Preliminary selection of phosphate solubilising plant growth promoting microorganisms

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Introduction

- Agriculture is the dominant sector in most Sub-Saharan countries of Africa. It provides employment to the majority of the population with a significant contribution to GNP and foreign exchange earnings.
- Agricultural productivity is low and the people depending on agriculture are generally poor.
- Depletion of soil fertility is a primary cause of low per capita food production (Bremen et al. 2001; Sanchez 2002).
- Fertilizer use is low (8 kg/ha) and inadequate to replace the nutrients removed in harvested crops (Gregory and Bumb 2006).
- A shortage of the essential plant nutrient (P) limits agricultural production on a global scale. Mineral P fertilizers are scarce but are essential to increase and maintain crop yields (George et al. 2006). However, when applied to soils, both P fixation and precipitation occur (Fernandez et al. 2007).
- Increasing problems associated with the use of synthetic chemicals (impacts on health and the environment, resistance development in plant pathogens and pests) has driven an ever-increasing interest in the use of native beneficial microorganisms to improve plant health and productivity (Avis et al. 2008).
- Cameroonian soils are generally low in fertility, particularly phosphorus and nitrogen and need to be fertilized to achieve adequate growth.
- Research has been undertaken with the aim at maintaining the fertility of Cameroonian soils by biological means.
- The objective of this study is to identify and characterize efficient phosphate solubilising microorganisms that allow better mineral nutrition of plants.

Methodology

- Soil samples were collected in the five agro ecological zones of Cameroon and assessed for pH and P availability.
- We have generated a culture library of soil isolates using LB media.
- Phosphate solubilising ability was tested by growth in P free minimal media supplemented with either Ca(NO3)2, AIP, FePO4, or Na-Phyate and with dye (BCG).
- Colony (n) and halo zone (z) diameter and the ratio z/n were evaluated as an indicator for isolate efficiency.
- Phosphate solubilising ability was tested by growth in P free minimal media supplemented with either Ca(NO3)2, AIP, FePO4, or Na-Phyate and with dye (BCG).
- The ratio z/n serves as an indicator for the isolate efficiency; the higher the ratio, the greater the activity of the microorganism.
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- The acidifying activity of the microorganism is demonstrated by the pH decrease observed as a halo (yellow) zone surrounding the colony.
- The solubility of the different phosphate types decreases in the order: Ca-P > Al-P > Na-phytate > Fe-P.
- The ratio z/n serves as an indicator for the isolate efficiency; the higher the ratio, the greater the activity of the microorganism.
- Ongoing research is focused on: -Quantitative assay in liquid media containing sparingly soluble phosphates and determination of the organic acids involved in the process of phosphate solubilisation. -Identification of isolates by sequencing of the SSU ribosomal gene combined with phylogenetics. -Assessment of phosphate solubilisation ability in P free minimal media supplemented with different sparingly soluble phosphate types.
- P availability increases with soil alkalinity.
- Significant differences in P availability between sites within a region and between land uses, showing depletion of P availability in farmers’ fields.
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Results

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Conclusion

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References


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