**CharCoir Coco Coin Investigation**
Performed: 25th June 2024
By: Terra Australis LLC

# Background

In this study, we aimed to determine the impact of three different hydration techniques on the water holding capacity of CharCoir Coco Coins. A sleeve containing 78 coco coir coins, as they are commercially sold, was used for the test. Each coin was individually weighed before and after applying one of three hydration methods: Top Soak, Bottom Soak, and Submerging. This allowed us to calculate the water holding capacity for each coin under each treatment condition.

The **Top Soak** method involved using a watering wand or a similar device to slowly irrigate the coco coir coins until runoff was observed. The **Bottom Soak** method consisted of placing the coins in a shallow water tray, allowing the water to wick up through the coins until they could hold no more water. The **Submerging** method involved completely submerging the coins in water for 30 minutes to ensure they were adequately saturated.

To analyze whether the differences in hydration methods were statistically significant, we conducted an ANOVA (Analysis of Variance) test. The results revealed that there were indeed significant differences in the water holding capacities of the coins depending on the hydration method used. Specifically, the F-value obtained was 19.887247, which is much higher than the critical F-value of 3.118642, and the p-value was 1.1765E-07, far below the standard threshold of 0.05. These findings strongly suggest that the method of hydrating the coco coir coins has a substantial effect on their water holding capacity, indicating that the choice of hydration technique can significantly influence the performance of the coco coir coins in practical applications.


# What does the data mean to you?

Our tests conclude that best practice for hydrating cubes is **Submerging** them entirely for 30 minutes to ensure complete hydration, followed by **Bottom Soak** or wick feeding. We did not “shake”, “squeeze”, “wring”, or otherwise disturb the water content of the Coco Coin with any technique. The **Bottom Soak** method produced the most consistent results.

Further investigation is needed to understand water consumption rates, evaporative losses, and other influential factors on propagation performance.

The following data highlight the key differences between hydration strategies, but also highlight the consistency of the dehydrated, compressed coin and its hydraulic properties when irrigated. The consistency of this product can be viewed as an asset to any business looking to increase and standardize their propagation performance.

# Trial and ANOVA Data

*Table 1: Coco Coin Hydration Raw Data*

| Top Soak | | | Bottom Soak | | | Submerge | | |
|---|---|---|---|---|---|---|---|---|
| *#* | *Dry Weight (g)* | *Soaked Weight (g)* | *#* | *Dry Weight (g)* | *Soaked Weight (g)* | *#* | *Dry Weight (g)* | *Soaked Weight (g)* |
| 1 | 7 | 46 | 27 | 7 | 44 | 53 | 7 | 49 |
| 2 | 7 | 40 | 28 | 7 | 44 | 54 | 7 | 50 |
| 3 | 8 | 41 | 29 | 7 | 45 | 55 | 7 | 49 |
| 4 | 8 | 44 | 30 | 7 | 44 | 56 | 6 | 50 |
| 5 | 7 | 39 | 31 | 7 | 42 | 57 | 7 | 45 |
| 6 | 7 | 39 | 32 | 7 | 49 | 58 | 7 | 45 |
| 7 | 8 | 43 | 33 | 7 | 45 | 59 | 7 | 44 |
| 8 | 6 | 42 | 34 | 7 | 44 | 60 | 7 | 53 |
| 9 | 7 | 39 | 35 | 6 | 44 | 61 | 7 | 49 |
| 10 | 7 | 48 | 36 | 7 | 41 | 62 | 7 | 48 |
| 11 | 7 | 45 | 37 | 7 | 46 | 63 | 7 | 43 |
| 12 | 8 | 38 | 38 | 7 | 44 | 64 | 7 | 47 |
| 13 | 8 | 44 | 39 | 7 | 49 | 65 | 7 | 44 |
| 14 | 7 | 45 | 40 | 7 | 44 | 66 | 8 | 50 |
| 15 | 8 | 42 | 41 | 7 | 42 | 67 | 7 | 48 |
| 16 | 7 | 43 | 42 | 7 | 43 | 68 | 7 | 48 |
| 17 | 7 | 39 | 43 | 7 | 44 | 69 | 7 | 49 |
| 18 | 8 | 42 | 44 | 8 | 48 | 70 | 7 | 50 |
| 19 | 7 | 40 | 45 | 6 | 44 | 71 | 7 | 44 |
| 20 | 7 | 44 | 46 | 7 | 44 | 72 | 7 | 49 |
| 21 | 7 | 48 | 47 | 7 | 45 | 73 | 7 | 50 |
| 22 | 6 | 46 | 48 | 7 | 40 | 74 | 7 | 45 |
| 23 | 7 | 45 | 49 | 7 | 44 | 75 | 7 | 45 |
| 24 | 8 | 44 | 50 | 7 | 47 | 76 | 7 | 44 |
| 25 | 8 | 45 | 51 | 7 | 42 | 77 | 6 | 45 |
| 26 | 6 | 36 | 52 | 7 | 43 | 78 | 7 | 45 |

*Table 2: Coco Coin Data (Calculated)*

| | *Dry (g)* | *95% CI* | *Soaked (g)* | *95% CI* | *WHC (mL)* | *WHC/g* | *VWC* (%)* |
|---|---|---|---|---|---|---|---|
| ***Top Soak*** | 7.23 | 0.26 | 42.58 | 1.27 | 35.35 | 4.89 | 34.3% |
| ***Bottom Soak*** | 6.96 | 0.14 | 44.27 | 0.88 | 37.31 | 5.36 | 36.2% |
| ***Submerge*** | 6.96 | 0.14 | 47.23 | 1.08 | 40.27 | 5.78 | 39.1% |
| ***Total*** | 7.05 | 0.11 | 44.69 | 0.74 | 37.64 | 5.34 | 36.6% |

The ANOVA output provided can be interpreted as follows:

Anova: Single Factor

SUMMARY

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Column 1 | 26 | 1107 | 42.5769231 | 9.85384615 |
| Column 2 | 26 | 1151 | 44.2692308 | 4.76461538 |
| Column 3 | 26 | 1228 | 47.2307692 | 7.14461538 |

ANOVA

| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 288.538462 | 2 | 144.269231 | 19.8872473 | 1.1765E-07 | 3.11864213 |
| Within Groups | 544.076923 | 75 | 7.25435897 | | | |
| Total | 832.615385 | 77 | | | | |

**Source of Variation:**

***Between Groups:*** Variance due to the differences between the groups.
***Within Groups:*** Variance within each group (also called Error or Residual variance).

**Sum of Squares (SS)**

***Between Groups:*** 288.538462, measures the variance between the groups.
***Within Groups:*** 544.076923, measures the variance within each group.
***Total:*** 832.615385, total variance in the data.

**Degrees of Freedom (df)**

***Between Groups:*** 2, calculated as the number of groups minus 1 (k - 1, where k is the number of groups).
***Within Groups:*** 75, calculated as the total number of observations minus the number of groups (n - k, where n is the total number of observations and k is the number of groups).
***Total:*** 77, total degrees of freedom (n - 1).

**Mean Square (MS)**

***Between Groups:*** 144.269231, calculated as SS Between Groups divided by df Between Groups.
***Within Groups:*** 7.25435897, calculated as SS Within Groups divided by df Within Groups.

**F:** 19.887247, the test statistic, calculated as MS Between Groups divided by MS Within Groups. It measures the ratio of variance between the groups to the variance within the groups.

**P-Value:** 1.1765E-07, the probability that the observed results occurred by chance. A very small p-value indicates strong evidence against the null hypothesis.

**$F_{Crit}$:** 3.118642, the critical value of F at a specified significance level (usually 0.05). If the calculated F value is greater than the F critical value, the null hypothesis is rejected.

**Interpretation:**

***F-Value*** (19.887247) is much larger than the $F_{crit}$ (3.118642), indicating that there are significant differences between the group means.

***P-Value*** (1.1765E-07) is much smaller than 0.05, indicating that the observed differences between the groups are statistically significant.

**Conclusion:**

There is strong evidence to reject the null hypothesis, suggesting that the means of the groups are significantly different. The technique used for hydrating the propagation cells has a significant impact on their performance.

There is strong evidence to suggest that the way you hydrate the coco coir coins (Top Soak, Bottom Soak, or Submerging) significantly affects their water holding capacity. In other words, the differences in the methods you used to hydrate the coco coir coins are not due to random chance; they have a real impact on how much water the coco coir coins can hold.