Evaluation of Bull Kelp-Extracted Biostimulant: Product Effect on Adventitious Root Growth (2nd Trial)

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Report Summary

- Results from the initial adventitious root bioassay are available in a separate document.
- The Test Product evaluated in these trials was a Bull Kelp extract biostimulant. Treatments were prepared following methods described for the first bioassay; a concentration of 1g/L (dry basis) was selected based on rates for biostimulant application commonly found in literature.
- A Commercial Control was included which was a highly concentrated Rockweed extract biostimulant. This was included to emphasize the beneficial effects of the Test Product in comparison to a commercially available product.
- Results suggest the Test Product and the Commercial Control had similar responses when comparing fresh weights, dry weights, root length, and surface area.
- The Test Product outperformed the Commercial Control when comparing root count, root volume, and fork count.

Methods: Treatment Preparation

- The Test Product was prepared as a liquid treatment using the dry matter content to calculate the dry product equivalent in grams per litre.
- This method provides consistency when evaluating batches during early product development.
- The rate of 1g/L (dry basis) was based on typical ranges for biostimulant applications found in literature.
- The commercial treatment was prepared following manufacturer recommendations.
- Treatment volume application was equivalent to 78 mL per liter.

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Table 1: Product moisture data

Product	Moisture Content (%)	Dry Matter Content (%)
GW (Test Product)	98.7	1.3

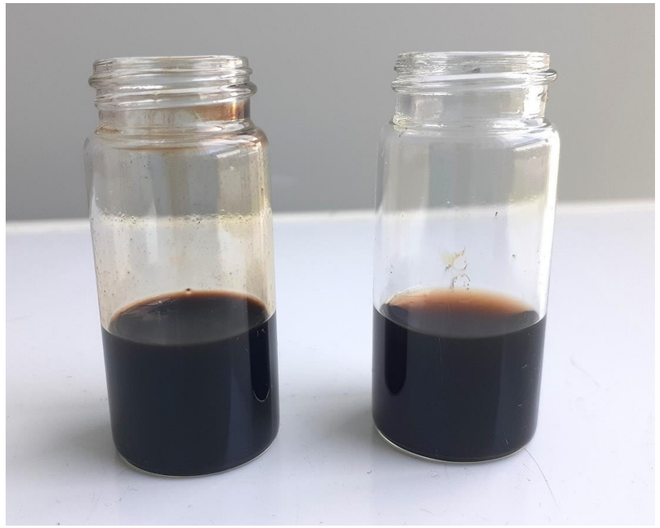

Image 1: Test Product concentrate (left) and treatment (right).

Methods: Treatment Preparation

Table 1: Treatment application details

Treatment No.	Product	Application Rate (dry basis)	Product Application (mL/L)	pH
1	GW (Test Product)	1 g/L	78.7	7.34
2	Commercial Control	1 g/L	3	7.47
3	Water Control	na	na	6.90

Methods: Bioassay

- Mung bean seeds (*Vigna radiata*) were sterilized and broadcast planted in general use potting soil. After 5 days of growth, seedlings of uniform size were selected and placed in 10 mL of treatment solution. Each treatment had 24 replicates and were grown under lights for 6 days.
- The number of roots (>0.5 cm) was recorded, and stems were cut 1.0 cm from the base. Fresh and dry weights were recorded.
- Root morphology was determined using WinRHIZO imaging software (Regent Instruments Canada).
- Statistical analysis was performed; data was tested for normality (Shapiro-Wilk test) and homogeneity of variances (Bartlett's test) within treatments. If data was normally distributed and variances were equal between treatment groups, a one-way ANOVA and Tukey post-hoc test were performed.

Results Summary

- Similar to the initial adventitious root bioassay, results suggest that both biostimulant products included in the trial out-perform the water control suggesting the presence of plant bioactive compounds such as phytohormones, polysaccharides, and polyphenols.
- The Test Product (Bull Kelp Extract) had statistically significant differences over the Water Control when comparing fresh weights and all morphological measurements.
- The Test Product and the Rockweed Extract Commercial Product showed similar responses when comparing fresh weights, dry weights, root length, and surface area.
- The Test Product outperformed the Commercial Product when comparing root count (17% difference), root volume (11% difference), and fork count (25% difference).
- Standard Deviation and Percent Differences Over Controls for all trials are included in a separate document.

Results: Fresh Weight

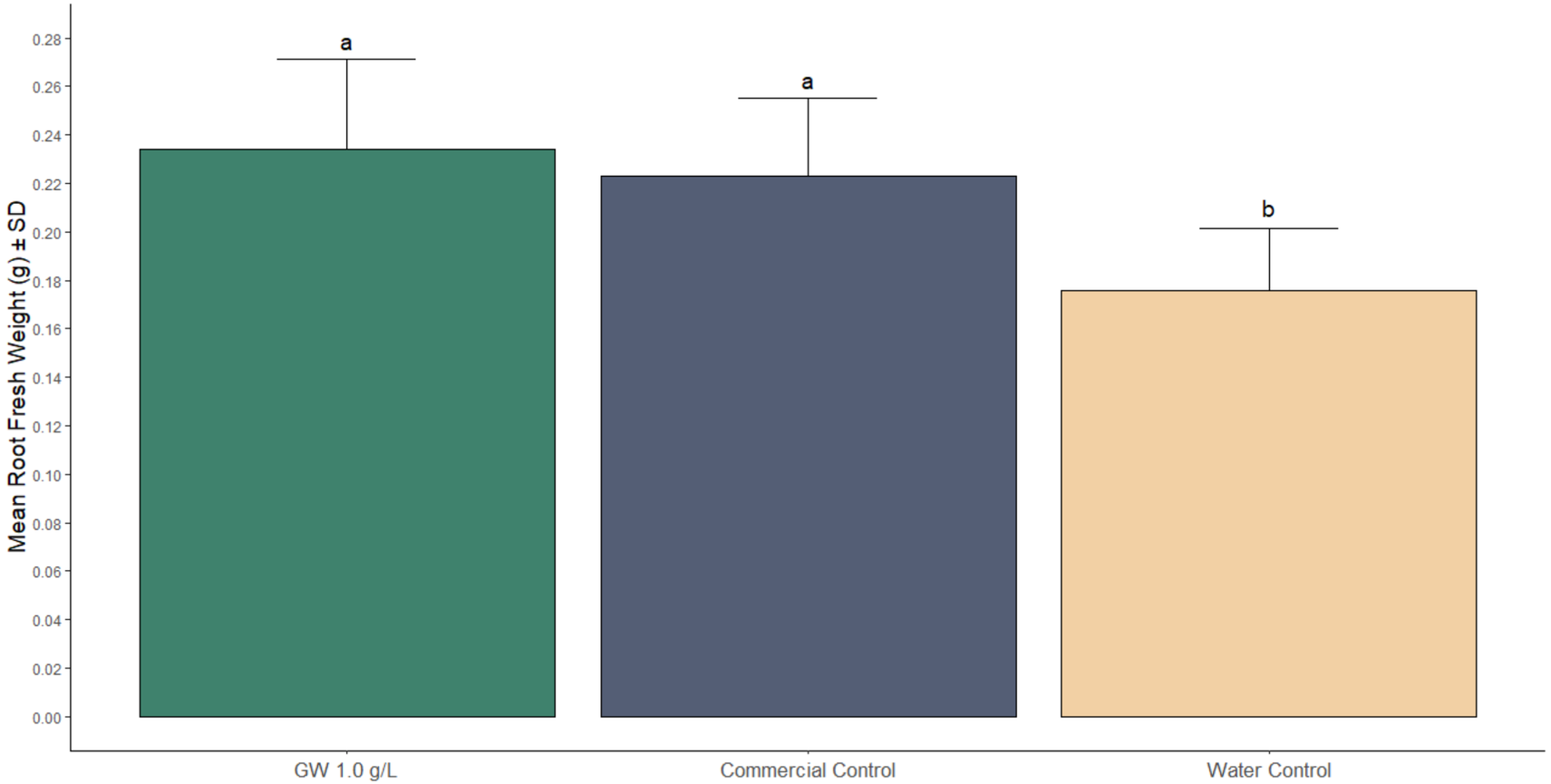

Figure 1: Fresh weight results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

GW treatment and Commercial control treatments show similar mean root fresh weights, and both are significantly greater than the Water control. This indicates that the GW treatment increased root fresh weight to a similar extent as the commercial control treatment

Results: Dry Weights

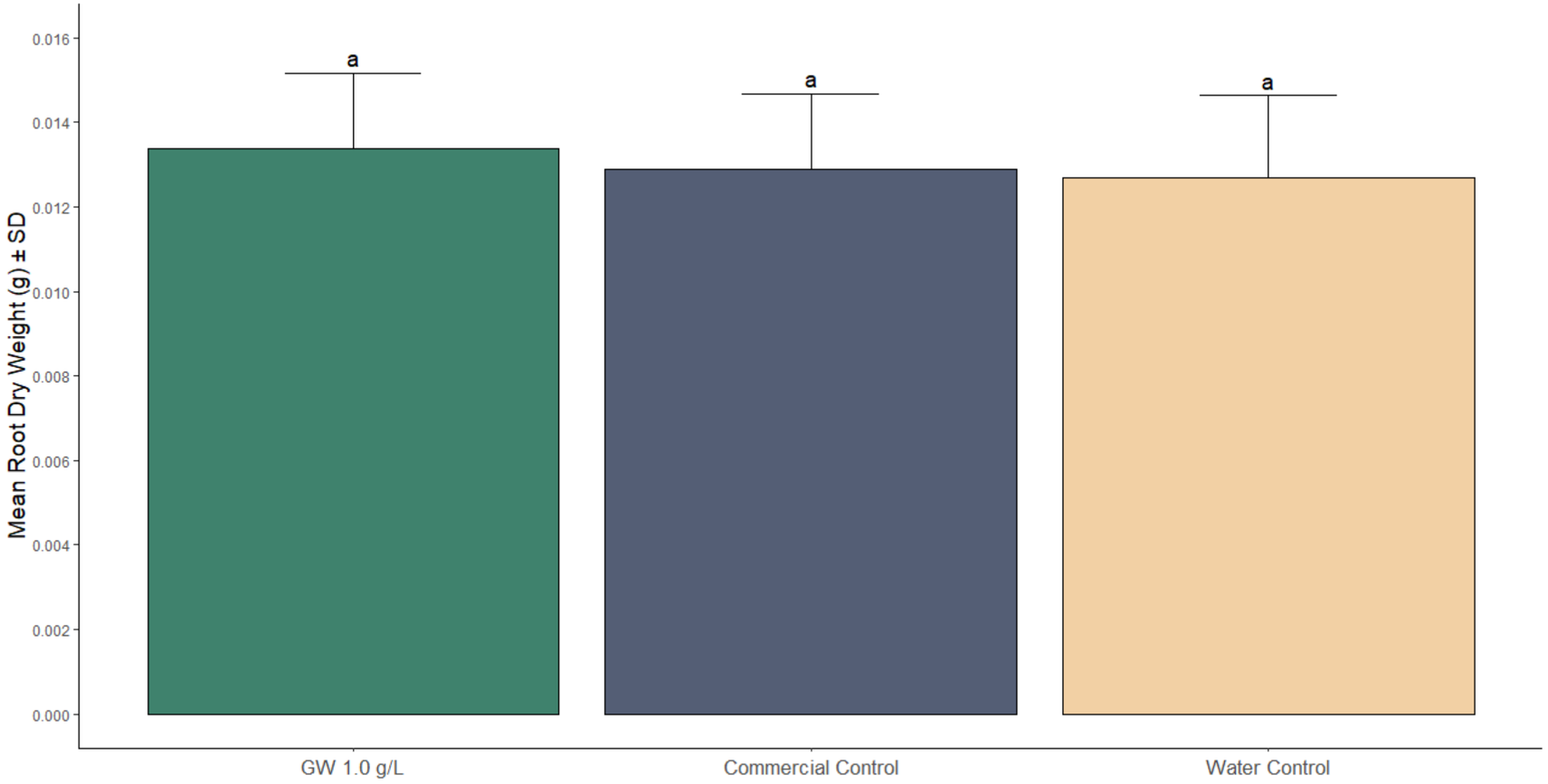

Figure 2: Dry weight results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

The root dry weight in the GW treatment, Commercial control, and Water control groups are not significantly different from each other.

Results: Root Count

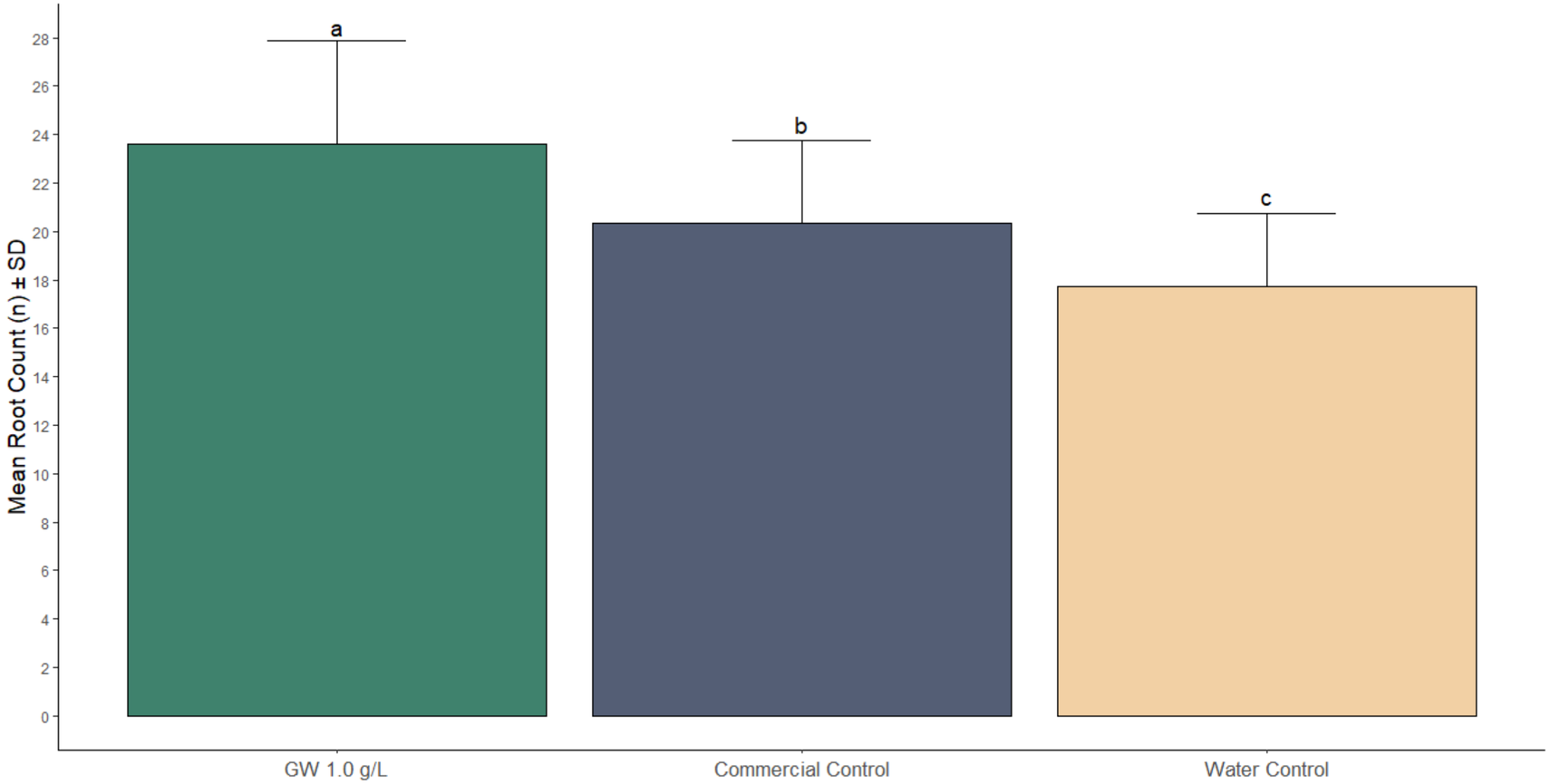

Figure 3: Root count results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

The GW treatment resulted in the highest mean root count, which is significantly greater than both the Commercial control and Water controls. The GW product showed a 17% difference when compared to the commercial control and a 28% difference when compared to the water control.

Results: Length

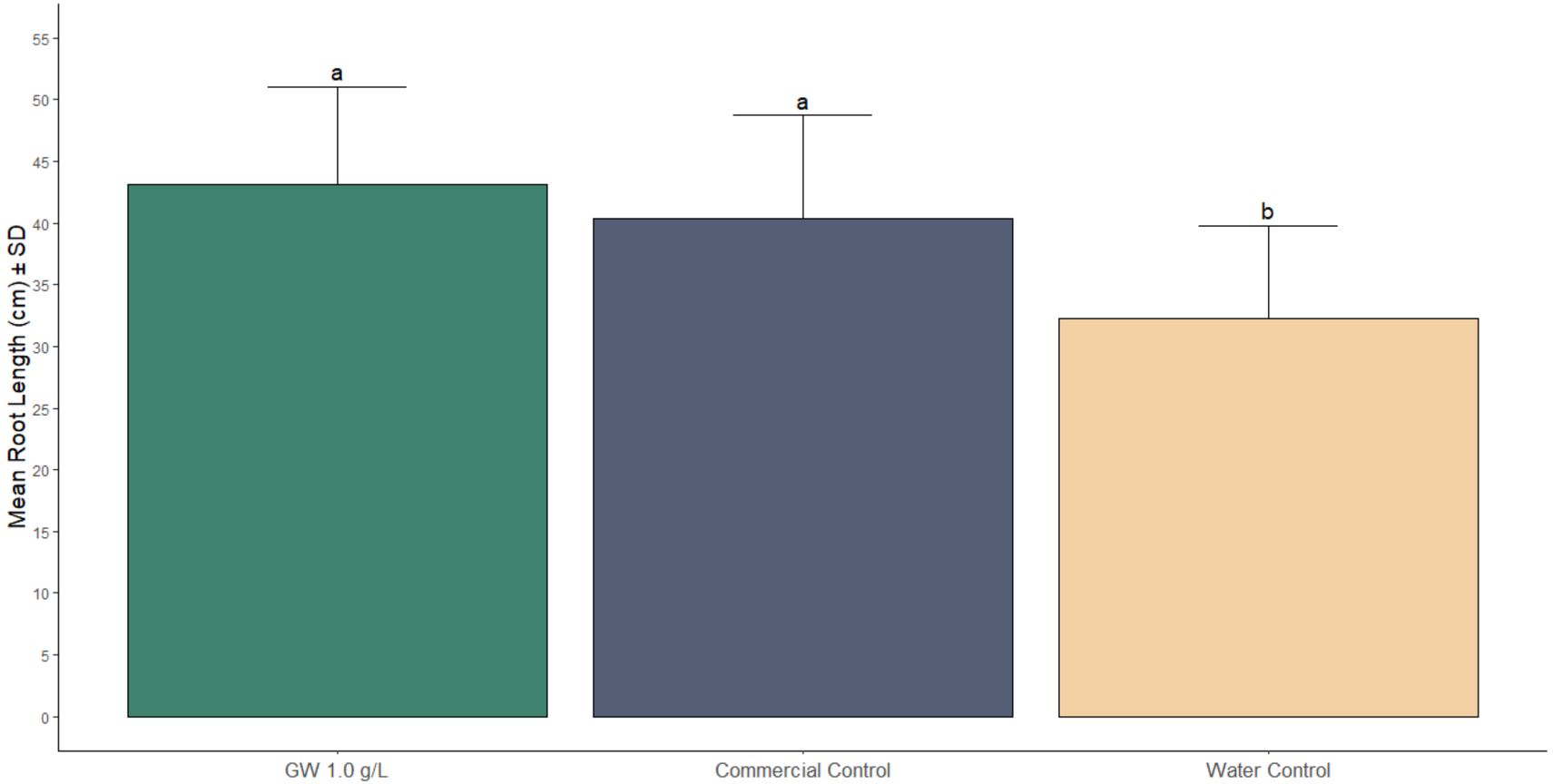

Figure 4: Average total length results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

The root length in the GW treatment and Commercial control is not significantly different from each other but is significantly higher than the Water control. The GW treatment had an average 29% difference in total length when compared to the Water control.

Results: Root Surface Area

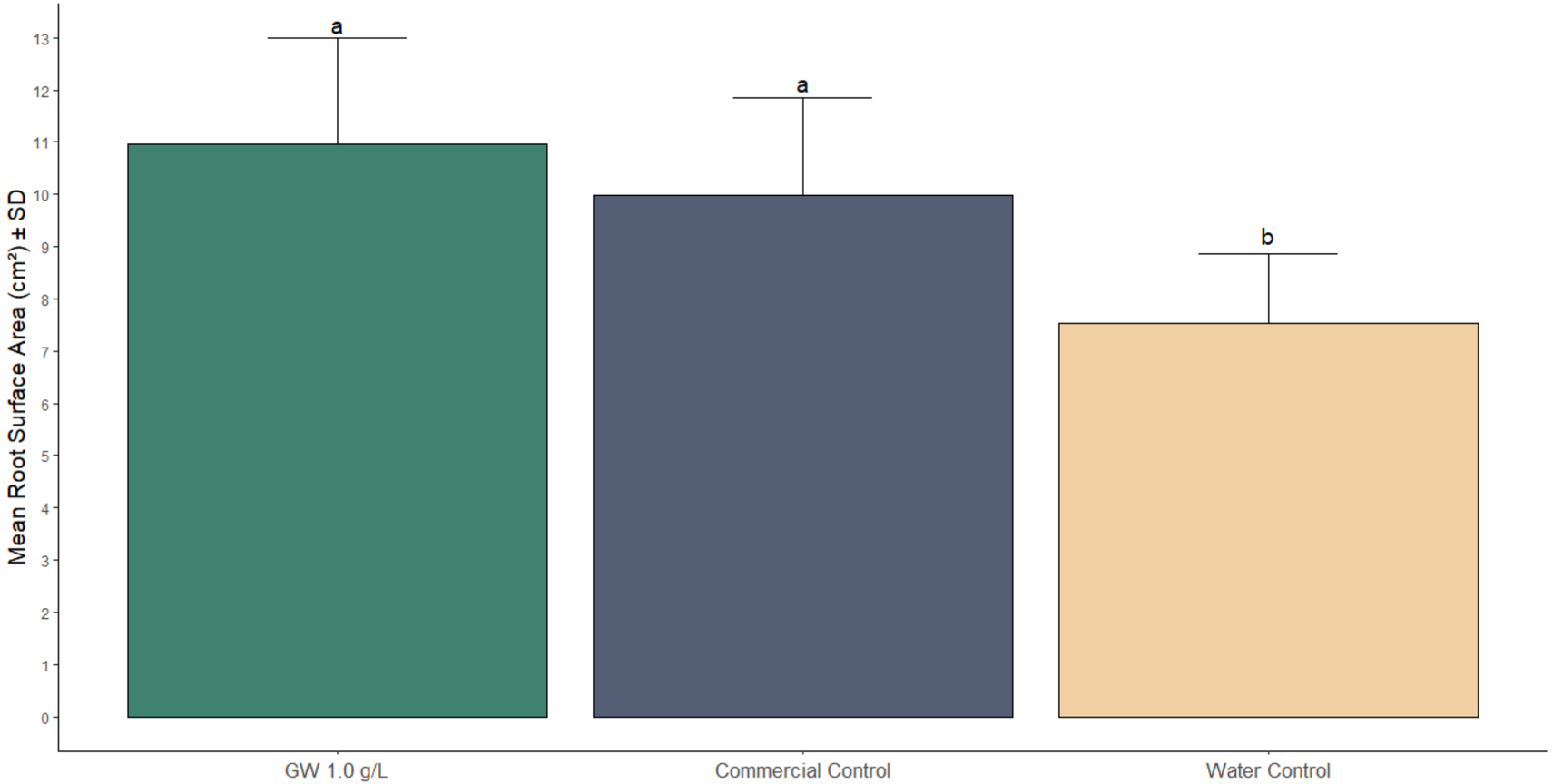

Figure 5: Root surface area results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

The root surface area in the GW treatment and Commercial control is not significantly different from each other but is significantly higher than the Water control. The GW treatment showed a 37% difference in surface area over the water control.

Results: Root Volume

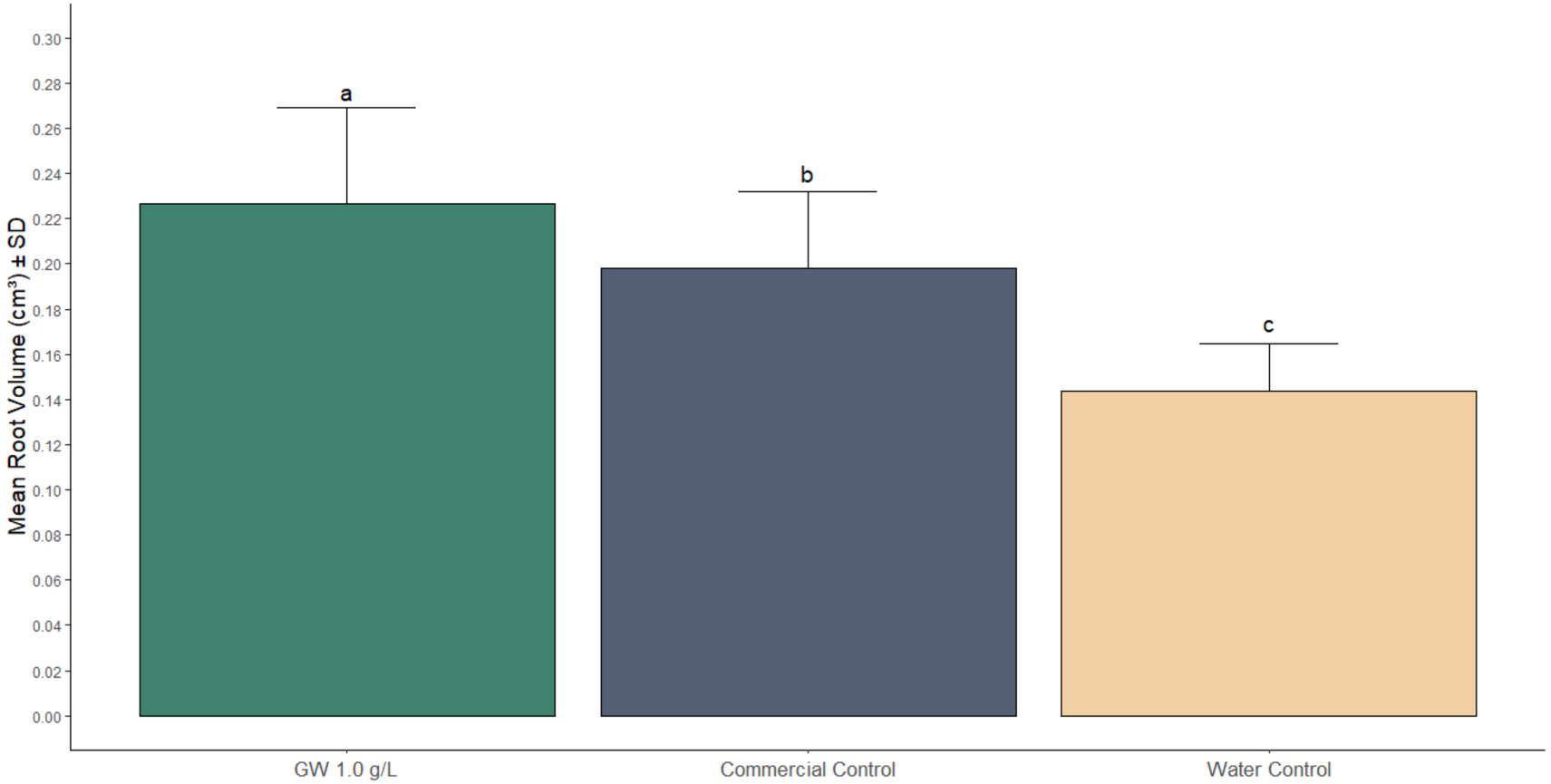

Figure 6: Root volume results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

GW treatment resulted in the highest mean root volume, which is significantly greater than both the Commercial control and the Water control. On average the GW product showed an 11% difference when compared to the commercial control and a 44% difference when compared to the water control.

Results: Fork Count

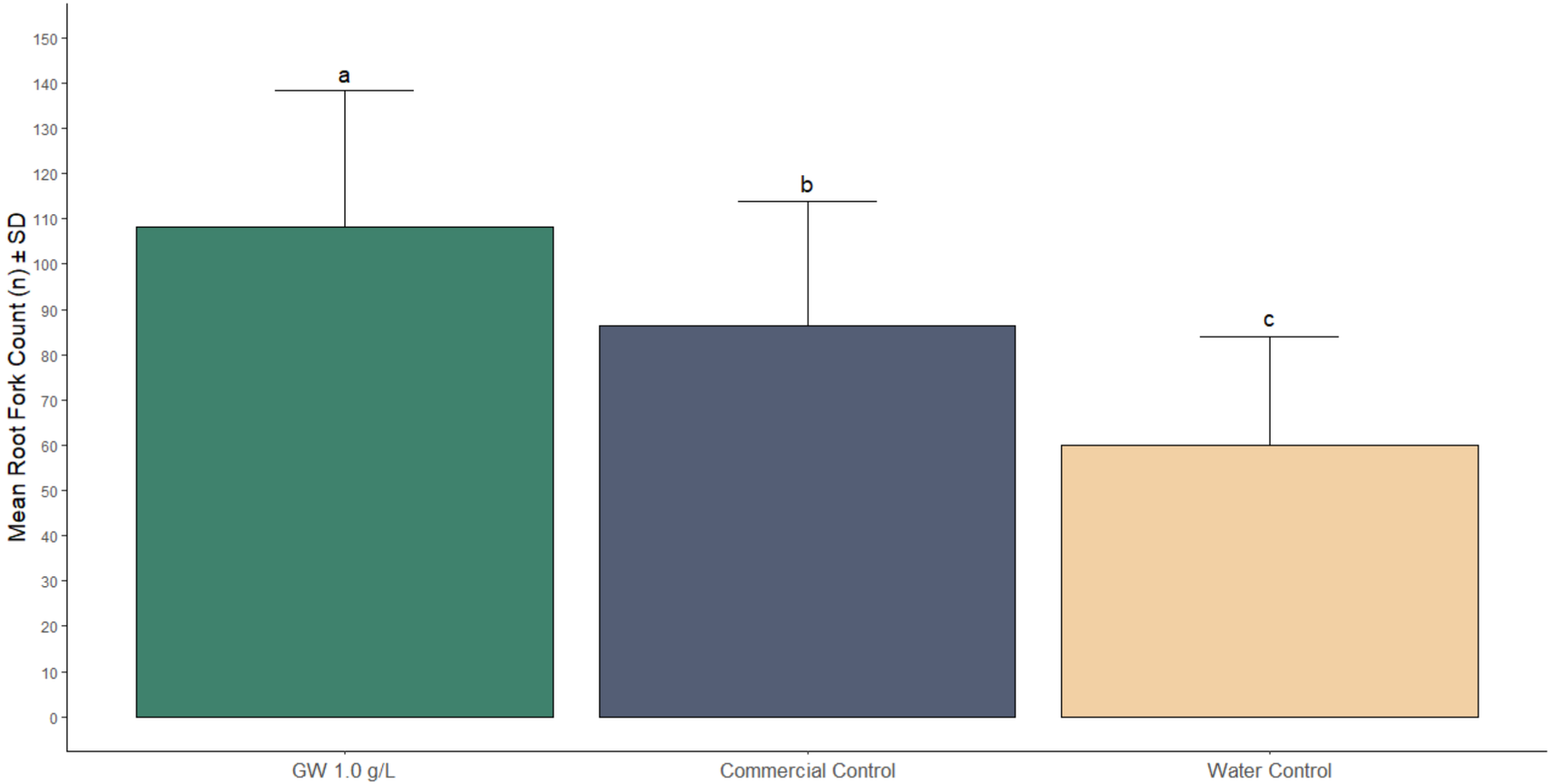

Figure 7: Fork count results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

GW treatment resulted in the highest mean fork count, which is significantly greater than both the Commercial control and the Water control. When comparing averages, the GW product showed a 25% difference when compared to the commercial control and a 60% difference when compared to the water control.

Treatment Images

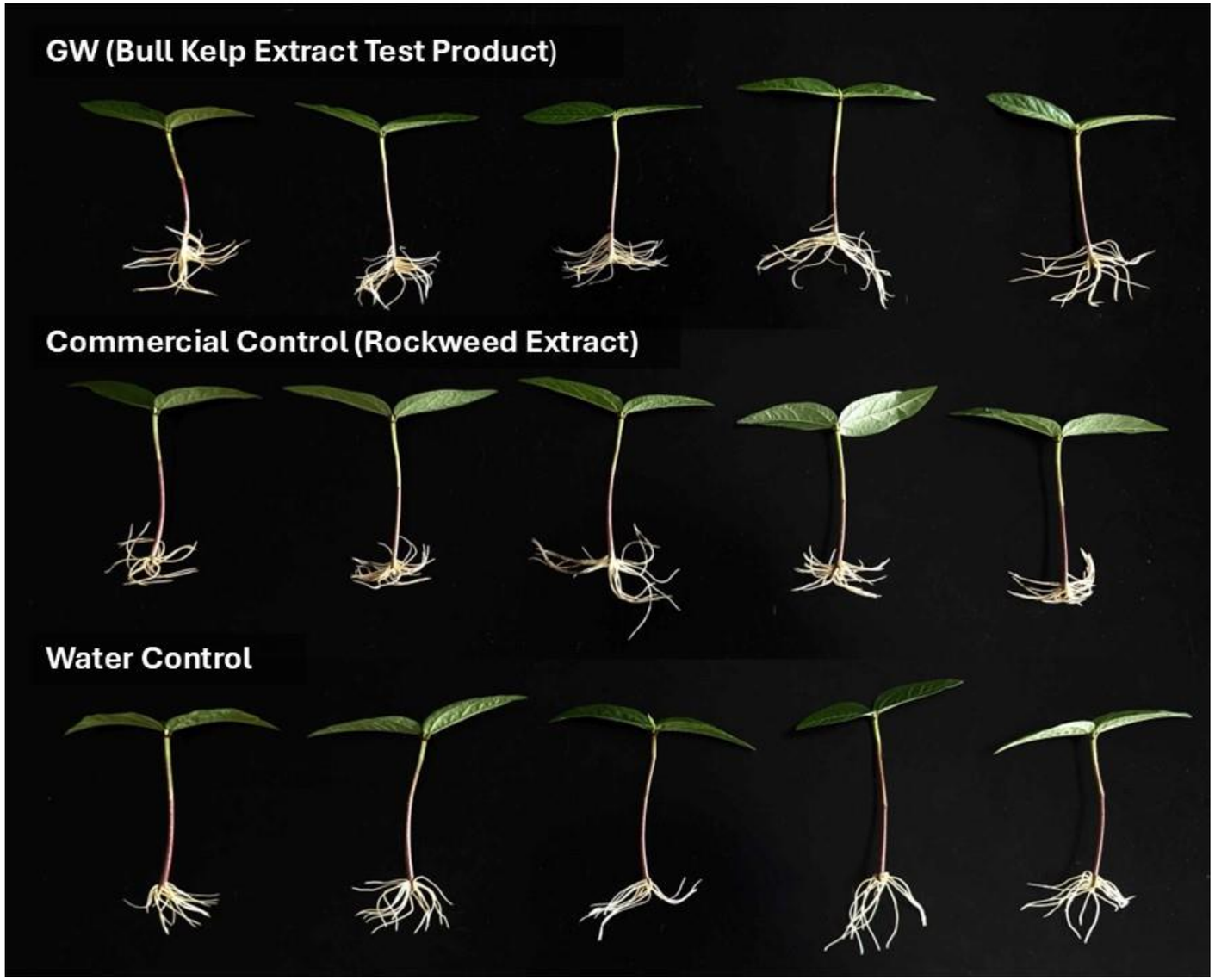

Image 2: Representative samples from each treatment group (2nd Trial).

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