Effect of Sunflower Oil and Sesame Seed Treatment Mixture at Different Ratios on Postharvest Quality of Quail Fresh Meat

Abstract: To fulfill the food demand from consumer, any potential fresh food must be given fully attention in term of their quality to ensure the purchasing activity could be done at the market level. Other than well known meat produces from all ruminant animals such as cow and goat, quail is also one of the options for meat produces. However, similar issue is also faced by quail meat which is meat deterioration due to oxidation process after slaughtering. In this study, treatment mixture consisting of sunflower oil with sesame seed at three different ratios (1:3, 1:1 and 3:1) were applied on fresh quail meat to determine the effect on postharvest quality of quail meat. Postharvest parameters which observed in this study were weight loss, color, pH and firmness of the meat. Results showed in term of prolong the shelf life with maintaining meat quality, treatment 3 at 3:1 ratio gave significant effects (p<0.05) compared to control for weight loss, pH and firmness parameters. Meanwhile for the colour parameter, none of the treatment ratios showed the ability for maintaining the red colour of meat.

Keywords: Sunflower oil, sesame seed, postharvest quality, quail meat.

INTRODUCTION

Japanese quail (Coturnix japonica) is the smallest species in poultry group which getting more exposure to be another option for human food supply. Quail is also one of the most desirable alternatives to chicken and other animal meat due to their low-fat content and good level of phospholipid where quail mainly reared for its egg and meat (Ionîţă et al, 2010). Regarding to this opportunity, any issues which can harmful the quail meat quality should be studied and one of the issues is meat deterioration. Poultry product including quail meat is susceptible to deterioration due to the oxidation reaction and lipid peroxidation of polyunsaturated fatty acid (Est’evéz, 2015). Meat deterioration obviously will affect the purchasing decision among the consumers. This also will decrease the number of food supply option for consumers. At commercial level, synthetic food additive has been used to prolong meat shelf life and maintaining meat quality. However, drug residue leftover in meat was reported and has led the researchers to explore natural sources to face this meat quality issue (Florou-Paneri et al, 2006; Thomas, 2010). Natural sources as an alternative to synthetic based antioxidant was proposed to be used as nutraceuticals, pharmaceuticals, antioxidant, colouring and flavouring in meat products as nowadays it is started to reach its maximum request, globally. Recently, plant oil from wide ranges of plants species have been tested as additive for meat quality (Stevanović et al.,2018). Thus, the study was conducted to evaluate the effect of designated treatment mixture at different ratios on postharvest quality of fresh quail meat.

MATERIALS AND METHODS

Experimental materials and location

Japanese quail (Coturnix japonica) carcasses was obtained from a quail farm in Marang District, Terengganu (5°12’27.76”N, 103°12’17.8”E). Immediately after slaughtered, carcasses were properly packed for transportation to the Laboratory of Postharvest Technology, Universiti Malaysia Terengganu (5°24’11.39”N, 103°05’9.60”E). Once arrived, all samples were thoroughly washed to ensure any foreign material such as feather and dust were removed. Carcasses were equally divided into 4 batches according to the treatment (Control, 1:3, 1:1, 3:1 treatment solution ratios). Quail’s carcasses then were stored in walk-in-chiller at 5°C. Sunflower oil and sesame seed were purchased from local market and further processes were all conducted at this same laboratory.
**Preparation of experimental solution**

Sesame seed was cleaned with tap water followed by filtration process to separate them from any unwanted dirt. The seeds were then dried in the oven at 50°C until the seed loss its moisture. After a couple of days, dried sesame seed was weighted accordingly (Treatment 1: 100g, Treatment 2: 150g and Treatment 3: 62.5g) and were crashed into fined powder. Sesame seed powder was boiled in distilled water to be a decoction solution. Decoction was done until the oil started to appear on the surface of boiled water. Sesame seed decoction was set to cool for a few minutes before it was filtered to remove the remaining seeds. Sesame seed decoction was filled in 3 different jugs representing 3 different treatment solution. Meanwhile, the commercial sunflower oil was measured up to 625mL, 1500mL and 1000mL and were mixed with 1000mL, 1500mL, and 625mL of sesame seed decoction, respectively. Egg yolk were added in the solution as an emulsifier for each solution.

**Postharvest parameters assessment:**

**Weight loss**

The weight loss of quail’s carcasses was evaluated by using percentage of weight loss calculation method. Weight analysis of carcasses was measured by using an electronic balance for every 2 days of interval. Weight difference between initial day and final weight was considered as total weight loss and expressed as percentage weight loss by using equation below (Hatoum and Kaplan, 2013).

\[
\text{Percentage of Weight Loss } \% = \frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \times 100
\]

**Colour**

Analysis of colour for quail’s carcasses was observed for every 2 days interval. The carcasses lightness (L*), redness (a*) and yellowness (b*) value were all measured by using Minolta Chroma-meter (Model CR-400X Minolta Camera Co. Ltd. Japan.) Commission Internationale l’Eclairage (CIE; L*, a*, b*) readings that appeared on the chromameter’s monitor was recorded and analyzed.

**Firmness**

Analysis of carcasses firmness was measured for every 2 days of interval by using TA-Tx Plus Texture Analyser (Stable Micro Systems, United Kingdom).

Carcasses were analyzed by using 5 mm diameter probe P/5. The machine was set up for pre-test speed at 2.0 mm/s; post-test speed at 5.0 mm/s; distance at 5.0 mm; and time for 5.0s (Ikhlas *et al.*, 2011). The firmness value was expressed in Newton (N).

**pH**

Analysis for quail’s pH value was evaluated for every 2 days of interval. Quail carcasses for each treatment was took out from storage and cut into 5g muscle and ground in 30 mL of distilled water by using stomacher. Homogenized quail’s meat solution then filled in beaker. The pH value of the homogenized meat was measured using pH meter (GLP 21+, Crison, Barcelona, Spain).

**Data analysis**

Experimental design involved in this study was considered as complete randomized design (CRD). The effectiveness of different ratios solution (sunflower oil to sesame seed decoction) was evaluated to the statistical One-Way Analysis of Variance (ANOVA) as well as Kruskal-Wallis and Friedman’s test. Any statistical significance was determined at p<0.05 and pairwise comparison was used to analyzed the significant difference between treatment for data obtained from each parameter observed. Data analysis was made by using IBM SPSS Statistic 25. In this study case, 3 carcasses were used on day-0 as an initial reading for all parameter. Every groups including control was placed with 24 carcasses.

**RESULTS AND DISCUSSION**

**Percentage of meat weight loss (%)**

Result in Figure 1 indicates the amount of weight loss experienced by quail carcasses during the storage period. The percentage of weight loss shows how much water does the carcasses loss during storage. At the end of day-8, there was a significant difference between control and treatment 3 (p<0.05). Treatment 3 was able to maintain the body weight of the carcasses until the end of the study. The treatment ratios of sunflower oil to sesame seed decoction (3:1) proved that high amount of sunflower oil was able to slowdown water loss in quail meat. Sunflower oil has the ability to reduce oxidation of the meat due to the presence of phenolic compound (Rehab and El Anany, 2012).
Meat colour observation ($L^*$ $a^*$ $b^*$)

Meat colour need to be maintained or bright in colour in order to reach its market requirement (American Meat Science Association, 2012). The treatment for $L^*$ value of colour was not significant (Figure 2). The application of both sunflower oil and sesame seed decoction unable to slow down the colour changes on the carcasses. The $a^*$ value of colour is indicating the redness of the meat (Figure 3). At the end of day-8, there was a significant difference between control and treatment 2 (p<0.05). Thus, untreated quail $a^*$ value indicates that the redness of the quail was retain. The $b^*$ value of colour indicates the yellowness of the meat (Figure 4). At the end of day-8, there was no significant difference. Thus, the application of the plant oil was unable to slow down the colour changes of the quail meat. There was no natural ingredient from both materials can influenced the quail meat colour maintaining up to this study.

Figure 1: Percentage of weight loss (%)

Figure 2: The lightness of carcasses ($L^*$)

Figure 3: The redness of carcasses ($a^*$)

Figure 4: The yellowness of carcasses ($b^*$)
Determination of meat pH

On day-4, there was a significant difference between treatment 2 and control (p<0.05) (Figure 5). On day-8, there was a significant difference between treatment 1 and control (p<0.05). Poultry meat as well as quail need to maintain its pH value (range of 5.5 to 6.3) (Moawad et al., 2018). Treatment 3 are able to maintain the quail pH at the end of the storage period. This study showed that treatment 3 are significantly effective on maintaining pH value. Loss of ATP in muscle during storage had trigger the conversion of glycogen to lactic acid via anaerobic thus causing pH decrement (Ahmad et al., 2005). Due to the presence of phenolic compound in sunflower oil and sesame decoction, the conversion of glycogen is able to slow down.

Figure 5: Meat pH values

Meat firmness

On day-6 and 8, there was a significant difference between control and treatment 3 (p<0.05). Quail meat need to maintain its firmness as an indicator to be categorized as good meat (Moawad et al., 2018). Treatment 3 increased the tenderness of quail meat and untreated quail able to maintain the firmness of the quail meat. Sesame seed and sunflower oil were able to increase body tissue integrity (Mohamed and Wakwak, 2014). However, the main objective is to maintain the condition of quail carcasses. Thus, untreated quail are significantly effective than treatment 3.

Figure 6: Firmness of carcasses (N)

CONCLUSION

In conclusion, the current study showed that treatment of quail carcasses with different ratios of sunflower oil to sesame seed decoction (1:3, 1:1, 3:1) are significantly effective to improve the shelf life and postharvest qualities of quail carcasses in term weight loss, pH and firmness of meat. However, the meat colour was not influenced by these experimental materials in term of maintaining the red colour of meat. Hence, the potential of these materials to be the natural additive for postharvest quality of quail meat are still there and further study is recommended. The natural ingredient existed in both sunflower oil and sesame seed can be a promising food additive for quail meat as well as other meat produces.

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REFERENCES


