

MOISTURE, TEXTURE AND COLOR DETERIORATIONS OF SPENT HEN JERKY PACKED IN DIFFERENT PACKAGING METHODS DURING STORAGE

Supaluk Sorapukdee^{1,*}, Chanpen Uesakulrungrueng¹, Komkhae Pilasombut¹ and Pussadee Tangwatcharin¹

¹Department of Animal Production Technology and Fisheries, Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand

*Corresponding author email: supaluk.so@kmitl.ac.th

Abstract – The objective of this study was to evaluate some quality deterioration of jerky produced from spent laying hen meat during storage. Reformed jerky products were packed in vacuum packaging and aerobic packaging with an oxygen absorber, stored at room temperature and then collected at day 0, 15, 30, 45, 60, 75 and 90 for determinations of water activity (a_w), moisture content, shear force and color. The results showed that a_w of packed product in different packaging methods were relatively constant during storage, but the moisture content was higher when products stored during 60–90 days, as compared to early storage ($P<0.05$). The product textures in different packaging during 90 days of storage were not significant changed ($P>0.05$). Regarding color, lightness value increased, while redness, yellowness, chroma and hue values decreased during prolong storage ($P<0.05$). Numbers of total plate count, yeast/mold and *S. aureus* of products along 90 days were less than the limit of detection, which referred to jerky were stable to micro-organisms. The advantage of aerobic packaging with an oxygen absorber rather than vacuum packaging was color stability of product, which redness, yellowness and chroma quite unchanged during storage up to 90 days without detrimental effect on moisture and texture.

Key Words – Humectants, Meat product, Semi-dried meat, Vacuum packaging

I. INTRODUCTION

Spent laying hen is commonly culled from herds after 70–80 wk of age mainly due to their low rate of egg production or chicken egg production was less than 60% of the herd. The meat looks quite tough, does not meet the needs of consumers. It can be used to produce a reformed jerky, because the production process is not complicated and is popular consumer products. There is a lack of information to evaluate effectiveness among packaging methods allowing products to be held for a shorter time. Therefore, The objective of this study was to investigate important changes in moisture, texture, color and microbiological quality of jerky processed from spent laying hen meat packed in two different packaging methods including of vacuum packaging and aerobic packaging with an oxygen absorber.

II. MATERIALS AND METHODS

Spent hen jerky product was formulated and processed according to the method of Sorapukdee et al. [1]. Jerky samples were placed in Nylon/LLDPE bags and then packed in different methods including (1) vacuum packaging and (2) aerobic packaging with an oxygen absorber. During 0, 15, 30, 45, 60, 75 and 90 days of storage at room temperature, a_w , moisture, Warner-Bratzler shear force, color (CIE $L^*a^*b^*$), and microbiological test (total plate count, yeast/mold and *S.aureus*) were carried out.

III. RESULTS AND DISCUSSION

Although a_w values among samples remained constant at 0.579-0.604 during storage, jerky packed in aerobic packaging with an oxygen absorber showed a higher a_w in days 45-90 than in days 0-30 (Table 1). The moisture content at day 0 was approximately 19.5%. Anyhow, moisture contents of products slightly increased during storage ($P<0.05$), especially for jerky packed in aerobic packaging with an oxygen absorber, it had a higher moisture content at day 75-90 than those packed in with vacuum packaging ($P<0.05$). The increased moisture in the product packed in aerobic packaging with an oxygen absorber coincidental occurred with increasing a_w during 45-90 days. Regarding texture, there were no significant differences among different methods of packaging ($P>0.05$), but there was seem to increase during storage. For instrumental color, jerky packed in vacuum packaging had lower values of lightness, redness and yellowness than those pack in aerobic packaging with an oxygen absorber (data not shown). According to the overall changes during storage, lightness of products tend to increased, and redness and yellowness values decreased, especially clearly observed in product packed in vacuum packaging ($P<0.05$).

Table 1 Changes in a_w , moisture content and shear force of spent laying hen jerky during storage

Parameters	Storage time (days)	Vacuum packaging	Aerobic packaging with O ₂ absorber
Water activity (a_w)	0	0.580 ± 0.00 ^{a,A}	0.580 ± 0.00 ^{a,C}
	15	0.580 ± 0.00 ^{b,A}	0.587 ± 0.00 ^{a,BC}
	30	0.579 ± 0.00 ^{a,A}	0.590 ± 0.01 ^{a,BC}
	45	0.587 ± 0.00 ^{a,A}	0.593 ± 0.01 ^{a,AB}
	60	0.586 ± 0.01 ^{a,A}	0.604 ± 0.01 ^{a,A}
	75	0.579 ± 0.01 ^{b,A}	0.593 ± 0.00 ^{a,AB}
	90	0.582 ± 0.01 ^{a,A}	0.588 ± 0.01 ^{a,AB}
Moisture content (% w.b.)	0	19.50 ± 0.71 ^{a,CD}	19.50 ± 0.71 ^{a,BC}
	15	19.10 ± 0.85 ^{a,D}	18.56 ± 0.30 ^{a,C}
	30	19.70 ± 0.83 ^{a,D}	19.85 ± 0.47 ^{a,BC}
	45	20.91 ± 0.71 ^{a,BC}	20.91 ± 1.02 ^{a,B}
	60	23.26 ± 1.89 ^{a,A}	24.71 ± 1.81 ^{a,A}
	75	23.04 ± 0.41 ^{b,A}	24.60 ± 0.24 ^{a,A}
	90	22.35 ± 0.50 ^{b,AB}	24.27 ± 0.72 ^{a,A}
Shear force (N)	0	30.49 ± 1.15 ^{a,C}	30.49 ± 1.15 ^{a,C}
	15	34.73 ± 2.80 ^{a,A}	33.82 ± 1.37 ^{a,A}
	30	30.29 ± 1.84 ^{a,C}	33.35 ± 2.87 ^{a,AB}
	45	31.69 ± 1.28 ^{a,BC}	31.28 ± 1.43 ^{a,BC}
	60	33.54 ± 1.24 ^{a,AB}	32.25 ± 0.80 ^{a,ABC}
	75	32.81 ± 1.30 ^{a,ABC}	31.45 ± 0.41 ^{a,ABC}
	90	32.95 ± 1.64 ^{a,ABC}	32.45 ± 0.62 ^{a,ABC}

^{a-b} Mean values with different superscripts within a same row are significantly different among packaging (P<0.05).

^{A-C} Mean values with different superscripts within a same column are significantly different during storage (P<0.05).

Concerning saturation index (C^*), jerky packed in aerobic packaging with an oxygen absorber exhibited a slightly decreased in saturation index ($C^*=18$ at the beginning to $C^*=15$ at the end of storage), while those packed in vacuum packaging showed a largely decrease in saturation index during 90 days of storage ($C^*=18$ at the beginning to $C^*=10$ at the end of storage). It was referred to a higher vividness of product in aerobic packaging with an oxygen absorber than another one. Finally, value of hue angle in the present study was maximum as 135 at the beginning and minimum as 58 at the end of storage, which referred to product color shift from yellow to red [2]. Again, more deterioration in this value was found in jerky packed in vacuum packaging ($h^\circ = 135$ to $h^\circ = 58$) than in aerobic packaging with an oxygen absorber ($h^\circ = 135$ to $h^\circ = 87$). The results relating color confirmed that aerobic packaging with an oxygen absorber was a suitable packaging that providing color stability as compared to vacuum packaging. According to microbiological analysis, the results indicated that total aerobic bacteria, yeast and mold and *S. aureus* counts of spent hen raw meat were found as 2.79 ± 0.29 , 2.56 ± 0.03 and 2.77 ± 0.04 Log CFU/g, respectively. After jerky processing, total aerobic bacteria, yeast and mold and *S. aureus* counts of all jerky samples were reduced to undetectable levels and also were lower than the detection limit in all storage times.

IV. CONCLUSION

The deterioration profile of jerky during storage was quite stable a_w , slightly increased moisture content, toughen texture and lighten color together with decreased in redness, yellowness, saturation index and hue angle. The vacuum packaging was superior for packing the jerky in term of controlling the moisture of product, but it was largely affecting to color deterioration. The aerobic packaging with an oxygen absorber provided the advantage into the product by stabilizing color without detrimental impact on moisture changes.

ACKNOWLEDGEMENTS

This work was supported by a grant from the Thailand Research Fund under the project number RDG5620043. The authors would like to express their sincere thanks to Faculty of Agricultural Technology, KMITL for the financial support.

REFERENCES

1. Sorapukdee, S., Uesakulrungrueng, C. & Pilasombut, K. (2016). Effects of humectant and roasting on physicochemical and sensory properties of jerky made from spent hen meat. Korean Journal for Food Science of Animal Resources 36: 326-334.
2. Mcguire, R. G. (1992). Reporting of objective color measurements. Horticultural Science 27: 1254-1255.