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**Data Suggests No Difference in Rates of Water Loss and Stomata Density Between Leaves Under Wind Intensity**

**Abstract:**

We hypothesized that plants would have a higher transpiration rate and stomata density for leaves under higher wind intensity. The purpose of this experiment was to determine whether changes wind intensity can affect transpiration or number of stomata in the plant which is important because humans are altering environments, specifically wind, through construction of large buildings. The significance of this study is to better understand environmental factors on rates of transpiration for better agriculture practice in environments with limited water resources. The approach taken to the address the hypothesis included taking six sprigs from a *Gleditsia triacanthos* (Honey Locust) tree on the rooftop garden. Then a potometer was used to find the rate of transpiration in five minute trials for each sprig; each sprig was placed under three different trials. The three treatment trials were no wind, low setting on a fan, and high setting on the same fan. Determining stomata density was accomplished by painting clear nail polish on a leaf, drying it, and then examining the leaf under a microscope at 40X to count the stomata. Overall, the average rate of transpiration for the sprig under no wind was 0.0249 mL per minute, low wind was 0.0115 mL per minute, and high wind was 0.034 mL per minute. The statistical analysis we used was an ANOVA and Tukey-Kramer test and the results were found to be significant (p **≈** 0.037, α = 0.05), and this indicated that there was a statistical difference between the means of the different groups. The Tukey-Kramer test also found that there was a significant difference between no wind vs low wind, no wind vs high wind, and low wind vs high wind. In conclusion this caused us to reject our null hypothesis and indicated that wind intensity did have an impact on rate of transpiration.

**Methods**

Six sprigs were taken from the same section of a *Gleditsia triacanthos* (Honey Locust) tree, and their rates of transpiration were measured. Three trials were run for each sprig for five minutes. The three trials corresponded to the treatment which included the control (no wind), low wind, and high wind intensity. To measure stomatal density, a leaf was taken from each sprig and a swatch of clear nail polish was painted over the underside of the leaf. Then we examined the leaf under a microscope at 40X, and the number of stomata in 1 cm2 circle of the leaf were counted twice for each leaf. Then an ANOVA test was conducted on all groups and a threshold of α = 0.05. In addition, the Tukey-Kramer test was also ran to find significant differences between pairs of treatment groups and also had a similar threshold of α = 0.05.

**Results**

Overall, the rate of water loss of sprigs under high wind was higher than sprigs under low wind and no wind. The sprig under no wind was 0.0249 mL per minute, low wind was 0.0115 mL per minute, and high wind was 0.034 mL per minute [Fig. 1]. An average of 76 stomata were on the leaves of our plants of the wind springs and an average of 64 stomata for no wind plants [Fig. 2]. The ANOVA and Tukey-Kramer test and the results were found to be significant (p **≈** 0.037, α = 0.05), and this indicated that there was a statistical difference between the means of the different groups. The Tukey-Kramer test also found that there was a significant difference between no wind vs low wind, no wind vs high wind, and low wind vs high wind [Fig. 1].

**Discussion**

We hypothesized that plants would have a higher transpiration rate and stomata density for leaves under higher wind intensity. The p-value from the two-tailed t-test was greater than alpha value of 0.05 [Fig. 1]. The alpha value was 0.05, and the p-value was greater than that, so the null hypothesis was failed to be rejected. An average of 76 stomata were on the leaves of our plants of the wind springs and an average of 64 stomata for no wind plants [Fig. 2]. The tree was in a warm humid climate which kind of explains these finds because wind intensity is usually not a major impact on the environment.

Despite this data, more trials should be run to ensure accuracy in the conclusions. The focus of air being blown changed several times when the position of the hairdryer or fan was moved which could have affected the data. The sprig under high wind had bigger leaves and more surface area than that under low wind, which could have affected the rate of water loss. This data is important because it provides insight into how the plant responds to varying environments, and possibly a basis for growing plants in certain climates.

**Figures and Tables**

**Figure 1.** Average Water Loss in Leaves Under Different Wind Intensities.

**Figure 2**. Average Stomata Density

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