Benefits of ammonium fertilization for plant-PGPM interactions

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Attempts to use soil microorganisms with potential for nutrient mobilization as inoculants to improve nutrient acquisition of crops have a long history. However, a major limitation of these approaches is a frequently limited reproducibility of effects under practical conditions. Testing a range of commercial products based on *Bacillus*, *Pseudomonas*, *Trichoderma* and *Penicillium* strains, revealed that the expression of their plant growth promoting potential on maize was strongly dependent on the form of nitrogen supply. Superior performance was recorded in combination with ammonium-based fertilizers, stabilized by nitrification inhibitors instead of nitrate dominated fertilization. A closer examination of the ammonium effects revealed a stronger stimulation of root growth induced by the inoculants, associated with an ammonium-induced elongation of root hairs. Accordingly, ammonium-fertilized maize plants showed higher endogenous auxin (IAA) levels and increased auxin-production potential was demonstrated for *Bacillus* and *Pseudomonas* strains in presence of stabilized ammonium, both, on artificial growth media and after-isolation from the rhizosphere. Higher root colonization of maize plants supplied with stabilized ammonium was recorded for a *Trichoderma harzianum* strain. Moreover, the synergistic effect of microbial and ammonium-induced root growth promotion resulted in a larger root surface area, involved in rhizosphere acidification due to proton-extrusion in response to ammonium uptake, mediating the mobilization of Ca-phosphates and micronutrients such as Zn and Mn. Finally, ammonium fertilization suppressed root infection by the seed-borne pathogenic fungus *Fusarium proliferatum*. The findings demonstrated that plant-PGPM interactions are strongly dependent on the form of N fertilization offering management options, which have been recently patented.

Biography

I K Mpanga is currently a PhD Student at the University of Hohenheim, Germany, where he obtained his MSc in Crop Sciences. His work focuses on fertilization strategies to improve plant-growth promotion of microorganisms which is under the just ended European Union Project called Bioeffector chaired by Guenter Neumann at University of Hohenheim, Germany.

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