



Theme 1

Status and trends of global soil nutrient budget



Selection of PGPR bacteria to improve and increase bean productivity

Rim Tinhinen MAOUGAL¹, M. KECHID¹, K. BAZIZ², A. DJEKOUN¹, universit  freres Mentouri Constantine 1 Algeria, ²universit  Batna 2 Chahid Mostefa Ben Boulaid, Algeria

INTRODUCTION

Confronted to an increase in the world's population, the planet is in front of a problem of food security.

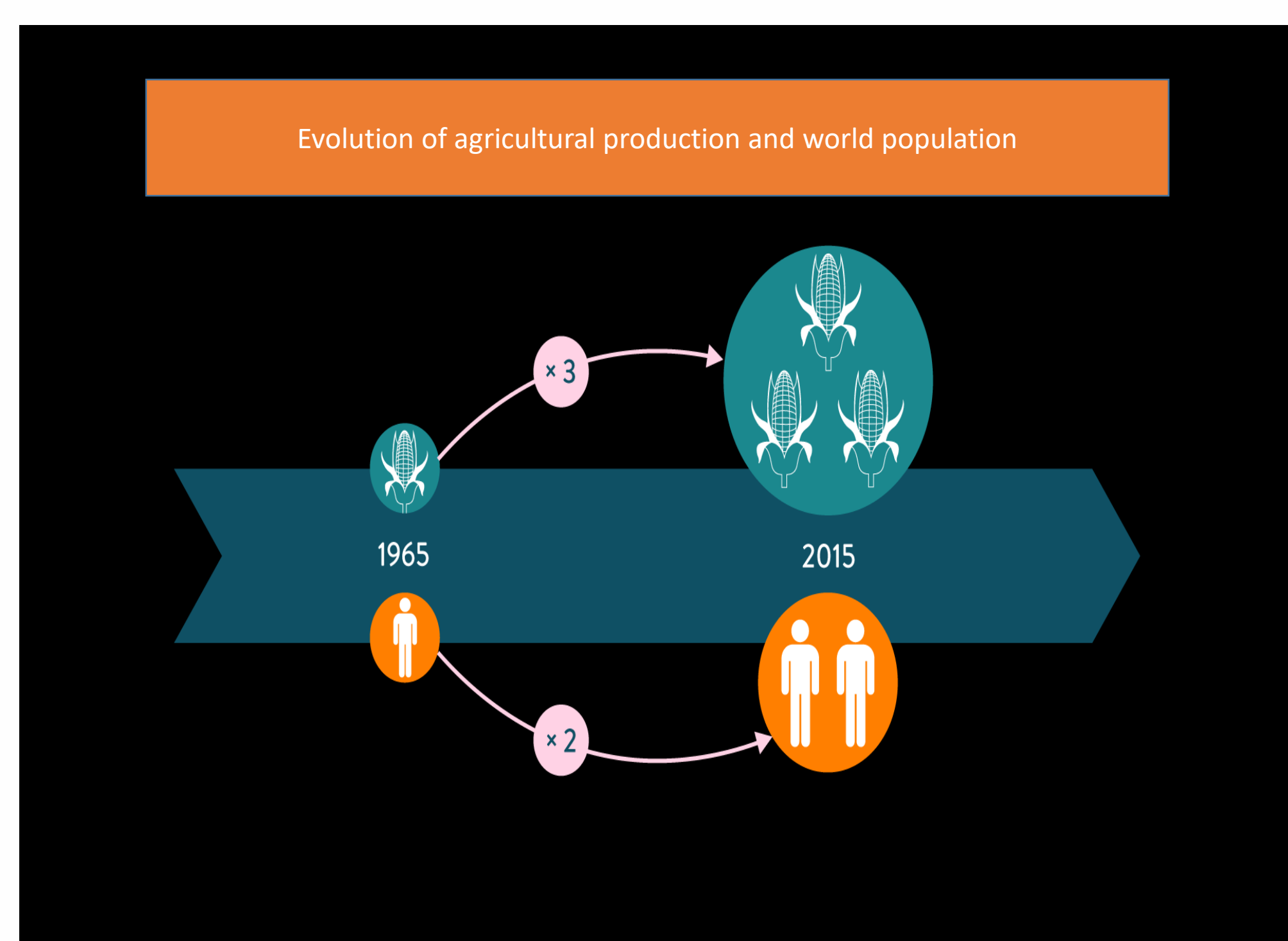


Fig 1: Evolution of agricultural production and world population

Agriculture will have no choice but to increase production to keep pace and therefore increase the use of chemical fertilizers which present negative effects on both the environment and human health.

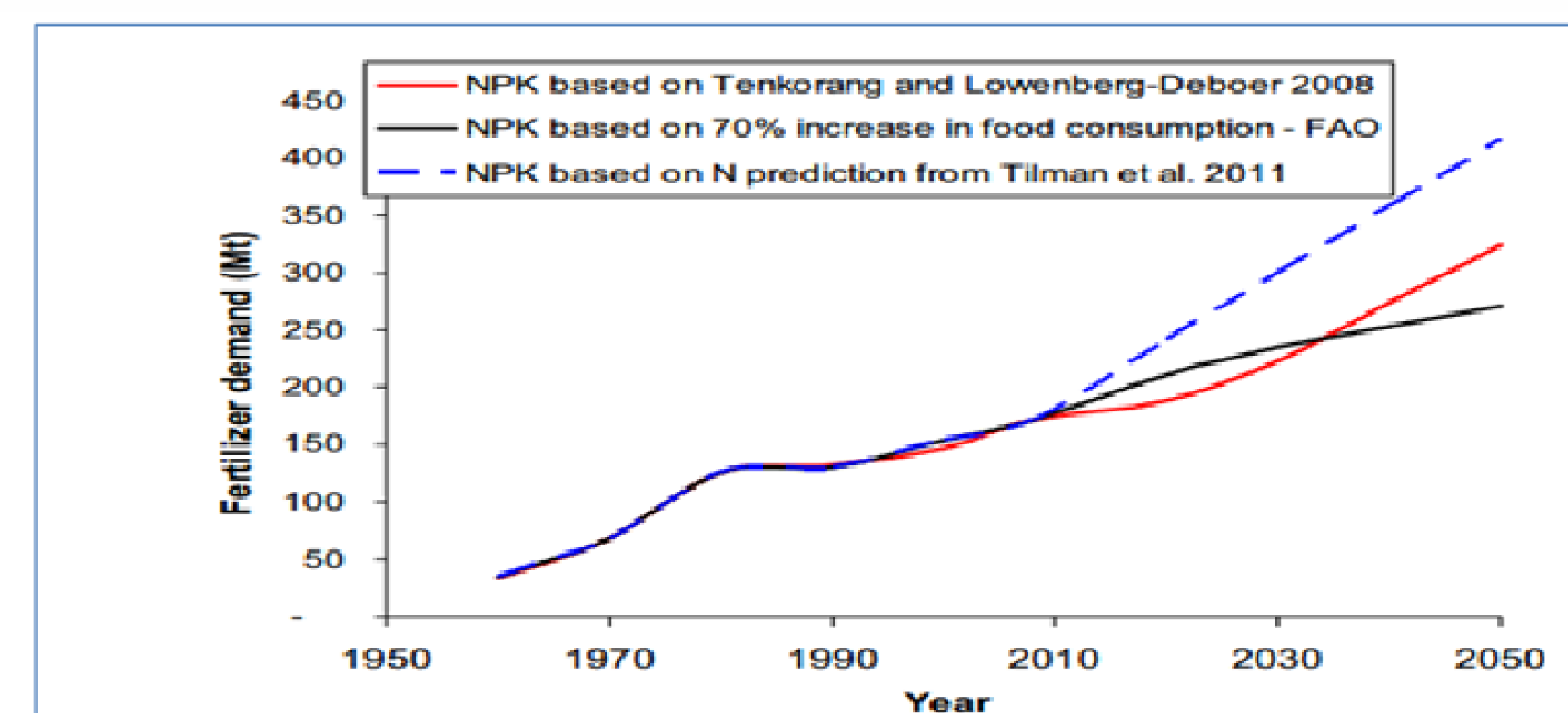
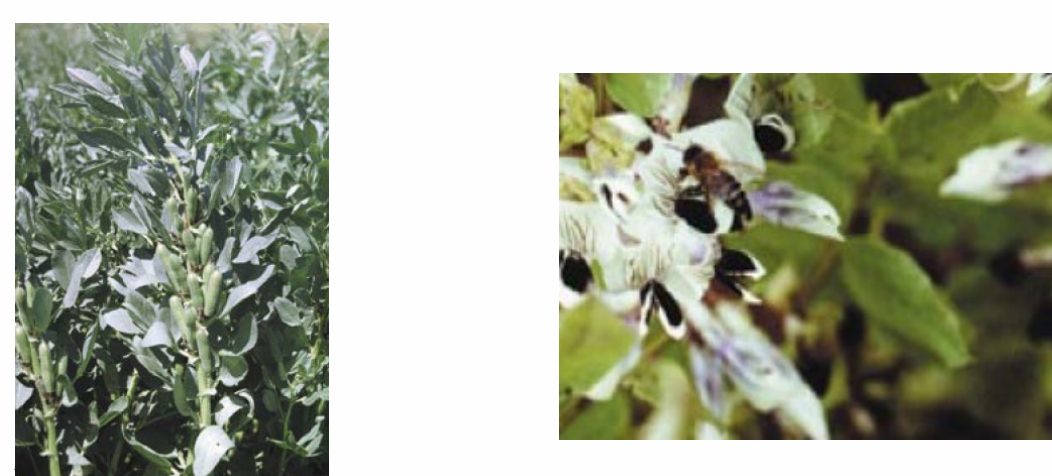


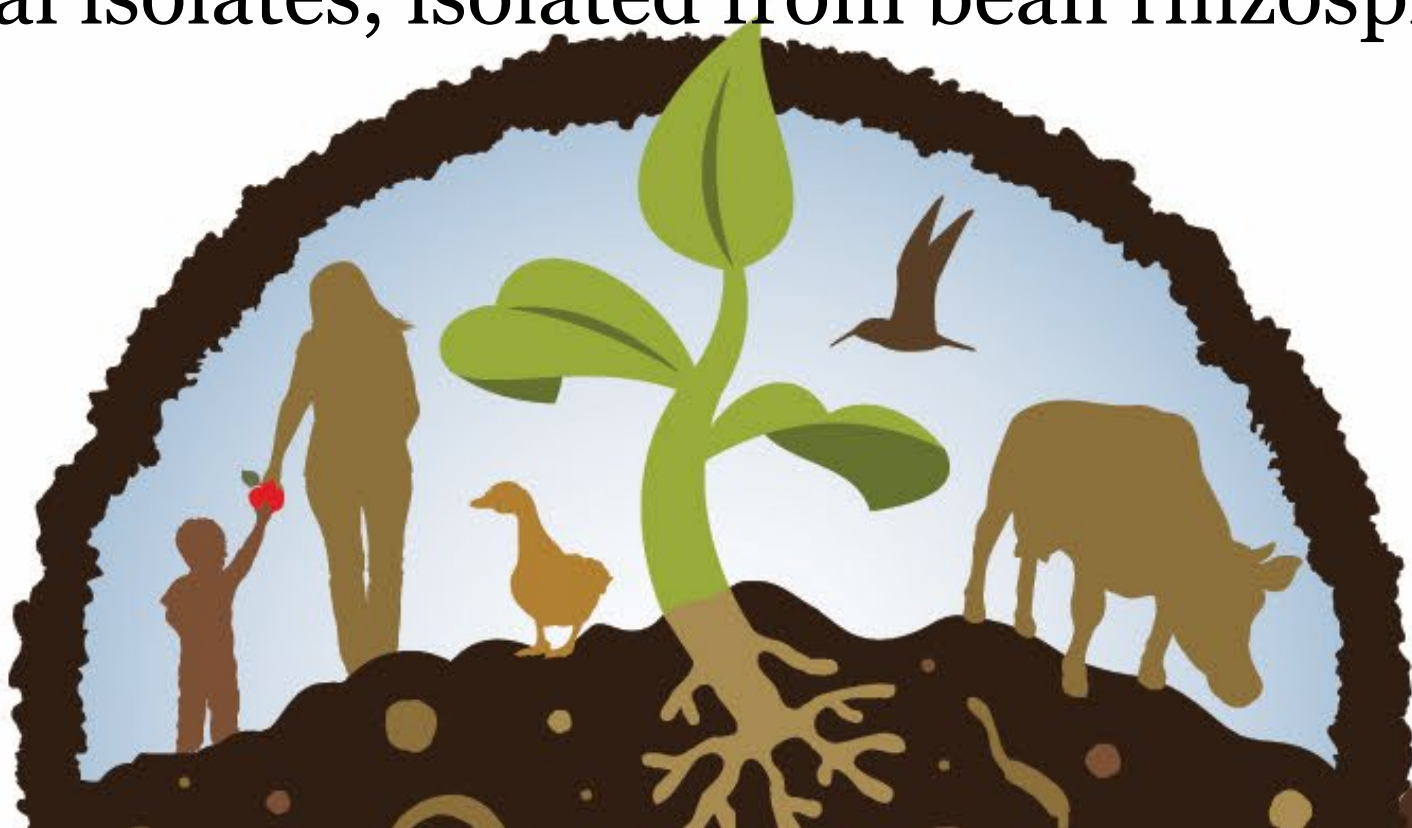
Fig 2: increased fertilization

Among the available solutions, the use of rhizobacteria to promote plant growth. They also have an important role in maintaining the soil balance. Among these bacteria there are those that have shown their ability to promote plant growth:

Plant Growth Promoting Rhizobacteria (PGPR). Scientists identified some PGPR characters involved in promoting plant growth, while all these characters are not able to study.



The aim of this study was to evaluate PGP activities of bacterial isolates, isolated from bean rhizosphere.

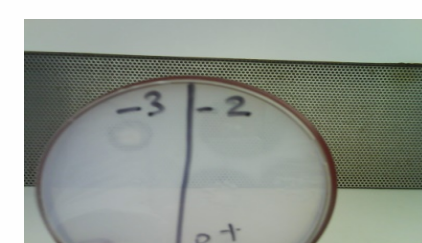


METHODOLOGY

We characterized 110 isolated strains. These bacteria were isolated from 5 varieties of faba bean rhizosphere grown in the region of Constantine Algeria.

Assays and analyses performed

1- Isolation of rhizobacteria



By isolation on general and specific medium:

- Total bacteria
- Utilizing phytate bacteria

2- characterization of bacterial isolates



- Morphology
- Respiratory enzyme

3- Plant growth- promoting traits

Plant growth promoting traits

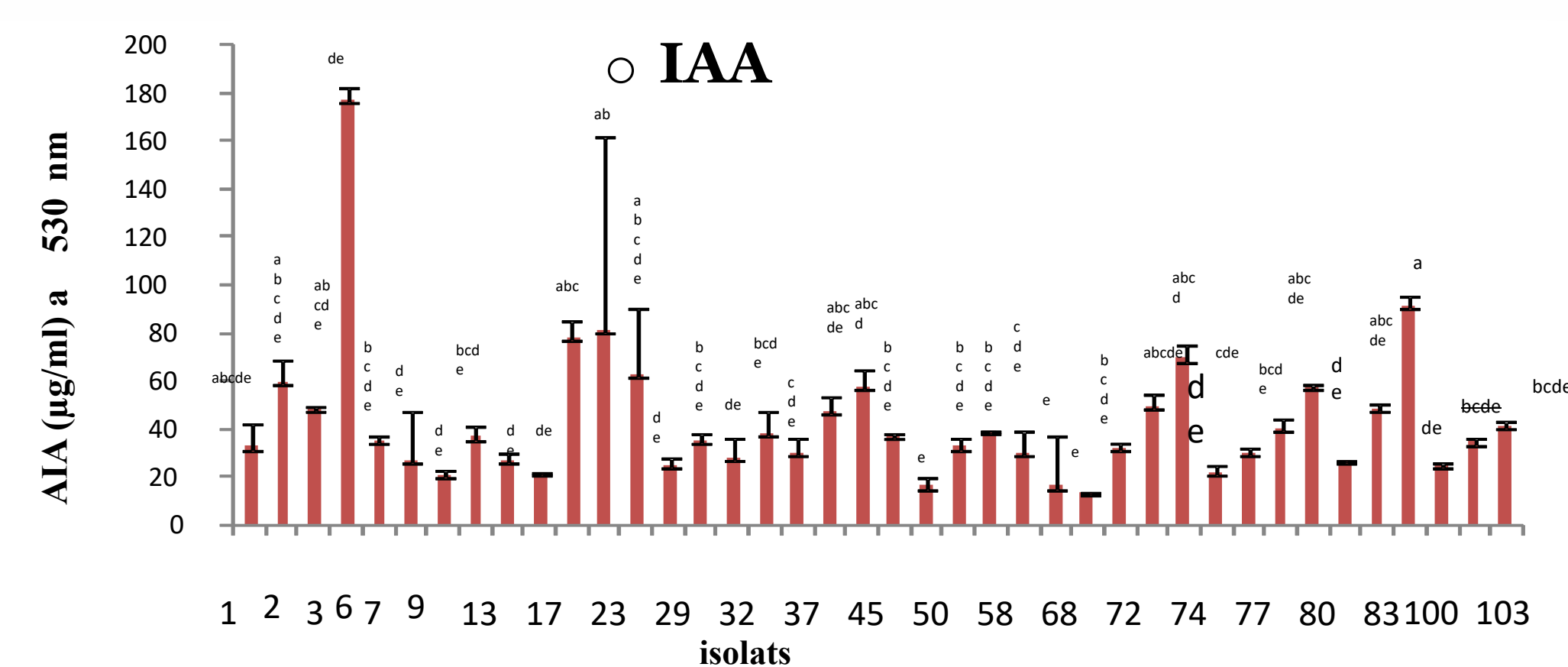
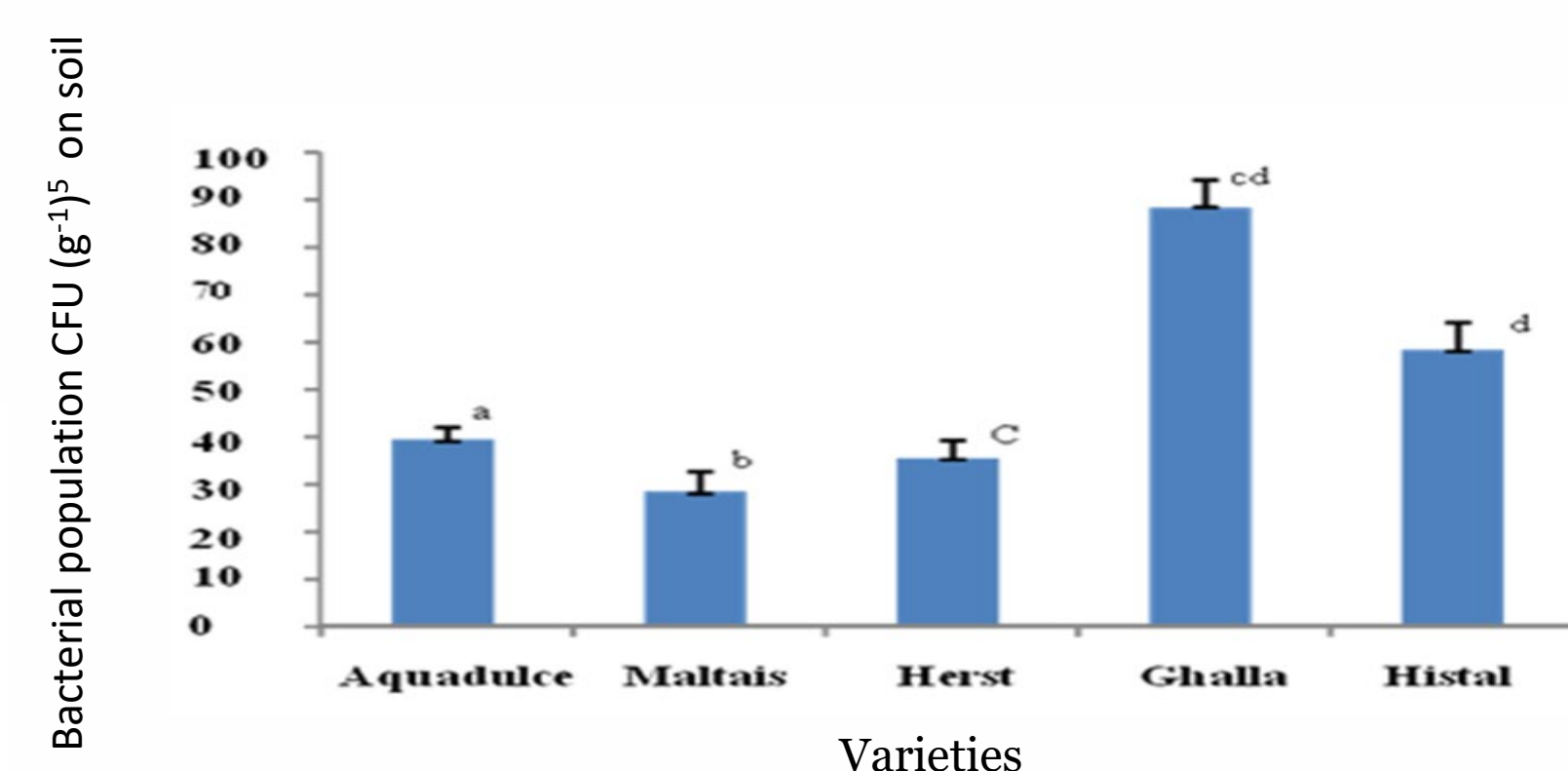


Table 2: Traits favoring plant growth

Isolates code	P solubilization	Ammonium production	Nitrogen detection	Isolates code	P solubilization	Ammonium production	Nitrogen detection
1	-	-	+	50	-	+	+
2	+	-	-	56	+	+	+
3	+	-	-	58	+	+	+
6	-	+	+	61	+	+	+
7	-	±	+	68	+	- (vert)	-
9	-	-	+	70	-	+	-
13	-	-	-	72	-	- (vert)	+
15	+	+	+	73	+	+	+
17	+	+	+	74	+	±	+
19	+	+	+	75	-	+	-
23	-	+	+	77	-	- (vert)	+
24	+	+	+	79	+	+	-
29	-	±	+	80	-	±	+
31	-	+	+	82	-	±	+
32	-	-	-	83	+	±	+
35	-	+	-	92	+	-	-
37	+	+	+	100	+	±	+
38	+	+	+	101	+	-	-
45	-	+	+	103	-	-	+
46	-	±	+	110	+	-	+

RESULTS

1- Isolation of rhizobacteria



Phenotypic characterization

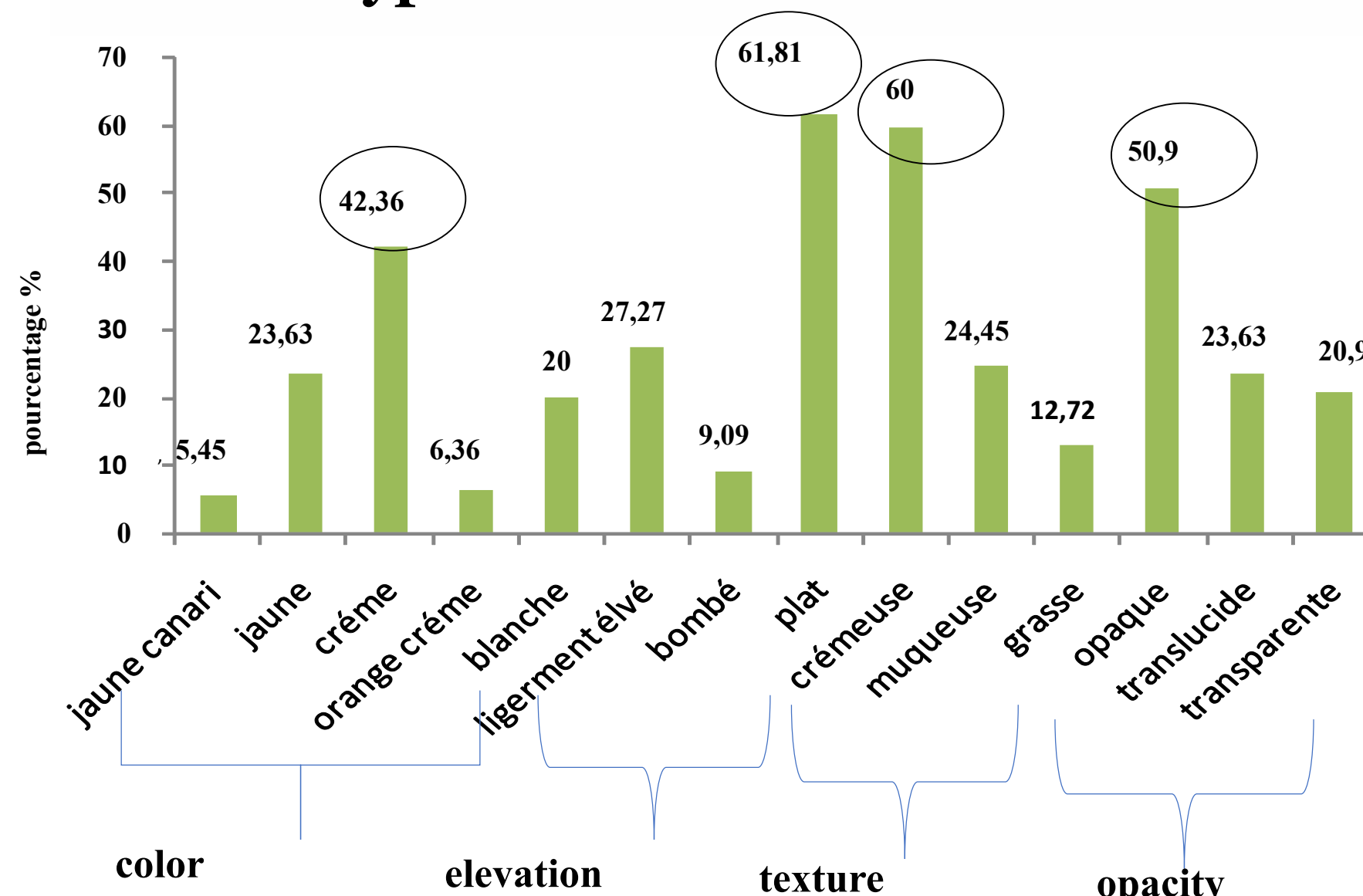


Table 1: microscopic characteristics of bacterial isolates from Faba bean rhizosphere

Isolates code	Gram reaction	cell shape	motility	Isolates code	Gram reaction	cell shape	motility
1	-	Bacillus	highly motile	50	-	Long rods	motile
2	-	Bacillus	highly motile	56	-	Rods	slowly motile
3	-	Bacillus	highly motile	58	-	Bacillus	highly motile
6	+	Bacillus	highly motile	61	-	Bacillus	highly motile
7	-	Bacillus	highly motile	68	-	Long rods	motile
9	-	Bacillus	highly motile	70	-	Bacillus	highly motile
13	-	Bacillus	highly motile	72	-	Rods	slowly motile
15	-	Bacillus	highly motile	73	-	Bacillus	highly motile
17	-	Bacillus	highly motile	74	-	Long rods	motile
19	-	Bacillus	highly motile	75	-	Rods	slowly motile
23	-	Rods	slowly motile	77	-	Rods	slowly motile
24	-	Rods	slowly motile	79	-	Bacillus	highly motile
29	-	Rods	slowly motile	80	-	Rods	slowly motile
31	+	Long rods	motile	82	-	Long rods	motile
32	-	Bacillus	highly motile	83	-	Rods	slowly motile
35	-	Bacillus	highly motile	92	-	Rods	slowly motile
37	-	Long rods	motile	100	-	Bacillus	highly motile
38	-	Long rods	motile	101	-	Bacillus	highly motile
45	+	Long rods	motile	103	-	Bacillus	highly motile
46	-	Long rods	motile	110	-	Bacillus	highly motile

Respiratory enzymes

65% of isolates are oxidase negative, and 87.5% are catalase +.

Solubilization of phosphaaate compounds

Of the 40 strains, 20 were able to solubilize insoluble inorganic P compounds forming a clear halo around the colony



Nitrogen fixation and Ammonia production

Our results showed that 72.5% of the isolates tested are able to fix nitrogen.

67.5% of our isolates produced ammonia.



Conclusion

✓ The phenotypic identification of the 110 bacterial isolates made it possible to demonstrate different bacteria: Most of the isolates are cream-coloured, slightly raised, flat and opaque, of gram-, catalase+ and oxidase-, Of different shapes (mainly Bacilli) which confirms the existence of diversity within these bacterial populations

✓ Among these isolates, some have the ability to solubilize inorganic phosphate;

✓ Certain strains studied seem to be interesting candidates for an inoculation test;

References

1-Govindasamy, V., Senthilkumar, M., Mageshwaran, V., Annapurna, K., 2009. Detection and characterization of ACC deaminase in plant growth promotingrhizobacteria. J. Plant Biochem. Biotechnol. 18, 71-76.

2-Walia, A., Mehta, P., Chauhan, A., Shirkot, C.K., 2014. Effect of Bacillus subtilis strainCKT1 as inoculum on growth of tomato seedlings under net house conditions.Proc. Natl. Acad. Sci., India Sect. B: Biol. Sci. 84 (1), 145-155.