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Editorial

Unravelling Rhizospheric Diversity and Potential of Phytase Producing Microbes

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Phosphorus (P) is considered the ultimate limiting nutrient for plants because of its form as insoluble complexes. To address P deficiency, different organic and inorganic fertilizers are added to soils. Inorganic P instantly become unavailable by forming complexes with metal ions and excess P-fertilizers application also leads to water eutrophication of P. Phytic Acid (PA; constitutes 15-50% of total P depending on soil types) as a component of organic P also form stable complexes and its natural degradation is almost impossible. Therefore, role of P solubilizing microbes in rhizosphere become important for P cycling. Several rhizospheric bacterial and fungal species have been reported to play important role in P solubilization in soil [1]. Based on several studies on diversity of P solubilizing microbes and enzymes in varying agro-ecosystems, soil P availability and its uptake by plants is mainly attributed to microbial phosphatases and plant exudates. Phytase producing microbes have gained recent interest due to their plant growth promoting abilities and P pollution management applications [2,3].

Several research groups have studied diversity of different groups of phytases and organisms in diverse habitats for multiple applications of phytases and it includes phytase producing microbes in rumen by Yanke, et al. [2] and Nakashima, et al. [4], β-propeller phytases in aquatic environment by Cheng and Lim [5], phytase producing marine yeasts by Hirimuthugoda, et al. [6], phytase producing yeasts in fermented food by Hellström, et al. [7], and β-propeller phytase genes in the intestinal contents of grass carps by Huang, et al. [8]. A detailed bioinformatic analysis for diversity of phytases was carried out by Lim, et al. [9], and the comparative '*in silico*' gene analysis of phytases was carried out by Kumar, et al. [10-12]. Phytase producing bacterial isolates were also reported from rhizosphere of pasture plants. Jorquera, et al. [13] and Acuña, et al. [14] suggested more than one mechanism for utilizing insoluble forms of P. After a long term experiment to study the effect of organic and conventional cropping systems on crop performance and soil fertility, Mäder, et al. [15], suggested that the higher soil microbiological activity and higher biodiversity found in organic plots. To understand the complexity of P availability and uptake, Oberson, et al. [16] have studied fresh and residual phosphorus uptake by ryegrass from soils with different fertilization histories. Some others were also carried out to study effect of varying fertilization and soil conditions on microbial diversity [1,17-19]. Considering the fact that plants are not able to utilize P directly from organic P, studies has been conducted with the objectives of determining the effect of phytase producing bacteria on plant growth [20-22]. Several phytase producing bacterial isolates from Himalayan soils were reported with plant growth promoting activities [1,23]. Rangarajan, et al. [24] has demonstrated change in diversity of P solubilizing pseudomonads isolated from three different plant rhizospheres and concluded variation in soil was more predominant on changing diversity than plant types. Azziz, et al. [25] have studied abundance and diversity of culturable phosphate solubilizing bacteria (PSB) under crop rotations and found potential isolates for use as bioinoculants. Effect of long-term application of manure and fertilizer on biological and biochemical activities (including phosphatase activity) in soil during crop development stages was studied by Mandal, et al. [26], and an interaction between grain yield and phosphatase activity was reported. Genetic diversity of plant growth promoting rhizobacteria isolated from rhizospheric soil of wheat under saline condition was studied by Verma, et al. [27]. According to a study by Nayak, et al. [28], long-term application of compost influences microbial biomass and enzyme activities in a tropical *Aeric Endoaquept* planted to rice under flooded condition. Role of phytase in PA rich soils have not been explored and a study for diversity of these microbes (culturable and un-culturable) and phytase activity in different agro-ecosystems might reveal importance of this unique community in understanding of underlying plant-microbe interactions.

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