SHORT COMMUNICATION

The Effect of Slaughter Age on the Bacterial Number, pH and Carcass Weight Loss of Japanese Quails Stored at 4^0C for 14 Days

Jamaludin*, M. H, Aisyah, W. S. K., Shazani, S. and Amin, M. R.
Faculty of Agro-Based Industry, Universiti Malaysia Kelantan,
Jeli Campus, Jeli, Kelantan, Malaysia
*Corresponding author: hafiz@umk.edu.my

Abstract

The main objective of this study was to evaluate the effect of slaughtering age on the bacterial profile, pH, and carcass loss of dressed Japanese **quails** (*Coturnix japonica*) stored aerobically at 4^oC over a period of 14 days. Quails at 3 weeks (n=15), 9 weeks (n=15) and 36 weeks (n=15) were slaughtered and divided into triplicate samples at storage time of 0, 3, 7, 10 and 14 days. There was no difference ($P > 0.05$) in total aerobic bacteria, pH and carcass weight loss percentage between the birds of different slaughtering age at the respective sampling days. Except for quail dressed weight, sampling age did not affect bacterial numbers, pH and carcass weight at the respective sampling day during the aerobic chilled storage of Japanese quails. Future studies should consider other meat quality parameters to include the various biochemical and physical changes of carcass during storage.

Keywords: Quails, meat quality, spoilage, bacteria

Introduction

The Japanese quail (*Coturnix japonica)* is largely farmed for its eggs and meat, and is considered as an alternative source of animal proteins (Faitarone *et al.* 2005). The increasing demand for quail meat has led to the increase in the studies on quality and shelf life (Aminzade *et al*., 2012; Bonos *et al*., 2010). The overall quality of meat is dependent on intrinsic factors such as pH, water holding capacity, biochemical and content and extrinsic factors including meat bacteria profile and storage condition (Lawrie and Ledward, 2006). Slaughtering and animal conditions have also been shown to affect the overall quality of meat and oxidative activity was higher in older animals or when the animals were exerted with stress (Levine and Stadtman, 2001). Jamaludin *et al*. (2010) proposed possible relationship between high overall oxidation with decrease in bacterial growth. While meat quality and shelf life of quail are of great interest, information on bacterial growth during aerobic chilled storage of quail is limited. The aim of this study was to observe the effect of slaughter age on bacterial number, pH and carcass weight loss during aerobic storage at 4^oC of Japanese quails.

Materials and Methods

Live unsexed quails (*Cotournix japonica*), of ages 3 weeks (n=15), 9 weeks (n=15) and 36 weeks (n=15) finished on soybean meal, were slaughtered after 6 h feed withdrawal. The birds were dressed 1 h postmortem, weighed, and wrapped individually using cling film and kept in the dark at 4^{o}C for 14 days. Three birds at day 0, 3, 7, 10 and 14 were used to calculate total aerobic bacteria (TAC), pH and carcass weight loss percentage. Day 0 was sampled at 6 h postmortem. The TAC was prepared using the whole carcass rinse procedure (Cox *et al*., 1981) by adding 100 ml of 0.1% bacto peptone solution (Difco) in stomacher bag and shaken for 1 min. The carcass rinsates were decanted and diluted in sterile 0.1% bacto peptone solution (Difco). The TAC were enumerated from the carcass rinsates on nutrient agar (Difco), and incubated at 30^{o}C for 24 h. The pH was determined by homogenizing 2 g of the quail breast in 10 ml cold deionized water using an automated pH meter. Carcass weight change was calculated from the difference in the weight of individual bird at its respective sampling day compared to the bird's initial weight. Analysis of variance was used to estimate the effect of quails of different slaughtering ages on TAC, pH and carcass weight loss of quails during 14 d of aerobic chilled storage. The data were analyzed using general linear model of SAS and statistical differences among the means were detected using Tukey test at α level of 0.05.

Results and Discussion

The ages of the birds were 3, 9 and 36 weeks which represented young, ideal and spent groups, respectively. There was no significant difference ($P > 0.05$) for the dressed weight of 9 and 36 weeks old birds (Figure 1). The dressed weight of 3 weeks old birds was lower ($P > 0.05$) than the birds slaughtered at older ages. The carcass weight of the young birds was as expected since the quails had not reached the maximum age of maturity (Randall, 2008). Furthermore, the growth rate is linear for the first 5 weeks and later slows with age (Balcıoğlu *et al*., 2005).

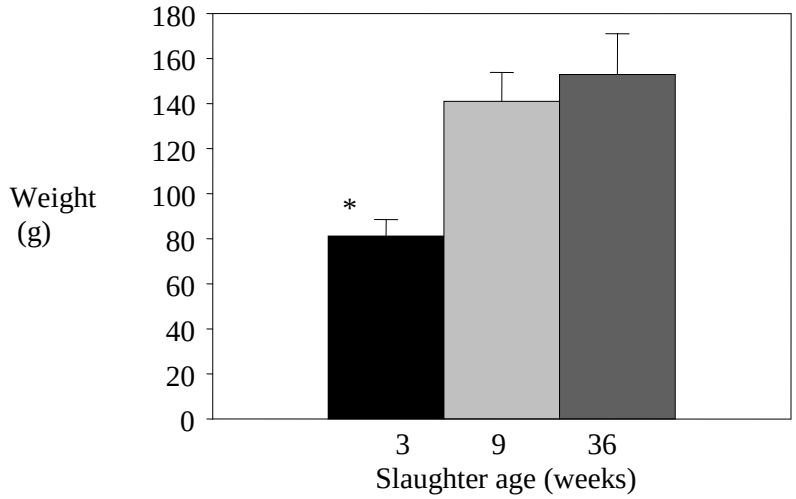

Figure 1. The weight of dressed quails at different slaughtering ages.
The column refers to the mean ± standard deviation as error bars.
*Significantly different at $P < 0.05$.

Slaughter age is known to affect meat quality, and young animals tend to be tender and are preferred by consumers (Lawrie and Ledward, 2006). Sometimes older animals would normally have stronger taste with their own niche consumers.

While previous studies on the quail quality have been conducted (Genchez *et al*., 2008; Boni *et al*., 2010; Wilkanowska and Kokoszynski, 2011), information on the bacterial growth during aerobic chilled storage of quail carcass is limited. In the present study, TAC on carcass increased ($P < 0.05$) with the increase in storage time. However, the carcass was considered spoilt at day 10. No significant difference ($P > 0.05$) in TAC was observed between quails of different slaughter ages at all sampling times. Although bacterial progression was similar regardless of slaughter age, the best feed ratio would be of great interest to commercial producers.

In general, the pH value of meat would depict the overall quality of the product (Lawrie and Ledward, 2006). The pH increased ($P < 0.05$) with increasing storage time for 3- and 9- week slaughter ages, while no significant increase ($P > 0.05$) in pH was observed for the spent quails for the same storage period (Table 1). The pH of young quails was lower ($P < 0.05$) than the older quails where lower pH was only observed on day 3, while no difference ($P > 0.05$) in pH was observed between slaughter age at the respective sampling days (Table 1). The overall pH value of the birds observed was higher than the normal recommended pH associated with normal ultimate pH (5.6-5.8) for meat, but was lower than that observed by Boni *et al.* (2010). Although the pH in young animals was lower than older animals (Poltowicz and Joanna, 2012), no significant difference in pH was previously observed for quails regardless of slaughter age (Abdullah *et al*., 2010).

Table 1: The effect of slaughtering age on the total aerobic count (TAC), pH and carcass weight (%) of quails stored at 4°C over 14 days

Parameter	Age (weeks)	Storage (days)				
		0	3	7	10	14
TAC (CFU/ml)	3	4.6 ± 0.3^{a}	5.3 ± 0.3^{b}	5.8 ± 0.1^{b}	6.8 ± 0.2^{c}	7.2 ± 0.2^{c}
	9	4.4 ± 0.1^{a}	5.0 ± 0.1^{b}	5.3 ± 0.1^{b}	6.7 ± 0.4^{c}	6.5 ± 0.3^{c}
	36	4.3 ± 0.3^{a}	5.1 ± 0.1^{b}	5.4 ± 0.2^{b}	6.5 ± 0.3^{c}	6.9 ± 0.6^{c}
pH	3	-	6.3 ± 0.0^{ax}	6.4 ± 0.0^{a}	6.4 ± 0.0^{ab}	6.5 ± 0.0^{b}
	9	-	6.2 ± 0.1^{axy}	6.2 ± 0.1^{a}	6.4 ± 0.1^{b}	6.4 ± 0.2^{b}
	36	-	6.1 ± 0.0^{y}	6.2 ± 0.1	6.3 ± 0.1	6.3 ± 0.1
Carcass weight loss (%)	3	-	2.11 ± 0.93^{ab}	4.82 ± 1.04^{bc}	6.3 ± 0.03^{cd}	7.82 ± 1.1^{d}
	9	-	1.66 ± 0.52^{a}	3.88 ± 0.56^{b}	4.08 ± 0.34^{d}	5.58 ± 0.29^{e}
	36	-	1.89 ± 0.49^{ab}	2.73 ± 0.29^{cd}	3.99 ± 1.38^{de}	4.83 ± 0.5^{e}

^{abcde} Means in the same column with the same superscripts are not significantly different ($P < 0.05$)
^{xy} Means in the same row with the same subscripts are not significantly different at ($P < 0.05$)

Overall, the percentage loss of carcass weight increased with increasing storage period (Table 1). The weight loss for the young quails (3 week slaughter age) was numerically higher but was not significantly different ($P > 0.05$) than the quails of the older slaughtering ages (9 weeks and 36 weeks) at all sampling days.

The price associated with a chilled product can fetch a better price than a frozen product. The deterioration of chilled product is quicker than the frozen product (Lawrie and Ledward, 2006). The length of the shelf life of a carcass depends on the initial quality of a carcass, and factors such as slaughter age may influence shelf life. Furthermore, its economic implication in the breeding of quails must also be taken into consideration for a sustainable production of the birds.

Conclusion

The quail slaughtered ages examined in the present study had no significant effect on the TAC, pH and carcass weight loss regardless of the birds' age at the respective sampling days. In future studies other parameters associated with carcass quality should also be evaluated to understand the effect of slaughter age on the overall meat quality of Japanese quails.

References

Abdullah, A.Y., Muwalla, M.M., Maharmeh, H.O., Matarneh, S.K. and Abu Ishmais, M.A. 2010. Effects of strain on performance, age at slaughter and duration of post-chilling on meat quality traits of broiler. Asian-Aust. J. Anim. Sc. 23(12): 1645-1656.

Aminzade, B., Karami, B. and Lotfi, E. 2012. Growth response and carcass characteristics of Japanese quail to Mentha piperita plant supplementation. ABAH Bioflux 4(1): 24-27.

Balcıoğlu, M.S., Kızılkaya, K., Yolcu,H.İ. and Karabağ, K. 2005. Analysis of growth characteristics in short-term divergently selected Japanese quail. South African J. Anim. Sci. 35(2).

Boni, I., Huda, N. and Ismail, N. 2010. Comparison of meat quality characteristics of young and spent quail. Asian J. Food and Agro-Industry 3(5): 498-504.

Bonos, E.M., Christaki, E.V. and Florou-Paneri, P C. 2010. Performance and carcass characteristics of Japanese quail as affected by sex or mannan oligosaccharides and calcium propionate. South African J. Anim. Sci. 40(3): 173-184.

Cox, N A., Thomson, J.E. and Gregory, D.W. 1981. Sampling of broiler carcasses from Salmonella with low volume water rinse. Poult. Sci. 64: 1116-1120.

Faitarone, A.B.G., Pavan, A C., Mori, C., Batista, L.S., Olieira, R.P., Garcia, E.A., Pizzolante, C.C., Mendes, C.C. and Shere, M.R. 2005. Economic traits and performance of Italian quails reared at different cage stocking densities. Brazilian J. Poult. Sci. 7(1): 19-22.

Genchev, A., Mihaylova, G., Ribarski, S., Pavlov, A. and Kabakchiev, M. 2008. Meat quality and composition in Japanese quails. Trakia J. Sci. 6(4): 72-82.

Jamaludin, M.H., Bekhit, A.E.D., Cochrane, G. and Bremer, P. J. 2010. The relationship between microbial growth and some biochemical parameters in venison and beef during aerobic storage at 4oC. 2010. Proc. Inter. Congress on Meat Science and Technology 2010, Jeju, South Korea.

Lawrie, R.A. and Ledward, D.A. 2006. Lawrie's Meat Science (7th ed.). Cambridge, England: Woodhead Publishing.

Levine, R.L. and Stadtman, E.R. 2001. Oxidative modification of proteins during aging. Experimental Gerontology 36: 1495-1502.

Poltowicz, K. and Doktor, J. 2012. Effect of slaughter age on performance and meat quality of slow growing broiler chickens. Ann. Anim. Sci. 4: 621-631.

Randall, M. and Bolla, G. 2008. Raising Japanese Quails. Primefacts 602, New South Wales Department of Primary Industries, Australia.

Wilkanowska, A. and Kokozynski, D. 2011. Comparison of slaughter value in Pharaoh quail of different ages. J. Central European Agric. 12(1): 145-154.