

CHARACTERIZATION OF CARCASS TRAITS IN ELK DEER

SangWoo Kim^{1*}, SunHo Choi¹, BeomYoung Park², ChangYeon Cho¹, Poongyeon Lee¹, YeoungGyu Ko¹, YongHee Yoo¹, Byung Chan Sang³, and Sang Ho Moon⁴

¹Animal Genetic Resources Station, National Institute of Animal Science, RDA, Namwon, South Korea

²Animal Products Research and Development Division, National Institute of Animal Science, RDA, Suwon, South Korea

³Department of Animal Biosystem Science, Chungnam National University, Daejeon, South Korea

⁴Department of Animal Science, Konkuk University, Chungju, South Korea

*Corresponding author (Phone: +82-63-620-3531; Fax : +82-63-620-3590; e-mail: deerking@korea.kr)

Abstract— This study was conducted to investigate the carcass traits of Elk Deer in Korea. Male Elk deer were slaughtered in February before casting and females in November at weaning season after giving birth. Slaughter weights were 224.8kg and 262.5kg, carcass percents were 59.7% and 54.5%, and meat percents were 47.9% and 39.9% for cow and bull, respectively. Head, legs and skin percentages were 3.7%, 2.3% and 6.6% for cow, and 4.9 %, 2.6% and 7.5% for bull, respectively. Meat cuts production for Elk deer was highest in hindleg followed by ribs, foreleg, and loin in order. Male and female showed different meat cut production pattern. Each sex showed similar mineral and amino acids contents. In chemical composition of carcass, protein, fat and ash were 22.4%, 0.3% and 1.0% for male deer. Fat percentages were 16.5% for female and 1.8% for male. Shear forces were 10.0 kg/cm² and 8.3kg/cm², respectively. Saturated fatty acids contents and unsaturated fatty acids contents in male Elk deer carcass were 43.70% and 56.30% for 2 year-olds; 41.10±3.95% and 58.90±3.95% for adults, showing higher unsaturated fatty acids level.

Index Terms - Elk deer, Carcass, Mmeat percentage, Venison

I. INTRODUCTION

Three types of deers, a gross total of more than eighty thousand heads in six thousand farms as of year 2008, are currently raised in Korean farms: sika deer (*Cervus nippon*), red deer (*Cervus elaphus*), and elk deer (*Cervus canadensis*). Unlike other deer consuming countries where venison is widely consumed, deer breeding in Korea mostly focus on the velvet antler production. Thus, to balance the supply and demand as well as to insure development of domestic deer industry, finding ways to utilize venison is critical. Utilization of venison is widely studied in countries such as New Zealand and Canada. Carcass traits for fallow deer (*Dama dama*), and red deer have been studied (Drew, Fennessy & Greer, 1977). Carcass traits of Elk deer at the Animal Genetic Resources Station, National Institute of Animal Science, Korea was investigated to provide characteristics of meat production and carcass for domestically raised deer. Carcass yield, carcass composition, meat cuts production, physical characteristics, chemical characteristics and mineral composition were analyzed in this study.

II. MATERIALS AND METHODS

Five female and five male Elk deer were used in this study. Male deer were slaughtered in February before casting, while female deer were slaughtered in November after parturition and weaning. After skinning, carcass were cut with six primal cuts and stored at cooler for 24 hours. After deboning, yield and meat cuts production were measured. Since there is no set standard for Trade lean meat weight of venison, meats were trimmed after beef primal cut protocol and weighed. Carcass percent (dressing percent), meat cut production, and by-products (bone, fat) production were calculated. The contents of moisture, crude protein, crude fat, and crude ash were analyzed by AOAC(1990) with *longissimus* muscles, and water holding capacity was measured by Laakkonen, Wellington, & Skerbon (1970). WB-shear force was measured on cooked steaks (2.54 cm thick) in a pre-heated water bath for 60 min until the core temperature reached 70 °C and then cooled in running water (ca. 18°C) for 30 min to reach a core temperature below 30°C. Eight cores of 1.27-cm diameter were made for each sample, and peak force was determined using a V-shaped shear blade with a cross-head speed of 400 mm/min (Wheeler, Shackelford & Koohmaraie, 2000). Cooking loss was calculated as percent of weight changes during cooking for WB-shear force measurement. Objective meat color was determined by a Minolta Chromameter (CR300, Minolta, Japan) on freshly cut surface after a 30-min blooming at 1°C.

Table 1. Experimental design

Items	Time of Slaughter	Number of Heads			
		Female		Male	
		2 years	Adult	2 years	Adult
T1	February	-	-	1	4
T2	November	1	4	-	-

III. RESULTS AND DISCUSSION

A. Carcass characteristics

Slaughter weights of Elk deer were 175.5kg, 224.8kg for 2 years-old and adult female and 212kg, 262.5kg for 2 years-old and adult male, respectively. Carcass percent for male Elk deer were 57.6, 59.7% for 2 years-old and adult female and 55.2, 54.5% for 2 years-old and adult male, respectively. Carcass percent as well as meat percent for female deer were higher than those for male. These carcass percent data were lower than that of sika deer (63.9% for female and 58.3% for male) (Kim, Choi, Sang, Seo & Moon, 2006) and were similar to that of red deer (58.4% for female and 56.3% for male) (unpublished data). Fat content for female deer were notably higher than that of male deer probably due to the fact that male deer are slaughtered in February when winter weight loss is occurred. Head, legs and skin percentages were 3.7%, 2.3% and 6.6% for female, and 4.9 %, 2.6% and 7.5% for male, respectively (data not shown).

Table 2. Carcass characteristics of Elk deer

Items	Elk			
	Female		Male	
	2 years	Adult	2 years	Adult
Slaughter weight (kg)	175.5	224.8±3.0	212.0	262.5±23.8
Carcass weight (kg)	101.1	134.2±7.5	108.6	143.6±21.9
Dressing percentage (%)	57.6	59.7±2.7	51.2	54.5±3.5
Lean meat weight (kg)	84.1	113.7±6.6	88.8	118.8±19.6
Meat percentage (%)	47.9	50.6±2.3	39.9	44.1±3.2
Raw skin percentage (%)	7.1	6.6±0.8	7.5	7.5±0.5
Leg percentage (%)	2.6	2.3±0.1	2.8	2.6±0.2
Head percentage (%)	3.9	3.7±0.3	4.2	4.9±0.3
Fat percentage (%)	6.8	9.9±2.44	3.8	1.8±0.8
Bone percentage (%)	16.5	15.1±0.8	18.2	17.4±1.1

B. Meat cut production

Hind-leg (23.6, 24.5% of carcass weight of female, male Elk deer) showed highest meat cut production for each part of Elk deer. Next highest meat cut production was ribs, foreleg, and loin in that order. Male and female showed different meat cut production pattern.

Table 3. Portion cuts production for each part of Elk deer carcass

Item	Female				Male			
	2 Years		Adult		2 Years		Adult	
	weight(kg)	Ratio(%)	weight(kg)	Ratio(%)	weight(kg)	Ratio(%)	weight(kg)	Ratio(%)
Slaughter weight(kg)	175.5	-	224.8±3.0	-	212.0	-	262.5±23.8	-
Carcass weight(kg)	101.1	100	134.2±7.5	100	108.6	100	143.6±21.9	100
Tenderloin	2.02	2	2.67±0.1	2.0	2.27	2.09	2.97±0.4	2.07
Attacher	-		0.21±0.17	0.2	0.15	0.14	0.27±0.1	0.19
Loin	10.72	10.6	13.56±1.46	10.1	8.69	8.00	13.11±2.2	9.13
Hind-leg	24.99	24.7	31.67±1.62	23.6	31.04	28.58	35.21±4.6	24.52
Fore-leg	9.22	9.1	12.08±0.45	9.0	9.53	8.78	14.21±2.7	9.90
Fore-shank	3.42	3.4	3.98±0.24	3.0	3.67	3.38	4.49±0.6	3.13
Hind-shank	4.50	4.5	5.49±0.29	4.1	4.93	4.54	5.66±0.8	3.94
Brisket	3.87	3.8	4.87±0.17	3.6	2.33	2.15	2.60±0.3	1.81
Whole ribs	14.98	14.8	20.83±1.65	15.5	6.84	6.30	10.89±1.8	7.58
Fat	16.7	16.5	20.2±1.5	15.1	11.40	10.50	15.22±2.4	10.60
Bone	6.8	6.7	13.4±3.7	10.0	4.13	3.80	2.60±1.4	1.81

C. Physical characteristics

Physical characteristics of Elk deer meat is shown in Table 3. Compared to 30 months old Bull (Korean beef cattle), Elk deer meat showed higher shear force value, lower cooking loss, and similar water holding capacity (Cho et al., 2006). Meat color of venison had more redness (CIE a value) when compared to beef. Young deer had lower shear force value. Slaughter stress should be reduced since slaughter stress generally affects physical characteristics of meat.

Table 4. Physical characteristics and Meat color CIE (L*, a*,b*) value in Elk deer

Item	Female		Male	
	2 Years	Adult	2 Years	Adult
Physical characteristic s				
Cooking loss (%)	31.68	32.1±0.9	31.68	29.0±2.1
Shear force (kg/cm ²)	8.78	10.0±2.3	8.78	8.3±2.4
Water holding capacity (%)	57.73	57.4±1.9	57.73	53.6±1.3
Meat color CIE				
L * (lightness)	34.2	32.5±0.9	34.2	32.0±0.2
a* (redness)	18.0	17.9±0.8	18.0	15.7±1.0
b*(yellowness)	6.8	6.7±0.6	6.8	5.6±0.8

D. Chemical composition

Fat content of male Elk loin was quite low (0.3%) and crude protein content of male Elk loin (22%) was similar to that of sika deer and red deer. Crude protein content of venison was higher than beef while crude fat content was markedly lower. Chemical composition and mineral composition of male Elk deer are shown in table 5 and table 6.

Table 5. Chemical composition of loin from Male Elk deer male Elk deer (Unit : %)

Item	Male Elk deer	
	2 Years	Adult
Moisture	75.9	75.5±0.5
Protein	22.8	22.4±0.2
Fat	0.3	0.3±0.2
Ash	1.0	1.0±0.0

Table 6. Mineral composition of loin from male Elk deer male Elk deer (Unit : ppm)

Composition	Ca	P	K	Na	Mg	Fe	Mn	Zn	Cu
2 Years	44.0	1668.6	2809.3	332.7	219.7	14.8	0.0	16.8	0.6
Adult	39.4	1486.3	2686.1	296.1	199.2	23.3	0.0	23.0	0.7

E. Fatty acid contents

Saturated fatty acids contents and unsaturated fatty acids contents in male Elk deer carcass were 43.70% and 56.30% for 2 year-olds; 41.10±3.95% and 58.90±3.95% for adults, showing higher unsaturated fatty acids level.

Table 7. Fatty acid compositions of loin from male elk (Unit : %)

Item	Male	
	2 Years	Aadult
C14:0	6.91	4.36±1.00
C16:0	23.84	24.14±4.92
C16:1n7	2.47	7.67±3.64
C18:0	12.95	12.59±2.30
C18:1n9	23.19	22.25±3.17
C18:1n7	0.00	0.00±0.00
C18:2n6	14.27	14.87±4.52
C18:3n6	0.00	0.07±0.05
C18:3n3	0.51	0.48±0.14
C20:1n9	0.00	0.16±0.11
C20:2n6	0.22	0.22±0.18
C20:3n6	0.94	0.93±0.36
C20:4n6	12.73	10.15±4.27
C20:5n3	0.31	0.30±0.09
C22:4n6	0.47	0.66±0.31
C22:5n3	1.17	1.09±0.42
C22:6n3	0.00	0.04±0.08
SFA ¹⁾	43.70	41.10±3.95
USFA ²⁾	56.30	58.90±3.95
Mono	25.66	30.08±6.47
Poly	30.64	28.82±10.14
n3	1.99	1.92±0.66
n6	28.64	26.90±9.51
n6/n3	14.36	14.05±1.32
MUFA ³⁾ /SFA	0.59	0.73±0.10
PUFA ⁴⁾ /SFA	0.70	0.785

1) SFA : Saturated fatty acid,

2) USFA : Unsaturated fatty acid

3) MUFA : Monounsaturated fatty acid,

4) PUFA : Polyunsaturated fatty acid

IV. CONCLUSION

The carcass percent and fresh meat percent of Elk deer were: higher in female than male; higher in 2 year-olds than adults for both sex. The fat content of male Elk deer was markedly lower than that of female. For meat cut production, hindleg had highest portion. For physical characteristics, meat from female deer showed better quality than that of male.

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