



Characterization of potential maize Plant Growth Promoting Rhizobacteria (PGPR) in different agro-ecological zones of central and northern Benin.

Agbodjato N.¹, Noumavo P. A.¹, Adjanohoun A.², Salami H.¹, Sezan A.³, Baba-Moussa L.^{1*}

¹Laboratoire de Biologie et de Typage Moléculaire en Microbiologie, Département de Biochimie et de Biologie Cellulaire, Université d'Abomey-Calavi, Cotonou, Bénin; ²Centre de Recherches Agricoles Sud, Institut National des Recherches Agricoles du Bénin, Attogon, Bénin; ³Laboratoire de Biomembrane et de Signalisation Cellulaire, Département de Physiologie Animale, Faculté des Sciences et Techniques, Université d'Abomey-Calavi.

*Corresponding author: laminesaid@yahoo.fr

INTRODUCTION

The rhizosphere is soil area surrounding the roots, directly or indirectly influenced by the root and which has a strong antimicrobial activity [1]. Some of these microorganisms positively impacting the plant physiology. These microorganisms include Plant Growth Promoting Rhizobacteria (PGPR). The objective of this study is to characterize maize PGPR in different agro-ecological zones (AEZ) of central and northern Benin.

MATERIAL AND METHODS

Area study : The study was conducted in five AEZ (I, II, III, IV and V) covering central and northern Benin (Figure 1).

Samples collection : 45 samples of root-soil rhizospheric were collected from AEZ (nine/zone). The samples were carried to the laboratory in an icebox and kept at 4°C temperature before analyses. Others crops grown in area study were identified.

Isolation of rhizobacteria : The samples were streaked on specific medium; Nutrient agar for Bacillus and Serratia, King's A and B for Pseudomonas, Plat Count Agar for aerobic mesophilic Flora (AMF) [2].

Characterization of rhizobacteria : The rhizobacteria isolates were identified firstly by macroscopic and microscopic observations. They were followed by biochemical and enzymatic tests [3].

In vitro screening for PGPR activities : All isolates were investigated for the production of hydrogen cyanide [4] and ammonia [5].



Figure 2. Agro-ecological zones.

RESULTS AND DISCUSSION

Crops grown in area study

Beyond maize, rice, sorghum, millet, bean, cotton, manioc, peanut, bambara groundnut, yam and pimento were grown.

Rhizobacteria distribution in AEZ and type of soil.

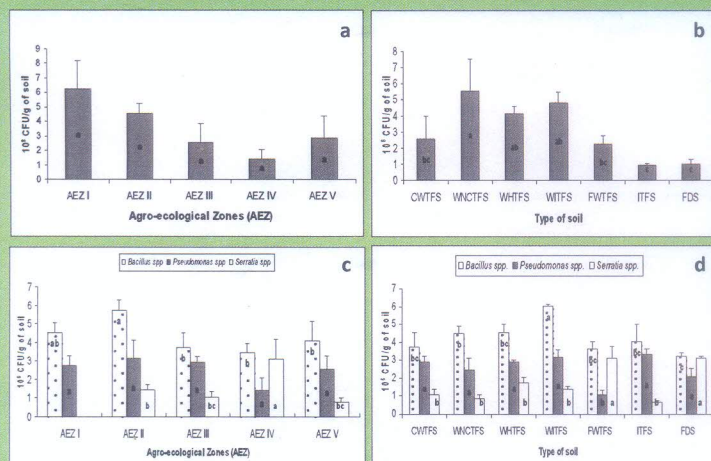


Figure 1. Distribution of aerobic mesophilic Flora (a,b) and Bacillus, Pseudomonas, Serratia (c,d) in AEZ and soils.

CWTFs: Washing and Concretion Tropical Ferruginous Soil; WNCFTs: Washing and No Concretion Tropical Ferruginous Soil; WHTFs: Washing and Hydromorphic Tropical Ferruginous Soil; WITFS: Washing and Idurite Tropical Ferruginous Soil; FWTFs: Few Washing Tropical Ferruginous Soil; ITFS: Impoverished Tropical Ferruginous Soil; FDS: Few Developed Soil; The means with different letters are significantly different with probability level of 5% according to Student Newman-Keuls test.

- High variability of microbiological charge in another AEZ and soils.
- Aerobic mesophilic flora was highly in AEZ II and washing and no concretion tropical ferruginous soil.
- *Serratia marcescens* has not been found in washing and concretion tropical ferruginous Soil.
- This variability is due to difference in physico-chemical properties of soils.

Rhizobacteria identified

Table 1. Species of rhizobacteria isolated from maize rhizosphere.

Genus	Species
Bacillus	<i>B. polymyxa</i>
	<i>B. panthothenicus</i>
	<i>B. anthracis</i>
	<i>B. thuringiensis</i>
	<i>B. circulans</i>
Pseudomonas	<i>P. cichorii</i>
	<i>P. putida</i>
	<i>P. syringae</i>
Serratia	<i>S. marcescens</i>

- In southern Benin (AEZ VI, VII and VIII), Adjanohoun [6] were not found *B. panthothenicus*, *B. anthracis*, *P. cichorii*, *P. syringae* and *S. marcescens*.
- Beninese maize rhizosphere and contains a wide microbial diversity .

Production of plant growth promoting metabolites

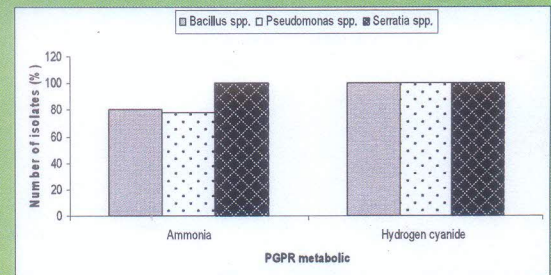


Figure 1. Production of plant growth promoting metabolites by rhizobacteria isolates

- *B. subtilis* MA-2 and *P. fluorescens* MA-4 are real producers of ammonia and significantly increase the biomass plants [7].
- Hydrogen cyanide is strongly implicates in biological control of plant diseases [8].

CONCLUSION AND PROSPECT

Beninese maize rhizosphere contains a wide bacterial diversity. The bacterial charge varies both in agro-ecological zones and type of soils. In future prospect, this rhizobacteria isolates will be assessed to promote maize seed germination and growth development.

REFERENCES

- [1] Hiltner L. et al. (1904), Arb. DLG., 98:59-78. [2] Yadav J. et (2010), Biological Forum — An Int. J., 2:15-18. [3] Bergey D. H. et al. (1923), (Eds.) Williams et Wilkins, Baltimore, 441-442. [4] Lorck H. (2004), Plant Physiol., 1:142-146. [5] Cappuccino J. C. and Sherman N. (1992), (Eds.) Benjamin/Cummings. New York, USA. 125-179 pp. [6] Adjanohoun A. et al. (2011), Int. J. Biol. Chem. Sci., 5:433-444. [7] Mishra P; K. et al. (2008), Annal. Microbiol. 58:1-8. [8] Haas D. and Defago G. (2005), Biological control of soil-borne pathogens by fluorescent pseudomonads. Nat. Rev. Microbiol., 3: 307-319.

ACKNOWLEDGEMENTS

Le Directeur Scientifique
Institut National des Recherches Agricoles du Bénin

