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Correlations between meat quality and components of blood serum in steers fattened

Ida Bagus Djagra[a] and Hiroshi Wada

(*Laboratory of Animal Redroduction*)

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Summary

In fattened steers of Holstein breed correlation coefficients between factors of the carcass, and between roast grade and size of selected body parts were studied. Study of correlation between roast grade and levels of serumal components of blood taken at slaughter was carried out in the steer above mentioned. Roast grade had minus significant correlation to fat cover depth and daily gain, and plus significant correlation to hips width and thurls width. Correlations between roast grade and concentration of blood serum magnesium or cholesterol were shown, but not significant. There were significant minus correlations between roast grade and concentrations of TP, Al, Gl, Ca, Ca/Mg in the serum. Ratio of Mg/ (Ca+P+Mg) had a significant positive correlation to roast grade. When grouped by sire, steers group with low daily gain had generally a high quality of roast.

Introduction

There are four breeds of beef cattle in Japan, namely, Japanese Black breed, Japanese Brown breed, Japanese shorthorn and Japanese polled of cattle. Among these breeds, the Black breed of cattle is superior to other three breeds in quality of meat. There seem many facters influencing the quality of beef. Even the breed is same, quality of beef varies with individual cattle and conditions of environment and feeding.

In Japan, fat deposit in the eyemuscle is essential customarily in decision of selling price of the carcass and the fat deposit is the most important as the necessaries of quality of beef. Farmers and producers of beef cattle are concerned about fat deposition, and they have an earnest wish to learn the means increasing fat deposit in the eyemuscle.

The most inportant causative factor of fat deposition is an inherited ability. Heritability of fat deposition in the meat was reported by Gravat[1,2] to be 0.5. This means that heredity is responsible for an half of fat deposition in the meat. Environmental and feeding conditions are responsible for another half of the fat deposition in the meat. Accordingly, there is a room for improvement of quality of meat by improving the feeding condition and controlling the environmental condition.

This study was designed for learning the factors correlating with meat quality for the purpose finding a technical mean for improvement of quality of beef.

Methods and materials

Carcasses of 50 steers of Japanese Black breed exhibited in the 16th Annual Carcass Show of Okayama Prefecture in the end of December in 1977 by the Federation of Agricultural Cooperative of Okayama Prefecture were employed in the study. After

a) *Present address: F. K. H. P., Udayana University, Denpasar, Bali, Indonesia*

Table 1. Data of growth and carcass (1)

Steer			Feeding period (mos)	Growth (Final size)							Fattening index (B/H×100)	Carcass data						Remark
Number	Age (days) (A)	Name of sire*		Hight, withers (cm) 〔H〕	Heart girth (cm)	Chest, depth (cm)	Hips, width (cm)	Thurls, width (cm)	Liveweight at slaughter (cm) 〔B〕	Daily gain for life (kg)		Carcass weight (kg) 〔C〕	Dressing percentage (%) (C/B×100)	Fat deposit in eyem-uscle	Carcass price (Yen/kg)	Eye muscle, area (cm²)	Fat cover, depth (mm)	
1	686	Mo	13	131.6	206	71.0	51.2	51.2	554	0.76	420.9	367.0	66.2	1.5	1,750	63	20	b
2	701	Mor	15	132.5	211	74.0	49.5	52.5	583	0.79	440.0	390.0	66.9	1.5	1,650	55	19	b
3	742	T	15	131.6	217	76.0	54.4	54.0	672	0.87	510.6	431.5	64.2	1.5	1,760	51	18	b
4	752	11-M	15	131.5	207	71.5	50.0	51.3	594	0.75	451.7	370.5	62.4	3.0	1,900	66	12	b
5	764	O	17	127.0	217	74.0	52.8	50.3	608	0.76	478.7	398.0	65.5	1.0	1,630	64	19	
6	796	2-A	18	133.0	206	72.0	48.0	42.0	575	0.68	432.3	377.5	65.7	2.5	1,920	51	18	
7	801	T	19	140.2	225	74.6	52.4	57.0	697	0.83	497.1	463.5	66.5	2.5	2,060	74	14	b
8	815	F	17	138.0	210	76.0	51.5	49.0	556	0.65	402.8	367.0	66.0	3.0	2,300	71	12	b
9	842	Mor	21	141.5	230	78.0	54.0	53.0	710	0.81	501.7	463.5	65.3	3.0	1,950	67	21	b
10	847	F	21	132.0	217	76.0	53.2	50.4	608	0.68	460.6	407.5	67.0	3.5	2,160	69	18	
11	852	7-Ito	19	137.6	219	78.2	54.0	54.0	680	0.76	494.1	442.0	65.0	4.5	3,510	63	15	b
12	852	Mor	19	137.8	234	79.0	54.0	56.5	704	0.79	510.8	476.0	67.6	3.0	1,900	59	23	
13	857	3-H	20	134.0	220	76.8	51.4	52.2	646	0.72	482.0	410.0	63.5	3.0	2,050	69	17	b
14	862	Mor	20	141.4	221	78.0	52.6	52.4	650	0.72	459.6	418.0	64.3	4.0	2,800	60	17	
15	870	11-M	20	126.3	203	71.5	51.0	49.3	518	0.56	410.1	326.5	63.0	2.5	1,750	48	12	
16	871	Mor	19	135.4	222	79.5	52.5	51.6	620	0.68	457.9	415.0	66.9	3.5	2,250	57	25	b
17	871	T	19	136.6	222	78.3	50.6	51.0	624	0.68	456.8	410.5	65.8	2.5	1,960	75	14	b
18	883	Mor	19	134.0	224	79.6	55.2	52.4	686	0.74	511.9	438.0	63.8	2.5	1,910	68	11	b
19	883	11-M	21	138.4	224	80.4	54.4	53.6	675	0.73	487.7	446.5	66.1	3.0	2,200	67	19	
20	883	Mor	22	140.0	217	79.0	57.3	51.2	779	0.85	556.4	520.5	66.8	2.5	1,850	59	25	b
21	888	Mor	21	134.2	233	79.2	52.3	50.0	712	0.77	530.5	473.0	66.4	3.5	2,280	77	16	b
22	888	11-M	22	142.0	227	79.0	55.6	55.0	690	0.74	485.9	450.5	65.2	2.5	1,800	54	21	
23	890	11-I	21	135.6	216	77.7	53.8	54.0	630	0.67	464.6	415.0	65.9	1.5	1,840	59	16	
24	893	Mor	20	132.6	209	73.0	54.0	54.5	610	0.65	460.0	397.0	65.1	1.5	1,730	66	19	
25	893	T	19	141.6	225	89.0	56.4	51.5	696	0.75	491.5	456.5	65.6	2.5	1,800	56	28	b
26	900	11-M	19	131.0	205	73.0	53.0	53.0	561	0.59	428.2	364.5	65.0	3.5	2,460	59	11	b

Table 1. Data of growth and carcass (2)

Steer			Feeding period (mos)	Growth (Final size)							Fattening index (B/H×100)	Carcass data						Remark
Number	Age (days) (A)	Name of sire		Hight, withers (cm) 〔H〕	Heart girth (cm)	Chest, depth (cm)	Hips, width (cm)	Thurls, width (cm)	Liveweight at slaughter (cm) 〔B〕	Daily gain for life (kg)		Carcass weight (kg) 〔C〕	Dressing percentage (%) (C/B×100)	Fat deposit in eye-muscle	Carcass price (Yen/kg)	Eye muscle, area (cm²)	Fat cover, depth (mm)	
27	903	11-M	23	138.0	225	80.8	54.6	56.0	722	0.77	523.1	473.0	65.5	1.5	1,760	66	25	b
28	913	F	21	136.6	224	77.8	53.2	50.5	651	0.68	476.5	426.0	65.4	3.5	2,150	56	27	b
29	919	F	22	134.0	220	75.3	54.0	52.0	600	0.62	447.7	407.5	67.9	2.0	1,810	66	20	b
30	919	H	15	135.0	227	79.6	55.0	56.0	720	0.75	533.3	473.5	65.8	3.5	2,360	76	16	b
31	920	S-13	22	143.0	235	77.0	59.0	57.2	751	0.78	525.1	511.5	68.1	4.0	2,400	56	25	b
32	921	Mo	22	138.5	228	75.0	58.0	57.3	778	0.81	561.7	532.5	68.4	3.0	2,000	70	27	b
33	923	T	20	140.1	215	76.5	51.5	51.0	615	0.63	438.9	408.0	66.3	3.0	2,100	63	13	b
34	927	11-I	22	131.2	213	75.0	50.0	46.0	553	0.56	421.4	378.0	68.4	2.0	1,731	44	14	
35	928	11-I	22	141.0	233	80.5	59.5	57.0	738	0.76	523.4	494.0	66.9	2.0	1,850	64	14	
36	932	T	24	140.5	232	82.0	54.6	53.5	698	0.72	496.7	470.0	67.3	4.5	2,850	71	18	
37	942	T	22	143.0	220	89.5	53.3	52.5	691	0.70	483.2	450.0	65.1	3.5	2,301	76	14	b
38	944	Mor	22	132.0	222	83.0	55.0	53.5	606	0.61	459.0	410.5	67.7	2.5	1,990	57	9	
39	949	Mor	23	140.0	220	77.0	58.0	57.8	648	0.65	462.8	427.0	65.9	4.0	3,000	74	11	b
40	953	11-M	21	139.6	225	77.0	59.0	55.0	670	0.67	479.9	448.0	66.9	4.0	2,600	52	15	b
41	962	2-N	24	138.0	224	77.0	56.6	54.6	672	0.67	486.9	449.5	66.9	4.0	2,850	70	14	b
42	964	2-N	24	135.2	230	81.2	54.6	56.0	670	0.66	495.5	461.5	68.9	4.5	3,150	70	26	b
43	972	Mor	24	137.0	235	78.0	58.0	57.0	746	0.74	544.5	493.5	66.2	5.0	4,500	78	18	b
44	973	Mor	20	137.4	230	80.0	57.0	55.0	750	0.74	545.8	481.5	64.2	2.5	1,800	59	20	
45	982	Mor	24	141.0	233	78.2	58.0	54.4	773	0.76	548.2	510.0	66.0	3.0	1,830	47	18	b
46	987	W	23	139.0	241	82.8	56.0	59.2	845	0.83	607.9	566.5	67.0	3.0	1,880	76	15	b
47	989	11-M	23	137.8	222	76.4	51.0	50.6	632	0.61	458.6	415.5	65.7	4.0	1,950	67	19	b
48	992	2-A	24	140.0	248	81.0	59.0	55.0	796	0.77	568.5	552.5	69.4	3.5	1,950	76	14	b
49	1,072	T	27	143.0	227	89.0	53.6	53.6	737	0.66	515.3	486.0	65.9	4.0	2,600	74	13	b
50	1,166	F	31	134.5	231	80.7	57.0	56.4	760	0.63	565.0	514.0	67.6	2.5	1,760	73	28	b
AV.				136.7	222.5	77.8	54.2	53.2	669.2	0.72	489.0	442.7	66.1	2.9	2,166	64.2	18.0	

* Abbreviation of name of sire

2−A : 2nd−Akashi
F : Fujiiwa
H : Hanahusa
3−H : 3rd−Hanahusa
7−Ito : 7th−Itozakura
11−I : 11th−Itoya
11−M : 11th−Matsuda
Mo : Motokifuku
Mor : Moriichi
2−N : 2nd−Nakatani
O : Okushige
S−13 : 13th Sakae
T : Takaniwa
W : Watanabe

b : determined for blood serum components

Table 2 Data of steer and carcass

Steer	Mean ± S. D.
Age, days	898.1 ± 85.7
Body weight, kg	681.1 ± 72.5
Height at withers, cm	136.6 ± 4.1
Heart girth, 〃	222.5 ± 9.5
Depth of chest, 〃	77.8 ± 3.6
Width of hips, 〃	54.2 ± 2.7
Width of thurls, 〃	53.2 ± 3.1
Daily weight, 〃	0.72 ± 0.07
Fattening index	488.8 ± 52.0
Body weight before slaughter, kg	669.2 ± 72.8
Feeding period, mos.	20.7 ± 3.1
Carcass	
Carcass weight, kg	442.7 ± 51.5
Dressing percent, %	66.1 ± 1.4
Fat cover depth, mm	18.6 ± 5.5
Fat deposit in eye muscle	2.94 ± 0.9
Eye muscle area, cm	64.2 ± 8.8
Carcass price (whole), yen	1022268 ± 313965
Carcass price, yen/kg	2252 ± 608

Table 3. Concentration of components of blood serum and their ratio

Components or ratio	Mean ± S. D.
TP, g/dl	6.5 ± 1.3
Al, 〃	2.8 ± 0.6
Gl, 〃	3.7 ± 0.7
Chol, g/dl	172 ± 56
BUN, 〃	13.9 ± 4.2
Ca, 〃	7.0 ± 2.1
P, 〃	4.8 ± 1.9
Mg, 〃	1.6 ± 0.4
Ca/Mg 〃	4.8 ± 2.1
P/Mg 〃	3.4 ± 1.7
Ca/P 〃	1.6 ± 0.7
Ca+P 〃	11.8 ± 3.7
Ca+P/Mg 〃	8.2 ± 3.7

Table 4 Correlation between factors relating to carcass

(n=50)

(1) Roast grade	: Total fat deposit	Y = 2.3+0.004X ;	r=0.530**
(Y)	: Age (days)	Y = 0.005X−1.023 ;	r=0.497**
	: Fat cover depth (mm)	Y = 4.44−0.07X ;	r=−0.510**
	: Feeding period (mos)	Y = 0.8+0.004X ;	r=0.475**
	: Daily gain (kg)	Y = 6.192−4.223X ;	r=−0.350*
	: Eye muscle area (cm^2)	Y = 0.49+0.04X ;	r=0.320
	: Carcass weight (kg)	Y = 1.43+0.004X ;	r=0.225
	: Body weight (kg)	Y = 1.562+0.0023X ;	r=0.190
	: Dressing percentage	Y = 0.104X−3.75 ;	r=0.171
	: Hips width	Y = 0.14X−4.42 ;	r=0.444**
	: Thurls width	Y = 0.132X−3.92 ;	r=0.378*
(2) Total fat deposit	: Eye muscle area	Y = 5.065X−125.12 ;	r=0.615**
(Y)	: Age	Y = 0.41X−158.36 ;	r=0.556**
	: Carcass weight	Y = 0.52X−34.4 ;	r=0.361*
	: Body weight	Y = 0.36X−45.05 ;	r−0.350*
	: Daily gain	Y = 432.78X−307.08 ;	r=−0.323
	: Fat cover depth	Y = 268.35−3.14X ;	r=−0.245
	: Dressing percent.	Y = 8.673X−363.679 ;	r=0.180
(3) Fat cover depth	: Dressing percent.	Y = 61.13+1.205X ;	r=0.320
(Y)	: Body weight	Y = 4.82+0.02X ;	r=0.259
	: Daily gain	Y = 8.605+13.188X ;	r=0.178
	: Carcass weight	Y = 10.35+0.0018X ;	r=0.175
	: Age	Y = 11.67+0.007X ;	r=0.125
(4) Carcass weight	: Body weight	Y = 0.701X−26.64 ;	r=0.98**
(Y)	: Daily agin	Y = 216.56+323.332X ;	r=0.453**
	: Fat cover depth	Y = 419.922+1.677X ;	r=0.175
(5) Dressing percent	: Age	Y = 60.703+0.0061X ;	r=0.387*
(Y)	: Body weight	Y = 61.24−0.0072X ;	r=0.359*
	: Fat cover depth	Y = 64.57+0.085X ;	r=0.320
	: Daily gain	Y = 66.5−0.5X ;	r=−0.023
(6) Eye muscle area	: Fat cover depth	Y = 76.795−0.567X ;	r=−0.361*
(Y)	: Age	Y = 40.723+0.028X ;	r=0.317
(section between 8 th and 9 th ribs)	: Carcass weight	Y = 49.48+0.037X ;	r=0.228
	: Body weight	Y = 48.39+0.026X ;	r=0.222
	: Dressing Percent.	Y = 19.77+0.702X ;	r=0.120
	: Daily gain	Y = 74.85−11.96X ;	r=−0.103
(7) Carcass price	: Roast grade	Y = 555.33+543.05X ;	r=0795**
(Y)	: Daily gain	Y = 3681.74+1967.7X)	r=0.239

Key : Total fat deposit (TFD) = Eye muscle area (mm) X Roast grade

Roast grade=fat deposit in eye muscle

Table 5. Correlation coefficient between meet quality of steer and its level of concentration of blood serumal component

(n=35)

Roast grade :				
Tp	(Y)	Y=4.48−0.09X	;	r=−0.54**
Al	(Y)	Y=4.41−0.23X	;	r=−0.49**
Gl	(Y)	Y=4.20−0.24X	;	r=−0.488**
BUN	(Y)	Y=3.6−0.03X	;	r=−0.28
Chol	(Y)	Y=4.01−0.005X	;	r=0.29
Ca	(Y)	Y=4.48−0.21X	;	r=−0.43**
Mg	(Y)	Y=2.84−0.69X	;	r=0.26
P	(Y)	Y=3.64−0.15X	;	r=−0.21
Ca/Mg	(Y)	Y=3.49−0.012X	;	r=−0.36*
P/Mg	(Y)	Y=3.44−0.02X	;	r=−0.30
Ca/p	(Y)	Y=3.6−0.2X	;	r=−0.19
TFD	(Y)	Y=2.3+0.004X	;	r=0.53**
Mg/ (Ca+P+Mg)	(Y)	Y=2.50+4.78X	;	r=0.41*
Total protein				
Al	(Y)	Y=3.14+1.82X	;	r=0.6484**
Gl	(Y)	Y=2.48+1.16X	;	r=0.9428**
Bun	(Y)	Y=6.50+0.24X	;	r=0.3425*
Chol	(Y)	Y=4.85+0.03X	;	r=0.4320**
Ca	(Y)	Y=3.68+0.81X	;	r=0.6001**
Mg	(Y)	Y=10.58−0.72X	;	r=−0.1929
P	(Y)	Y=4.68+0.85X	;	r=0.5005**
Ca/P	(Y)	Y=8.43+0.68X	;	r=0.0998
Roast grade	(Y)	Y=4.70−0.09X	;	r=−0.5253**
TFD	(Y)	Y=329.7−12.8X	;	r=−0.5079**

Table 6. Average carcass data of progenies by sire

Name of sire	Moriichi	Takaniwa	Fujiiwa	11-Matsuda	2-Nakayama	Motokihuku
No. of progenies	9	7	4	3	2	2
Progeny no. (Steer no.)	2, 9, 16 18, 20, 21 39, 43, 45	3, 7, 17 25, 33, 37 49	8, 28, 29, 50	26, 40, 47	41, 42	1, 32
Age (days)	886	892	953	947	963	804
Body weight (Kg)	695	676	642	621	709	666
Dressing Percentage	66.0	65.6	66.7	65.9	67.9	67.3
Carcass weight (Kg)	415.3	443.7	428.6	409.3	455.5	449.8
Daily gain (Kg)	0.75	0.73	0.65	0.62	0.67	0.79
Fat cover depth (mm)	18	16	22	20	20	24
Roast grade	3.2	2.8	2.9	3.8	4.3	2.3
Total fat deposit	210.8	191.4	190.0	227.5	297.5	152.3
Eye muscle area (cm)	64.7	67.0	66.5	59.0	70.0	66.5
Fattening index	505.9	484.7	473.0	455.6	491.2	541.3
Hight at withers (cm)	137.3	139.4	135.8	136.1	136.6	135.1
Width of Hips (cm)	55.0	53.2	54.0	54.3	55.6	54.6
Width of thurls (cm)	53.3	53.0	52.0	53.0	55.3	54.3
Carcass price (whole) (Yen)	1117435	957277	872993	957231	1367400	853625
Carcass price (Yen/Kg)	2413.33	2084.43	2005.00	2336.67	3000.00	1875.00

Table 7. Average concentrations of blood serumal components of steers grouped by sire

Name of sire	Moriichi	Takaniwa	Fujiiwa	11-Matsuda	2-Nakayama	Motokihuku	
No. of progenies	9	7	4	3	2	2	
Steer no.	2, 9, 16 18, 20, 21 39, 43, 45	3, 7, 17 25, 33, 37 49	8, 28 29, 50	26, 40, 47	41, 42	1, 31	$\overline{X}$
Total protein 〔Tp〕 (g/dl)	6.7	6.6	6.3	6.1	5.9	7.2	6.5
Alubumin 〔Al〕 (〃)	2.9	2.7	2.6	3.1	2.4	2.8	2.8
Glolesterol 〔Gl〕 (〃)	3.8	3.9	3.7	3.0	3.5	4.4	3.7
Cholesterol 〔Chol〕 (mg/dl)	178	161	169	149	139	149	158
Blood ureal nitrogen 〔Bun〕 (〃)	14.2	12.2	12.5	14.4	13.1	14.3	13.5
Calcium 〔Ca〕 (〃)	6.9	6.4	7.6	6.8	4.7	7.9	6.7
Phosphorus 〔P〕 (〃)	4.5	3.9	5.4	4.9	3.7	5.2	4.6
Magnesium 〔Mg〕 (〃)	1.5	1.6	1.3	1.4	2.0	1.8	1.6
Ca/Mg	5.1	4.1	6.2	5.4	2.5	4.4	4.6
P/Mg	3.6	2.5	4.4	4.4	2.1	2.9	3.3
Ca/p	1.7	2.1	1.4	1.6	1.3	1.6	1.6
Ca+P (mg/dl)	11.5	10.4	12.9	11.7	8.5	13.1	11.4
(Ca+P) /Mg	8.7	6.5	10.6	9.5	4.5	7.3	7.9

withdrawn the feed about 24 hours, the steers were slaughtered. The carcass was cooled for 48 hours in a refrigerated room and then judged for their grade by the regular member of jdugding team of the show, including the junior author. Blood was taken from 35 steers at the time of slaughtering. The blood was allowed to stand in room temperature for about 10 hours. Then the blood was centrifuged and serum was seperated from it. The blood serum was analized for the concentrations of total protein (TP) , alubumin (Al), globulin (Gl), blood ureal nitrogen (BUN) , cholesterol (Chol), calcium (Ca), magnecium (Mg), and phosphorus (P) respectively, using Vete−aid, a spectrophotometer made py Fijihira Industrial Co. Ltd.

For study of growth or development of the body of the fattened steer, heart girth, hight at withers, depth of chest, width between hips, width between thurls, and width between pinbones were measured before slaughter.

Daily liveweight is the quotient of liveweight just before slaughter divided by days after birth. Dressing percentage is the percentage of carcass weight to liveweight just before slaughter. Fattening index is the quotient of liveweight in kg just before slaughter divided by hight at withers in meter. Eye muscle area is the area of eye muscle of roast between 7 th rib and 8 th. The area was measured by using a sectioned transparent plate scale which was put on eye muscle to read off the area. Depth of fat cover shown is the average depth of fat covers at the withers and the loin.

The carcass was sold just after the show by auction at the Okayama Carcass Market. Selling price shown is the price at the auction.

Results and Discussions

Individual data of steer and carcass are shown in Table 1 . The data are summarized in Table 2 . Average concentrations of components of blood serum and their mutual ratios are shown in Table 3 . Correlations between factors in carcass, steer and concentration of blood serum component are shown Table 4 through Table 7 .

There were significant correlations between meat quality and hips width, thurls width of steers respectively. Eye muscle area had no significant correlation with hips width and thurl width respectively. It is interested that width of hips has a significant correlation with fat deposit in the eye muscle. In Japan, it has been said customary that meat of cattle with a narrow pin bones width is superior in quality. This type of rump has been called the barley−shaped rump. A wide hips width results in relatively narrow pin bones width. Correlations between facters in carcass and/or steer were examined. The result of the examination are shown Table 4 . Meat quality had a sinificant positive correlation with age of steer, and had a significant negetive correlation with daily gain and fat cover depth. Eye muscle area had a significant negative correlation with fat cover depth. Carcass weight had significant positive correlation naturally with liveweight and daily gain. Dressing percentage had significant positive correlation with age of steer and liveweight. Carcass price showed a significant highly positive correlation with roast grade. This shows that roast grade, namely, fat deposit in the eye muscle is the most important factor in trade of beef in Japan.

Correlations between concentrations of blood serum components are shown in Table 5 .

Blood serum concentration of TP, Al, Gl, Ca or Ca/Mg had significant positive correlation to roast grade (fat deposit in eye muscle) respectively.

Correlations between concentration of total protein in blood serum and eye muscle area, roast grade respectively in the same table. There was a significant negative correlation between concentration of total protein in blood serum and roast grade. This is due to that protein stimulate the thyroid gland and then thyroid gland induce

a mobilization of lipids from the tissue. Actually, a highly significant positive correlation between concentrations of total protein and cholesterol was shown. This showed that hyperthyroidism and excessive amount of dietary protein are not preferable to fat deposition inthe meat. Actually there was a highly significant positive correlation between concentration of total protein and concentration of cholesterol in the blood serum. Concentration of total protein in the blood serum had significant positive correlation with alsoconcentrations of albumin, globulin, blood ureal nitrogen, calcium, phosphorus respectively. These substances also are not preferable to improvement of meat quality.

Correlations of fat deposit in the eyemuscle to factors concerning carcass in fattened cattle were reported in several papers[3–12]. However, information regarding the relations of blood serum components and serumal amino acids to fat deposit in the eye muscle of cattle is scant except the present authors' [5–7]. This is the first paper in this field of research.

References

1). GRAVAT, H. O. (1962) Z. Tierzüchtg. Züchtgs Biol. **78**, 43
2). GRAVAT, H. O. (1963) Z. Tierzüchtg. Züchtgs Biol, **78**, 139
3). ABRAHAM, H. C., et al. (1968) J. Anim. Sci. **27**, 604
4). GOOD, D. L., et al. (1961) J. Anim. Sci. **20**, 698
5). IDA BAGUS DJAGRA & H. WADA (1978) Jap. J. Zootech. Spe. 126
6). IDA BAGUS DJAGRA & H. WADA (in press) Jap. J. Zootech.
7). IDA BAGUS DJAGRA & H. WADA (in press) Jap. J. Zootech.
8). KUMASAKI, K. & Y. SASAKI (1972) Jap. J. Zootech. **43**, 366
9). MAGER, W. T., et al. (1968) J. Anim. Sci. **27**, 13
10). MATTHEWS, D. J. & J. A. BENNET (1962) J. Anim. Sci. **21**, 738
11). TSUCHIYA, H. &T. OKUBO (1962) Bul. Chugoku Nat. Agr. Exp. Sta. B**9**, 1
12). Japanese Cattle registry Association (1967) Meat Performance of Japanese Cattle

肥育牛の肉質と血液成分の関係について

Ida Bagus Djagla・和 田 宏
(家畜繁殖学研究室)

肥育したホルスタイン種去勢牛において，枝肉の諸要因間の，また肉質（ロース芯の脂肪没着）と牛体の特定部位の大きさの間の相関につき研究し，さらにと殺時に採った血液の血清成分の量と肉質の相関についても併せ研究した．肉質は皮下脂肪厚，平均日増体量と有意な負の相関があり，腰角幅臍幅と有意な正の相関があった．

血清成分のうちでは肉質（サシ）に対しMgおよびコレステロールが正の相関を示したが有意でなかった．全蛋白質，アルブミン，グロブリン，Ca，Ca/Mgなどは肉質に対し負の有意な相関があった．Mg/（Ca+P+Mg）は肉質と有意な正の相関を示した．父牛別に分けた場合，DGの小さい息牛群は肉質が高い傾向があった．

正 誤 表 (Errata)

頁 (Page)	行 (Line)	誤 (Erratum)	正 (Correct)
目 次	19	黒田 正紀	黒木 正紀
13	25	nodes folded out after	nodes unfolded after
17	22	Kliwer[6)]	Kliewer[6)]
18	3	Kliwer	Kliewer
29	29	absortion	absorption
37	7	breed correlation	breed, correlation
37	25	eyemuscle	eye muscle
37	29	eyemuscle	eye muscle
38	12	slaughter (cm) 〔B〕	slaughter (kg) 〔B〕
38	21	eyem-uscle	eye-muscle
39	12	slaughter (cm) 〔B〕	slaughter (kg) 〔B〕
39	14	89.5	79.5
39	15	83.0	73.0
40	27	Chol , g/dl	Chol , mg/dl
41	17	r—0.350*	r=0.350*
41	39	r=0795**	r=0.795**
41	40	Y=3681.74+1967.7 X)	Y=3681.74+1967.7 X;
42	22	Bun	BUN
43	29	〔Tp〕 (g/dl)	〔TP〕 (g/dl)
43	31	Glolesterol	Globulin
44	17	7 th	8 th
44	17	8 th	9 th
44	29	thurl	thurls
44	47	respectively in	respectively are shown in
45	32	没着)	沈着)
55	2	I. KETUT LANA	I KETUT LANA
69	Fig. 4	soil layer (cm)	soil surface (cm)