COMPARISON OF BEEF QUALITY TRAITS IN JEJU BLACK CATTLE, HANWOO AND AUSTRALIAN WAGYU

ChungNam Kim, KyoungBo Ko, MyoungSu Kang and YounChul Ryu*

Division of Biotechnology, SARI, Jeju National University, Jeju, Republic of Korea

*Corresponding author email: ycryu@jejunu.ac.kr

I. INTRODUCTION

Hanwoo (*Bos Taurus coreanae*) raised in South Korea includes three types of Korean native Hanwoo such as yellowish brown Hanwoo, black tiger-striped Chikso (Korean brindle cattle), and Heugu (Jeju black cattle) [1]. Jeju black cattle is smaller than Hanwoo and tinged with overall black. It is also known that Jeju black cattle is good enough to be presented to the royal family [2]. Although Jeju black cattle has a small population because it has been hybridized due to breed improvement projects to improve meat quality, studies have been conducted for mass breeding of Jeju black cattle in Jeju Island. Therefore, this study was performed to collect baseline data for mass breeding projects of Jeju black cattle by comparing quality of Jeju black cattle.

II. MATERIALS AND METHODS

1) Color: The meat color and fat color were repeatedly measured three times using a Minolta chromameter (Model CR-300, Minolta Camera co. Osaka., Japan) after cutting sirloin into pieces of 2.5 ㎝ square and then exposing them to the air for 30 minutes on the 14th day at the completion of beef aging (L*; Lightness, a*; Redness, b*; Yellowness).
2) Cooking loss: After cutting sirloin into pieces of 2 x 4 x 6 ㎝ measuring the weight, and then putting them into a polyethylene bag, the sample was heated until its core temperature reached 73℃. The weight was the sample was measured again and calculated in percentage.
3) Shear force: After collecting the sirloin (approximately 2.5 ㎝-thick) heated to 73℃ of the core temperature using a 13 mm cork borer(No.6, Sigma-aldrich, U.S.A), the sample was repeatedly measured six times using a texture analyzer(CT3, U.S.A, Trigger value; 22.0 ㎜, Trigger load; 0.0005 ㎏, probe; 3 ㎜).
4) Texture profile analysis (TPA): After cutting the sirloin (approximately 3.0 ㎝-thick) heated to 73℃ of the core temperature into pieces of a certain size (2.5 x 2.5 x 2.5 ㎝), the specimen was repeatedly measured three times using a texture analyzer.

III. RESULTS AND DISCUSSION

Hanwoo and Jeju black cattle showed lower meat lightness (L*) than Australian Wagyu. In addition, their fat lightness (L*) was 44.63, 55.73, and 66.70, respectively. Taking a comprehensive view of the meat lightness (L*) and fat lightness (L*) of Jeju black cattle, Hanwoo, and Australian Wagyu, meat color of Jeju black cattle and Hanwoo appeared darker than Australian Wagyu because their lightness values were lower than that of Australian Wagyu. There was no significant difference between breeds in cooking loss.
Table 2 shows the measurement results of the shear force and texture profile analysis (TPA) by breed of Jeju black cattle, Hanwoo, and Australian Wagyu. Shear forces automatically evaluate the tenderness of meat, and the lowest shear force was measured in Australian Wagyu. There was no difference in shear force between Hanwoo and Jeju black cattle. There was no significant difference in the measurement results of TPA to evaluate hardness and gummies of meat between breeds. In the measurement results of springiness, Australian Wagyu showed high springiness.

Table 1 Comparison of color and cooking loss according to breed

	Hanwoo (N=17)	Jeju Black Cattle (N=12)	Wagyu (N=4)	Significance

Meat L*	35.14[a] (1.87)[1)]	32.54[a] (2.46)	41.25[b] (3.86)	**
Meat a*	20.18 (2.25)	22.13 (1.62)	22.92 (0.75)	NS
Meat b*	7.61[a] (1.82)	8.54[a] (1.56)	11.38[b] (1.66)	*
Fat L*	55.73[b] (5.41)	44.63[a] (4.00)	66.70[c] (1.16)	**
Fat a*	13.05 (4.28)	14.04 (4.50)	12.27 (2.50)	NS
Fat b*	10.71 (1.86)	9.56 (1.90)	10.57 (1.91)	NS
Cooking loss (%)	21.44 (3.37)	20.90 (3.50)	20.14 (2.06)	NS

[a-b]means with different superscripts in the same row differ significantly.
Level of significance: NS=not significant, *$P < 0.05$, **$P < 0.01$.
[1)]Means±standard deviation.

Table 2 Comparison of tenderness and texture profiles according to breed

	Hanwoo (N=17)	Jeju Black Cattle (N=12)	Wagyu (N=4)	Significance
Shear force (kg)	3.32[a] (0.68)[1)]	3.51[a] (0.31)	1.69[b] (0.213.86)	**
Hardness (kg)	2.93 (0.43)	2.61 (0.67)	2.61 (0.46)	NS
Adhesiveness (mJ)	6.30 (3.29)	5.65 (2.36)	4.26 (2.01)	NS
Resilience	0.08 (0.01)	0.09 (0.02)	0.09 (0.02)	NS
Cohesiveness	0.40 (0.05)	0.39 (0.01)	0.38 (0.04)	NS
Springiness (mm)	10.52[ab] (1.93)	9.28[b] (2.60)	13.37[a] (1.99)	*
Gumminess (kg)	1.21 (0.21)	1.04 (0.18)	1.01 (0.23)	NS
Chewiness (mJ)	126.2 (34.2)	91.8 (34.6)	124.7 (28.1)	NS

Level of significance: NS=not significant.
[1)]Means±standard deviation.

IV. CONCLUSION

Compared to other breeds, meat of Jeju black cattle was darker and had higher shear force. There was no significant difference in the measurement results of TPA between breeds. It is considered that the results of this study will be used as basic data for mass breeding projects for Jeju black cattle (Heugu) and high quality production of Jeju black beef.

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REFERENCES

1. Lee, S. S., Yang, Y.H., Cho. I.C., Kim, N.Y., Ko, M.S., Jung. H.Y., & Han, S.H (2009). Relation of expression level of melanin synthesis genes according to the MC1R genotypes with the coat color patterns in Hanwoo, Jeju black cattle and Holstein. Korea Journal of life Science 19:384-389.
2. Moon, Y.H & Jung, I.C. (2012). Physicochemical characteristics of Korean black cattle-fed Mugwort. *Korea* Journal of life Science 22:587-594.