



**One Health**  
Student Conference  
USAMV București



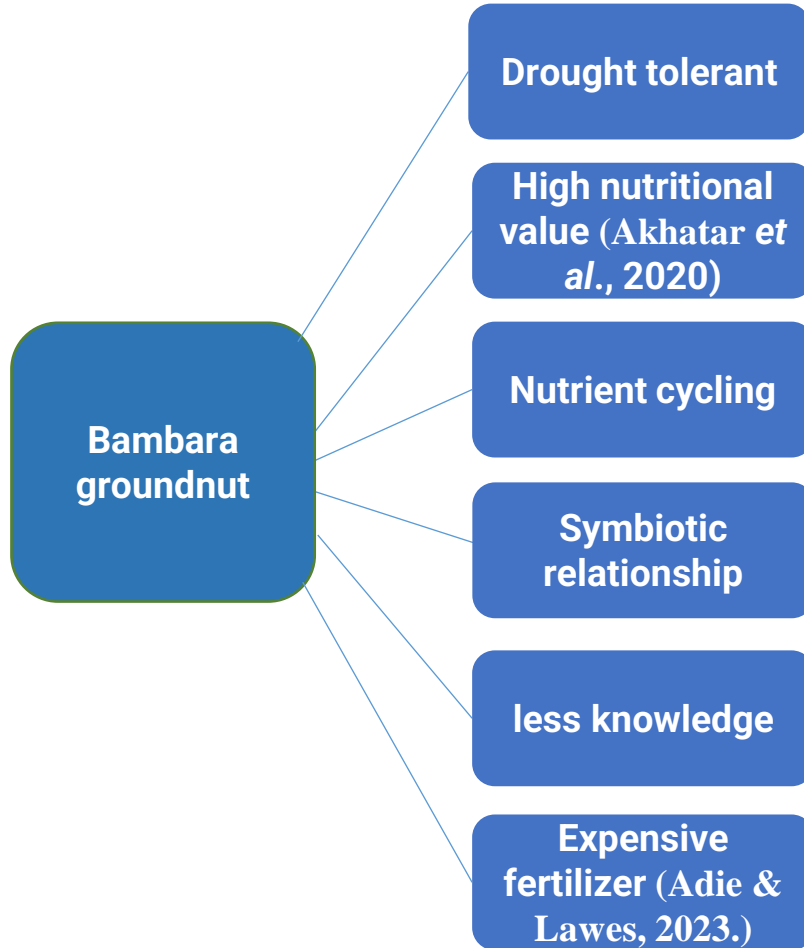
**SYMBIOSIS OF RHIZOBACTERIA ASSOCIATED WITH VIGNA SUBTERRANEA AND THEIR NUTRIENT CYCLING EFFICIENCY IN MPUMALANGA, KWAZULU-NATAL, AND LIMPOPO PROVINCES, SOUTH AFRICA**

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# Introduction



**Objective:** To determine the incidence and diversity of rhizobacteria associated with communally produced Bambara groundnut roots in Mpumalanga, KwaZulu-Natal, and Limpopo Province and their N-cycling and P-cycling ability.



# Materials and methods

- Mpumalanga (8), Limpopo (1), KwaZulu-Natal (2)

- Nutrient agar
- Pikovskaya's agar
- Simmons citrate agar

- Morphological
- Molecular

Sample collection

Sterilization

Media

Replication

Isolate identification

Data analysis

- 70 % alcohol
- 3.5 % (v/v) sodium hypochlorite (NaOCl)

- The experiments will be replicated 3 times

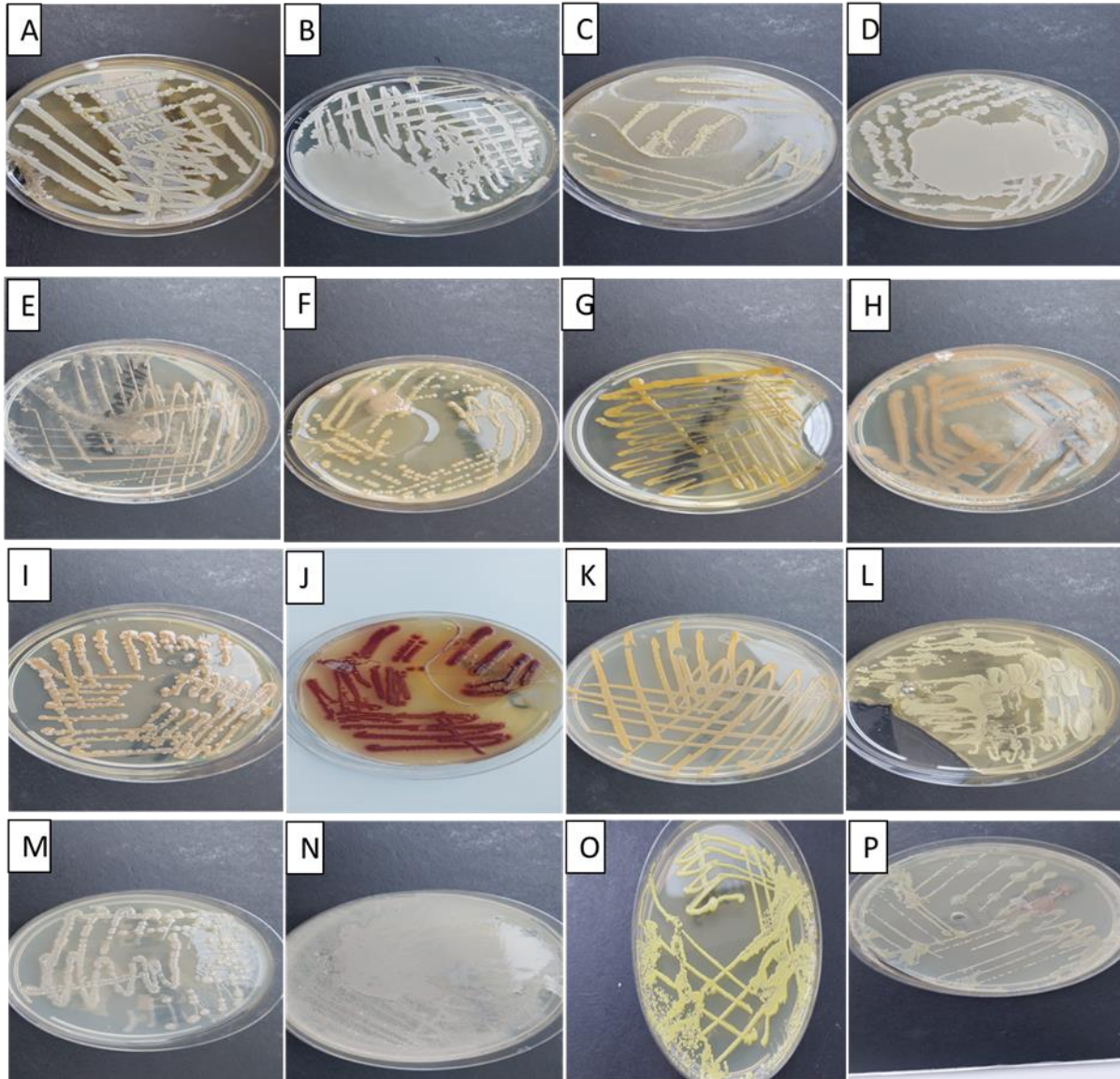
- Simpson index (D)
- Shannon-Weiner (H')



# Results and discussion

**Table 1. Morphological features of 209 root nodule bacteria colonies isolated from Bambara groundnut**

Colour	Elevation	Shape	Surface	Margin	Probable organisms
White	Flat	Irregular	Rough and wrinkled	Undulate	<i>Bacillus licheniformis</i>
Opaque	Flat	Filamentous	Rough	Filamentous	<i>Bacillus pumilus</i>
Grey white	Convex	Round	Smooth	Entire	<i>Enterobacter absyriae</i>
White	Flat	Round	Smooth	Entire	<i>Stenotrophomonas pavanii</i>
Cream white	Flat	Round	Smooth	Entire	<i>Stenotrophomonas geniculate</i>
Cream white	Flat	Round	Smooth	Entire	<i>Stenotrophomonas lactitubi</i>
White brown	Flat	Round	Smooth	Entire	<i>Leucobacter chromiisistens</i>
Slightly yellow	Convex	Round	Smooth	Entire	<i>Sphingobacterium faecium</i>
Yellow	Round	Raised	Smooth	Entire	<i>Micrococcus yunnanensis</i>
Yellow to orange	Raised	Round	Smooth	Entire	<i>Stenotrophomonas maltophilia</i>
Yellow white	Convex	Round	Smooth	Entire	<i>Kaistella daneshvariae</i>
Cream white	Flat	Punctiform	Smooth	Entire	<i>Lysinibacillus sphaericus</i>
Yellow	Flat	Rhizoid	Smooth	Irregular	<i>Proteus columbae</i>
White	Convex	Round	Smooth	Entire	<i>Mammaliococcus sciuri</i>
Cream	Convex	Round	Smooth	Entire	<i>Sphingobacterium multivorum</i>
Cream white	Flat	Punctiform	Rough	Lobate	<i>Lysinibacillus pakistanensis</i>
Yellow white	Convex	Round	Smooth	Entire	<i>Neorhizobium petrolearium</i>
Bright yellow	Convex	Filamentous	Smooth	Filamentous	<i>Cellulosimicrobium cellulans</i>





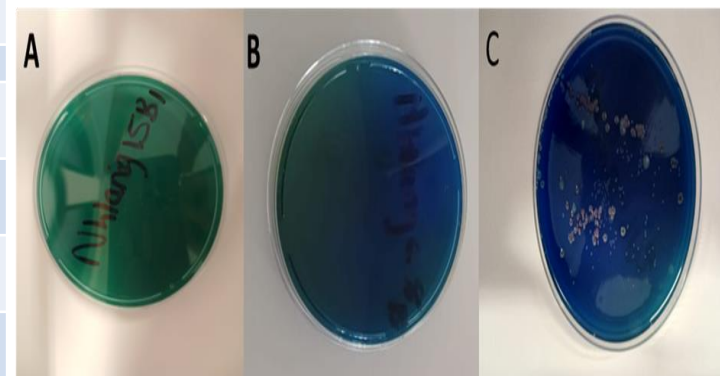
# Results and discussion

Table 2. Rhizobia isolates from Bambara groundnut root nodules showing sequence similarity (%) with the NCBI database bacterial strains after 16S rRNA gene sequencing

Probable organisms	%	E-value	Isolate location
<i>Bacillus licheniformis</i>	81.22	0.0	Boschfontein, Hlamalani, Casteel, Bush, Mkhuhlu, and Nhlanguyuke
<i>Bacillus pumilus</i>	90.08	0.0	Boschfontein, Hlamalani, Nkomazi, Univesrity of Mpumalanga, and Zululand
<i>Enterobacter absuriae</i>	83.12	0.0	Boschfontein, Casteel, Nkomazi, UMP, Zululand, Nhlanguyuke, and Gabaza
<i>Stenotrophomonas pavanii</i>	91.12	0.0	Boschfontein, Hlamalani, Casteel, University of Mpumalanga and Zululand, Nhlanguyuke, and Gabaza
<i>Stenotrophomonas geniculate</i>	93.97	0.0	Boschfontein, University of Mpumalanga, Bushbuckridge, and Nhlanguyuke
<i>Stenotrophomonas lactitubi</i>	85.89	0.0	Boschfontein, Nkomazi, University of Mpumalanga, Bushbuckridge, Mkhuhlu, University of Zululand, Nhlanguyuke, and Gabaza
<i>Leucobacter chromiisistens</i>	86.83	4e-177	Hlamalani, Casteel, University of Mpumalang and Zululand, and Gabaza
<i>Sphingobacterium faecium</i>	90.34	0.0	Hlamalani, University of Mpumalanga, Bushbuckridge, University of Zululand, Nhlanguyuke, and Gabaza
<i>Micrococcus yunnanensis</i>	87.60	0.0	Nkomazi and University of Mpumalanga
<i>Lysinibacillus sphaericus</i>	78.33	2e-151	University of Mpumalanga, Bushbuckridge, Nhlanguyuke, and Gabaza
<i>Proteus columbae</i>	91.47	0.0	University of Mpumalanga and Zululand
<i>Mammaliococcus sciuri</i>	88.16	0.0	University of Zululand
<i>Sphingobacterium multivorum</i>	82.65	2e-153	University of Zululand
<i>Lysinibacillus pakistanensis</i>	78.93	1e-92	Gabaza
<i>Stenotrophomonas maltophilia</i>	93.55	0.0	Nkomazi, University of Mpumalanga, Bushbuckridge, Hazyview, University of Zululand, Nhlanguyuke, and Gabaza
<i>Neorhizobium petrolearium</i>	83.67	0.0	University of Mpumalanga and Zululand, and Nhlanguyuke
<i>Kaistella daneshvariae</i>	81.62	0.0	University of Mpumalanga and Zululand, and Nhlanguyuke
<i>Cellulosimicrobium cellulans</i>	80.21	2e-105	University of Mpumalanga and Zululand, and Gabaza

**Table 3. Nitrogen cycling and phosphate cycling plant growth promoting activities of rhizobia isolates from Bambara groundnut root nodules.**

Probable organisms	Nitrogen cycling	Phosphate cycling	Probable organisms	Nitrogen cycling	Phosphate cycling
<i>Bacillus licheniformis</i>	+	-	<i>Lysinibacillus sphaericus</i>	+	-
<i>Bacillus pumilus</i>	+	-	<i>Proteus columbae</i>	+	-
<i>Enterobacter absuriae</i>	+	-	<i>Mammaliicoccus sciuri</i>	+	-
<i>Stenotrophomonas pavanii</i>	+	-	<i>Sphingobacterium multivorum</i>	+	-
<i>Stenotrophomonas geniculate</i>	+	-	<i>Lysinibacillus pakistanensis</i>	+	-
<i>Stenotrophomonas lactitubi</i>	+	-	<i>Stenotrophomonas maltophilia</i>	+	-
<i>Leucobacter chromiirensistens</i>	+	-	<i>Neorhizobium petrolearium</i>	+	-
<i>Sphingobacterium faecium</i>	-	-	<i>Kaistella daneshvariae</i>	+	-
<i>Micrococcus yunnanensis</i>	-	-	<i>Cellulosimicrobium cellulans</i>	+	-





# Results and discussions

**Table 3.4: Functional bacterial diversity index of Bambara groundnut root nodule samples in Mpumalanga, KwaZulu-Natal, and Limpopo province.**

Province	Sample sites	Number of isolates	Species richness	Shannon diversity index ( $H'$ )	Simpson Index (D)	Pielou index (J)
MP	Hlamalani	10	6	1.79	0.16	0.78
	Boschfontein	15	6	1.63	0.23	0.56
	Nkomazi	14	7	1.77	0.13	0.67
	Bushbuckridge	12	6	1.63	0.15	0.66
	Mkhuhlu	5	3	1.05	0.20	0.66
	Casteel	5	4	1.33	0.10	0.83
	Hazyview	6	3	1.01	0.27	0.56
	UMP	40	21	2.81	0.05	0.76
KZN	UniZululand	64	23	2.85	0.94	0.68
	Nhlangenyuke	23	14	0.5	0.04	0.81
LP	Gabaza	15	10	2.21	0.06	0.82
	Total	209	43			

\*Mpumalanga province (MP), KwaZulu-Natal province (KZN), Limpopo province (LP)





## Conclusions and recommendations

DIVERSE SOIL MICROBIAL  
COMPOSITION

*CYCADLYSINIBACILLUS  
PAKISTANENSIS,  
MAMMALICOCCUS SCIURI,  
AND SPHINGOBACTERIUM  
MULTIVORUM*



# References

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# Thank you for your attention!

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