Effect of SRI GOLD BIO NPK and PICK UP GA on Grain Yield of Soybean (Glycine max L.)

Author: Shankar S. Kalambe (Msc Agriculture, Agronomy)
Affiliation: Zambia Agriculture Research Institute (ZARI)
Corresponding Author: kalambeshankar24@gmail.com

Abstract
A field experiment was conducted at Mochipapa Research Station, Choma, Zambia, during the 2024/2025 cropping season to evaluate the effects of two biofertilizers, SRI GOLD BIO NPK (granulated) and PICK UP GA (soluble powder), on soybean (Glycine max L.) productivity. SRI GOLD BIO NPK contains Azospirillum, Acinetobacter sp., and Bacillus megaterium, while PICK UP GA contains Bacillus cereus. Ten treatments, including sole applications, combinations with soybean inoculant, and integration with conventional fertilization, were evaluated using soybean variety Lukanga. Results showed that SRI GOLD BIO NPK significantly increased soybean grain yield when applied alone (991 kg/ha) or with inoculant (1543 kg/ha) compared to the unfertilized control (392 kg/ha). PICK UP GA alone produced 699 kg/ha, while its combination with inoculant yielded 832 kg/ha. Conventional fertilization (D Compound + inoculant) produced the highest yield of 1650 kg/ha. Notably, SRI GOLD BIO NPK with inoculant was statistically comparable to conventional fertilization, indicating its potential as a sustainable alternative.

Keywords: Soybean, SRI GOLD BIO NPK, PICK UP GA, biofertilizer, inoculant, yield, Azospirillum, Bacillus

Introduction

Biofertilizers play a pivotal role in sustainable agriculture by enhancing nutrient availability through microbial interactions in the rhizosphere. Soybean, a leguminous crop, benefits significantly from rhizobial inoculation; however, nutrient deficiencies often limit yield potential (Vessey, 2003). SRI GOLD BIO NPK contains Azospirillum, Acinetobacter sp., and Bacillus megaterium, which promote nitrogen fixation, phosphorus solubilization, and plant growth. PICK UP GA contains Bacillus cereus, known for growth-promoting effects in legumes. This study aimed to evaluate the efficacy of these biofertilizers, alone and in combination with soybean inoculant, in enhancing grain yield and potentially reducing dependence on inorganic fertilizers in Zambia.

The study hypothesized that:

1. Sole or complementary applications of SRI GOLD BIO NPK and PICK UP GA increase soybean yield compared to unfertilized control.
2. Integration of these biofertilizers with soybean inoculant enhances yield comparable to conventional fertilization.

Materials and Methods

2.1 Location

The experiment was conducted at Mochipapa Research Station, Choma, Zambia (pH 3.6–4.5, organic carbon 0.12–0.74%, phosphorus 0.55–6.5 mg/kg, CEC 2.5–3.5 cmol(+)/kg).

2.2 **Experimental Design**

A Randomized Complete Block Design (RCBD) with ten treatments and four replications was employed on 5 × 10 m plots.

2.3 Crop and Treatment Details

Soybean variety **Lukanga** was planted at a spacing of 45 cm × 15 cm.

Table 1. Treatments for soybean trial

Treatment No.	Description
1	No fertiliser
2	Soybean inoculant only
3	SRI GOLD BIO NPK at 300 kg/ha only
4	PICK UP GA only
5	SRI GOLD BIO NPK + soybean inoculant
6	PICK UP GA + soybean inoculant
7	Half rate SRI GOLD BIO NPK + soybean inoculant
8	Half rate PICK UP GA + soybean inoculant
9	SRI GOLD BIO NPK + PICK UP GA (producer recommendation)
10	Conventional (D Compound 200 kg/ha + inoculant)

Data Collection and Analysis

Grain yield was harvested from 1.8 m² net plots and extrapolated to per hectare basis. Data were subjected to ANOVA using R (version 4.2.3), and treatment means were compared using LSD at $p<0.05$.

Results and Discussion

3.1 Soybean Grain Yield

ANOVA revealed significant differences among treatments ($p<0.05$).

Table 2. Mean soybean grain yield under different fertility treatments

Treatment No.	Description	Yield (kg/ha)
10	Conventional (D Compound + inoculant)	1650a
5	SRI GOLD BIO NPK + inoculant	1543ab
7	Half rate SRI GOLD BIO NPK + inoculant	1293bc

9	SRI GOLD BIO NPK + PICK UP GA	1187cd
3	SRI GOLD BIO NPK only	991cde
8	Half rate PICK UP GA + inoculant	895de
6	PICK UP GA + inoculant	832e
4	PICK UP GA only	699ef
2	Soybean inoculant only	657ef
1	No fertiliser	392f

SRI GOLD BIO NPK consistently outperformed PICK UP GA in improving soybean yield. While PICK UP GA alone was less effective, its combination with inoculant increased yields modestly. The conventional fertilization regime yielded the highest; however, SRI GOLD BIO NPK with inoculant was statistically comparable, indicating its potential as an alternative to inorganic fertilizers.

Conclusion

SRI GOLD BIO NPK significantly enhanced soybean yields, especially when combined with inoculant, achieving results comparable to conventional fertilization. PICK UP GA, although less effective alone, contributed positively when integrated with inoculant. These findings demonstrate that biofertilizers, particularly SRI GOLD BIO NPK, can be effectively incorporated into soybean production systems in Zambia, promoting sustainable and environmentally friendly agriculture.

Acknowledgements

The authors acknowledge the Zambia Agriculture Research Institute (ZARI) and Contec Global Agro Limited for providing facilities, technical support, and biofertilizer inputs.

References

1. Vessey JK. Plant growth promoting rhizobacteria as biofertilizers. Plant Soil. 2003; 255:571–586.
2. Amalraj ELD, Mohanty D, Kumar GP, Desai S, Ahmed SMH, Pradhan R, et al. Potential microbial consortium for plant growth promotion of sunflower. Proc Natl Acad Sci India Sect B Biol Sci. 2015;85(2):635–642.
3. Thilagar G, Bagyaraj DJ, Rao MS. Selected microbial consortia developed for chili reduces application of chemical fertilizers by 50% under field conditions. Sci Hortic. 2016; 198:27–35.
4. Bashan Y, de-Bashan LE. How the plant growth-promoting bacterium Azospirillum promotes plant growth—a critical assessment. Adv Agron. 2005; 88:77–136.
5. Lugtenberg B, Kamilova F. Plant-growth-promoting rhizobacteria. Annu Rev Microbiol. 2009; 63:541–556.
6. **Shahwar, D., et al. (2023).** *Role of microbial inoculants as biofertilizers for improving crop productivity.* ScienceDirect. (ScienceDirect)
7. **Wijaya, A. A., et al. (2024).** *Yield stability of biofertilizer treatments to soybean in the rainy season.* De Gruyter. (De Gruyter Brill)
8. **Jarecki, W., et al. (2023).** *Soybean response to seed inoculation or coating with biofertilizers.* PubMed Central. (PMC)

9. **Omari, R. A., et al. (2022).** *Enhanced soybean productivity by inoculation with indigenous Bradyrhizobium strains.* Frontiers in Plant Science. (Frontiers)
10. **Zhao, G., et al. (2024).** *Development of biofertilizers for sustainable agriculture.* ScienceDirect. (ScienceDirect)
11. **Sarhadi, W. A., et al. (2025).** *Fertilizers and inoculants effects on soybean yield and yield components.* ResearchGate. (ResearchGate)
12. **Miljaković, D., et al. (2018).** *Effects of soybean co-inoculation with plant growth-promoting rhizobacteria in field trials.* Romanian Biotechnological Letters. (ResearchGate)
13. **Zhang, X., et al. (2025).** *Biofertilizers enhance soil fertility and crop yields.* MDPI. (MDPI)
14. **Marinković, J., et al. (2018).** *Effects of soybean co-inoculation with plant growth-promoting rhizobacteria in field trials.* Romanian Biotechnological Letters. (ResearchGate)
15. **Purcell, L. C., et al. (2013).** *Bradyrhizobium japonicum.* Wikipedia. (Wikipedia)