PE1.31 Prediction Equation of Retail Cuts in Hanwoo (Korean Native Cattle) 229.00

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Abstract— **Data from 42,113 Hanwoo carcasses were used to estimate the traits of yield grade factor and an additional 1066 carcasses were used to develop the equation. The average of fasting weight of cow, bull and steer were 529 kg, 596 kg, and 634 kg respectively. Carcass weight (CW), back fat thickness (BFT), and loin eye area (REA), were significantly (P<0.01) affected by sex and live weight. The trimmed fat weight of carcass were significantly differ (P<0.01) among sex group at the same groups of live weight but retail meat percentages were not affected by live weight group. The equation of predicting the retail meat product from this study could be expressed as a multiple regression (PRM) = - 4.18 + 0.63xCW (kg) - 1.74xBFT (cm) + 0.16xREA (cm^2), R^2=0.93.**

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I.INTRODUCTION

Retail product yield from the four primal cuts is an economically important trait for the beef industry [1]. Donald and Merkel [2] reported that the ultimate objective of beef industry includes the prediction of economic value of carcass with a standardized method. Shackelford et al [3], the best practice to estimate yield is to break down the whole carcass, but the development of an estimation equation using carcass traits is the more practical approach. It is more cost effective and practical. Douglas et al. [4] agreed that carcass measurement of various breeds is necessary to improve fitness of estimates for predicting yield of various breeds, sex and carcass traits. In particular, prediction functions estimated by data obtained from deboning, prime cutting and fat trimming could reduce variation of fitness. The objective of this experiment was to determine the prediction equation of retail production weight using carcass measurements in Hanwoo cattle.

II.MATERIALS AND METHODS

Live and carcass weights were recorded in 500g unit and trimmed retail cut was measured in 10g unit. Cold carcass weight determined after an 18-hour chilling at 1°C. Rib-eye area, on the other hand, was determined on the cut surface between the 13th rib and the first lumborume by using polar planimeter. Back fat thickness was determined on the cut surface between the 13th rib and 1/3rd position from the spinal column. ANOVA, regression, Duncan-test, and correlation coefficients were determined by using SAS package [5].

III.RESULTS AND DISCUSSION

Factors used for estimating yield equation are presented in table 1 and table 2 for sex. There were difference (P<0.01) between sex group in fasting weight, cold carcass weight. The diversity in back fat thickness between sex groups was likely attributed to difference in the rate and distribution of fat accumulation. Bulls had a significantly (P<0.05) higher retail meat, while that for cows and steers was similar. Reiling et al.[6] observed that the relatively low percentage of retail yield in cows could be attributed to higher fat percentage developed in internal organs during conception compared with that of steers. This result was likely related not only to breed specificity of Hanwoo. At constant market weight carcass from steer had higher (P<0.01) percentage of wholesale meat than carcass from female (Table 2). Table 4 showed that b-values for carcass weight, back fat thickness and rib-eye area were 0.616, -0.953, and 0.318 with probability levels of 0.001 respectively. These values indicate that back fat thickness was the prime determinant of yield. Similarly, Johnson et al.[7] reported that inclusion of back fat thickness in the prediction equation for yield considerably improved fitness compared with that estimated by using hot carcass weight and rib-eye area. As shown in Table 5, for the prediction of lean weight, the three sexes of predictors which have similar R^2 values (0.97, 0.92, and 0.94 respectively).The large

difference in fitness between sexes may be related to the difference in fat.

IV.CONCLUSION

The equation of retail cuts of Korean native cattle from this study could be expressed as a multiple regression y=-4.18 +0.63 CW(㎏) – 0.17 BFT(㎝) + 0.16 RA(㎠), R^2 = 0.93. Among sex group, the R^2 value of equation of cow is highest. Prediction of retail product using carcass yield grade factors should allow for rapid, precise and cost-effective assessment of variation in saleable meat product.

Table 1. Description of sample population and means for carcass yield grade traits in Hanwoo

Trait	Cow	Bull	Steer	Pooled SE	P-Value[1)]
Number of cattle	3,128	4,447	34,538	-	-
Fasting weight (□)	529.3[c]	596.0[b]	634.4[a]	0.37	0.0001
Cold carcass weight (□)	303.9[c]	352.0[b]	380.4[a]	0.25	0.0001
Back fat thickness (□)	12.8[a]	6.1[c]	11.9[b]	0.03	0.0001
Longissimus muscle area (□)	71.9[c]	82.7[a]	80.8[b]	0.05	0.0001
Percentage of retail cuts[2)]	65.5[b]	69.9[a]	65.3[c]	0.02	0.0001
Weight of retail cuts (kg)[3)]	200.5[c]	266.5[a]	246.8[b]	1.40	0.0001

[1)] Value is shown for each row [2)] Percentage estimated from yield grade equation. [3)] Weight of closely trimmed retail cuts.
[a,b,c] Means with same superscript in a row are not different statistically (P<0.05).

Table 2. Carcass yield traits by sex and market (n=42, 113)

Trait	Sex	Market weight (kg)								Pooled SE	P>F
		450≤	500≤	550≤	600≤	650≤	700≤	750≤	750>		
Fasting weight (kg)	Female	404.7[a]	482.2[b]	529.5[b]	578.5[b]	625.6[b]	676.5[a]	722.3[a]	786.0[a]	1.46	0.0001
	Male	396.4[b]	484.9[a]	530.9[b]	579.2[b]	626.5[b]	675.5[a]	725.5[a]	798.4[a]	1.22	0.0001
	Steer	406.9[a]	486.6[a]	534.3[a]	582.8[a]	629.6[a]	677.1[a]	724.9[a]	785.1[a]	0.36	0.0001
Cold carcass weight (kg)	Female	224.5[b]	272.5[c]	304.4[c]	335.1[c]	336.1[c]	399.4[b]	428.5[b]	472.9[a]	0.97	0.0001
	Male	224.7[b]	282.6[b]	312.2[b]	341.6[b]	370.9[b]	401.2[b]	432.3[b]	479.7[a]	0.79	0.0001
	Steer	231..3[a]	284.9[a]	316.9[a]	347.7[a]	377.8[a]	407.5[a]	437.5[a]	475.8[a]	0.24	0.0001
Back fat thickness(mm)	Female	8.8[a]	11.3[a]	12.5[a]	14.3[a]	15.9[a]	18.0[a]	19.7[a]	21.8[a]	0.11	0.0001
	Male	4.9[c]	5.1[a]	5.6[c]	5.8[c]	6.6[c]	7.0	7.5[c]	8.9[c]	0.05	0.0001
	Steer	6.9[b]	8.2[b]	9.7b[a]	10.6[b]	11.9[b]	13.1[b]	14.1[b]	14.9[b]	0.03	0.0001
Longissimus muscle area (cm^2)	Female	55.7[a]	67.7[c]	73.3[c]	77.7[b]	82.6[b]	85.5[b]	84.9[b]	91.4[b]	0.23	0.0001
	Male	55.8[a]	72.9[a]	77.9[a]	82.07[a]	85.5[a]	89.3[a]	92.9[a]	98.8[a]	0.17	0.0001
	Steer	58.0[a]	69.2[b]	74.1[b]	77.6[b]	80.9[c]	83.6	86.5[b]	89.7[b]	0.05	0.0001
Retailcuts[b] (kg)[1)]	Female	159.4[c]	189.4[c]	208.5[c]	226.1[c]	259.4[b]	274.5	283.2[c]	-	3.43	0.0001
	Male	188.2[a]	208.7[a]	231.8[a]	251.8[a]	267.1[a]	292.6[a]	310.0[a]	349.2[a]	2.28	0.0001
	Steer	175.2[b]	194.2[b]	215.8[b]	234.9[b]	255.5[b]	282.1[b]	293.7[b]	335.6[b]	1.70	0.0001

[1)] The number of cattle = 1066(cow=134, bull=338, steer=594); [a,b,c] With each trait, means with same superscript in a column are not different statistically (P<0.05).

Table 3. Least square means and standed error(SE) for car carcass component measures in a sex group (n=1066)

Items	Sex			Mean	SE
	female	male	steer		
Number of cattle	134	338	594	-	-
Fasting weight (□)	503.3 [c]	613.7 [a]	599.9 [b]	592.1	3.06
Hot carcass weight (□)	306.6 [c]	389.1 [a]	380.3 [b]	373.8	2.11
Cold carcass weight (□)	301.2 [c]	381.8 [a]	373.8 [b]	367.2	2.07
Dressingpercentage (%)[1)]	59.7 [b]	62.1 [a]	62.2 [a]	61.9	0.07
Lean weight (□)	200.5 [c]	266.5 [a]	246.0 [b]	246.8	1.40
Lean percentage (%)	66.6 [b]	69.8 [a]	65.9 [c]	67.3	0.12
Fat weight (□)[2)]	50.4 [b]	50.6 [b]	63.5 [a]	57.7	0.58
Fat percentage (%)[3)]	16.6 [a]	13.1 [b]	16.9 [a]	15.6	0.12
Bone weight (□)	34.1 [c]	45.1 [a]	42.0 [b]	41.9	0.27
Bone percentage (%)[4)]	11.4 [b]	11.9 [a]	11.3 [b]	11.5	0.04

[1)]Cold carcass weight/fasting weight; [2)] Carcass fat weight includes kidney fat and pelvic fat; [3)] Fat weight/cold carcass weight.; [4)] Bone weight/ cold carcass weight.; [a,b,c] Means with same superscript in a row are not different statistically (P<0.05)

Table 4. Stepwise regression to predict weight of retail cuts from whole carcass(n=1066).

Independent-Var.	Intercept	B value	Pr>F	R^2
CWT, □	-0.134	0.581	0.001	0.89
LA, □		0.385		
CWT, □	11.96	0.663	0.000	0.91
BF, □		-1.01		
CWT, □	1.468	0.616		
BF, □		-0.953	0.001	0.91
LA, □		0.318		

BF (backfat thickness, fat trimmed level = 0.5 mm), LA (longissimus muscle area), CWT (cold carcass weight).

Table 5. Multiple regression equations for predicting weight of closely trimmed retail cuts among sex

Sex	Intercept	CWT, □	BF, □	LA, □	R^2
Cow	-2.67	0.61	-1.31	0.23	0.97
Bull	8.08	0.62	0.23	0.15	0.92
Steer	5.03	0.62	-0.09	0.05	0.94
Total	-4.18	0.63	-0.17	0.16	0.93

CWT (cold carcass weight), BF (backfat thickness), LA (longissimus muscle area)

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