Predicting the Avocado Shelf Life Using Handheld Raman Spectrometer to Combat Food Waste

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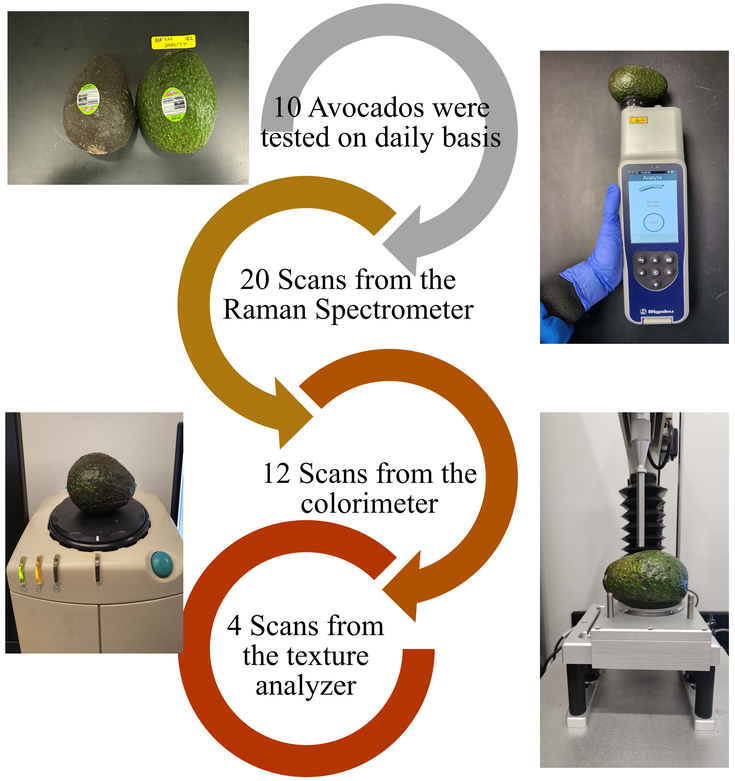
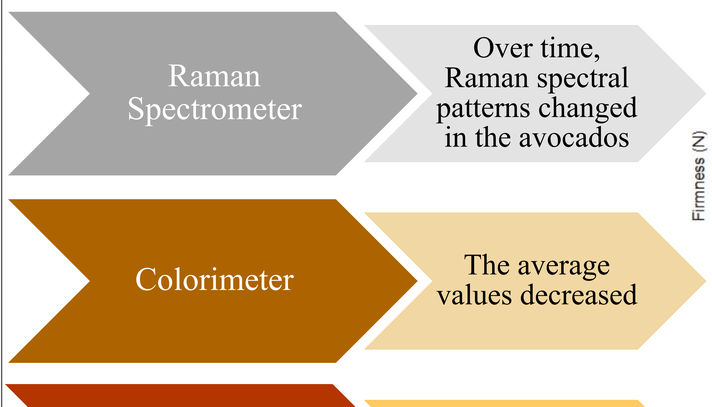
Introduction

- Food waste is the compilation of discarded food.
- 30-40% of food is discarded due to the overripe appearance of foods.
- Avocados are greatly consumed because of their health benefits but have a short shelf life.
- Hypothesis – The chemical composition of lipids, carbohydrates, and proteins in an avocado diminishes as it progresses through the ripening stage, leading to a loss of valuable nutrients. By measuring these chemical components over a week, strategies for understanding the avocado's shelf life can be customized to uphold these particular chemicals.

Experimental Design



Results



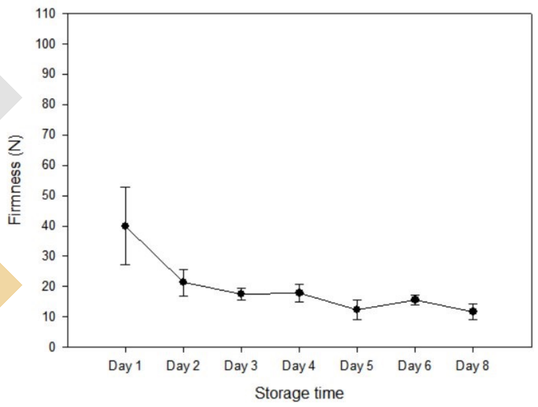


Figure 1: Representation of the texture analyzer results on the firmness of the avocados over a week.

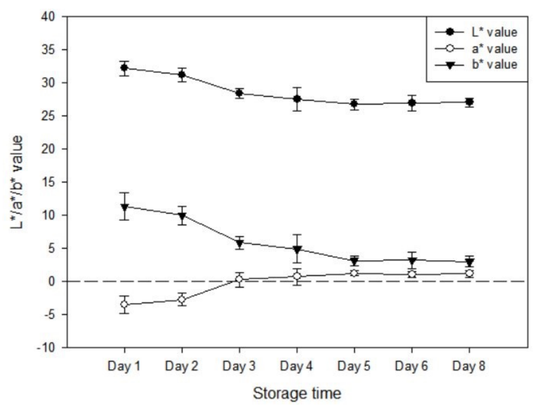


Figure 2: Representation of the colorimeter results on avocados over a week.

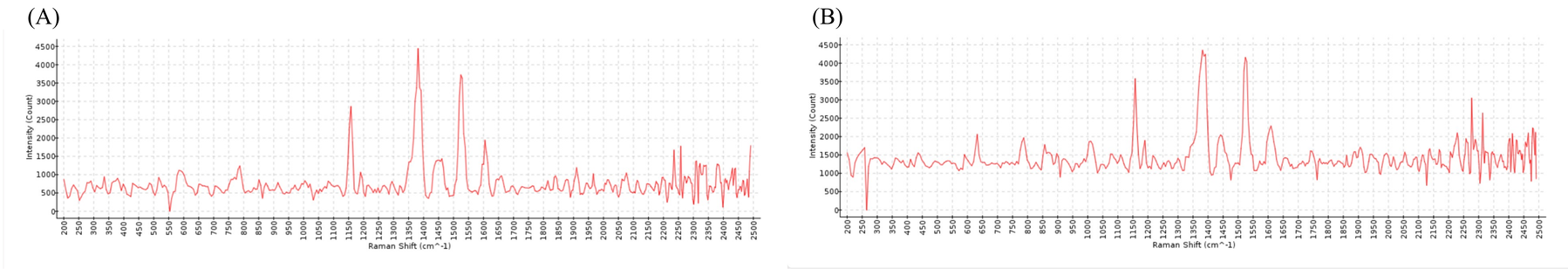


Figure 3: Representative Raman spectra obtained from avocados on Day 1 (A) and Day 6 (B).

Discussion and Conclusion

- The avocados that were not smooth from some sides or had abrasions may have led to abnormal scans.
- The Raman Spectrometer distinguished the chemical change of avocados at different storage stages and provided insight into the optimal time for avocado consumption.
- This data offers valuable suggestions for adjusting the harvesting process to align with consumer preferences for timely consumption.

References

- Cho, B.-H., Koyama, K., & Koseki, S. (2021). Journal of Food Measurement and Characterization, 15(2), 2021–2030.
- Dodo K, Fujita K, Sodeoka M. J Am Chem Soc. 2022 Nov 2;144(43):19651-19667. doi: 10.1021/jacs.2c05359. Epub 2022 Oct 10.
- Homez-Jara A., Cardenas-Roa H., Montealegre M., Lim L.T., Corradini M.G., Váquiro-Herrera H.A., and Sandoval-Aldana A. ACS Food Sci. Technol. 2023, 3, 5, 932–944
- Saletnik A, Saletnik B, Puchalski C. Molecules. 2021 Mar 11;26(6):1537.
- USDA. (2023). Food Waste FAQs. Usda.gov; USDA.