Phosphate solubilizing activity of native Guatemalan isolates of *Pseudomonas fluorescens*

José Alejandro Ruiz-Chután, Julio Ernesto Berdúo-Sandoval, Aníbal Sacbajá, Bohdan Lojka, Marie Kalousová, Jana Žiarovská, Cusimamani Fernández Eloy, Amilcar Sánchez-Pérez

**Introduction**

Phosphorus (P) is an essential element in agricultural production. However, due to fixation phenomenon in the soil, especially in Andisol soils of volcanic origin, only a small portion of can be used by plants [1]. Phosphate solubilizing microbes (PSMs) are an alternative to transform this element into soluble forms that can be used by plants; in addition to not generating environmental pollution [2]. In this study we aimed to assess in vitro the phosphate solubilizing activity and stability of native Guatemalan isolates of *Pseudomonas fluorescens* bacteria and its relation with its genetic diversity to find a viable alternative to the dependence on phosphorus fertilizers in the Andisols soils of Guatemala.

**Methodology**

From Andisol soil samples (Figure 1), we obtained 35 *P. fluorescens* isolates confirmed by PCR, and then we used AFLP molecular marker to evaluate its genetic diversity. The isolates were cultured in NBRIP medium with Ca\(_{3}\)(PO\(_4\))\(_2\) as an insoluble source of phosphorus, and the phosphate solubilization index (PSI) was measured (Figure 2). Data analysis: solubilization capacity - ANOVA and Tukey’s test (*Agricolae* [3], genetic diversity (*Past* [4]).

**Results**

We found a high genetic diversity within the analyzed isolates forming a first group with highest and a second group with lowest PSI, respectively (Figure 3). The ANOVA analysis showed significant differences (p<.01) of the PSI between isolates and also between collecting sites (Figure 4). At isolates level, (Tukey’s test groups p < .01), the Pf\(_{33}\), collected in Sacatepéquez, showed the highest PSI whereas Pf\(_{29}\), collected in Totonicapán, showed the lowest value. At collecting sites level, Sacatepéquez showed the higher and Totonicapán the lower PSI, respectively. About solubilization stability, we did not observe a defined pattern (Figure 5).

**Conclusions**

Here we show that native isolates of *P. fluorescens* have the potential to be a sustainable alternative to the problem of phosphorus fixation, from which the current dependence on chemical fertilization results. It is also important to mention the advantage of local adaptation of native isolates to biotic and abiotic factors. We recommend future research to evaluate the efficiency of isolates under field conditions.

**References**


**Acknowledgments**

The study was supported by Dirección General de Investigación (Digi) through project no. 4.8.63.4.45