Evaluation of Bull Kelp-Extracted Biostimulant: Product Effect on Adventitious Root Growth (3rd Trial)

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Report Summary

- Results from the first and second adventitious root bioassays are available as separate documents.
- The Test Product evaluated in these trials was a Bull Kelp extract biostimulant. Treatments were prepared following methods described in previous root bioassay reports; 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 weight, root count, root volume, and number of forks.
- The Test Product outperformed the Commercial Control when comparing total root length and surface area.

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.

Table 1: Product moisture data

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

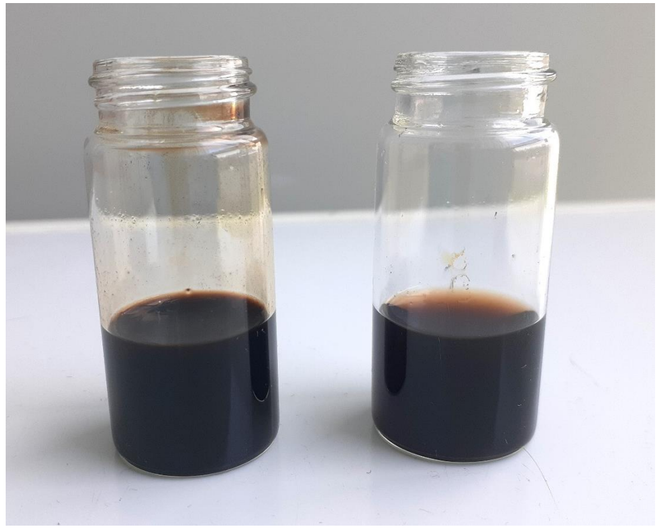

Image 1: Test Product concentrate (left) and treatment (right).

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	3.0	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 5 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 bioassays, 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, root counts, total length, surface area, root volume, and number of forks.
- The Test Product and the Rockweed Extract Commercial Control showed similar responses when comparing fresh weights, root count, root volume, and number of forks.
- The Test Product outperformed the Commercial Product when comparing total root length (14% difference) and surface area (14% difference).
- Standard Deviation and Percent Differences Over Controls for all trials are included in a separate document.

Results: Fresh Weight

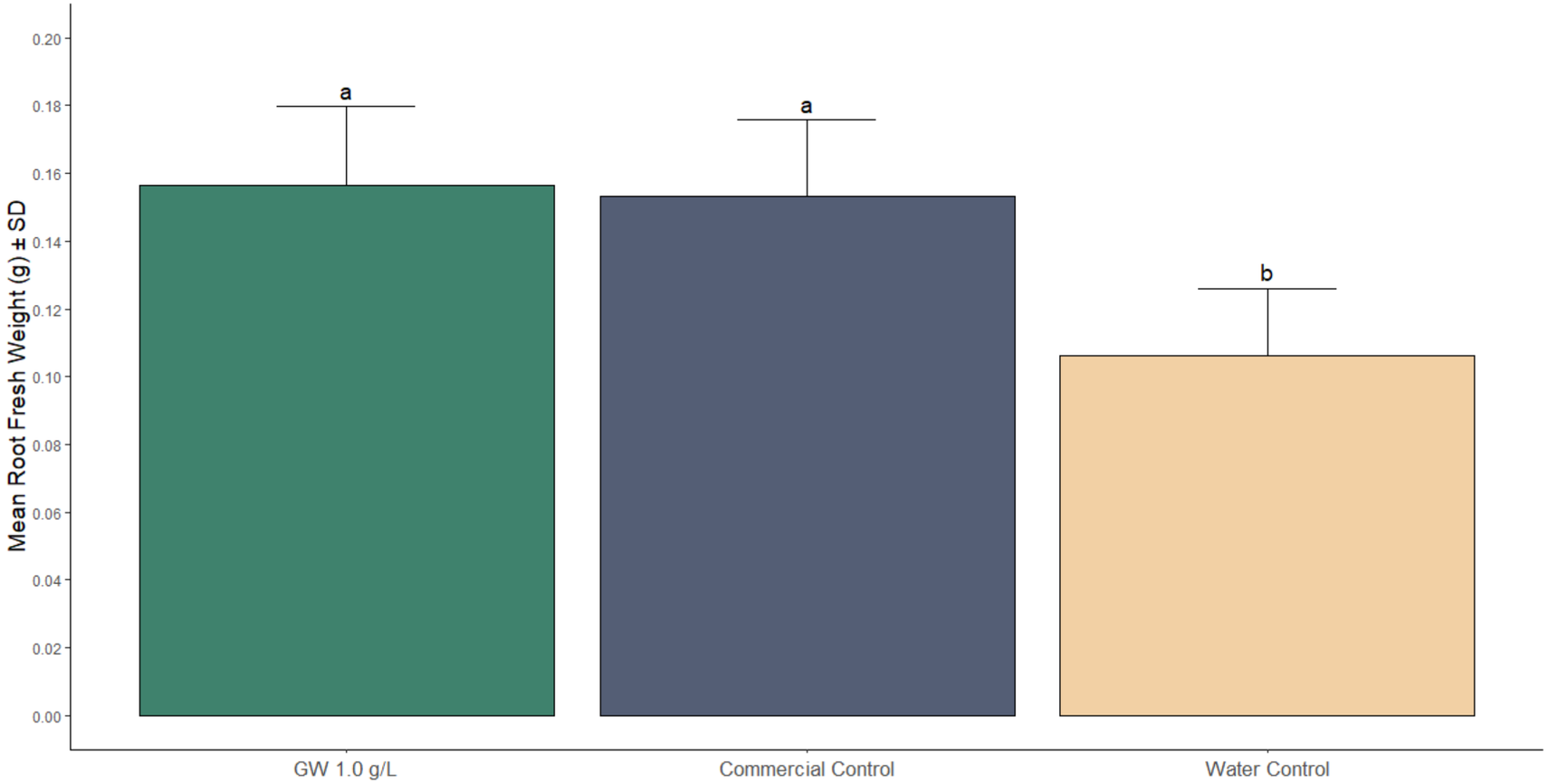

Figure 1: Fresh weight results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

GW treatment and Commercial control treatments show similar mean root fresh weights, and both are significantly greater than the Water control. On average, GW showed a 38% difference over the Water control.

Results: Dry Weights

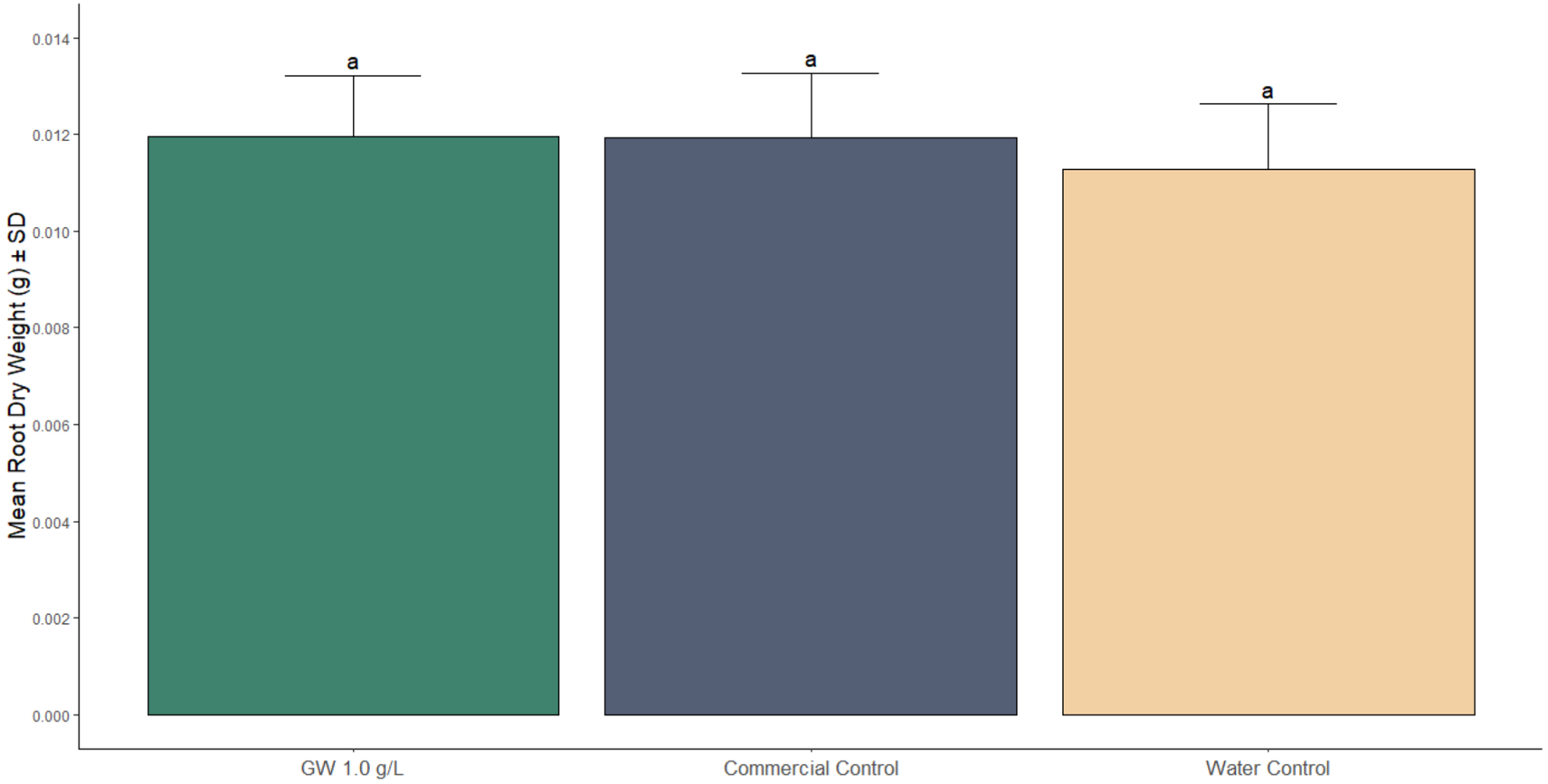

Figure 2: Dry weight results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

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

Results: Root Count

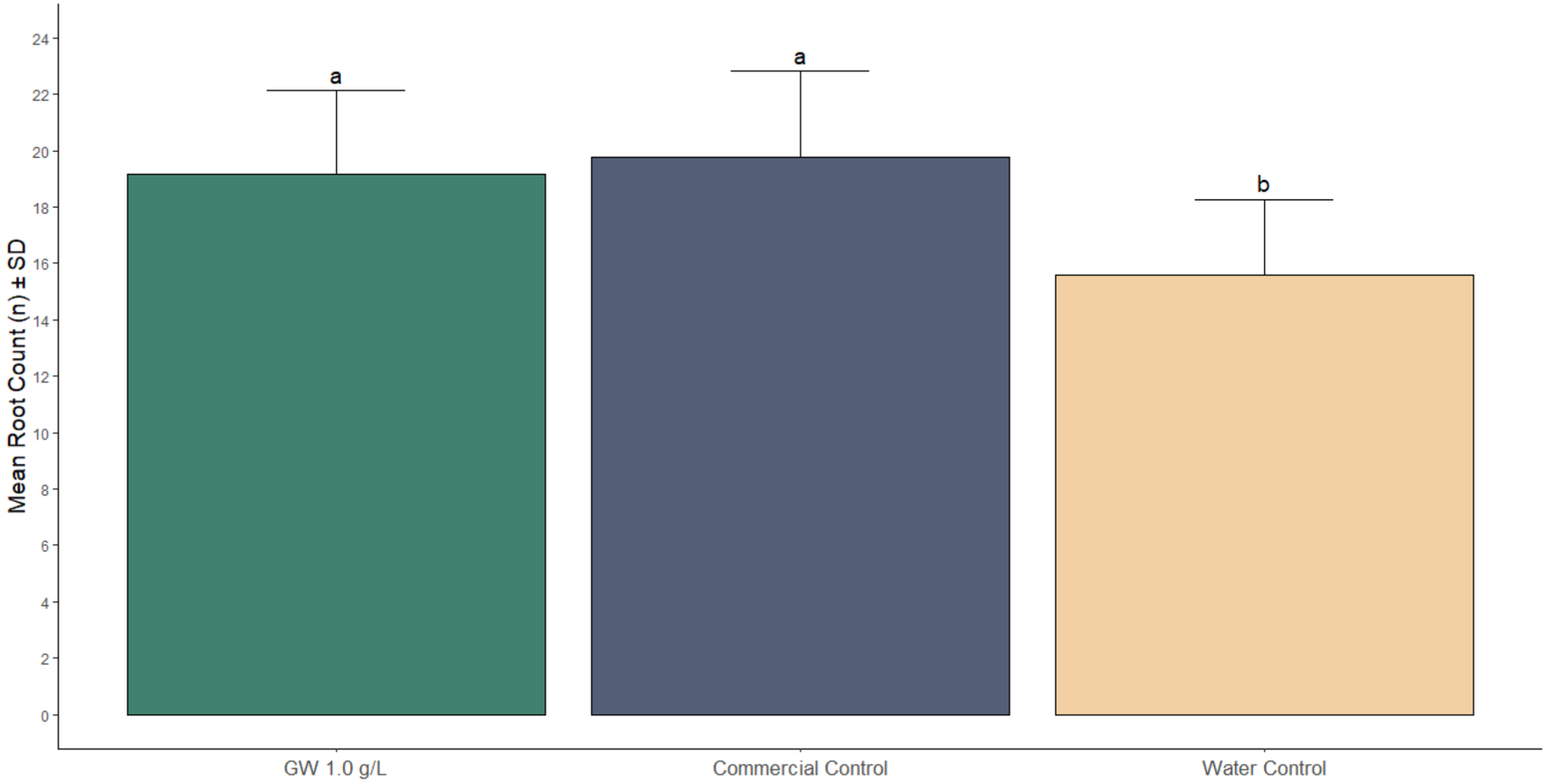

Figure 3: Root count results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

GW treatment and Commercial control treatments show similar mean root counts, and both are significantly greater than the Water control.

Results: Length

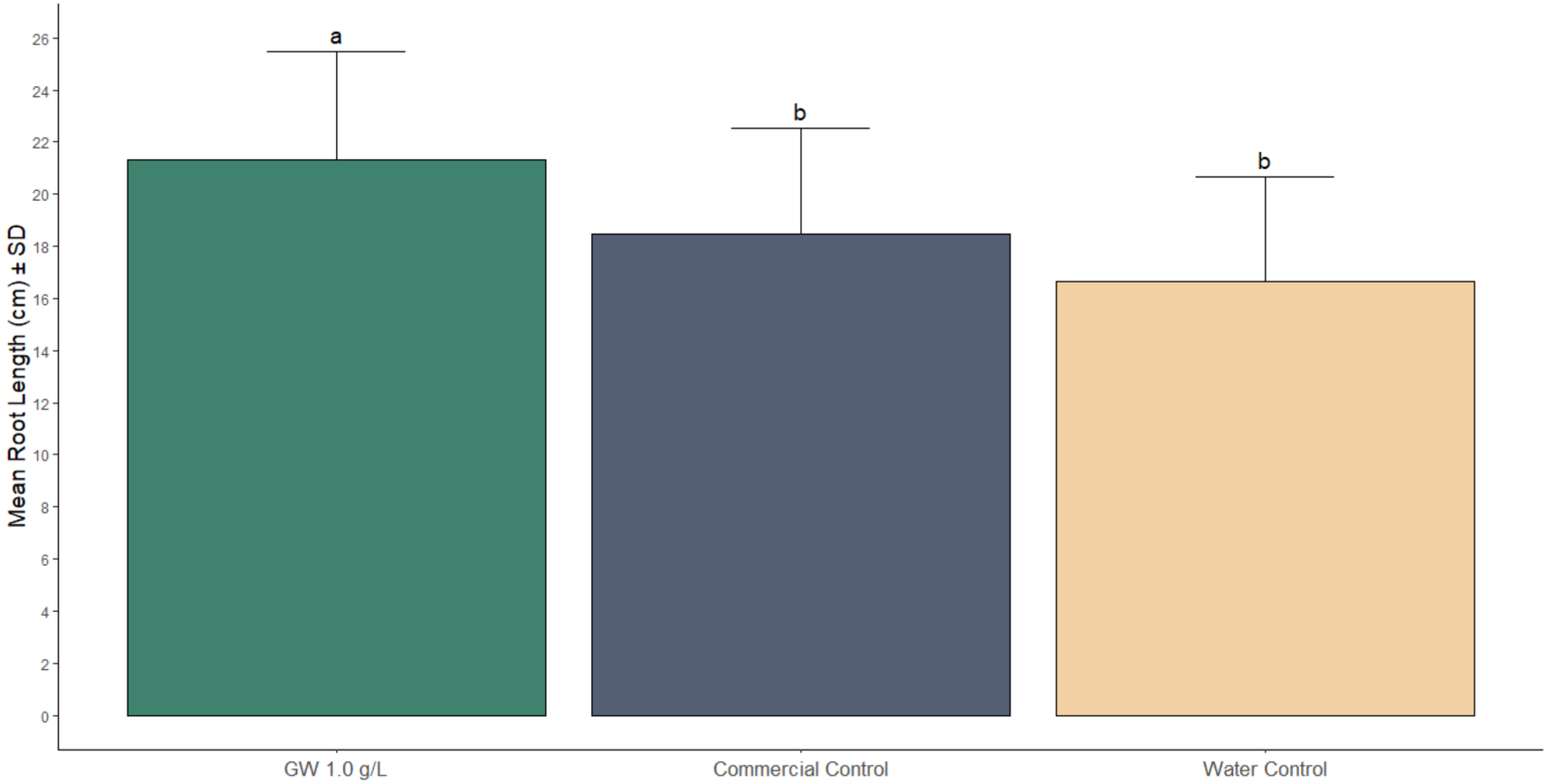

Figure 4: Average total length results for Test Product (GW) at 1g/L (dry basis) application rate. Included are Commercial and Water controls (n=24).

The GW treatment resulted in the longest mean root length, which is significantly greater than both the Commercial control and the Water control. On average, the GW product showed a 14% difference in total root length when compared to the Commercial control and 24% difference when compared to Water Control.

Results: Root Surface Area

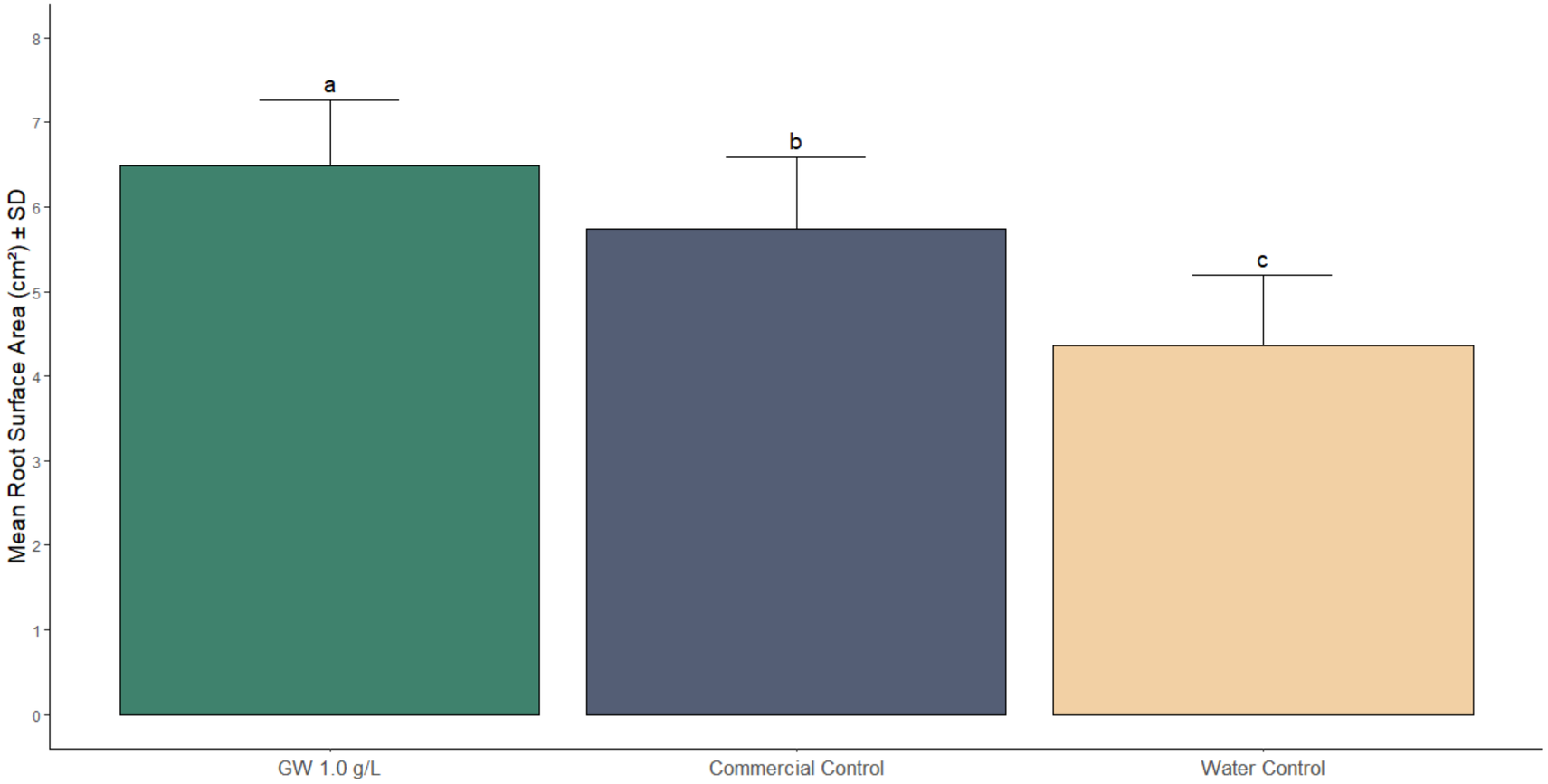

Figure 5: Root surface area results for Test Product (GW) at 1g/L (dry basis) application rate. Included are commercial and water controls (n=24).

The GW treatment resulted in the greatest mean root surface area, which is significantly greater than both the Commercial control and the Water control. The GW product showed 14% difference in root surface area when compared to the Commercial control and 39% difference when compared to the Water control.

Results: Root Volume

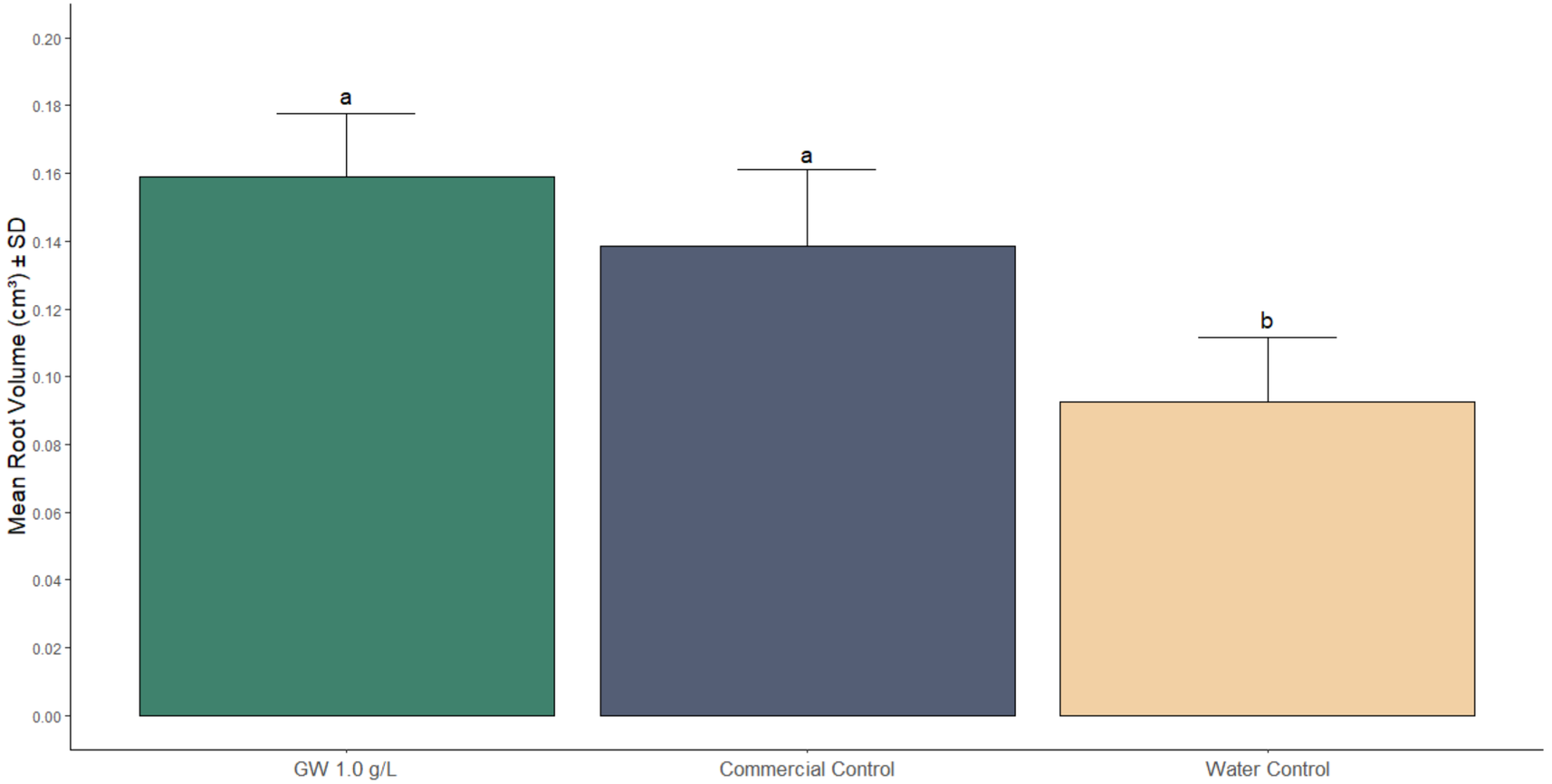

Figure 6: Root volume results for Test Product (GW) at 1g/L (dry basis) application rate. Included are commercial and water controls (n=24).

GW treatment and Commercial control treatments show similar mean root volumes, and both are significantly greater than the Water control. The GW product showed an average 53% difference in root volume when compared to the Water control.

Results: Fork Count

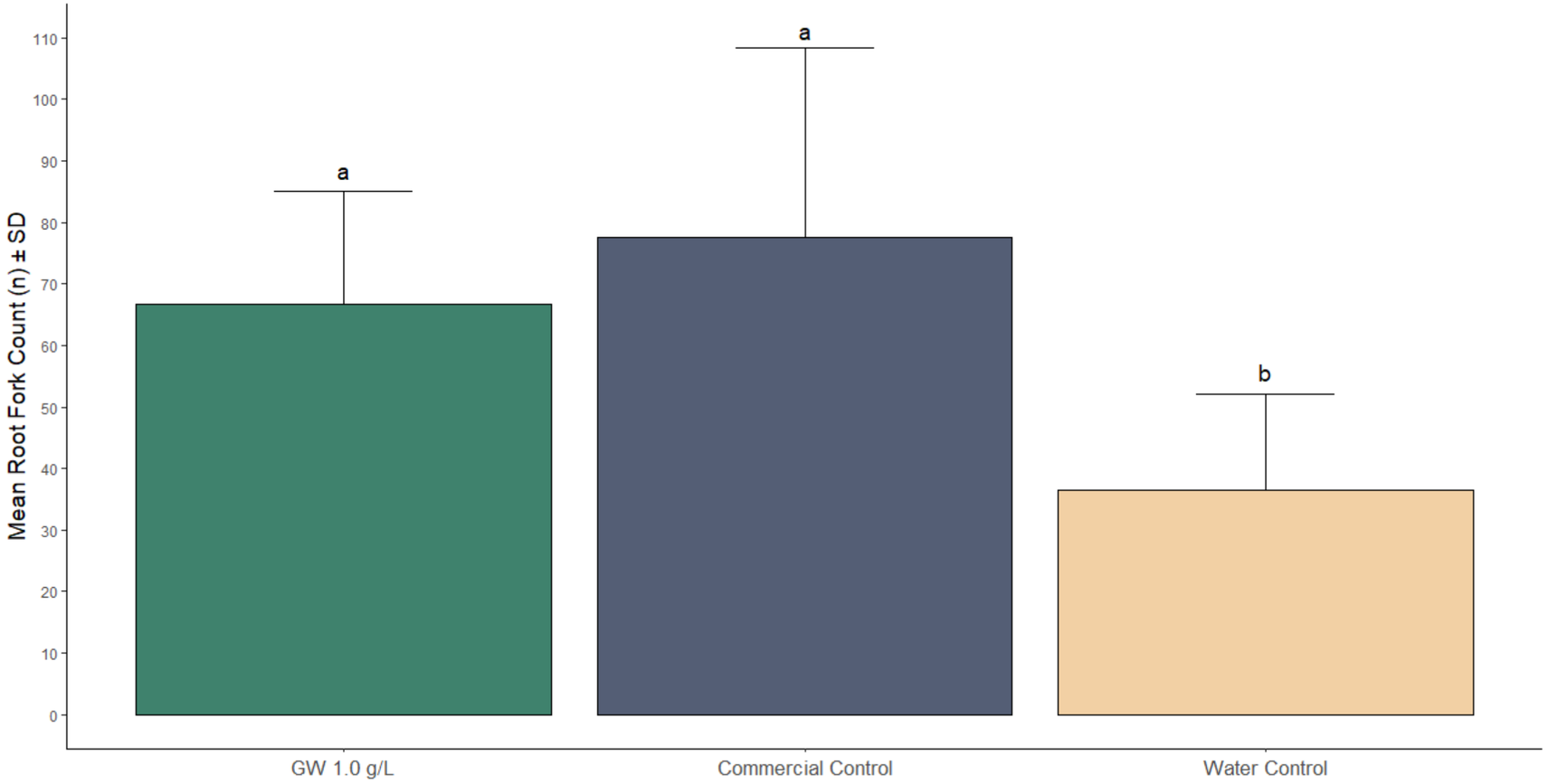

Figure 7: Fork count results for Test Product (GW) at 1g/L (dry basis) application rate. Included are commercial and water controls (n=24).

GW treatment and Commercial control treatments show similar fork counts, and both are significantly greater than the Water control. Results for the GW treatment show an average 64% difference when compared to the water control.

Treatment Images

Image 2: Representative samples from each treatment group (3rd Trial).

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