

POTENTIAL OF *BACILLUS THURINGIENSIS* B9 AND *BACILLUS PACIFICUS* B11 ISOLATED FROM TOMATO (*Solanum lycopersicum* L.) RHIZOSPHERE FOR ENHANCING GROUNDNUT (*Arachis hypogaea* L.) PRODUCTION AND REDUCING AFLATOXIGENIC *ASPERGILLUS FLAVUS* CONTAMINATION

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INTRODUCTION



Groundnut (*Arachis hypogaea* L.) is a vital legume crop providing high-quality protein and essential nutrients. However, production faces significant challenges:

- Aflatoxin contamination by *Aspergillus flavus* poses serious health risks
- Climate change and drought stress reduce yields
- Chemical inputs cause environmental and health concerns

Research objective: Evaluate the potential of *Bacillus* strains as sustainable biofertilizers and biocontrol agents for enhanced groundnut production and reduced *A. flavus* contamination

METHODS

Study Location: University of Dschang Research Farm and Phytopathology laboratory, Cameroon (Tropical highland climate, Oxisols, Altitude: 1,400m)

Workflow



Biological Strains

- *Bacillus thuringiensis* B9 & *Bacillus pacificus* B11 (Isolated from tomato rhizosphere)
- *Aspergillus flavus* (Toxigenic strain for antagonism tests)

Antagonism Assays (In Vitro)

- **Circular confrontation** - Direct colony interaction
- **Horizontal confrontation** - Side-by-side growth
- **Poisoned medium** - Bacterial metabolite effects

Field Trial Treatments

(T1: Control, T2: Poultry manure + DAP, T3: *Bacillus pacificus* B11, T4: *Bacillus thuringiensis* B9)

CONCLUSION

Bacillus pacificus B11 shows strong promise as a biofertilizer and biocontrol agent. Its capacity to enhance groundnut production while simultaneously reducing *Aspergillus flavus* contamination in soil and potentially pre-harvest aflatoxin B1 contamination offers a sustainable alternative to chemical inputs, contributing to safer, higher-quality food production and reduced public health risks.

Agricultural Implications: Potential for developing commercial bio-inoculants for sustainable groundnut production in tropical regions

RESULTS

Upon completion of these antagonism assays, the most effective percentage of growth inhibition of the toxigenic *Aspergillus flavus* was significantly ($p < 0.05$) high for the *B. pacificus* B11 strain, with 83.9% achieved through the circular confrontation method, 67.7% via the poisoned medium method, and 64.5% by horizontal confrontation. In contrast to *B. pacificus* B11, the *B. thuringiensis* B9 strain showed an inhibition percentage of 67.7% for circular confrontation, 48.4% for the poisoned medium method, and 35.5% for horizontal confrontation. The circular confrontation method was demonstrably the most effective approach for evaluating the antagonistic potential of the two strains examined.

Figure 1: Inhibition percentage of *B. pacificus* B11 and *B. thuringiensis* B9 on toxigenic *Aspergillus flavus*

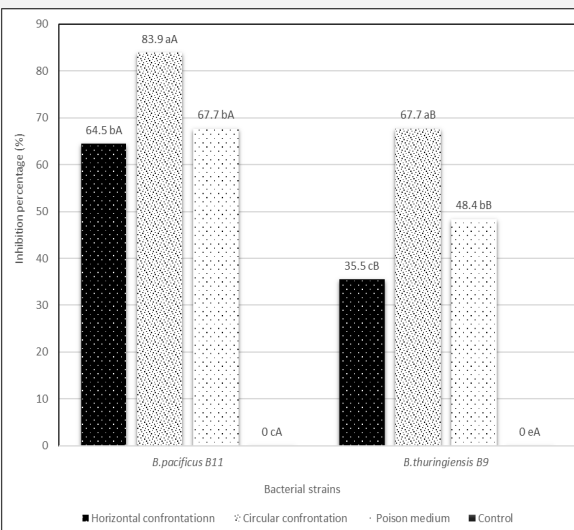


Figure 2: View of toxigenic *A. flavus* (A), horizontal confrontation (B), circular confrontation (C), and poison medium culture (D)

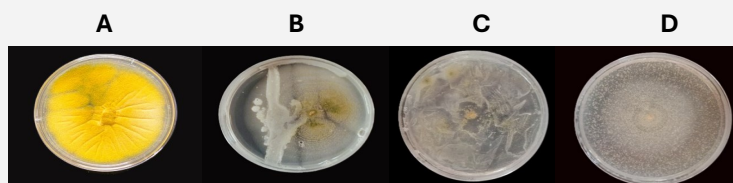


Table 1: Effect of treatment on germination, growth, biomass, yield and toxigenic *A. flavus* population in the soil.

Treatments	Control	Poultry manure + DAP	<i>Bacillus pacificus</i> B11	<i>Bacillus thuringiensis</i> B9
Variables				
Germination rate (%)	76.1	64.6	87.5	65
Vigor index	2478	3001	2668	2619
Plant height (Cm)	37.00	39.40	38.00	36.90
Collar diameter (Cm)	66.60	75.80	69.60	70.20
Number of branches	9.30	9.60	9.78	9.32
Leaf area (Cm ²)	1619	1630	1612	1531
Root length (Cm)	14.50	14.20	15.80	16.20
Aboveground biomass (t.ha ⁻¹)	27.20	35.90	35.60	31.50
Belowground biomass (t.ha ⁻¹)	8.77	10.40	9.85	8.98
Number of pods	26	29.00	40	26
Dry yield (t.ha ⁻¹)	2.75	3.01	4.61	3.08
Initial <i>A. flavus</i> population (CFU.g ⁻¹)	4.34 x 10 ⁶	4.34 x 10 ⁶	4.34 x 10 ⁶	4.34 x 10 ⁶
Final <i>A. flavus</i> population (CFU.g ⁻¹)	5.5 x 10 ⁶	3.9 x 10 ⁶	1.88 x 10 ⁶	7 x 10 ⁵