Honey has been utilized across civilizations for its antimicrobial and antioxidant benefits. This study examined the bioactivity of honey sourced from both local beekeepers and grocery stores in San Antonio, Texas. Analysis included antimicrobial activity, antioxidant potential, and phytochemical characteristics to ensure authenticity and bioactivity. Antimicrobial activity was determined via agar well-diffusion assay against Staphylococcus aureus, while antioxidant potential was assessed through DPPH assay.

Results indicated significant differences between honey from local beekeepers and grocery stores. Local honeys exhibited higher antimicrobial and antioxidant activity with darker color in comparison to grocery store honeys. Further research could enhance consumer awareness and establish industry standards for honey quality.

Objective

The objective of this study is to determine the bioactivity potential of honey samples from local TX beekeepers and grocery stores, which is a significant indicator of honey authenticity.

We hypothesize that honey from local beekeepers will exhibit higher bioactivity levels, thus indicating greater authenticity, compared to honey from grocery stores, as identified through antimicrobial and antioxidant activities.

Methods

In this study, DPPH radical scavenging assay was used to assess antioxidant activity, while zone of inhibition method was used to evaluate antibacterial efficiency against Staphylococcus aureus, and color analysis using a spectrophotometer at 560 nm to compare honey sourced from grocery stores and local beekeepers.

Results

Staphylococcus aureus is the leading cause of skin and soft tissue infections such as abscesses (boils), furuncles, and cellulitis. Although most staph infections are not serious, S. aureus can cause serious infections such as bloodstream infections, pneumonia, or bone and joint infections.

Local Texas beekeeper honey samples displayed a higher zone of inhibition (ZOI) against S. aureus, with an average of 20.83 mm, in contrast to grocery store honeys, which exhibited an average of 12.85 mm. According to Clinical Laboratory Standards Institute (CLSI), ZOI higher than 16 mm represents high antibacterial activity.

Numerous studies reported that most chronic diseases such as cancer, coronary, and neurological degeneration are a consequence of oxidative damage. Therefore, antioxidants are critical to prevent these diseases as they scavenge free radicals. High radical scavenging activity (RSA) percentages indicate stronger antioxidant properties. Local TX honey samples, with an average of 66.41%, demonstrated a 20% higher antioxidant potential compared to the average of grocery store honey, which remained at 46.41%. These differences emphasize the overall antioxidant capacity of local TX beekeeper honey in contrast to grocery store honey.

By referencing the USDA Color Standard Designation for color, averages were calculated, revealing absorbance ratios indicating an average of amber hue for local TX beekeepers honeys and a lighter amber shade for grocery store honeys.

Conclusions

- Overall, local beekeeper honey samples showed higher biological activity potential compared to commercial honeys.
- The inhibitory effect of local TX honeys (21mm) was significantly higher than grocery store honeys (13mm) against S. aureus.
- Local beekeeper honeys exhibited 20% stronger antioxidant activity compared to grocery store honeys.
- The average color of local honey was amber, while the color of grocery store honey was light amber.
- Our results suggest that honey from local TX beekeepers are stronger candidates to be classified as medical-grade honey; thus, to be used in medicinal applications.
- Grocery store honeys presented very limited antimicrobial and antioxidant activity, which can help the consumers making informed decisions when purchasing honey for therapeutic purposes.

Acknowledgements

The funding for this research was provided by the Sophomore Biology Research Initiative (SBRI) of Department of Integrative Biology at UTSA, which provides course-based undergraduate research experiences (CURE). We want to thank Dr. Erfaat Ozturk for his incredible support towards us and our research this year! He has given us great feedback and guided us during the experimental process, data analysis, and finalizing our research. We also want to thank Dr. Mariah Hopkins, Director of Integrative Biology CURE Labs, and Donna Degen, our CURE Lab Coordinator for providing students with the opportunity to grow and expand our research skills.