



Azotobacter on root growth, biomass and chlorophyll content in Bokchoy(*Brassica rapa*)

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Abstract

Introduction: The use of plant growth-promoting rhizobacteria (PGPR) as biofertilizers is an eco-friendly approach to improve crop productivity. *Azotobacter* spp. are free-living nitrogen-fixing bacteria known to enhance plant growth through nutrient availability and phytohormone production. This study aimed to evaluate the effect of *Azotobacter* inoculation on root growth, biomass, and chlorophyll content of bok choy (*Brassica rapa*).

Method: A preserved stock culture of *Azotobacter* was grown on selective medium and cultured in LB broth at 37 °C for 72 h. The bacterial cells were harvested by centrifugation at 10000 rpm for 10 min and resuspended in sterile distilled water to prepare a concentrated inoculum. Bok choy seeds were surface-sterilized and soaked in the bacterial suspension for 24 h before sowing in sterilized soil .Plant growth parameters including root length, total biomass, and chlorophyll content were measured after the growth period.

Result: The results showed that *Azotobacter*-treated plants exhibited increased root length and biomass compared to the control plants. In addition, chlorophyll content was higher in inoculated plants, indicating improved photosynthetic efficiency and overall plant vigor.

Conclusion :In conclusion, *Azotobacter* inoculation significantly enhanced growth and physiological parameters of bok choy. The findings suggest that *Azotobacter* can be effectively used as a biofertilizer to promote sustainable vegetable production.

INTRODUCTION

- Plant growth-promoting bacteria (PGPR) are beneficial microbes that help plants grow by fixing nitrogen, producing hormones, and improving nutrient uptake. *Azotobacter* is a free-living nitrogen-fixing bacterium that can increase root growth, biomass, and chlorophyll content in vegetables.
- Bok choy is an important leafy vegetable, and its growth can be improved using biofertilizers like *Azotobacter*. This study investigates the effect of *Azotobacter* inoculation on root length, total biomass, and chlorophyll content of bok choy.

OBJECTIVES

- To evaluate the effect of *Azotobacter* inoculation on the root growth of bok choy .
- To determine the impact of *Azotobacter* treatment on total plant biomass of bok choy.
- To assess the influence of *Azotobacter* inoculation on chlorophyll content of bok choy leaves.
- To compare growth and physiological parameters between *Azotobacter*-treated and untreated (control) plants.

METHODS

- Azotobacter* strains were revived from stock cultures on selective media and incubated at 37 °C for 72 h. Actively growing cultures were inoculated into Luria–Bertani (LB) broth and incubated at 37 °C for 72 h. Bacterial cells were harvested by centrifugation at 10,000 rpm for 10 min, and the pellet was used for seed treatment.
- Bok choy seeds were soaked in the *Azotobacter* cell pellet for 24 h; untreated seeds served as the control. Treated and control seeds were sown in soil-filled pots. After germination, a soil drench with *Azotobacter* broth was applied around the root zone 7 days after germination. Plants were grown under controlled conditions and harvested to measure root length, total biomass, and chlorophyll content.



Figure: *Azotobacter* growth on selective media



Fig.: Treated plant

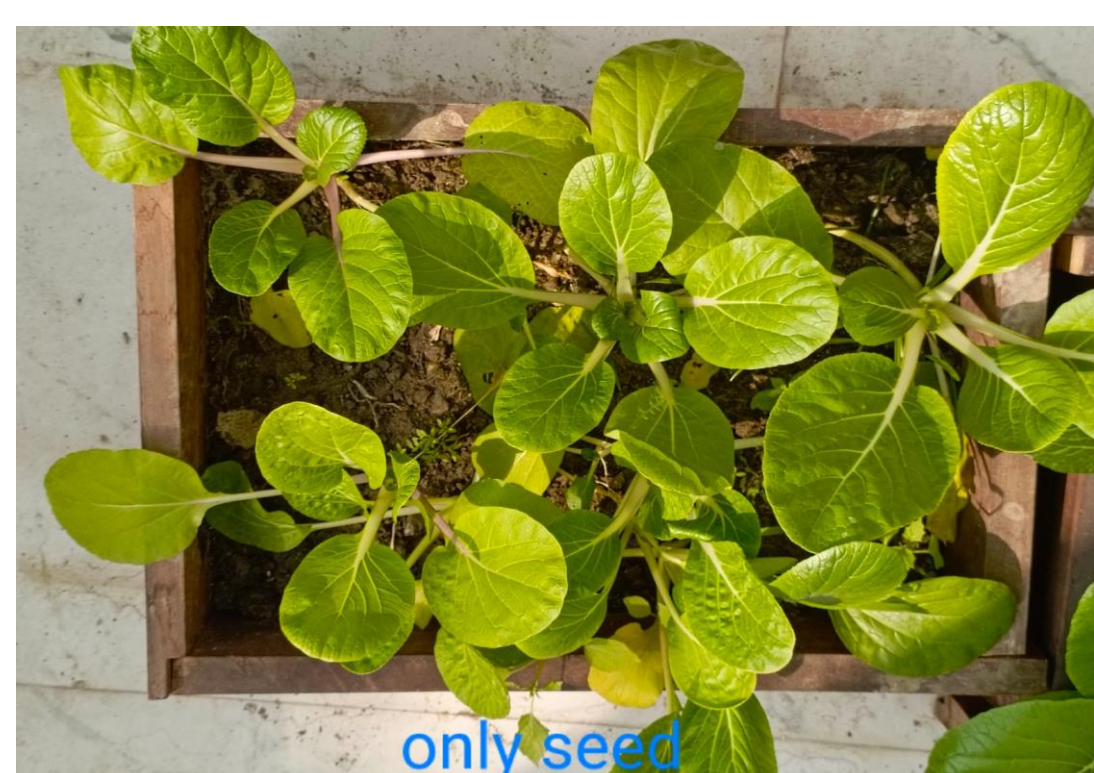


Fig.: Control Plant

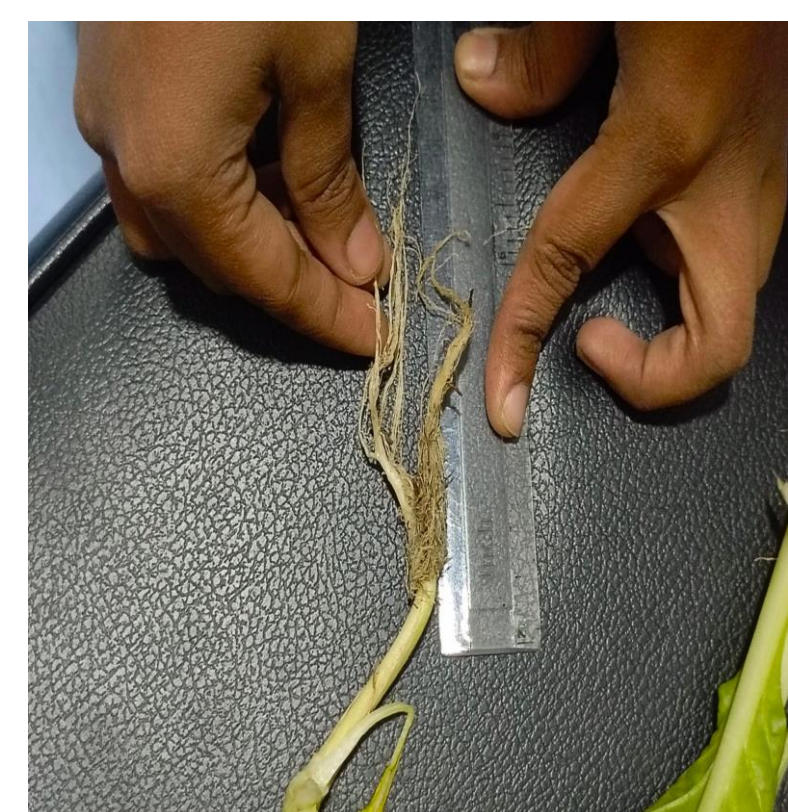


Fig.: Measurement of root length

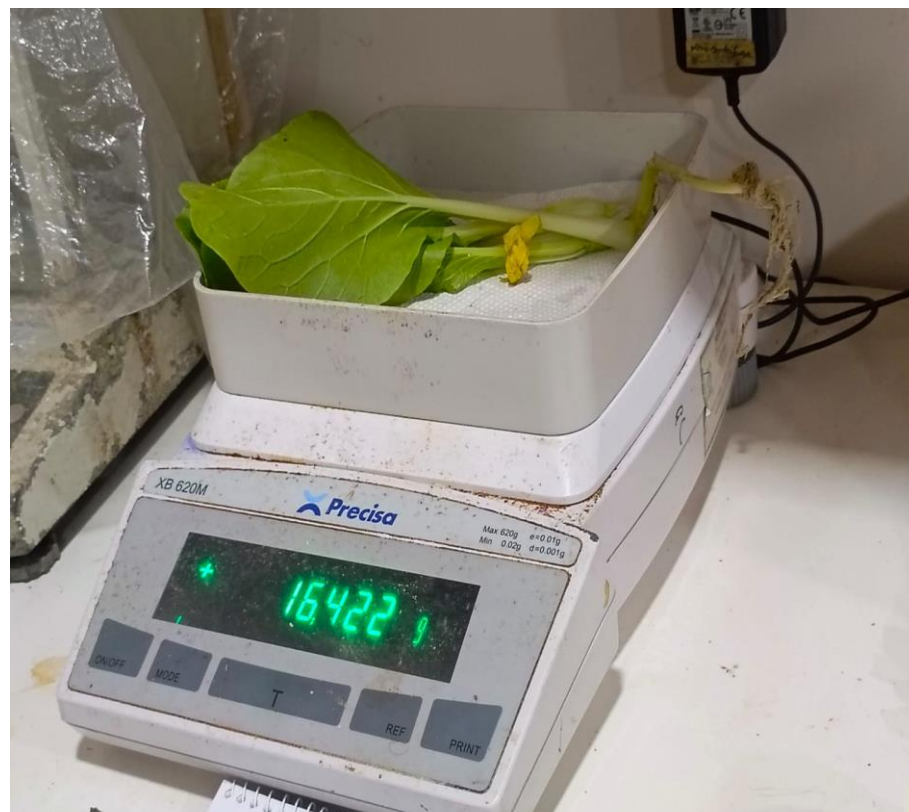


Fig.: Biomass measurement

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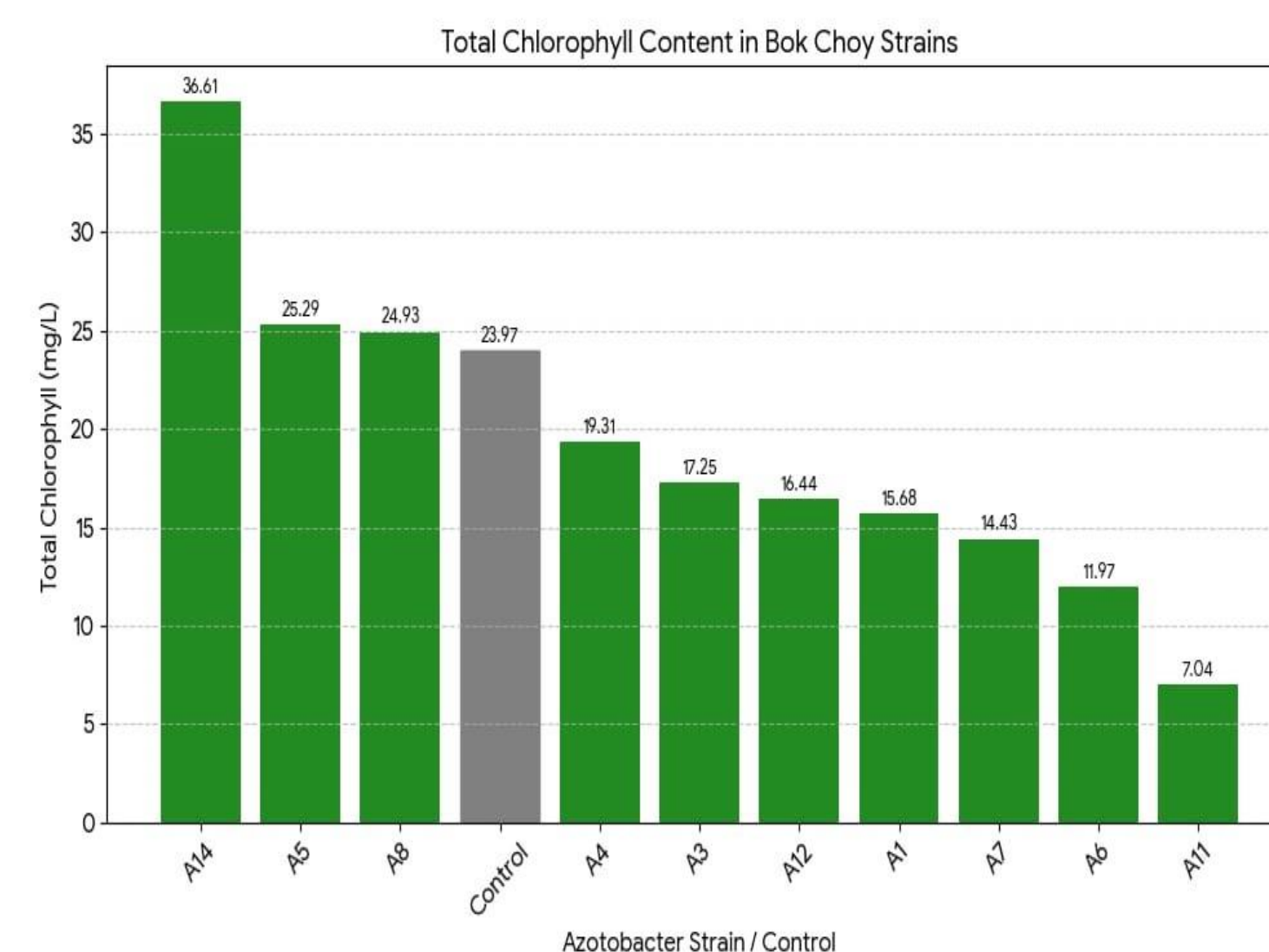
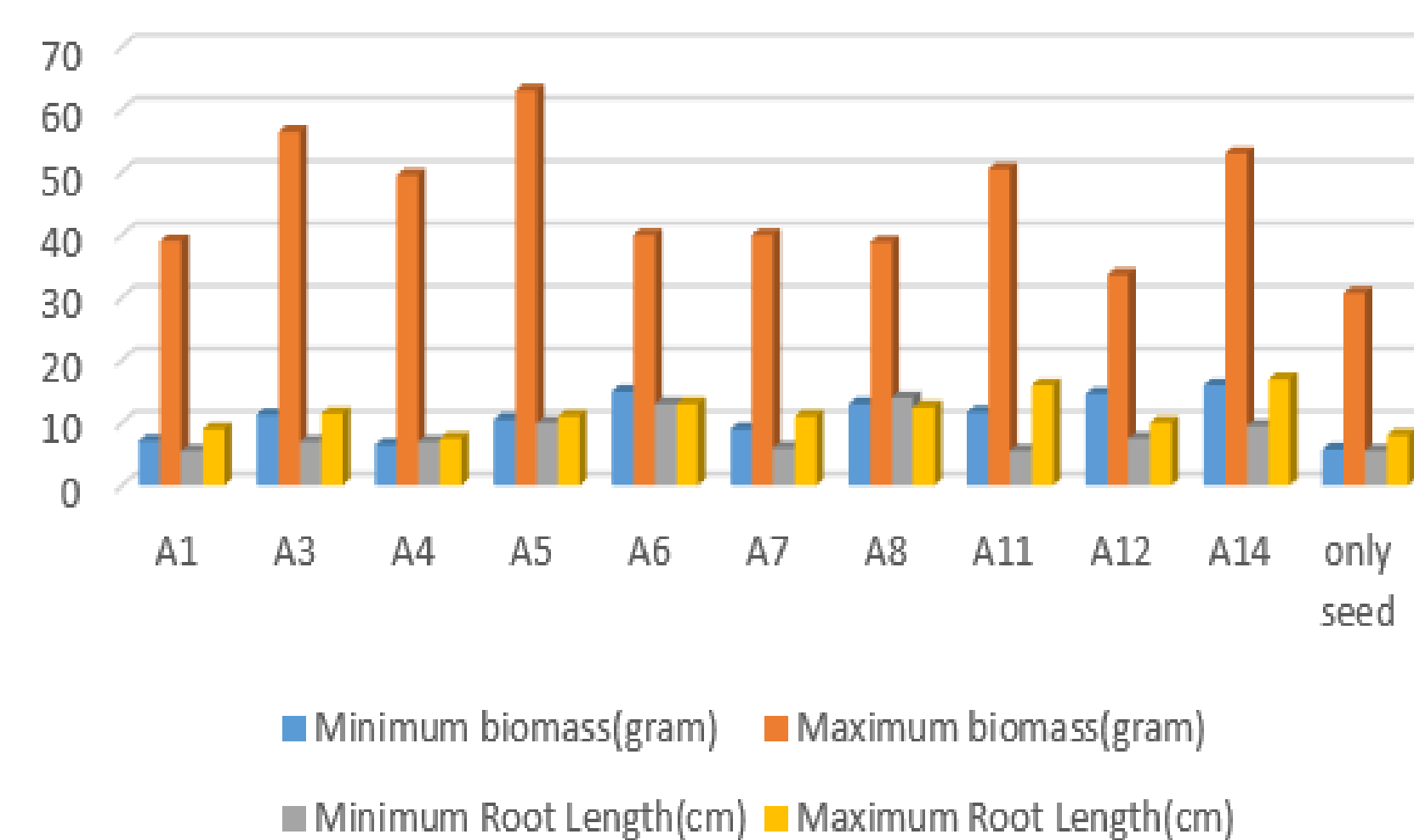
METHODOLOGY



RESULTS

- Most treated plants showed longer roots than control.
- Biomass was higher in most *Azotobacter*-treated plants
- Three *Azotobacter* strain treated plants had higher total chlorophyll levels suggests improved photosynthesis

Comparison of Biomass and Root Length between Control and *Azotobacter* Treated seed



Discussion

- Azotobacter* inoculation increased root length compared to control plants.
- Improved root growth may be due to bacterial production of plant growth hormones and better nutrient uptake.
- Treated plants showed higher total biomass, indicating enhanced overall growth.
- Increased chlorophyll content suggests improved photosynthesis and plant health.
- Results support the role of *Azotobacter* as an effective plant growth-promoting rhizobacterium (PGPR).