

# Evaluation of Coco Peat-Based, Plant Growth-Promoting Rhizobacteria Formulation for Drought Stress Management and Sustainable Agriculture

Chinyere Augusta Ajuzieogu, Mercy Singabele Oviyaibo

Department of Microbiology, Federal University Otuoke, Bayelsa State, Nigeria

ajuzieoguca@fuotuoque.edu.ng

## INTRODUCTION & AIM

- ✓ Drought (water stress), exacerbated by climate change, increasingly threatens agricultural lands, impacting crop yields and quality.
- ✓ Plant growth promoting rhizobacteria (PGPR) have been reported to enhance plant growth and stress tolerance through various mechanisms, including nutrient solubilization, phytohormone production, and others.
- ✓ Encapsulation is used as a strategy to protect living cells from environmental stresses (drought), and prolong their shelf-life as well as enhancing their activity (Yaakov et al., 2022).
- ✓ The aim therefore, was to produce formulations based on a material that is completely biodegradable, sustainable, retain moisture and protect PGPR, in order to tackle drought stress.
- ✓ Coco peat is remarkable for its ability to retain moisture and conserve water resources, hence its choice for the formulation.

## METHOD

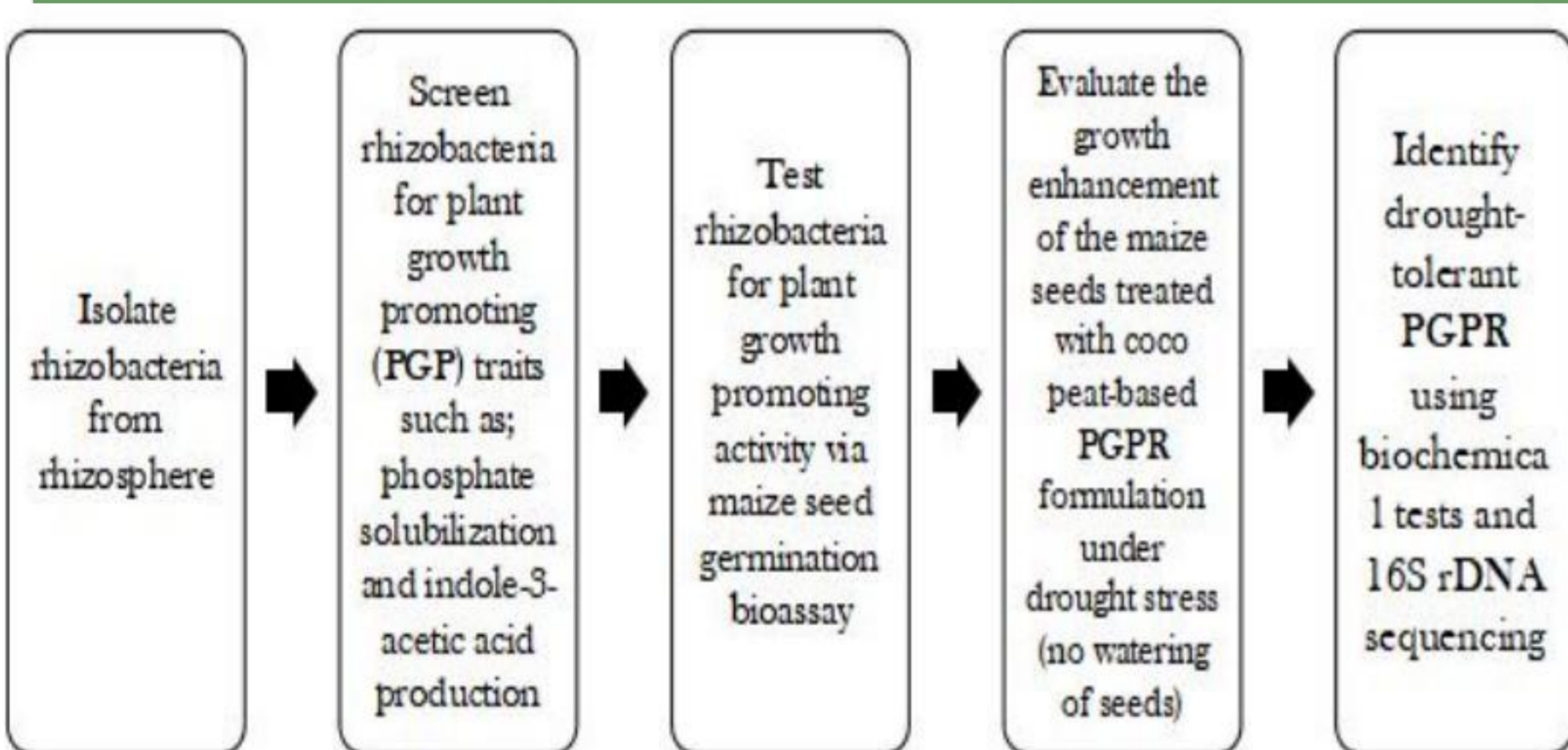


Table 1: Experimental design for pot experiment for 14 days

Samples	Experiment
POT 1	1.5 kg soil + 2g coco peat + 20 ml <i>Priestia flexa</i> + maize seeds — watering
POT 2	1.5 kg soil + 2g coco peat + 20 ml <i>Staphylococcus aureus</i> + maize seeds — watering
POT 3	1.5 kg soil + 2g coco peat + 20 ml <i>Klebsiella</i> sp. + maize seeds — watering
POT 4	1.5 kg soil + 2g coco peat + 20 ml <i>Actinomyces</i> sp. + maize seeds — watering
Control	Maize seeds + 2g coco peat + 20 ml sterile distilled water — watering



Plate 1: Coco peat-Based PGPR

## RESULTS & DISCUSSION

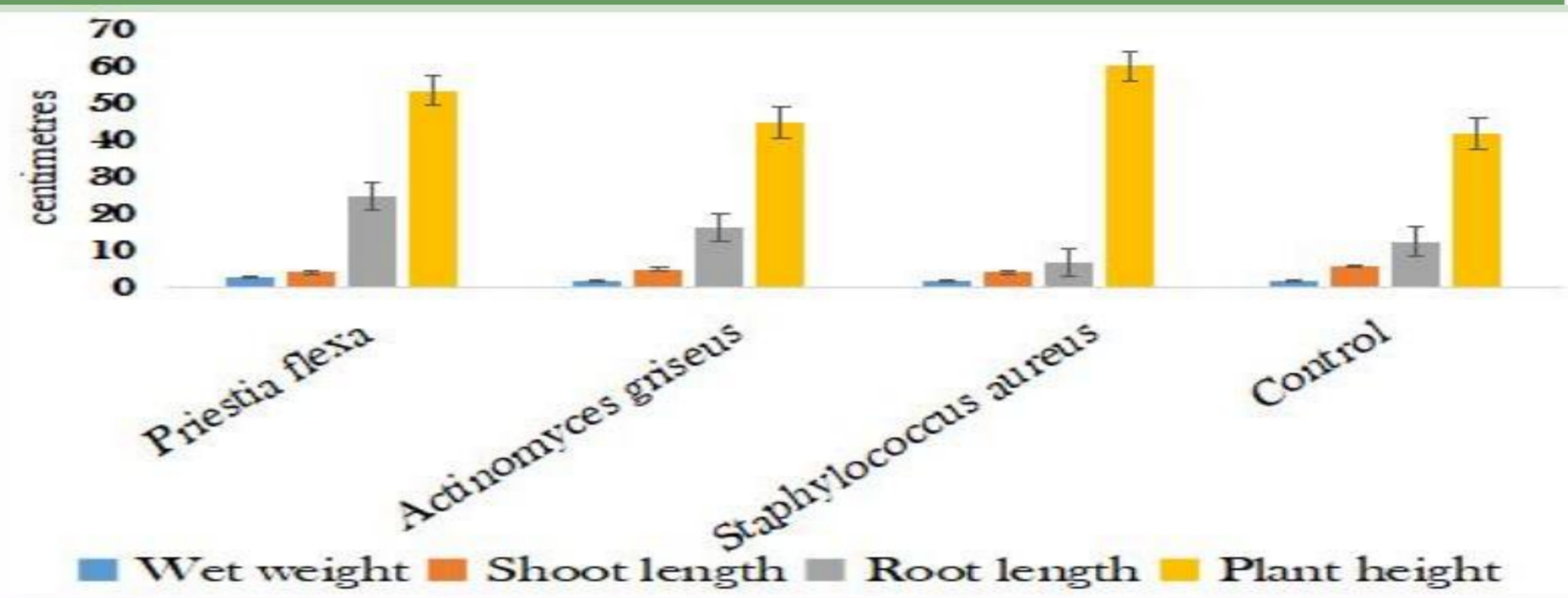


Fig.1. Effect of plant growth promoting rhizobacteria on *Zea mays* vegetative growth under drought stress at Day 7.

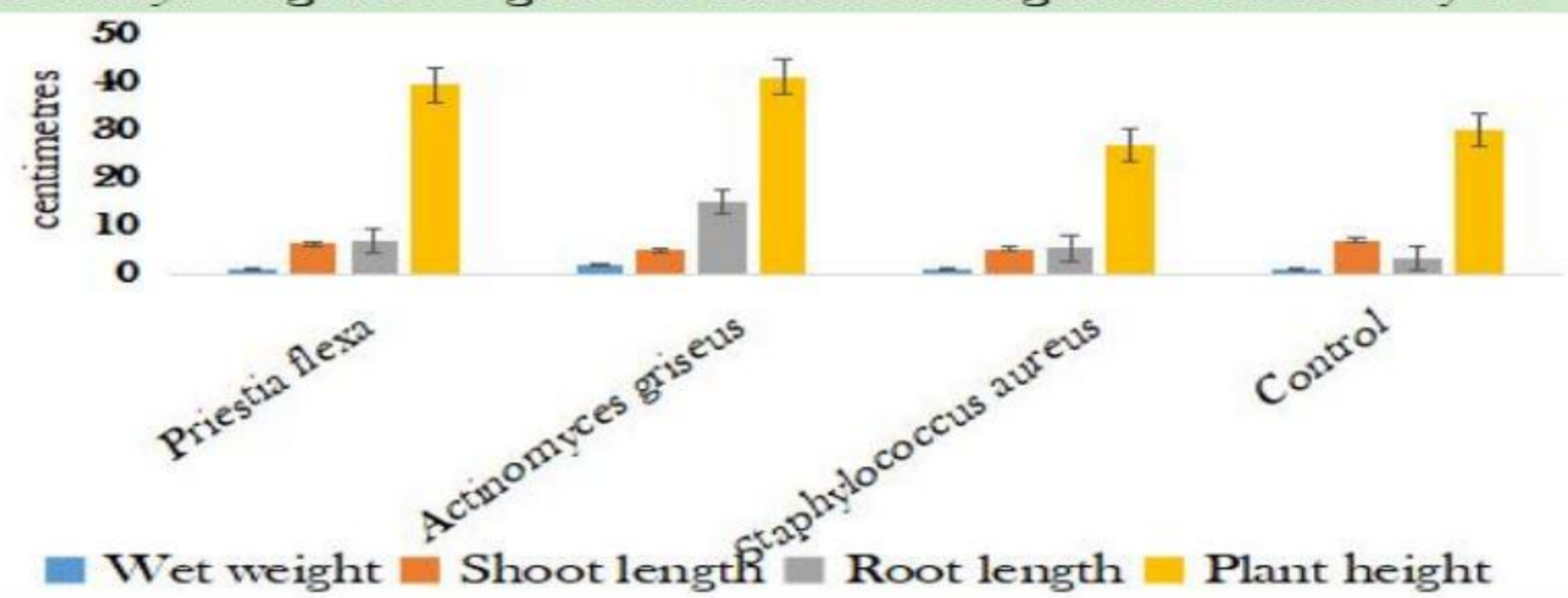


Fig.2. Effect of plant growth promoting rhizobacteria on *Zea mays* vegetative growth under drought stress at Day 14

However, at Day 16, all plants withered except for treatments with the formulations; (2g coco peat+20 ml *Priestia flexa*) and (2g coco peat+20 ml *Staphylococcus aureus*).

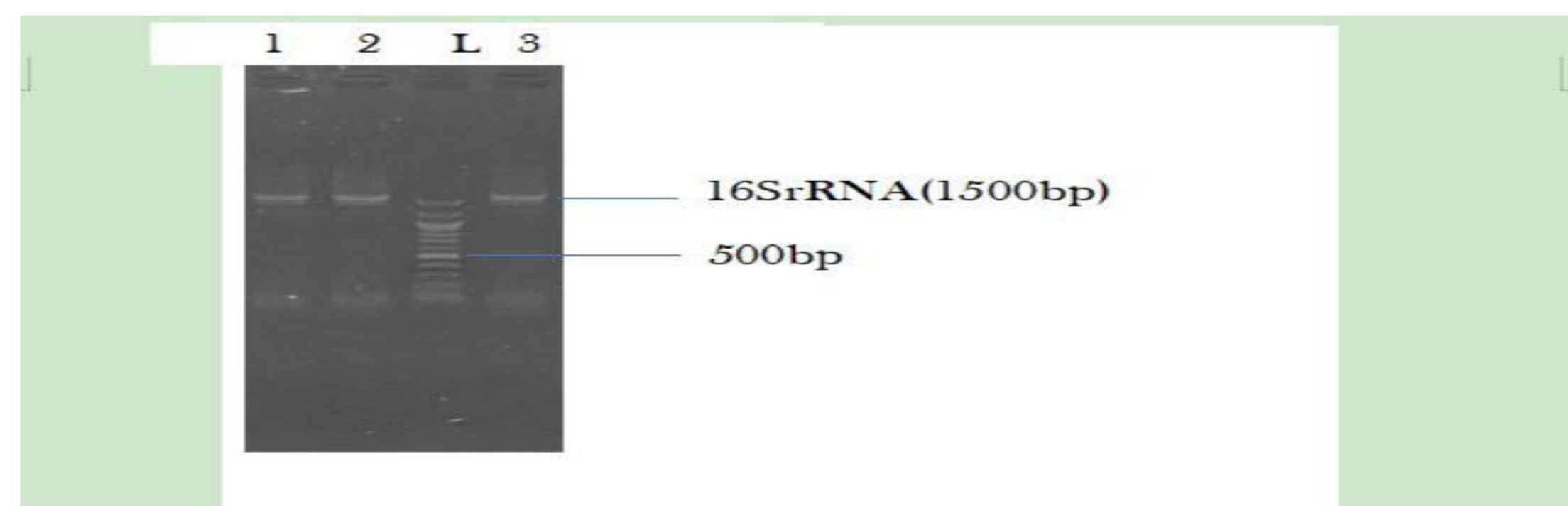


Plate 2: Agarose gel electrophoresis showing the amplified 16s rRNA. Lanes 1-3 represent the amplified 16srRNA at 1500bp while lane L represents the 100bp DNA ladder.

## CONCLUSION

This study therefore projects the potential of coco peat based-rhizobacteria fertilizers in managing drought stress and enhancing plant growth, thus effectively achieving Sustainable Development Goal 2, which targets “ensuring sustainable food production systems and implementing resilient agricultural practices”.

## REFERENCES

- Chukwuneme, C.F., Babalola, O.O., Kutu, F.R.K., & Ojuederie, O.B. (2020). Characterization of actinomyces isolates for plant growth promoting traits and their effects on drought tolerance in maize. *Journal of Plant Interactions*, 15(1), 93-105.
- Yaakov, N., Kottakota, C., Mani, K.A., Naftali, S.M., Zelinger, E., Davidovitz, M., Ment, D. & Mechrez, G. (2022). Encapsulation of *Bacillus thuringiensis* in an inverse pickering emulsion for pest control applications. *Colloids and Surfaces B: Biointerfaces*, 213, 112427.