

Evaluation of Bull Kelp-Extracted Biostimulant: Product Effect on Adventitious Root Growth (1st Trial)

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PREPARED BY: BioManufacturing Division



Report Summary



- The Test Product evaluated was a Bull Kelp extract biostimulant. The treatment application rate was prepared after assessing the dry matter content; a concentration of 1 g/L (dry basis) was selected based on rates commonly found in literature for biostimulant application.
- 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 had comparable fresh and dry weights compared with the Commercial Control.
- When comparing root morphology, the Test Product outperformed the Commercial Control when comparing total length, surface area, volume, and root forking.



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 product was prepared following manufacturer recommendations.
- Treatment volume application was equivalent to 78 mL per Liter.

Table 1: Product concentrate 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 6 days.
- The number of roots (>0.5 cm) was recorded, and stems were cut 1.5 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



- Both biostimulant products included in the trial generally out-performed the water control suggesting the presence of plant bioactive compounds such as phytohormones, polysaccharides, and polyphenols.
- The Test Product (Bull Kelp Extract) often showed less variability in test results, suggesting a more consistent growth pattern when compared to both the commercial and water control.
- When comparing morphological characteristics, the Test Product showed significantly greater results when compared to both the commercial and water control.
- The Test Product outperformed the Commercial Product when comparing total length (22% difference), surface area (15% difference), root volume (8% difference), and number of forks (26% difference).
- Standard Deviation and Percent Differences Over Controls for all trials are included in a separate document.



Results: Fresh Weight

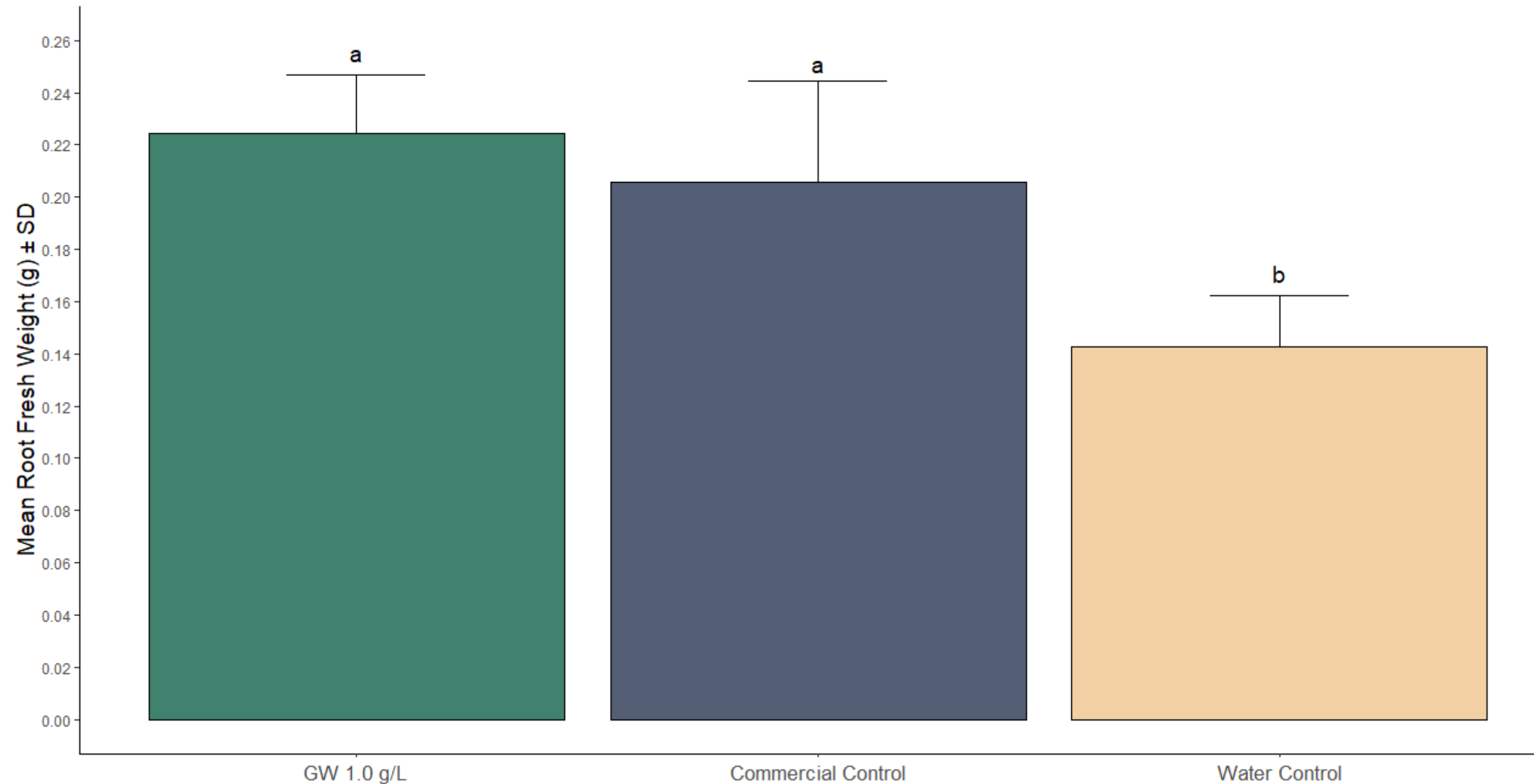


Figure 1: Fresh weights for Test Product (GW) at 1g/L (dry basis) application rate. Included for comparison are Commercial and Water controls (n=24).

The root fresh weight in the GW treatment and Commercial control is not significantly different from each other but is significantly higher than the Water control. On average, results for the GW treatment showed a 42% difference when compared to the water control.



Results: Dry Weights

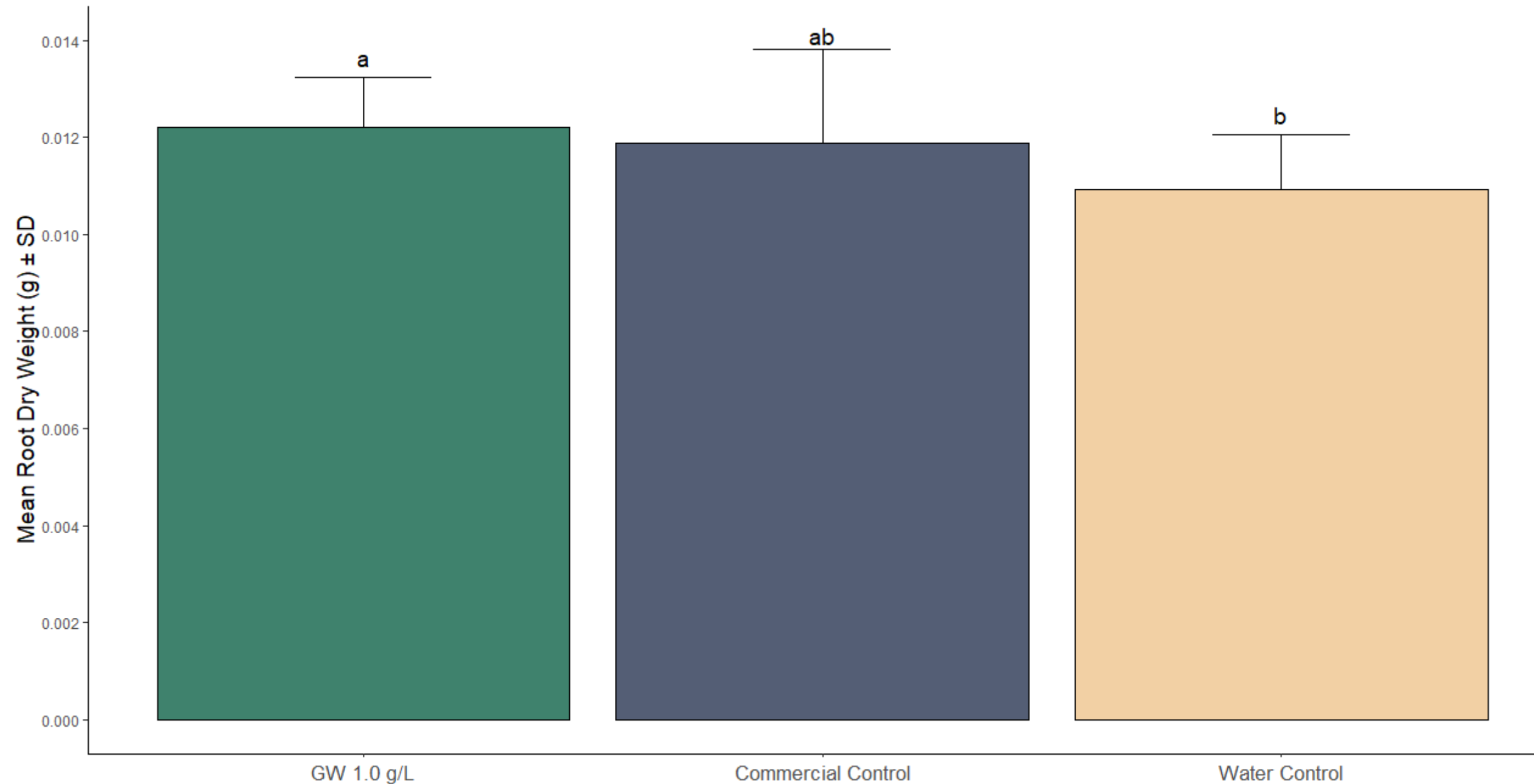


Figure 2: Dry weights for Test Product (GW) at 1g/L (dry basis) application rate. Included for comparison are Commercial and Water controls (n=24).

The root dry weight in the GW treatment and Commercial control groups is not significantly different from each other but is significantly higher than the Water control. The GW treatment resulted in a similar increase in root dry weight as the commercial control.



Results: Root Count

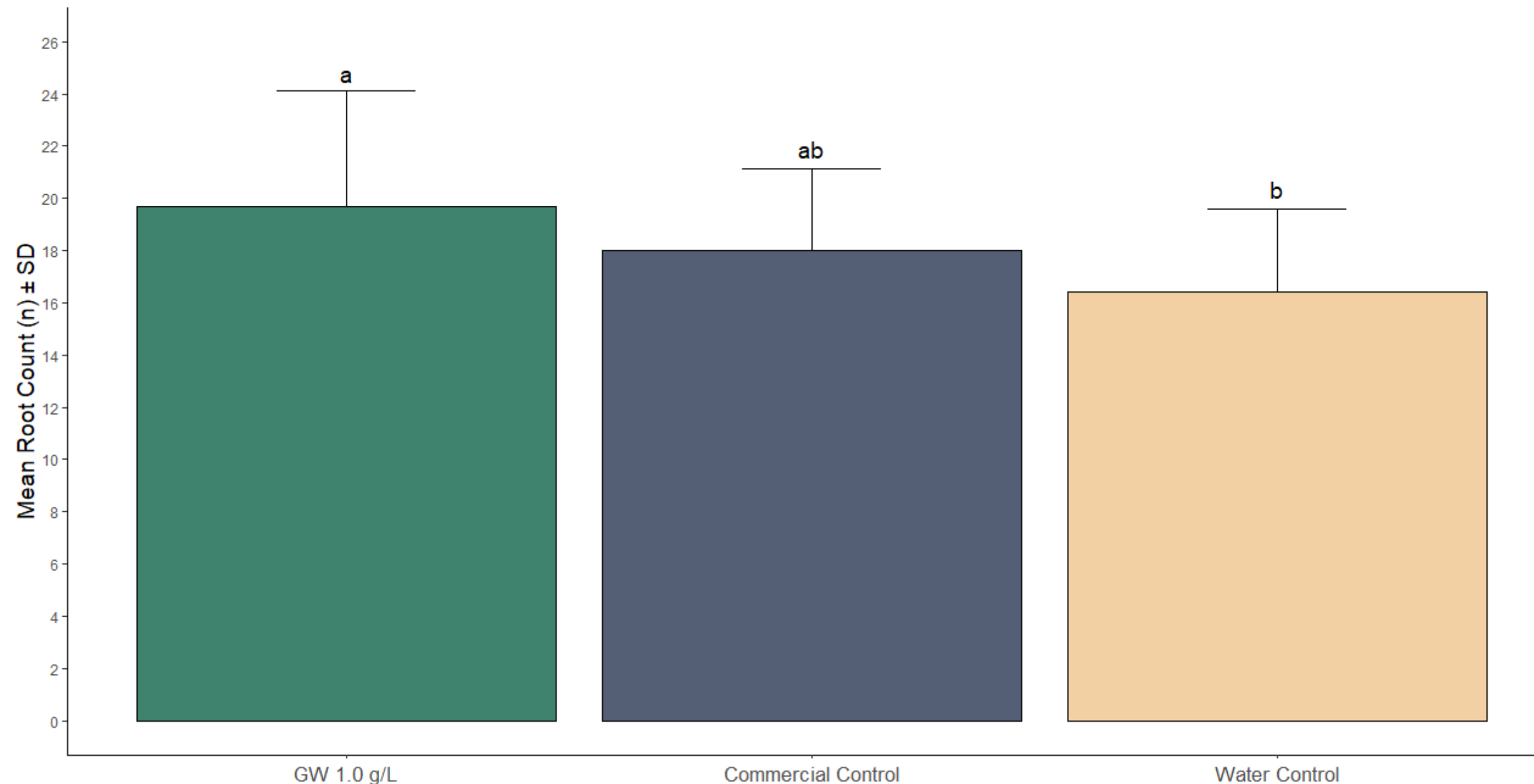


Figure 3: Root counts for Test Product (GW) at 1g/L (dry basis) application rate. Included for comparison are Commercial and Water controls (n=24).

GW treatment shows the highest mean root count, which is significantly higher than the Water Control. The Commercial control is not significantly different from either the GW treatment or the Water control. The GW treatment showed an average 14% difference in results when compared to the water control.



Results: Length

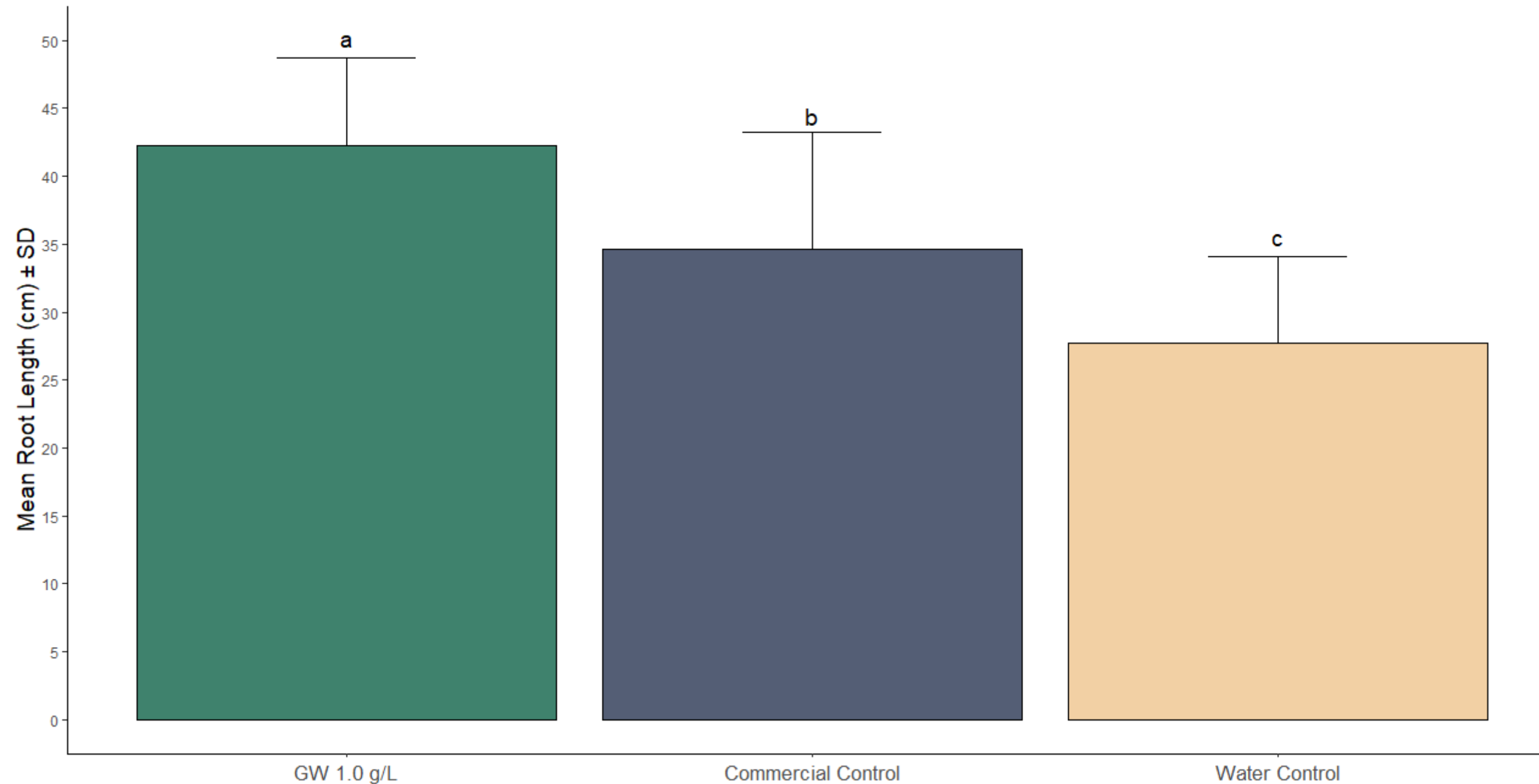


Figure 4: Total root lengths for Test Product (GW) at 1g/L (dry basis) application rate. Included for comparison are Commercial and Water controls (n=24).

GW treatment resulted in the highest mean root length, which is significantly greater than both the Commercial control and the Water control. The GW product showed a 22% difference when compared to the commercial control and 42% difference when compared to the water control.



Results: Root Surface Area

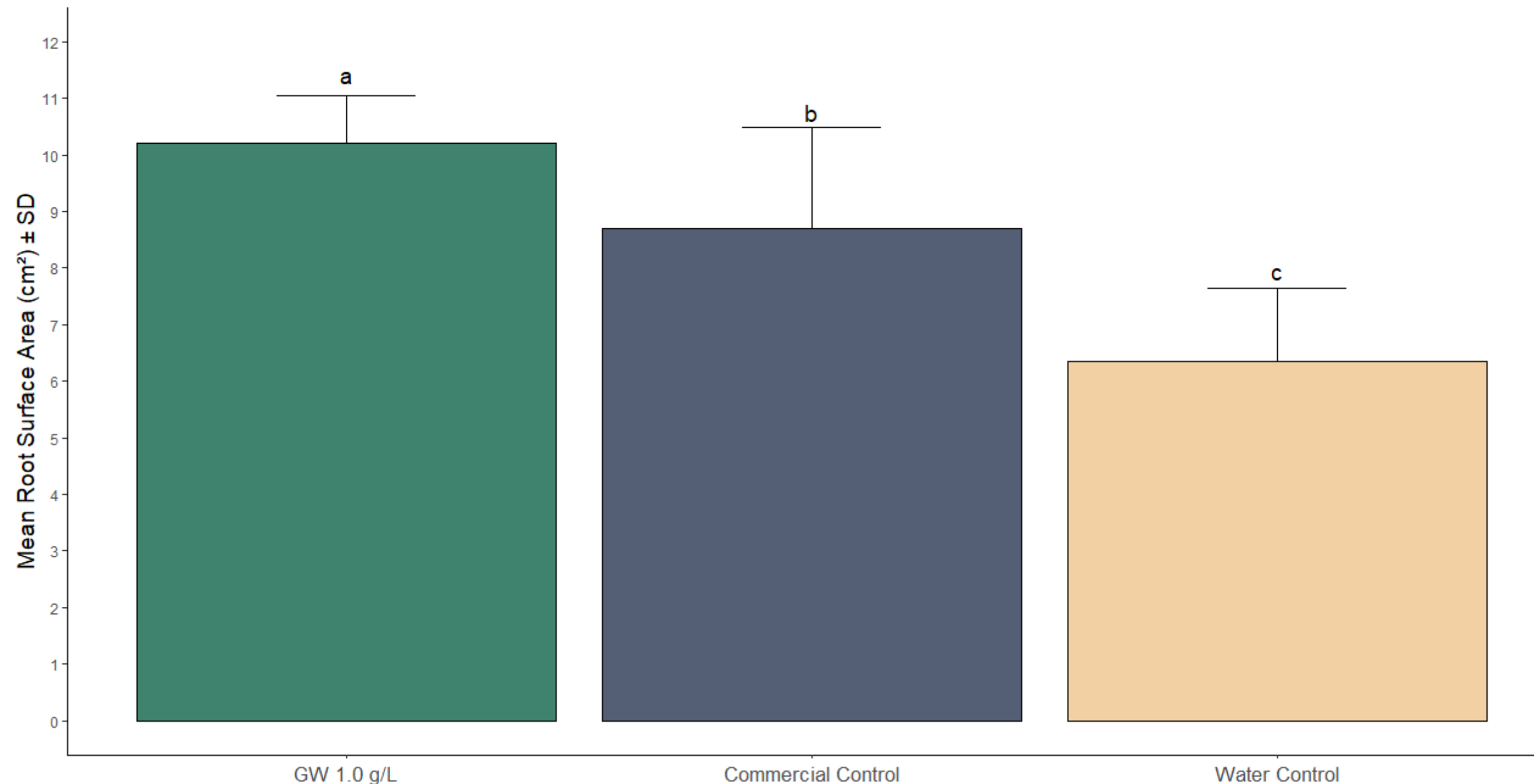


Figure 5: Surface area for Test Product (GW) at 1g/L (dry basis) application rate. Included for comparison are Commercial and Water controls (n=24).

GW treatment resulted in the highest mean root surface area, which is significantly greater than both the Commercial control and the Water control. The GW product showed an average 15% difference when compared to the commercial control and a 46% difference when compared with the water control.



Results: Root Volume

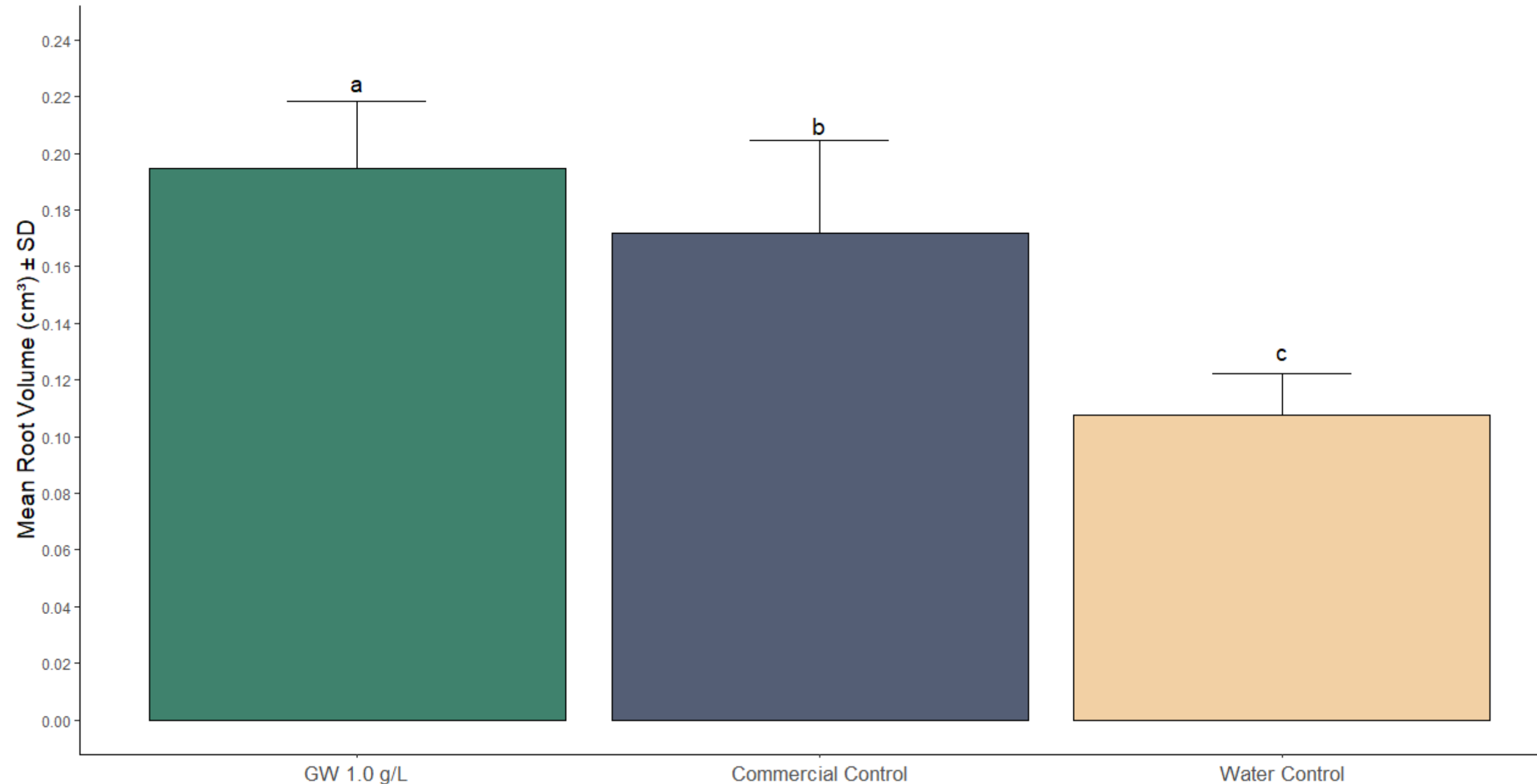


Figure 6: Root volume for Test Product (GW) at 1g/L (dry basis) application rate. Included for comparison are Commercial and Water controls (n=24).

GW treatment resulted in the highest mean root volume, which is significantly greater than both the Commercial control and the Water control. The GW product showed on average an 8% difference when compared to the commercial control, and a 50% difference when compared to the water control.



Results: Root Fork Count

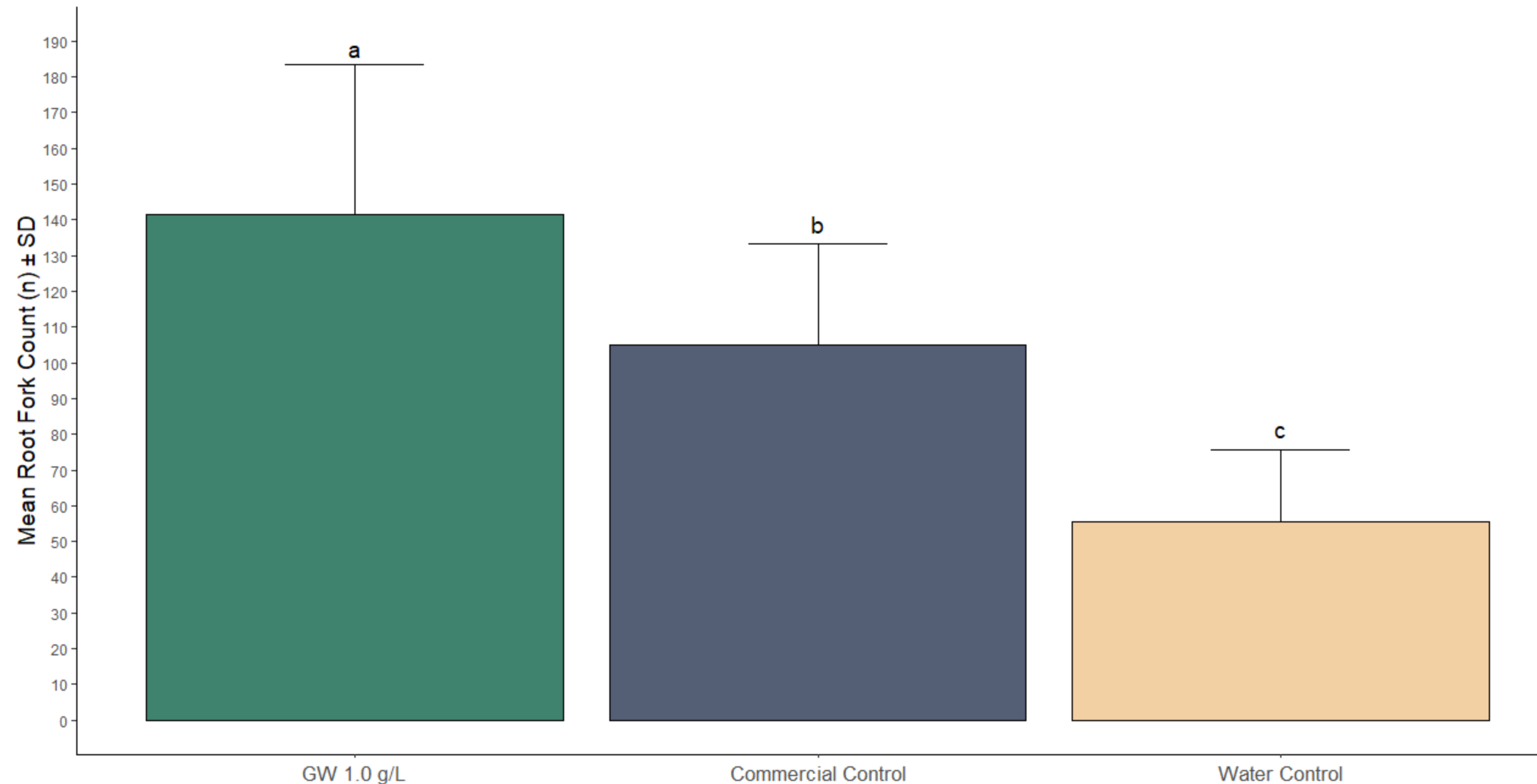


Figure 7: Root fork count for Test Product (GW) at 1g/L (dry basis) application rate. Included for comparison are Commercial and Water controls (n=24).

GW treatment showed the greatest number of root forks and was significantly greater than both the Commercial control and the Water control. The GW product showed an average 26% difference when compared to the commercial control and an 82% difference when compared to the water control.



Treatment Images

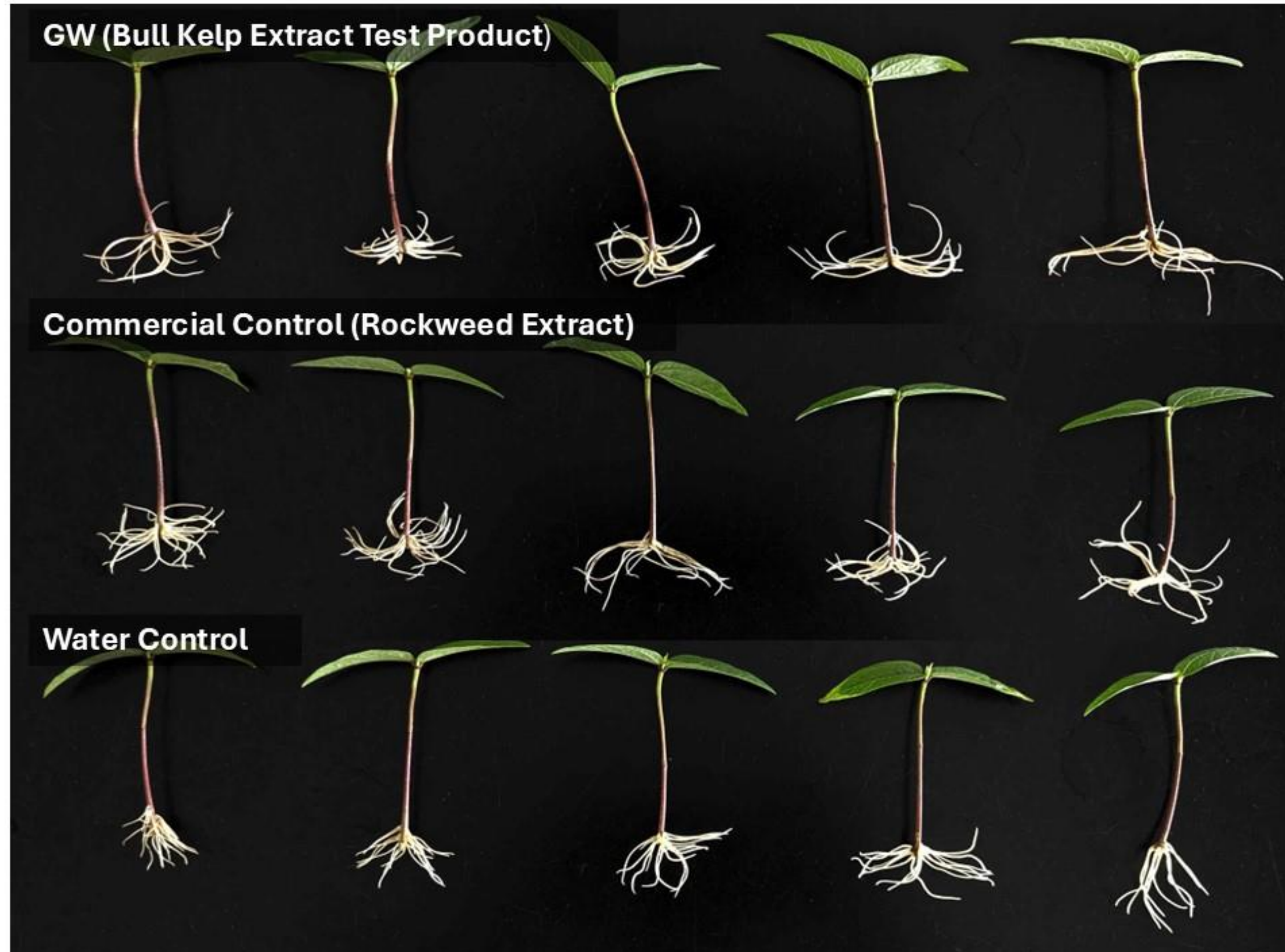


Image 2: Representative samples from each treatment group (1st Trial).



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