important knowledge advance for developing both high crop productivity and improved soil quality.