Preserving Bananas: Cling Wrap or Foil?

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I. Statistical Question

We are trying to determine the effect of wrapping, cling wrap versus foil, on banana preservation over two hours.

Bananas are known to become brown quickly, usually within an hour, as they oxidize in the presence of air. An enzyme in bananas, polyphenol oxidase, causes a reaction when exposed to air. People often want to save part of an opened banana to eat later, so they wrap the banana to slow down the process of oxidation. We chose this topic because we wanted to find out which type of wrapping, foil or cling wrap, preserves bananas better.

Our hypotheses are as follows:

H_0:$\mu_f - \mu_c = 0$, where $\mu_f$is the mean rating for foil and μ_c is the mean rating for cling wrap. The mean rating of the bananas for foil is the same as the mean rating for cling wrap.

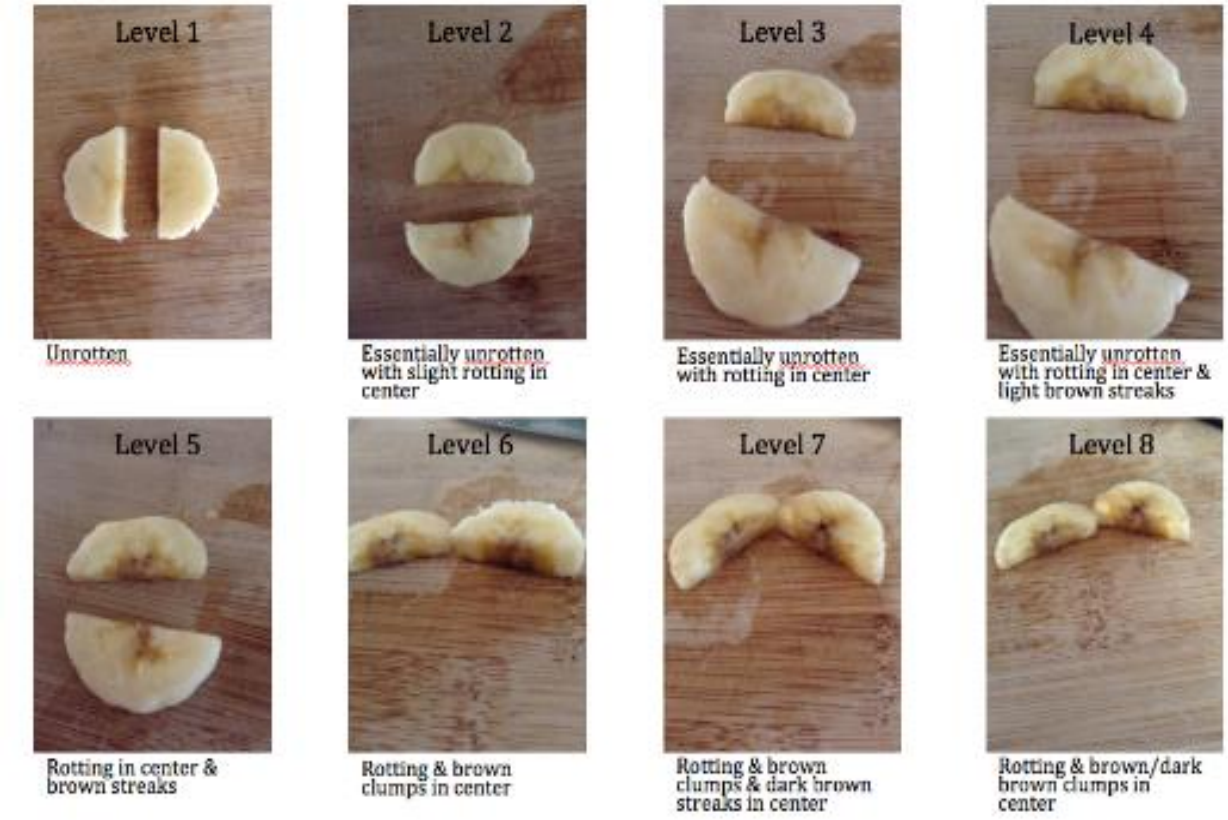
H_a:$\mu_f - \mu_c < 0$ where μ_f is the mean rating for foil and μ_c is the mean rating for cling wrap. The mean rating of the bananas for foil less than the mean rating for cling wrap.

II. Data Collection

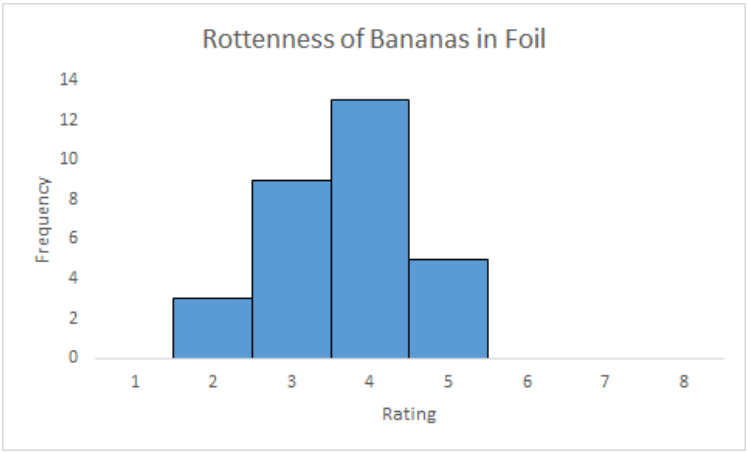
To collect the data, we used bananas of the same type and of approximately equal ripeness and cut them into pieces of equal size. Then, we cut the cling wrap and foil into equal pieces. We randomly assigned each piece of banana to a treatment, foil or cling wrap, by numbering each banana and using a random number generator to select 30 bananas to be wrapped in foil. The remaining 30 were wrapped in cling wrap. Next, we wrapped the banana pieces in the assigned type of wrapping and let the bananas sit in the open on the counter at room temperature for two hours. After two hours, we rated each banana piece based on the level of rottenness/blackness and found the mean rating for each treatment group. This banana rating chart was created by taking pictures of two pieces of banana left in the open every fifteen minutes. To ensure we got the most accurate results as we could, we cut and wrapped the bananas as quickly as we could. To address the confounding variable of location, we put equal amounts of cling wrapped and foil wrapped bananas in every direction on the counter.

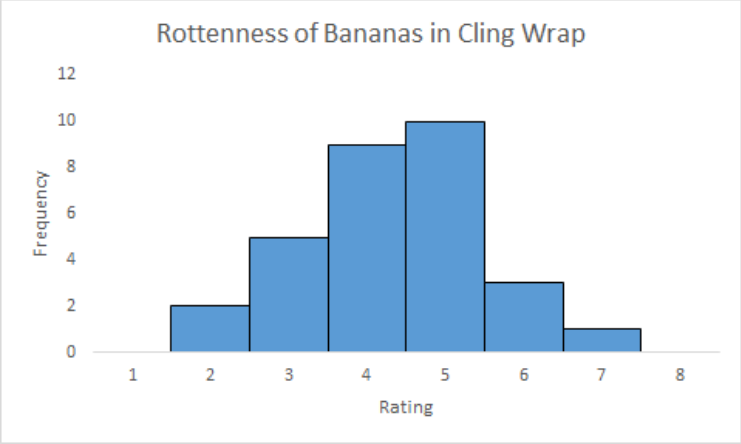

celebrate
fresh

Banana Rottenness Chart



III. Data Display





Both histograms of the rottenness level of bananas are unimodal and roughly symmetric. There are no outliers for either graph, but the standard deviation for the rottenness level of cling-wrapped bananas is greater than that of the foil-wrapped bananas. The center of the foil-wrapped bananas is between 3 and 4, whereas the center of the cling-wrapped bananas is between 4 and 5.

Summary Statistics for Foil-Wrapped Bananas

Minimum	2
Q1	3
Median	4
Q3	4
Maximum	5
Mean	3.667

Standard Deviation	0.884
Sample Size	30

Summary Statistics for Cling-Wrapped Bananas

Minimum	2
Q1	4
Median	4
Q3	5
Maximum	7
Mean	4.333
Standard Deviation	1.184
Sample Size	30

From the summary statistics, the mean rottenness level of the foil-wrapped is substantially lower than that of the cling-wrapped bananas. There is greater variability in the cling-wrapped bananas compared to the foil-wrapped bananas.

IV. Data Analysis

We did a two sample t-test for means at 95% confidence to determine if there was a significant difference in rottenness between the bananas wrapped in foil and bananas wrapped in cling wrap. We checked the conditions: normal, independent, and random. The bananas were randomly assigned treatments. For independence, we assumed that each banana piece was independent of another. To ensure normality, we used a large sample size of 30 pieces for each treatment, satisfying the Central Limit Theorem.

$$t = \frac{(\bar{x}_f - \bar{x}_c) - (\mu_f - \mu_c)}{\sqrt{\frac{s_f^2}{n_f} + \frac{s_c^2}{n_c}}} \qquad t = \frac{4.333 - 3.667}{\sqrt{\frac{1.184^2}{30}} + \sqrt{\frac{0.884^2}{30}}} = 2.47$$

Degrees of Freedom = 53.670

P value= 0.00834

V. Conclusion

Since the p-value of 0.00834 is less than the significance level of 0.05, we reject the null hypothesis and conclude that the mean rating of rottenness for foil was significantly lower than the mean rating for cling wrap. Thus, foil wrap is a better way to preserve bananas than cling wrap.

VI. Reflection on Process

Potential errors and shortcomings of our process could have affected the results of our experiment. Although the sizes of the cling wrap and foil were roughly equal, cling wrap was stretchier and could be wrapped around the banana multiple times. The sizes of the banana pieces also could have changed our results. Since the ends of the banana were slightly smaller, they had a larger surface area to volume ratio, so they might have rotted faster and their ratings could have affected the final results. A more accurate study could have been done if we had wrapped each banana piece only one layer and cut off the rest to make each experimental unit more consistent. Furthermore, using more banana pieces and ensuring that each banana piece was the same size would have improved our results.

It is appropriate to assume that foil wrapping is a better method of preserving bananas than cling wrap because the study was a randomized experiment with large sample sizes.

VII. Appendix

Raw Data:

Foil Ratings:

4, 4, 4, 3, 4, 4, 3, 5, 3, 4, 5, 4, 2, 2, 3, 4, 4, 4, 3, 3, 3, 4, 5, 5, 2, 3, 5, 3, 4, 4

Cling Wrap Ratings:

4, 6, 7, 3, 5, 4, 4, 5, 3, 5, 4, 5, 5, 4, 3, 2, 2, 4, 5, 4, 3, 6, 5, 4, 4, 5, 3, 5, 5, 6

Cling Wrap

Foil Wrap

Works Cited

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