Effect of white sesame seeds and cayenne pepper on quality in reduced sodium and low-fat precooked pork patties

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Abstract

Background: These precooked products have challenge of flavor change and shelf life during refrigerated storage. Sesame seeds and cayenne pepper can effectively inhibit lipid oxidation and discoloration in meat system. Limited research has focused on their functionalities on the reduced sodium and low-fat meat category.

Materials and Methods: The characteristics of reduced sodium and low-fat precooked pork patties prepared with white sesame seeds or cayenne pepper were analyzed for pH, Hunter L*, a*, and b*, heme iron, and 2-thiobarbituric acid-reactive substances (TBARS) at refrigerated day 0, 4, and 7.

Results: There was a non-significant interaction between treatment and storage time for measurements. Despite of the natural redness from the cayenne pepper, the color of precooked pork patties was preserved with cayenne pepper and white sesame seeds with higher Hunter a* value compared to the control. The TBARS values demonstrated considerable antioxidant activity of white sesame seeds or cayenne pepper in precooked pork patties, while the treatment with cayenne pepper has a significantly lower value than the control.

Conclusion: It is concluded that the addition of white sesame seeds or cayenne pepper alleviated the problems of lipid oxidation and discoloration in precooked pork patties.

Keywords: Cayenne pepper, lipid oxidation, pork patties, sesame seeds
oxidation and discoloration in meat system. The aims of this study were to evaluate the effectiveness of adding white sesame seeds and cayenne pepper to inhibit lipid oxidation and to maintain color stability in precooked pork patties.

MATERIALS AND METHODS

Sample preparation
The 24-h postmortem pork ham was ground through a 3-mm plate and 1% NaCl was added. The raw meat was blended with natural food ingredients (no addition, 5% white sesame seeds, or 1% cayenne pepper). Ninety grams of ground pork was molded in a Petri dish with a diameter of 90 mm and the thickness of Patty was 5 mm. Then, pork patties were cooked on a hot plate until the internal temperature of the patties reached 75°C. These samples were placed in a tray, covered with aluminum foil, and stored at 4°C. Measurements of \( a^* \), \( b^* \), \( L^* \) color values, pH values, heme iron, and 2-thiobarbituric acid-reactive substances (TBARS) values were observed on precooked pork patties on 0, 4, and 7 days of storage. This test was repeated three times.

Color measurement
Color of \( a^* \), \( b^* \), and \( L^* \) values were detected with Minolta colorimeter (CR-10, Konica Minolta Sensing, Inc., Japan). The \( a^* \) indicates redness; \( b^* \) indicates yellowness; and \( L^* \) indicates lightness. Each value was the mean of 10 determinations.

Heme iron
Total pigment test was detected with the modified method from Ockerman. Total pigments (ppm; \( \mu g/g \)) = Total pigment (ppm; \( \mu g/g \)) hematin. Heme iron (ppm; \( \mu g/g \)) = Total pigment (ppm; \( \mu g/g \)) × 0.0882. Heme iron was measured by the modified technique of Clark et al., the iron content was calculated with the factor of 0.0882 \( \mu g/g \) hematin. Heme iron (ppm; \( \mu g/g \)) = Total pigment (ppm; \( \mu g/g \)) × 0.0882.

pH measurement
The pH values of the samples were tested with a pH meter. Before measuring, the pH meter was standardized by buffer solutions (pH 7.00 and 4.00 at 25°C). Ten grams of the sample was blended with 100 ml of distilled water in a polyethylene bag using a Stomacher (Easy Mix, Germany) for 1 min.

2-Thiobarbituric acid-reactive substances values
The pork patties were measured by the modified extraction method of TBARS. Test tubes of the samples were placed in the dark at room temperature (25°C) for 15 h, and the amounts of color were measured with a ultraviolet-visible spectrophotometer (SP8001, Metertech Inc., Taiwan) at 532 nm to calculate the TBARS values.

Statistical analysis
Data were analyzed by the general linear model procedure, and differences among the means were detected at the 5% level with Duncan’s new multiple range test by SAS, Statistical Analysis System Package, SAS Institute Inc. Cary, NC 27513, USA.

RESULTS
The characteristics of reduced sodium and low-fat precooked pork patties added with white sesame seeds or cayenne pepper were analyzed for pH, Hunter \( L^* \), \( a^* \), and \( b^* \), heme iron, and TBARS on refrigerated day 0, 4, and 7. There were nonsignificant interactions between treatment and storage time for all measurements; therefore, the main effects are shown as results in this study. Three treatments were significantly different when detecting Hunter \( b^* \) values; the Hunter \( b^* \) value of the pork patty with cayenne pepper was significantly higher than that of pork patty with white sesame seeds, which had higher \( P < 0.05 \) value compared to control. Three treatments were significantly different when detecting Hunter \( a^* \) values; the Hunter \( a^* \) value of the pork patty with cayenne pepper was the highest \( P < 0.05 \) among treatments and that of control was the lowest \( P < 0.05 \). However, all treatments had the same Hunter \( L^* \) values. During refrigerated storage, pork patties had significantly higher Hunter \( a^* \) values on day 4 or 7 compared to on day 0. For Hunter \( b^* \) values, there was nonsignificant difference with chilled storage among three treatments. Moreover, the Hunter \( L^* \) values of precooked pork patties increased on day 7 compared to that on day 0 \( P < 0.05 \). Despite the natural redness from the cayenne pepper, the color of precooked pork patty was prepared with cayenne pepper and white sesame seeds with higher Hunter \( a^* \) value compared to the control. It is that oilseed or spice added maintained better color in this experiment. The addition of white sesame seeds or cayenne pepper had the same pH values as control \( P > 0.05 \). The pork patties with different treatment maintained the same pH during refrigerated storage in this study \( P > 0.05 \). The values of TBARS demonstrated considerable antioxidant activity of the white sesame seeds or red cayenne in precooked pork patties, while the treatment with red cayenne has a significantly lower value than the control. Although there was nonsignificant difference between TBARS values of pork patties with white sesame seeds and control, samples with oilseeds had higher mean. Sesame products can serve as a chelating agent to bind ferrous ions in food system. According to these results, addition of white sesame seeds or cayenne pepper did solve the problems of lipid oxidation and color evaluation in reduced sodium and low-fat precooked pork patties.

CONCLUSION
It is concluded that the addition of white sesame seeds or red cayenne alleviated the problems of lipid oxidation and discoloration.

Table 1: Main effect of Hunter \( a, b, L \) values, pH values, heme iron, and 2-thiobarbituric acid-reactive substances values of precooked pork patties with different treatments during refrigerated storage

<table>
<thead>
<tr>
<th>Treatment</th>
<th>( a )</th>
<th>( b )</th>
<th>( L )</th>
<th>pH</th>
<th>Heme iron (( \mu g/g ))</th>
<th>TBARS (( \mu g/g ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>20.82c</td>
<td>48.61a</td>
<td>6.51b</td>
<td>9.09a</td>
<td>0.99a</td>
<td>22.92</td>
</tr>
<tr>
<td>T2</td>
<td>22.92b</td>
<td>48.77b</td>
<td>6.51a</td>
<td>9.13a</td>
<td>1.08a</td>
<td>22.92</td>
</tr>
<tr>
<td>T3</td>
<td>24.68a</td>
<td>45.50a</td>
<td>6.49a</td>
<td>9.67a</td>
<td>0.56a</td>
<td>22.92</td>
</tr>
<tr>
<td>Storage</td>
<td>Day 0</td>
<td>Day 4</td>
<td>Day 7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.24a</td>
<td>10.04c</td>
<td>9.41b</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23.02c</td>
<td>22.91c</td>
<td>22.50c</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
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<td>47.62c</td>
<td>47.91a</td>
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</tr>
<tr>
<td></td>
<td>6.50a</td>
<td>6.50c</td>
<td>6.51a</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
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<td>8.72a</td>
<td>8.12a</td>
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</tr>
<tr>
<td></td>
<td>0.31a</td>
<td>0.80a</td>
<td>1.25a</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Means with different upper case superscripts within a column, within main effect of treatment are significantly different \( P<0.05 \). Means with different lowercase superscripts within a column, within main effect of storage time are significantly different \( P<0.05 \).

abcMeans with different different upper case superscripts within a column, within main effect of treatment are significantly different \( P<0.05 \). Means with different lowercase superscripts within a column, within main effect of storage time are significantly different \( P<0.05 \).
in reduced sodium and low-fat precooked pork patties. Sesame products can serve as a chelating agent to bind ferrous ions in meat system, and cayenne pepper can effectively inhibit lipid oxidation and discoloration in meat system.

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Conflicts of interest
There are no conflicts of interest.

REFERENCES


