EFFECTS OF TUMBLING TIME AND TEMPERATURE ON THE QUALITY PROPERTIES OF ROASTED-TYPE CHICKEN JERKY

Park J.H., Choe J.H., Kim H.W., Hwang K. E., Yeo, E. J., and Kim C. J.*

Department of Food Science and Biotechnology of Animal Resources, Konkuk University, Seoul, Republic of Korea

Abstract - The objective of this study was to evaluate the quality characteristics of roasted-type chicken jerky according to tumbling and holding time, and temperature. Each sample was cured with using tumbling processing in different temperature (3°C and -3°C) for 0.5 h, 1 h, and 2 h. At each condition, cured meat was stuffed in the fibrous casing (80 mm diameter) then cooked and dried. In the case of sample with having 2 h tumbling, it was split into each treatment with another holding time (0, 6, and 24 h). As the tumbling time was increased, moisture, fat and ash content were significantly increased (P<0.05). However, protein content was decreased (P<0.05). For tumbled at same time, every yield had higher values at lower tumbling temperature. Samples tumbled at -3°C for 2 h has the highest juiciness and overall acceptability. Therefore, roasted-type chicken jerky tumbled at -3°C for 2 h has the best for quality characteristics.

Key Words – cooking method, restructured jerky, tumbling condition

I. INTRODUCTION

Jerky is one of the dried meat products with slicing and curing the raw meat. It has low calorie and weight, although it has an abundant protein. Especially, due to curing and drying process, it has a very low water activity and because of high salt content. For these reasons, jerky is well known to have a very high stability from microorganism [1]. As chicken contains all essential amino acids, it is well known to good species for providing protein source. On account of its lower saturated fatty acid and cholesterol compared to beef, it would be anticipated to satisfy a consumer's needs.

Generally, tumbling technique is useful method to reduce curing period and to dissolve the additives into meat. The temperature during tumbling process is mostly ranged from 0 to 4 ºC. If the tumbling process is used in -3 ºC, the solubility of meat protein, especially actin, is more outstanding than used in 0 to 4 ºC [2]. Consequentially, the yield and rehydration of final products are improved in the view point of manufacturing aspects.

The objective of this study was to investigate the effect of tumbling and temperature on the quality properties on roasted-type chicken jerky.

II. MATERIALS AND METHODS

1. Preparation of raw meat and curing solution

Chicken breast and leg were purchased from local market and skin of leg was removed before used as raw meat. The modified method of Han et al. [3] was utilized to prepare a curing solution.

2. Manufacture of roasted-type chicken jerky

The manufacturing process of roasted-type chicken jerky is shown in Fig. 1.

3. Analytical methods

3.1. Cooking yield

$$\text{Cooking yield (\%)} = \frac{\text{Weight of jerky after cooking (g)}}{\text{Weight of jerky before cooking (g)}} \times 100$$

3.2. Total (cooking and drying) yield

$$\text{Total yield (\%)} = \frac{\text{Weight of jerky after drying (g)}}{\text{Weight of jerky before cooking (g)}} \times 100$$

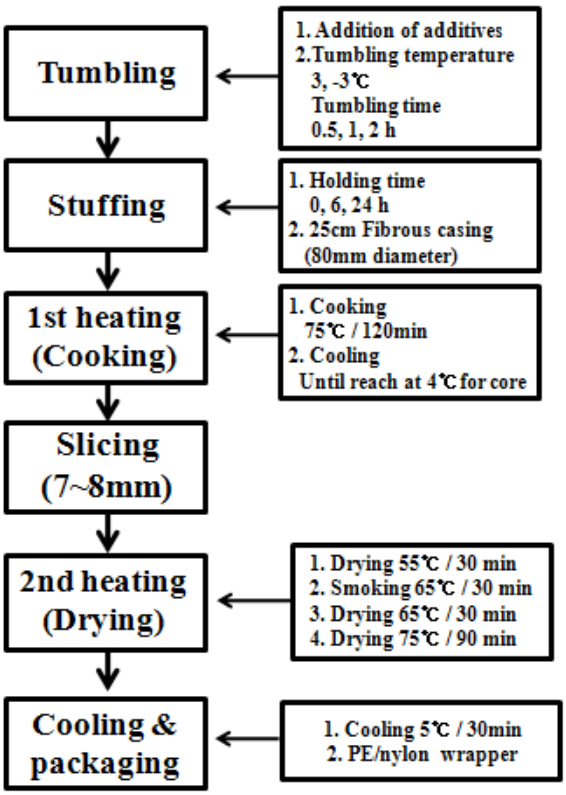

Fig. 1. The manufacturing process of roasted-type chicken jerky.

3.3. Proximate composition

Compositional properties of the roasted-type chicken jerky were measured using AOAC (2000) [4]. Moisture content was determined by weight loss after 12 h of drying at 105°C in a drying oven (SW-90D, Sang Woo Scientific Co., Bucheon, South Korea). Protein content was determined by Kjeldahl method with an automatic Kjeldahl nitrogen analyzer (Kjeltec® 2300 Analyzer Unit, Foss Tecator AB, Höganas, Sweden).

3.4. Water activity

Samples for water activity were minced into pieces approximately 1 mm × 1 mm × 1 mm in size. The water activity of each sample was determined in triplicate with a hygrometer (BT-RS1, Rotronic ag., Switzerland).

3.5. Sensory evaluations

Each jerky sample was subjected to sensory evaluations. The samples were served to 12 panel members with previous experience. Panelists were presented with randomly coded samples. The color (1 = extremely undesirable, 10 = extremely desirable), flavor (1 = extremely undesirable, 10 = extremely desirable), tenderness (1 = extremely tough, 10 = extremely tender), juiciness (1 = extremely dry, 10 = extremely juicy), and overall acceptability (1 = extremely undesirable, 10 = extremely desirable) of the samples were evaluated using a 10-point horizontal scale. Panelists were required to cleanse their palate between samples with water.

4. Statistical analysis

Analysis of variance was performed on all the variables measured using the General Linear Model (GLM) procedure of the SAS statistical package (SAS Institute, Inc., 2010) [5]. Duncan's multiple range test (P<0.05) was used to determine the differences between treatment means.

III. RESULTS AND DICSUSSION

As a tumbling time was increased, water content was significantly increased (P<0.05) in both treatment of 3 and -3 °C. In case of protein content, On the other hand, as a tumbling time was increased, protein content was significantly decreased (P<0.05) in both treatment of 3 and -3 °C. In the water activity, contrary to case of water content, as a tumbling time was increased, water activity was significantly decreased (P<0.05) in both treatment of 3 and -3 °C. Fig. 2 show an effect of tumbling condition which contains time and temperature and holding time on cooking and total yields. Cooking yields of the both treatment of 3 and -3 °C were significantly increased as a tumbling time was increased, though, decreased as a holding time was increased. Always treatment of -3 °C was significantly higher than it of 3 °C in the cooking yields. The treatment of -3 °C for 2 h was highest value in the total yields. At sensory evaluations, the treatment tumbled with -3℃ for 2h and no holding time was highest value in overall acceptability.

IV. CONCLUSION

It is more excellent quality characteristic when tumbled at -3 ℃ than 3℃, as tumbling time was increased and holding time was decreased.

ACKNOWLEDGMENTS

This study was supported by the Ministry of Agriculture and Forestry (608001-05-4-SB310), Republic of Korea. The authors also partially supported by the Brain Korean 21 (BK 21) Project from Ministry of Education and Human Resources Development.

REFERENCES

1. Shimolomaki, M., Franco, B. D. G. M., Biscontini, T. M., Pinto, M. F., Terra, N. M., and Zorn, T. M. T. (1998) charqui meats are hurdle technology meat products. *Food Rev. Int.* **14**, 339-349.
2. Feiner, G. (2006). Meat products handbook. New York: CRC Press, Inc. (Chapter 8).
3. Han, D. J., Jeong, J. Y., Choi, J. H., Choi, Y. S., Kim, H. Y., Lee, M. A., Lee, E. S., Paik, H. D., and Kim, C. J. (2007) Effects of drying conditions on quality properties of pork jerky. *Korean J. Food Sci. Ani. Resour*. **27**, 29-34.
4. AOAC. (2000). Official methods of analysis of AOAC. Vol. 41. (17th Ed.). Washington DC: Association of Official Analytical Chemists.
5. SAS. (2010) SAS/STAT Software for PC. Release 9.2, SAS Institute Inc., Cary, NC, USA.

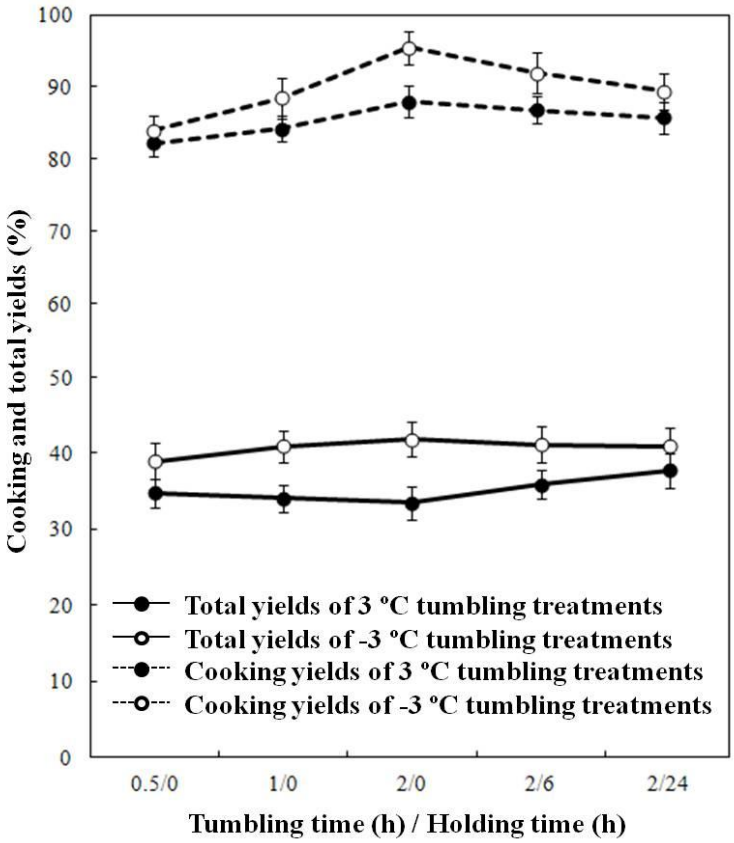

Fig. 2. Effect of tumbling condition and holding time on cooking and total yields of roast-type chicken jerky

Table 1
Effect of tumbling condition and holding time on water content, protein content and water activity of roast-type chicken jerky

Traits		Tumbling time (h) / Holding time (h)				
		0.5 / 0	1 / 0	2 / 0	2 / 6	2 / 24
Water content (%)	3°C	28.76±0.08$^{1)Bb}$	29.75±0.23^{AB}	30.88±0.34^{Ab}	30.33±1.33^{A}	30.02±1.43^{AB}
	-3°C	29.10±0.07^{Da}	29.94±0.08^{C}	31.44±0.24^{Aa}	30.62±0.39^{B}	30.19±0.39^{C}
Protein content (%)	3°C	51.70±0.65^{A}	47.52±0.26^{Cb}	44.20±0.08^{Eb}	46.11±0.20^{Db}	48.26±0.47^{B}
	-3°C	52.11±0.19^{A}	49.76±0.43^{Ba}	47.44±0.18^{Ea}	48.33±0.17^{Da}	48.72±0.40^{C}
Aw	3°C	0.82±0.00^{Ca}	0.83±0.00^{Ba}	0.82±0.00^{Da}	0.82±0.00^{Da}	0.84±0.00^{Aa}
	-3°C	0.82±0.00^{Bb}	0.82±0.00^{Bb}	0.80±0.00^{Db}	0.81±0.00^{Cb}	0.83±0.00^{Ab}

1)All values are mean ± standard deviation of three replicates.
A-D Means within rows with different superscript letters are significantly different (P<0.05).
a, b Means within columns with different superscript letters are significantly different (P<0.05).

Table 2
Effect of tumbling condition and holding time on sensory evaluations of roast-type chicken jerky

Traits		Tumbling time (h) / Holding time (h)				
		0.5 / 0	1 / 0	2 / 0	2 / 6	2 / 24
Color	3°C	8.44±0.73	8.56±0.53	8.56±0.53	8.67±0.50	8.67±0.50
	-3°C	8.56±0.53	8.67±0.50	8.56±0.53	8.44±0.73	8.22±1.09
Flavor	3°C	7.56±1.81	7.67±1.87	7.89±1.27	7.67±1.41	7.56±1.33
	-3°C	7.44±1.24	7.56±1.01	8.11±1.17	7.78±1.30	7.67±1.41
Tenderness	3°C	6.11±2.47	6.11±2.32	7.11±1.54	6.11±2.62	6.33±1.00
	-3°C	6.22±1.39	6.22±1.09	7.22±1.30	6.56±1.42	6.78±1.39
Juiciness	3°C	6.56±1.94	6.44±2.24	7.11±1.54	6.44±2.01	6.00±0.87
	-3°C	6.67±1.12^{AB}	6.56±1.01^{AB}	7.22±0.67^{A}	6.56±1.01^{AB}	6.11±1.05^{B}
Overall acceptability	3°C	7.33±0.71	7.33±1.12	7.78±0.44^{b}	7.78±1.09	7.44±0.88
	-3°C	7.33±0.50^{B}	7.44±0.73^{B}	8.22±0.36^{Aa}	7.39±0.93^{B}	7.22±0.97^{B}

1)All values are mean ± standard deviation of three replicates.
A, B Means within rows with different superscript letters are significantly different (P<0.05).
a, b Means within columns with different superscript letters are significantly different (P<0.05).