Protecting Beef Meat from Lipid Oxidation Using the Power of Texan Honeys

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Abstract

This study evaluates the antimicrobial and antioxidant properties of two Texan honeys (23H-50 and 23H-76) and one Manuka honey (M-256) in preventing lipid oxidation in ground beef patties. The research investigates pH, moisture, phenolic, and flavonoid contents of the honeys, employing spectrometric assays and protocols outlined by the International Honey Commission. Ground beef patties, with varying treatments including honey and sodium tripolyphosphate (STPP), were cooked and stored, and lipid oxidation was assessed over a 14-day period via peroxide value and color changes. Results indicate that M-256 outperforms STTP in preventing lipid oxidation, while 23H-76 exhibits moderate inhibition. 23H-50 demonstrates comparable efficacy to STPP initially but declines by day 3. Texan honeys with high antioxidant properties and low pH, like 23H-50, show promise in lipid oxidation prevention. Further research is needed to understand the longevity of honey’s preservation activity.

Introduction

• Meat spoilage: bio-chemical process driven by intrinsic and extrinsic factors.
• Intrinsic factors: moisture, pH, nutrient content, oxidative stress, inherent enzymes.
• Extrinsic factors: temperature fluctuations, inadequate storage, oxygen exposure.
• Sodium tripolyphosphate (STPP): chemical food preservative
• Meat spoilage: biochemical process driven by intrinsic and extrinsic factors.
• Intrinsic factors: moisture, pH, nutrient content, oxidative stress, inherent enzymes.
• Extrinsic factors: temperature fluctuations, inadequate storage, oxygen exposure.

Objective

1. To evaluate the antioxidant and antimicrobial properties of 2 Texans honeys and 1 Manuka honey in preventing lipid oxidation, by examining pH, moisture, phenolic, and flavonoid contents.
2. By incorporating honey into ground beef patties and examining lipid peroxidation via peroxide value and color changes over a 0-14 days period, this research seeks to provide valuable insights into the antimicrobial and antioxidant properties of Texan and Manuka honeys, and explore their meat preservation activity.

Materials and Methods

• Honey Samples: 2 Texan honeys (23H-50 and 23H-76) was obtained from Bexar county according to the map below. 1 Manuka Honey (M-256) samples were obtained from the lab.
• pH and Moisture: pH levels and moisture content was determined according to International Honey Commission (HIC) guidelines.
• Total Flavonoid Contents (TFC) and Total Phenolic Contents (TPC) were measured via spectrometer assay.
• Meat sample Preparation: Fresh ground beef from Alibaba International Market was portioned into 100g patties, one patty as blank (beef with no treatment), one patty with 0.05g STPP (control), three patties with 10g of honey each (samples).
• Patties were cooked until 76-78°C and Stored at 18°C.
• Peroxide Value: Iodometric Titration Method is used.

Results

<table>
<thead>
<tr>
<th>Day 0 Peroxide Value</th>
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<tbody>
<tr>
<td>23H-50</td>
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<tr>
<td>23H-76</td>
</tr>
<tr>
<td>M-256</td>
</tr>
<tr>
<td>STPP</td>
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<tr>
<td>No Treatment</td>
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Conclusions

• M-256 prevents lipid oxidation in beef better than STPP.
• 23H-76 does inhibit lipid oxidation but not as much as STPP.
• 23H-50 shows similar performance to STPP at day 0, but declines on day 3.
• Texan Hones with high antioxidant properties and low pH (23H-50) can prevent lipid oxidation.
• Future studies like prevention of raw meat and treatment with different types of honeys.

References

• McBirnie, Jason & Engeseth, Nikki (2002). Honey as a Protective Agent against Lipid Oxidation in Ground Turkey. Journal of agricultural and food chemistry. 50. 565-51. 10.1021/jf010820a.

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