



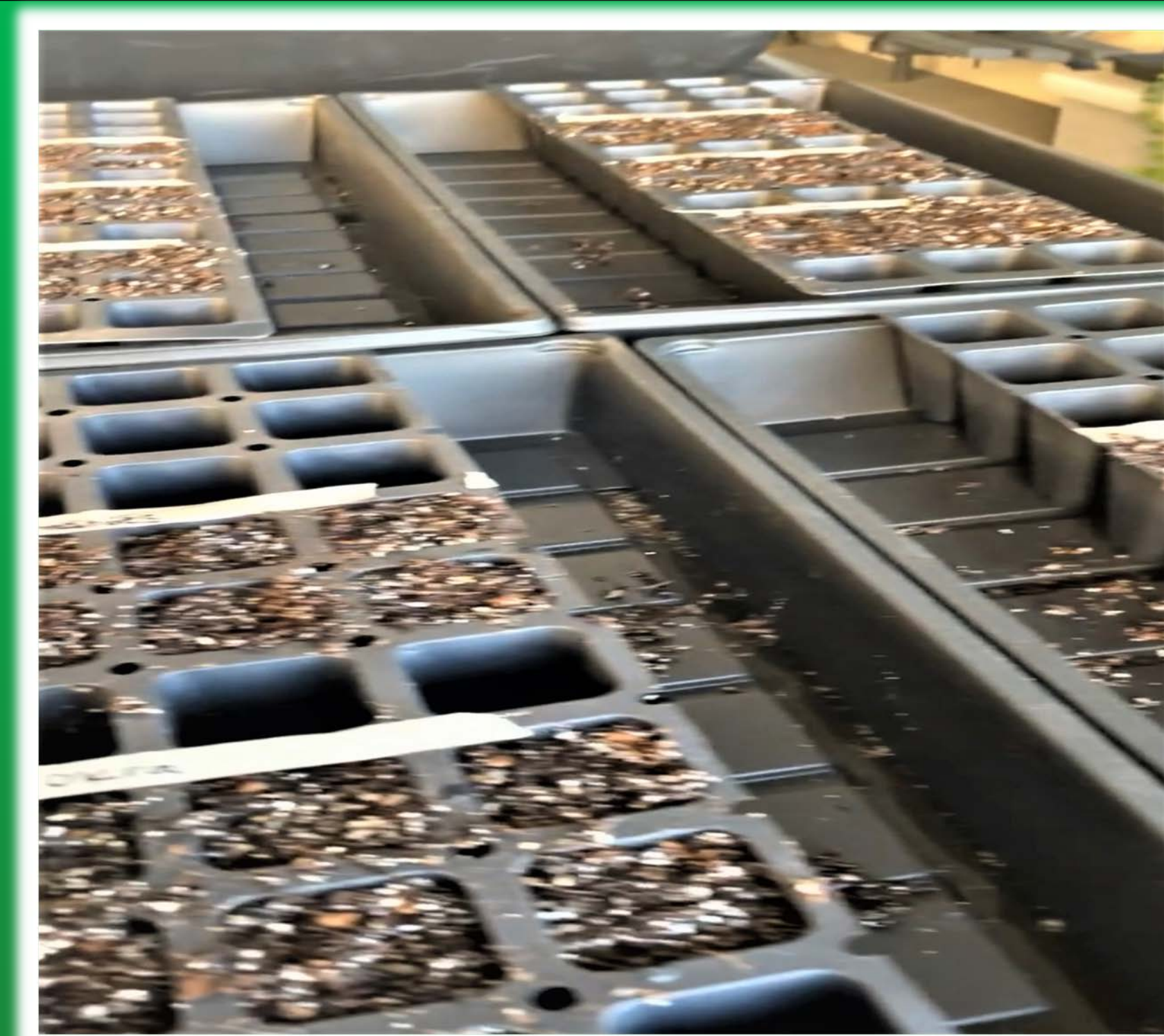
Promotion of Initial Plant Growth with Rhizobacterial Inoculation

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Introduction

There is a worldwide need for fast growing crops to develop improved crop yield. Development of new methods for improvement in crop yield include using rhizobacteria to promote initial plant growth. Adesemoye et al. (2008) reported that plant species of tomato (*Solanum lycopersium*), okra (*Abelmoschus esculentus*), and African spinach (*Spinacia oleracea*) increased in initial growth rates when the seeds were inoculated with rhizobacteria *Pseudomonas aeruginosa* and *Bacillus subtilis*. The hypothesis of this study is tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*Pisum sativum*) seeds inoculated with *P. aeruginosa* and *B. subtilis* will grow at a faster rate than the plants with non-inoculated seeds.



Materials and Methods

Twenty tomato (*S. lycopersium*) seeds, 20 okra (*A. esculentus*) seeds, and 20 pea (*P. sativum*) seeds were divided into 4 treatments of *P. aeruginosa*, *B. subtilis*, *P. aeruginosa* + *B. subtilis*, and distilled water (control). Five seeds from each plant were inoculated in each treatment for 1 hour before planting. The seeds were placed individually at the midpoint of 60 250-mL pots filled with Miracle-Gro potting mix. The plants were watered with 10 mL of distilled water three times a week. The height of the plants was measured at 3-day intervals for 14 days. After 14 days, the final wet weights and dry weights were measured by first removing soil with distilled water, then placing in a drying oven for 72 hours at 60 °C.

Root Lengths

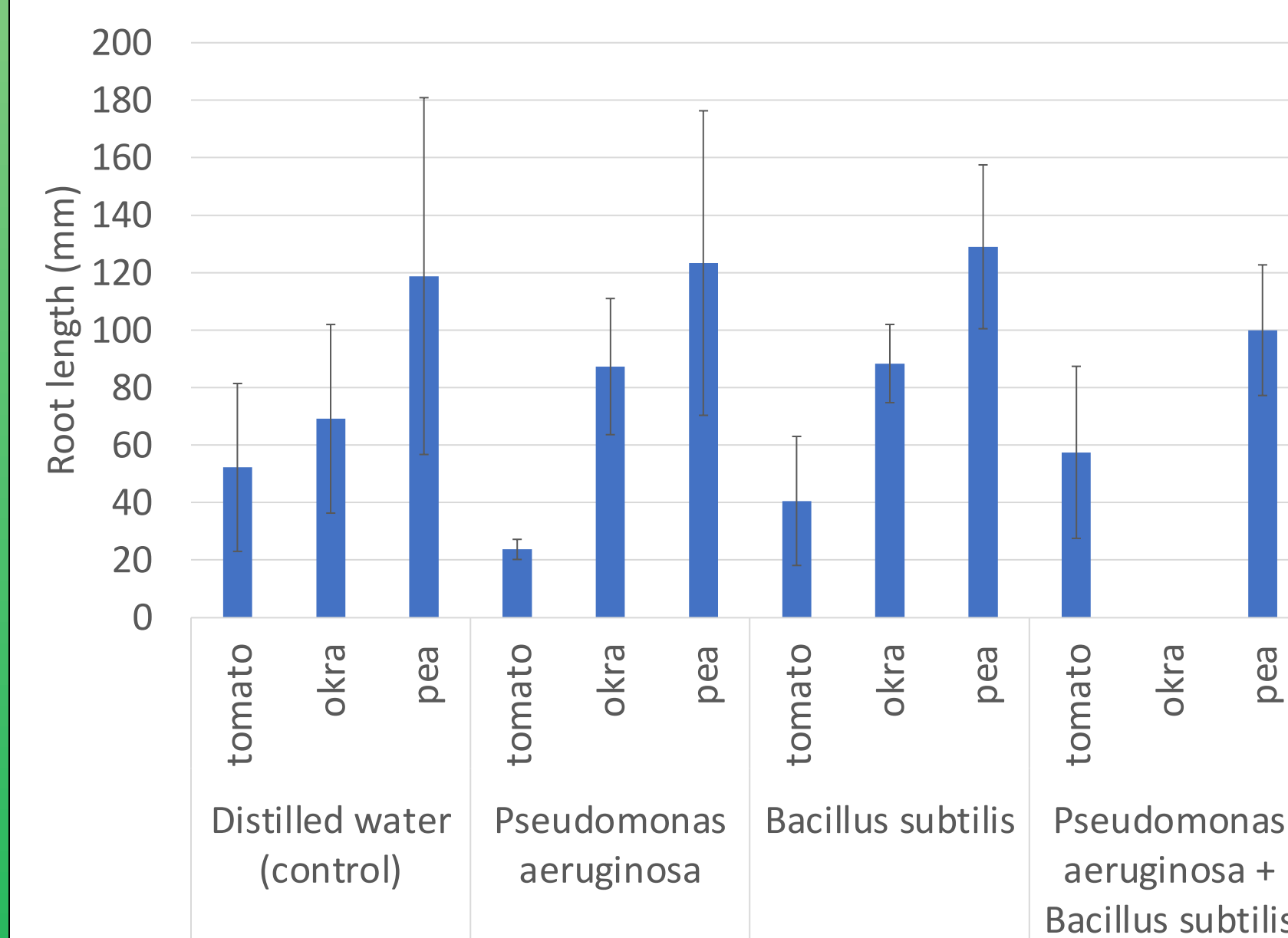


Figure 1. Root lengths (mm) after 14 days of tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*P. sativum*) plants with seeds inoculated in distilled water (control), *P. aeruginosa*, *B. subtilis*, and *P. aeruginosa* + *B. subtilis* (mean \pm SD).

Stem Lengths

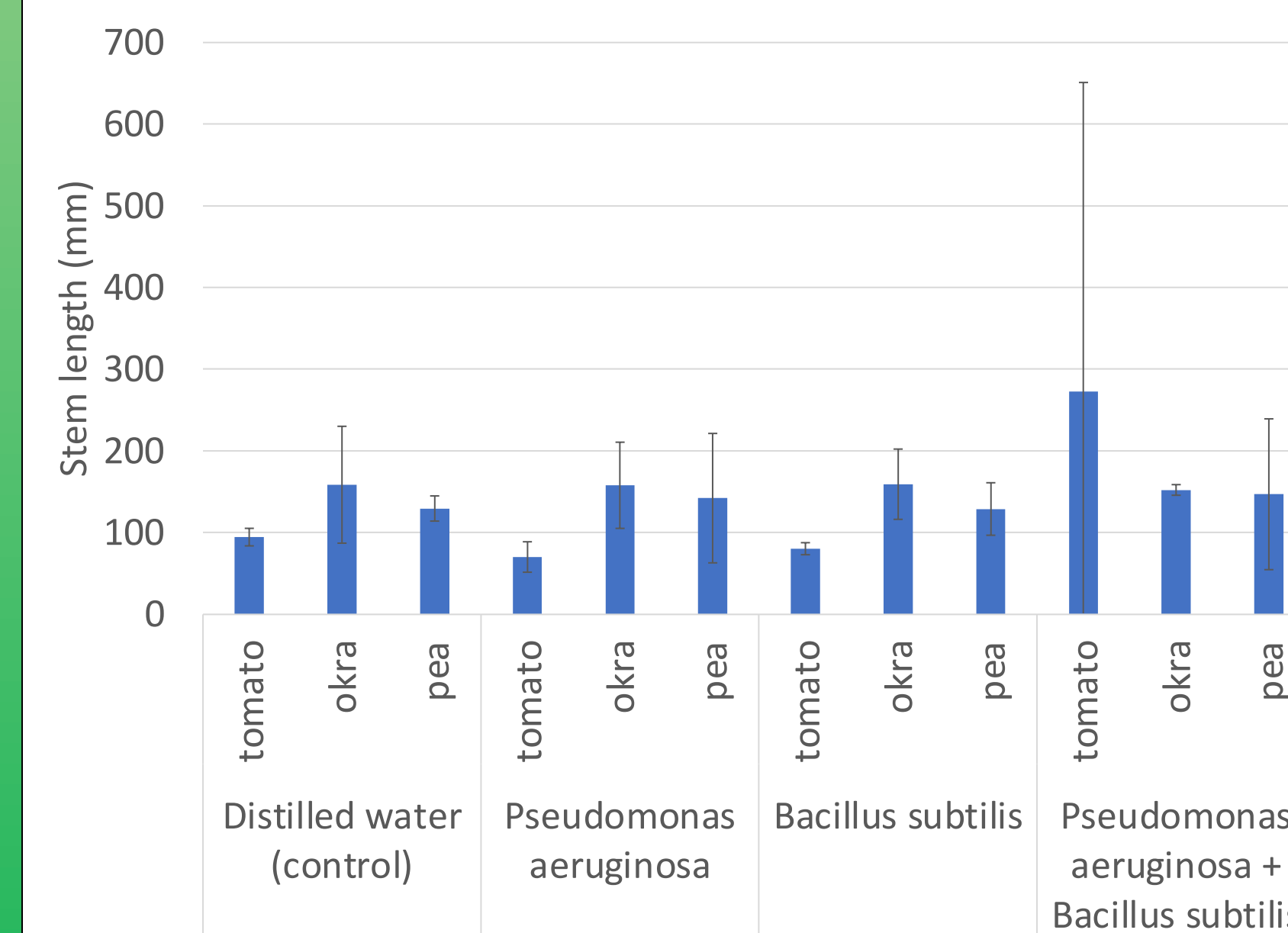


Figure 2. Wstem lengths (mm) after 14 days of tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*P. sativum*) plants with seeds inoculated in distilled water (control), *P. aeruginosa*, *B. subtilis*, and *P. aeruginosa* + *B. subtilis* (mean \pm SD).

Wet Weight

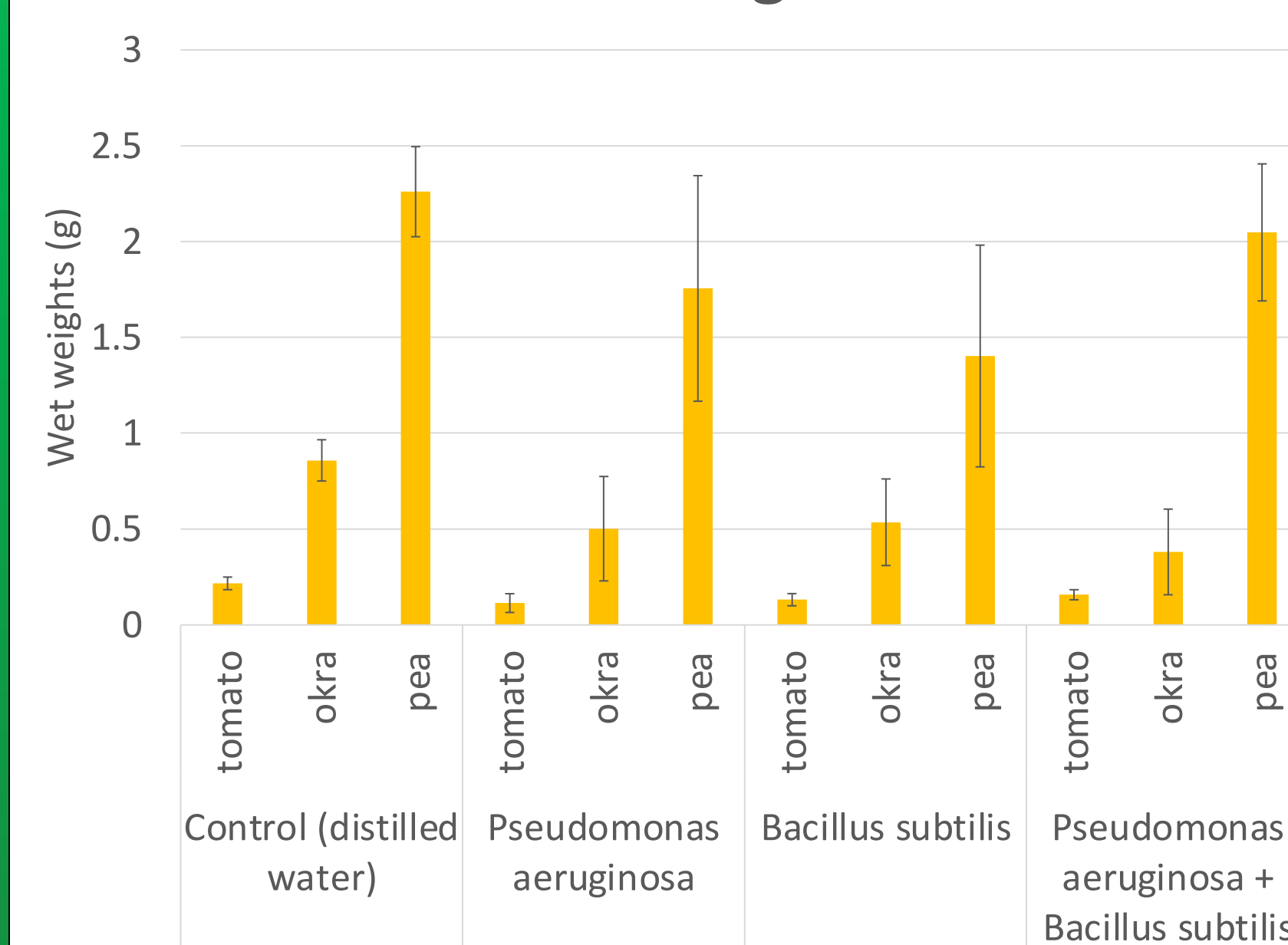


Figure 3. Wet weights (g) after 14 days of tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*P. sativum*) plants with seeds inoculated in distilled water (control), *P. aeruginosa*, *B. subtilis*, and *P. aeruginosa* + *B. subtilis* (mean \pm SD).

Dry Weights

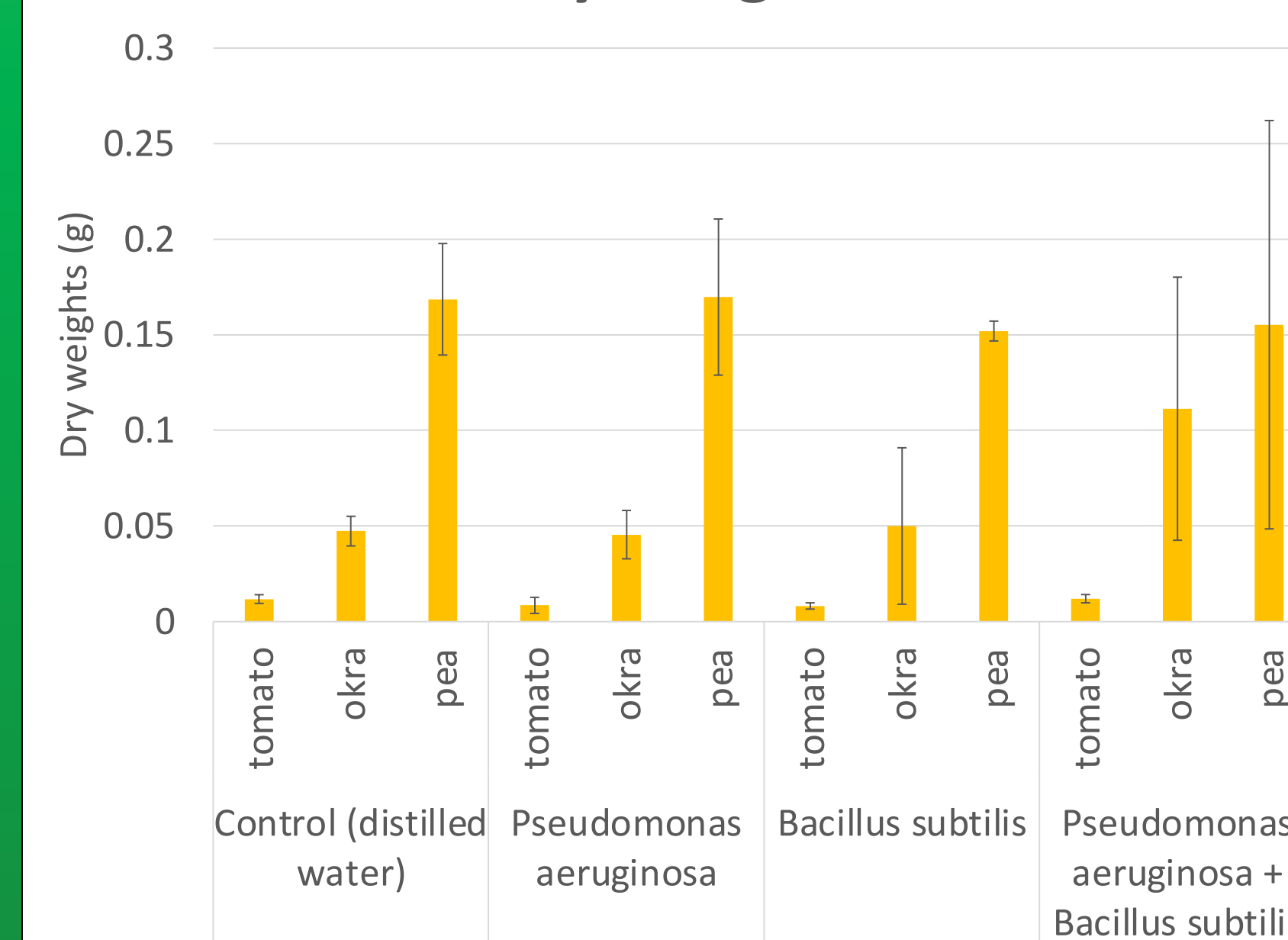


Figure 4. Dry weights (g) after 14 days of tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*P. sativum*) plants with seeds inoculated in distilled water (control), *P. aeruginosa*, *B. subtilis*, and *P. aeruginosa* + *B. subtilis* (mean \pm SD).

Results

The root lengths (mm) after 14 days of tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*P. sativum*) plants with seeds inoculated in distilled water (control), *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *Pseudomonas aeruginosa* + *Bacillus subtilis* were significantly different (1-way ANOVA, $F_{10,33}=5.42$, $p<0.05$, Figure 1). The stem lengths (mm) after 14 days of tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*P. sativum*) plants with seeds inoculated in distilled water (control), *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *Pseudomonas aeruginosa* + *Bacillus subtilis* were not significantly different (1-way ANOVA, $F_{11,33}=0.79$, $p=0.65$, Figure 2). The wet weights (g) after 14 days of tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*P. sativum*) plants with seeds inoculated in distilled water (control), *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *Pseudomonas aeruginosa* + *Bacillus subtilis* were significantly different (1-way ANOVA, $F_{11,24}=27.64$, $p<0.05$, Figure 3). The dry weights (g) after 14 days of tomato (*S. lycopersium*), okra (*A. esculentus*), and pea (*P. sativum*) plants with seeds inoculated in distilled water (control), *Pseudomonas aeruginosa*, *Bacillus subtilis*, and *Pseudomonas aeruginosa* + *Bacillus subtilis* were significantly different (1-way ANOVA, $F_{11,24}=6.16$, $p<0.05$, Figure 4).

Discussion

The data supports the alternative hypothesis that plants with seeds inoculated with rhizobacteria have faster initial growth than plants with non-inoculated seeds. Adesemoye et al. (2008) reported similar finding of increased growth in tomato (*S. lycopersium*) and okra (*A. esculentus*) but no significant difference between the overall performance of *P. aeruginosa* and *B. subtilis*. This research found a significant growth difference between tomato (*S. lycopersium*), okra (*A. esculentus*) and peas (*P. sativum*). This research inoculating seeds with rhizobacteria will result in faster initial growth rates and therefore can aid in faster crop growth.



Literature Cited

Adesemoye, A. O., Obini, M., & Ugoji, E. O. (2008). Comparison of plant growth-promotion with pseudomonas aeruginosa and bacillus subtilis in three vegetables. *Brazilian Journal of Microbiology*, 39(3), 423–426. <https://doi.org/10.1590/s1517-83822008000300003>