Soil Moisture and pH:

California Sage and Lemonade Berry

Writing Assignment 2 Group C2

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Research Question:

Do the soils samples of Lemonade Berry and California Sagebrush have a difference in the soil properties of moisture and pH?

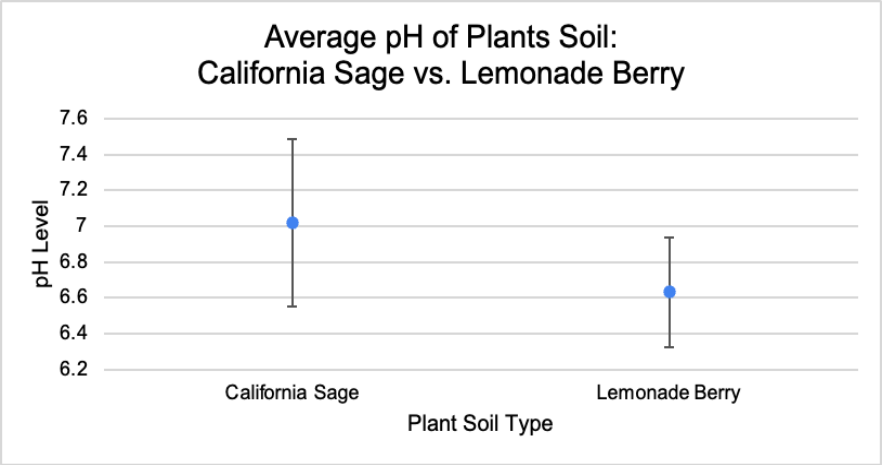
Figures

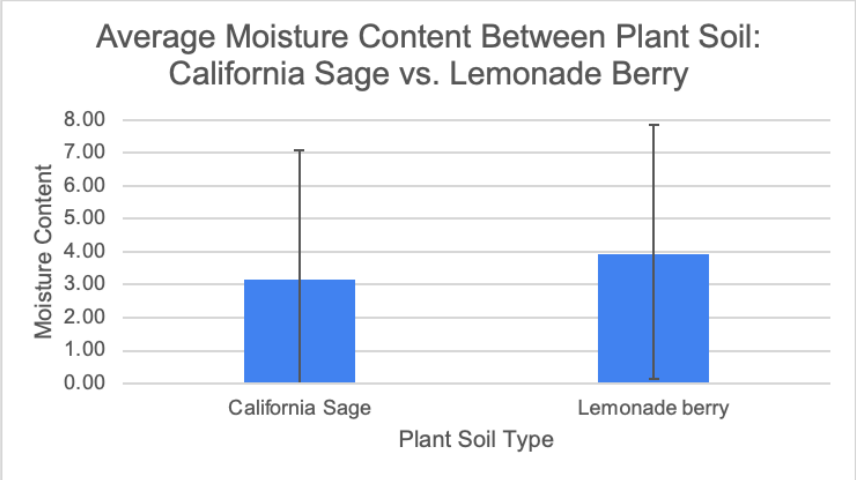
pH Table:

Soil Type	Average pH	STDEV	TTEST
California Sage	7.0173	0.4658	0.001300014
Lemonade Berry	6.6305	0.3083	

Soil Moisture Table:

Soil Type	Average Moisture Cont.	STDEV	TTEST
California Sage	3.16	3.9187	0.6504
Lemonade Berry	3.93	3.8016	





Evidence

Based on the data collected from the soil moisture lab, the average moisture content in the soil of the California sage plant was 3.16, while the lemonade berry had an average moisture of 3.93. In the California sage data, there were two outliers present which were 57.76 and -11.72. According to the outlier bounds, these values were above 16 and -7.1 making these an outlier, however, the values 13.64 and 13.21 in the lemonade berry data are not considered outliers since it falls under the upper bound. The standard deviation of the California sage was 3.9187 and the lemonade berry was 3.80. This tells us that the Sage data has more variety in values within the mean while the lemonade berry, having a slightly smaller standard deviation, has more values consistent within the mean. In terms of the p-value collected from the t-test, it demonstrates that the difference in both plant's moisture is not statistically significant since it had a p-value of

0.6504. While the average between both of the moisture contents were similar, the p-value suggests that there is a 65% chance this may be due to random chance/ variation.

Based on the central tendency of the pH data, it shows that the California sage data is right-skewed since it has larger error bars along with a mean of 7.017 pH being closer to the median due to the outliers. However the central tendency for the Lemonade berry seems to have a symmetric distribution with an average of 6.63 pH closer to the median of 6.67 pH. The standard deviation of the sage was 0.4658 and 0.308 for the lemonade berry. Additionally, the visual representation of the graph shows that there was much more variability between the values from the average for the California sage than the lemonade berry. According to the outlier bounds of the data, the pH 8.18, which appears twice in California sage data, would be considered an outlier which could explain the larger standard deviation for the sage compared to the lemonade berry. The p-value from the t-test suggests that there is a significant difference between the two soils, making it a 0.13% chance of being due to random chance.

Conclusion

According to the data that was collected, the soil moisture contents from the Lemonade Berry and California Sagebrush does not have a significant difference. We concluded this as we found the p-value was above the significance threshold, which means that we failed to reject the null hypothesis. In addition, we concluded that the pH contents between the Lemonade Berry and California Sagebrush did have a significant difference. This was observed as the p-value was below the threshold and we could reject the null hypothesis.

Explanation

Soil pH levels could be explained by current trends and other research findings on native species soil within the United States. For instance, according to the article “Direct and Indirect Effects Of Invasive Plants on Soil Chemistry and Ecosystem Function” by Jeffrey D. Weidenhamer, native plants could have a difference of pH levels due to plant activities. Weidenhamer explains that plants release their own compounds known as root exudates that could lower the pH. In addition, the article mentions that other plants, like invasive species, could alter the microbial communities (Bacteria, Fungi, and microorganisms) which affects the

chemical environment of the soil. Lastly, different plants take up different nutrients from the soil, which could overall affect the pH. (Weidenhamer, 2010). These examples stated in the article could explain these soils containing different pH in the experiment.

In addition to the article, “Soil pH, Soil Health and Climate Change” by Zdenko Rengel they also mention other natural factors. For instance it mentions how climate change (for instance rainfall and temperature) could affect the pH. This article also mentions how other organic materials composting could affect the organic acids within the soil. (Rengel, 2011) Overall, these articles were able to explain how the two soil samples could have different pH levels.

Work Cited

Weidenhamer, J.D., Callaway, R.M. Direct and Indirect Effects of Invasive Plants on Soil Chemistry and Ecosystem Function. *J Chem Ecol* **36**, 59–69 (2010). https://doi.org/10.1007/s10886-009-9735-0

Rengel, Z. (2011). Soil pH, Soil Health and Climate Change. In: Singh, B., Cowie, A., Chan, K. (eds) Soil Health and Climate Change. Soil Biology, vol 29. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-20256-8_4