Original Article

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

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INTRODUCTION

Ready-to-eat foods accounted a certain share of the meal market in recent years; therefore, the related technology has raised the attention for both food processing and culinary practitioners. These precooked products have challenge of flavor change and shelf-life during refrigerated storage. Armida *et al.*[1] indicated that the shelf-life of meat can been extended by the reduction of discoloration and lipid oxidation. Currently, the consumers like to choose the low-fat and reduced sodium food products.[2,3] Further, lipid oxidation and discoloration decrease the acceptance of precooked meat products. Shah *et al.*[4] concluded that natural antioxidants maintaining lipid oxidation are used to replace with synthetic antioxidants which would be toxicological in food. However, limited research has focused on their functionalities on the reduced sodium and low-fat meat category. Reduced sodium and low-fat precooked pork patties were the target product in this study for its popularity as a popular healthy choice of meat source in either breakfast or lunch alternatives. Sesame products or cayenne pepper can serve as natural antioxidants to effectively inhibit lipid

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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 irons, 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.[5] Total pigments (ppm; μg/g) = A640 × 680; heme iron was measured by the modified technique of Clark *et al*.;[6] the iron content was calculated with the factor of 0.0882 μg/μg hematin.[7] Heme iron (ppm; μg/g) = Total pigment (ppm; μg/g) × 0.0882.

pH measurement

The pH values of the samples were tested with a pH meter.[5] 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.[8] 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.[9]

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 [Table 1]. For color test, the Hunter a*value of the sample 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 b*values; the Hunter b*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.

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

Main effect	*a*	*b*	*L*	pH	Heme iron (μg/g)	TBARS
Treatment						
T1	8.38^{C}	20.82^{C}	48.61^{A}	6.51^{A}	9.09^{A}	0.99^{A}
T2	9.80^{B}	22.92^{B}	48.77^{A}	6.51^{A}	9.13^{A}	0.80^{AB}
T3	13.50^{A}	24.68^{A}	45.50^{A}	6.49^{A}	9.67^{A}	0.56^{B}
Storage time						
Day 0	12.24^{a}	23.02^{a}	45.55^{b}	6.50^{a}	11.05^{a}	0.31^{c}
Day 4	10.04^{b}	22.91^{a}	47.62^{ab}	6.50^{a}	8.72^{b}	0.80^{b}
Day 7	9.41^{b}	22.50^{a}	49.71^{a}	6.51^{a}	8.12^{b}	1.25^{a}

^{ABC}Means with different uppercase superscripts within a column, within main effect of treatment are significantly different ($P<0.05$), ^{abc}Means with different lowercase superscripts within a column, within main effect of storage time are significantly different ($P<0.05$). T1: Control, with 1% NaCl, T2: With 1% NaCl and 5% white sesame, T3: With 1% NaCl and 1% red cayenne. TBARS=2-Thiobarbituric acid-reactive substances (mg malonaldehyde/kg muscle)

CONCLUSION

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

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.

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