EFFECT OF KOREAN DRY-CURED HAM QUALITY AND STORAGE CHARACTERISTICS OF DIFFERENT PACKAGING CONDITIONS DURING COLD STORAGE

Jin Yeon Jeong[1], Sun Jin Hur[2], In Chul Hur[1], and Sang Keun Jin[1*]

[1]Department of Animal Resources and Technology, Jinju National University, Chilam-dong 150, Jinju, Gyeongnam, Korea
[2]Institute of Agriculture & Life Science, Gyeongsang National University, Gajwa-dong 900, Jinju, Gyeongnam, Korea
[*]Corresponding author (phone: +82-55-751-3283; fax: +82-55-751-3689; e-mail: skjin@jinju.ac.kr)

Abstract—**The objective of the study was to determine the meat surface color, biochemical and microbiological quality in sliced dry-cured ham packaged under the different packaging conditions during chilled storage. The dry-cured hams obtained from pig Ham in this study. The samples were divided into three groups. The outside of Samples was removed with a knife and the ends of the each piece were cut off. Then each piece was sliced (1.5mm thick) with a slicing machine. The samples were stored in a refrigerator at 4℃. The packes were opened for subsequent analysis (meat color, pH, TBARS(full name), VBN and microbials) after 0, 2, 4, 8 and 12 weeks of cold storage. The vacuum packaging and Modifed atmosphere packging dosen't promote clear differences in physico-chemical of Krean dry-cured ham such as pH and salinity. On the other hand, The meat color of vacuum package and MAP seems to be more stabile than air containing packaging during cold storage. In summary, preservation of meat color stability was achived using vaccum packaging, modified atmosphere packaging treatement rater than air containing packaging.**

Key words—**Differnet packaging conditions, Korean dry-cured ham, meat color,**

I. INTRODUCTION

The meat products industry demands the use of preservation methods which increases the shelf life of manufactrued muscle foods ensuring muscle food safety. In this case, the meat processing industry has developed different packagind technologies trying to extend the shelf life. Among these technologies, vaccum packaging and modified atomsphere packaging prevent products from contamination and evaporative losses and alos extend storage life (Stiles, 1990). Microbial growth, discoloration and lipid oxidation important factors determing shelf life and consumer acceptance of packed dry-cured products (Parra et al. 2010). Because most of Korean meat consumers prefer pork belly to ham, unpopular meat is a great distress to the Korean meat industry. Therefor many researches have been studied about the development of new product, such as dry-cured ham using unpopular meats. The objective of the study was to determine the meat surface color, physicochemical and microbiological quality in sliced Korean dry-cured ham packed under different packaging methods during chilled storage.

II. MATERIALS AND METHODS

The dry-cured hams obtained from porcine Ham in this study. The samples were divided into three groups:(1) Air containing packaging, (2)Vacuum-packaging and (3)Modifed atmosphere packaging(MAP;N_2/CO_2=7:3). The outside of samples was removed with a knife and the ends of the each piece was cut off. Then each piece was slieced (1.5mm thick) with a slicing machine. The samples were stored in a refrigerator at 4℃. The packes were opend for subsequent analysis after 0, 2, 4, 8 and 12 weeks of cold storage. Meat color (CIE L*,a*,b*) was measured by using a Minolta Chromameter (Minolta CR 400; Tokyo, Japan). Seven random readings were made from the surface of samples. pH was measured after homogenization of the primal sample with 10 volumes of distilled water. Lipid oxidation was measured by TBARS value. TBARS was measured by the method of Buege and Aust (1978) with modification. Microbial analysis was measured by measured total areobic bacterial counts. After open the packages, 10g of meat were taken from samples, and diluted in 90ml of 1% peptone water. The samples were homogenized in a stomacher for 3 min. The total areobic bacterial counts on Plate Count Agar incubated for 24h at 37℃.

III. RESULTS AND DISCUSSION

The L*-value was higher in control than those of other package samples during 12 weeks of storage. However, The a*-value was lower in control than those of other package samples during cold storage. The lightness (L*)? of air containing packaging sample was significantly($p<0.05$) higher compared to other package samples during 12 weeks of storage. And radness (a*) of atmosphere package sample was signficantly($p<0.05$) lower compared to other package samples. The meat color of vacuum package and MAP seems to be more stabile than atmosphere packging during cold storage. The results of pH and salinity were shown to no consistent trends. A low pH has been reported to increase lipid oxidation in variety of meat products (Martínez et al., 2005) although this reserch was not observed to the relationship between pH and TBARS. In the present study, lipid oxidation values (TBARS) were lower in the vaccum package treatment compared to those of other package samples during 12 weeks of storage. However, VBN values were higher in the vacuum package treatment compared to those of other package sampels during storage. Total plate count (log cfu/g) was not significantly different among the package samples.

Table 1. Meat color evolution in dry-cured ham during the storage period for all the packaging condition(4℃).

Items	Treatments[1)]	Storage (Weeks)				
		0	2	4	8	12
L^*	C	44.55 ± 0.29^{Aab}	48.35 ± 5.19^{Aa}	39.88 ± 1.46^{Ab}	49.38 ± 4.85^{Aa}	45.84 ± 2.03^{Aab}
	T1	35.51 ± 1.30^{Bb}	37.29 ± 1.32^{Bb}	27.61 ± 2.44^{Bc}	41.22 ± 1.59^{Ba}	37.44 ± 1.44^{Bb}
	T2	32.13 ± 0.14^{Cc}	38.23 ± 0.65^{Ba}	36.10 ± 3.58^{Aab}	33.50 ± 0.89^{Cbc}	36.66 ± 2.41^{Bab}
a^*	C	13.00 ± 0.56^{Aa}	7.57 ± 1.84^{Bb}	8.04 ± 1.60^{b}	4.20 ± 1.72^{Bc}	4.28 ± 1.04^{Bc}
	T1	12.40 ± 1.15^{A}	11.84 ± 0.36^{A}	9.98 ± 1.70	11.05 ± 0.89^{A}	11.35 ± 0.94^{A}
	T2	7.31 ± 0.14^{Bb}	10.64 ± 0.64^{Aab}	12.61 ± 3.58^{a}	8.76 ± 0.95^{Ab}	9.34 ± 1.53^{Aab}
b^*	C	7.14 ± 0.54^{Aa}	6.25 ± 1.01^{a}	7.01 ± 1.07^{Aa}	3.23 ± 0.67^{Bb}	5.60 ± 1.49^{a}
	T1	6.42 ± 0.59^{Aa}	5.06 ± 0.31^{b}	4.72 ± 0.77^{bc}	4.59 ± 0.70^{ABbc}	3.56 ± 0.66^{c}
	T2	3.12 ± 0.10^{Bc}	5.11 ± 0.23^{ab}	6.10 ± 1.24^{a}	5.91 ± 1.08^{Aab}	4.59 ± 0.44^{b}

Values are the means ± SD.
[a,b,c] Means in the same row with different letters are not significantly different($p<0.05$).
[A,B,C] Meas in the same column with different letter are not significantly different ($p<0.05$).

Table 2. Effect of packaging on pH and salinity(%) on dry-curd ham stored at 4℃ during 12 weeks.

Items	Treatments[1)]	Storage (Weeks)				
		0	2	4	8	12
pH	C	5.22 ± 0.05^{b}	5.35 ± 0.01^{Aa}	5.06 ± 0.03^{Ac}	4.97 ± 0.01^{Cd}	5.25 ± 0.05^{Ab}
	T1	5.14 ± 0.03^{d}	5.25 ± 0.01^{Bb}	4.98 ± 0.01^{Be}	5.19 ± 0.01^{Ac}	5.30 ± 0.01^{Aa}
	T2	5.20 ± 0.01^{b}	5.24 ± 0.01^{Ba}	5.00 ± 0.03^{De}	5.10 ± 0.01^{Bd}	5.14 ± 0.01^{Bc}
Salinity (%)	C	6.67 ± 0.29^{Bb}	8.17 ± 0.29^{a}	6.83 ± 0.29^{Bb}	7.67 ± 0.29^{Ba}	7.00 ± 0.50^{abB}
	T1	6.67 ± 0.29^{Bb}	8.33 ± 0.29^{a}	7.00 ± 0.00^{Bb}	7.00 ± 0.00^{Cb}	6.67 ± 0.29^{Bb}
	T2	7.33 ± 0.29^{Ac}	9.00 ± 0.50^{a}	8.00 ± 0.50^{Abc}	8.67 ± 0.29^{Aab}	7.67 ± 0.29^{Ac}

Values are the means ± SD.
[a,b,c] Means in the same row with different letters are not significantly different($p<0.05$).
[A,B,C] Meas in the same column with different letter are not significantly different ($p<0.05$).

Table 3. Effect of packaging on TBARS, VBN and Microbiological counts (log cfu/g) on dry-curd ham stored at 4℃ during 12 weeks.

Items	Treatments[1)]	Storage (Weeks)

		0	2	4	8	12
TBARS	C	0.50 ± 0.03 ^{Bc}	0.84 ± 0.02^{Bc}	1.68 ± 0.14 ^{ABa}	1.32 ± 0.12^{Bb}	2.00 ± 0.49^{Aa}
	T1	0.87 ± 0.21^{A}	0.78 ± 0.02^{C}	0.78 ± 0.09^{C}	0.67 ± 0.07^{C}	0.88 ± 0.22^{B}
	T2	0.32 ± 0.02^{Bc}	1.08 ± 0.04^{Ab}	1.18 ± 0.11^{Bb}	1.69 ± 0.24^{Ab}	2.65 ± 0.76^{Aa}
VBN	C	50.96 ± 4.04^{Ab}	63.93 ± 1.32^{Aa}	50.31 ± 1.48 ^{Bb}	39.48 ± 3.79^{Bc}	51.15 ± 11.6^{b}
	T1	40.32 ± 1.69 ^{Bd}	62.91 ± 0.86 ^{Ab}	49.75 ± 1.28^{Bc}	51.24 ± 1.75^{Ac}	70.93 ± 7.71^{a}
	T2	35.75 ± 2.76^{Bb}	55.35 ± 1.13^{Ba}	54.04 ± 1.62^{Aa}	35.93 ± 2.72^{Bb}	55.53 ± 0.8^{a}
Total plate counts	C	0.00±0.00 ^{Bc}	0.60±0.21^{b}	0.80±0.14 ^{b}	1.25 ±0.15^{b}	4.50±0.14 ^{a}
	T1	0.15±0.21 ^{Bb}	0.25±0.29^{b}	0.35±0.49 ^{b}	0.86 ±0.21^{b}	4.72±0.02 ^{a}
	T2	0.93±0.11 ^{Ac}	1.19±0.21^{bc}	1.38±0.03 ^{b}	1.86 ±0.43^{b}	4.60±0.01 ^{a}

Values are the means ± SD.
^{a,b,c} Means in the same row with different letters are not significantly different($p<0.05$).
^{A,B,C} Meas in the same column with different letter are not significantly different ($p<0.05$).

IV. CONCLUSION

In summary, preservation of meat color stability was best achieved using vacuum packaging, modified atmosphere packaging treatment rater than atmosphere packaging. In the present study, vacuum packaing and MAP dosen't promote clear differences in physico-chemical of Korean dry-cured ham.

ACKNOWLEDGEMENT

This research was supported by Grant from the Korean Rural Development Administration(Agenda Program, 20090101-036-105-001-02-00). The authors acknowledge a graduate fellowship provided by the Rural Development Administration through the agenda system Projects, Korea.

REFERENCES

Buege, A. J., Aust, S. D. (1978). Microsomal lipid peroxidation.Method in enzymology. 51:302-310.

Martínea, L., Dgenane, D., Cill, I., Beltrán, J. A., & Roncalés, P. (2005). Effect of different concentrations of carbon dioxide and low concnetration of carbon monoxide on the shelf-life of fresh pork sausage packagted in modified atmospher. Meat Science, 94, 219-255.

Parra, V., Viguera, J., Sánchez, J., Peinado, J., Espárrage, F., Gutierrez, J. I., & Andrés, A. I. (2010). Modified atmosphere packaging and vacuum packaging for long period chilled storage of dry-cured Iverian ham. Meat Science. 84,760-768.

Stiles, M. E. (1990). Modified atmosphere packaging and processing preserves and enhances flavor, freshness, and shelf life of foods.Freshness and Shelf Life of Foods ACS Symposium Series, 836,157-291.