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RELATIONSHIP BETWEEN TISSUE THICKNESSES MEASURED ON LIVE PINZGAU BULLS BY ULTRASOUND AND WEIGHT OF HOT CARCASS

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INTRODUCTION

Pinzgau breed is a dual-purpose breed categorized as a rare breed. This breed has been traditionally kept for milk production in mountain regions of Slovakia. Breeders and Breeders ´ Association oriented its breeding towards increase of milk performance. Breeding for beef production was not recognized as a priority during last decades. Low success at milk calf and fattened bull market showed a need to improve beef production traits, too. Access to EU and implementation of milk quota system are supposed to increase the importance of beef production especially in mountain regions.

The aim of our work was to investigate relationships between tissue thicknesses measured by ultrasound on live Pinzgau bulls and slaughter parameters, and to analyse their prediction ability for hot carcass weight estimated in vivo.

MATERIAL AND METHODS

Ultrasound measures, slaughter and carcass traits of 25 fattened bulls of Pinzgau cattle were analysed. Tissue thicknesses (muscle, subcutaneous fat and skin together) were measured 10 days before slaughter using ultrasound method at five positions: on the shoulder blade, the back behind the shoulder blade, the back on the last thoracic vertebrae and the last lumbar vertebra and on the os ischia. In order to eliminate measuring errors, four measurements on each position were taken. The equipment comprised Aloka SSD 500 echo camera, 3.5 MHz probe UST 5813 and ECM-9 echo coupler. Descriptive statistics (mean, minimum, maximum value and standard deviation) was calculated for each parameter in the

test. Person's coefficients of linear correlation among ultrasound measures and carcass quality traits were produced. Linear regression models used for hot carcass weight estimation included ultrasound measures, weight and age at ultrasound measurement. Ultrasound measures were involved in models separately or in different combination with age and weight.

Statistical analysis was carried out with SAS 8.2 program package using the REG PROCEDURE (Regression analyses, stepwise selection) (SAS 2001).

RESULTS AND DISCUSSION

Bulls were slaughtered at the age of 468 days. They were measured by ultrasound 10 days before slaughter. Average live weight at ultrasound measurement was 469 kg, average weight before slaughter was 470 kg and average hot carcass weight was 246 kg. Average daily gain within period between 150th day and age at ultrasound scanning was 1092 g. In experiment with older Pinzgau bulls, Kica et al. (2000) and Antal et al. (1991) reported 20 to 30 kg higher weight before slaughter and 90 g lower average daily gain. Papstein et al (1992) reported 120 g higher daily gain for the same breed and same period of fattening.

The highest tissue thickness (93.4 mm) was found on the back behind the shoulder blade followed by thickness on the os ischia. On the contrary, the lowest tissues thickness (54.9 mm) was found on the shoulder blade. Tissues on the last thoracic vertebra and the last lumbal vertebra had very similar thicknesses (69.9 mm). In comparison to our previous results with 15-month old Simmental bulls (Polák et all 2001), tissue thicknesses of Pinzgau bulls obtained in this study were 2 to 7 mm lower. Tissue thicknesses reported by Sakowski et al. (1996) and Słoniewski et al. (1996) for 500-day old Holstein bulls were similar to our results, however, those reported by Blanco et al. (2003) for 15-month old Holstein bulls were 14 – 32 mm lower. Basic statistics for given slaughter parameters; carcass quality and tissue thicknesses are given in Table 1.

Highest correlations were observed among hot carcass weight and tissue thicknesses on the os ischia (r= 0.67) and on the back behind the shoulder blade (r= 0.39). Correlation coefficients among conformation of the carcass according to EUROP system and tissue thickness on the os ischia, on the back behind the shoulder blade and on the last thoracic vertebra were statistically significant (r= -0.60; -0.59 and -0.47). Hamlin et al. 1995, Słoniewski et al 1997 and Polák et al. 2001 reported higher correlation coefficients (r>0.90) between weight before slaughter and ultrasound measures. As stated higher, scaling and

measuring of animals were done 10 days before slaughter. This could be a reason of big differences between results. In this study, there was found significant correlation only between weight before slaughter and tissue thickness on the os ischia (r=0,66). Sakowski et al. (1995) observed similar, little higher correlations with muscle thickness on the ischium (r = 0.64 – 0.70), whereas Polák et al. (2001) found out highest correlations with tissue thickness on the last lumbar vertebra and on the ischium. Słoniewski et al. (1996) reported higher correlations with muscle thickness behind the shoulder blade and on the ischium. Correlation coefficients among slaughter value indices and the dimensions measured by ultrasound are presented in Table 2.

With ultrasound measures involved separately as independent variables for prediction of hot carcass, the model, which included tissue thickness on the os schium fitted best (R^2=0.45). When age at ultrasound measurement and tissue thickness on the last thoracic were included, R^2 increased by 0.10. However, the model, with weight at ultrasound measurements and tissue thickness at the shoulder blade fitted better (R^2= 0.85). Similar R^2 were reported by Blanco et al. (2003) for in vivo prediction of hot carcass weight of 15-month old Holstein bulls. It has to be said that comparison of results obtained from different studies with different breeds and different number of animals and of different age and sex is difficult.

CONCLUSION

The highest predicting ability for in vivo estimation of hot carcass weight showed linear regression model where tissue thickness behind the shoulder blade measured by ultrasound was combined with weight at ultrasound measurement. The weight at ultrasound measurement as an independent variable had the highest influence on estimation of hot carcass weight. Generally, it could be said that rank of importance of analysed parameters is as follows: weight at ultrasound measurement, tissue thickness and age at ultrasound measurement.

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Table 1 Basic statistics

Parameters			*Mean*	*Minimum*	*Maximum*	*Standard Deviation*
Tissue thickness	on the shoulder blade	mm	54.88	44.50	62.80	4.65
	behind the shoulder blade	mm	98.38	87.80	110.00	5.63
	on the last thoracic vertebra	mm	69.91	61.00	77.00	4.17
	on the last lumbal vertebra	mm	69.88	59.80	79.00	4.07
	on the os ischia	mm	92.46	79.50	104.50	6.43
Daily gain		g	1092	867.00	1246.00	135.73
Age at ultrasound measurement		days	458.36	437.00	469.00	6.42
Weight at ultrasound measurement		kg	469.08	400.00	536.00	35.13
Dressing percentage		%	53.50	51.07	56.76	1.63
Kidney fat		kg	4.88	2.60	8.20	1.17
Weight of hot carcass		kg	245.84	204.00	274.00	19.59
Conformation of carcass			3.28	2.00	5.00	0.84
Fatness of carcass			2.88	2.00	4.00	0.44
Proportion of meat in carcass		%	74.77	73.33	77.78	0.98
Proportion of fat in carcass		%	5.91	4.35	7.89	0.68
Proportion of valuable cuts		%	52.11	49.88	54.47	1.25

Table 2 Person´s coefficients of linear correlations

Parameters	*Tissues thickness*									
	on the shoulder blade		*behind the shoulder blade*		*on the last thoracic vertebra*		*on the last lumbal vertebra*		*on the os ischia*	
Age at ultrasound measurement	0.32		0.23		0.15		0.22		0.20	
Weight at ultrasound measurement	0.04		0.31		0.20		0.12		0.66	**
Dressing percentage	0.17		0.22		0.09		0.11		0.14	
Kidney fat	-0.04		0.35		0.13		0.22		0.46	*
Weight of hot carcass	0.23		0.39	*	0.22		0.14		0.67	**
Conformation of carcass	-0.31		-0.59	**	-0.47	*	-0.31		-0.60	**
Fatness of carcass	-0.24		-0.06		0.08		-0.05		0.41	**
Proportion of meat in carcass	-0.03		0.05		0.01		-0.09		-0.36	
Proportion of fat in carcass	0.24		0.43	*	0.08		0.47	*	0.58	**
Proportion of valuable cuts	0.13		-0.13		0.05		0.04		-0.21	

Table 3 Linear regression models used for predicting of hot carcass weight.

Intercept	*Partial regression coefficients of independent variables (b_i)*							R^2
	Weight at ultrasound measurement	*Age at ultrasound measurement*	*Tissues thickness*					
			on the shoulder blade	*behind the shoulder blade*	*on the last thoracic vertebra*	*on the last lumbal vertebra*	*on the os ischia*	
56.10							2.05	0.45
-241.57		0.80			-1.28		2.27	0.55
-32.68	0.50		0.82					0.85