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Prediction of beef carcass meat and fat content with the joint usage of US and CT methods

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Objectives

The aim of this study was to estimate the lean and fat content of beef carcasses with the combined use of ultrasound (US) and computerized tomography (CT) techniques.
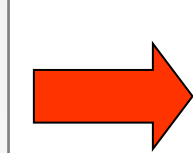
Lean kg, %

Fat kg, %

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Materials

50 animals, purebred Holstein and Hungarian Simmental bulls, and crossbred Charolais x Angus bulls and heifers were used to the evaluation, slaughtered in average 567 kg live weight and 498 d final age
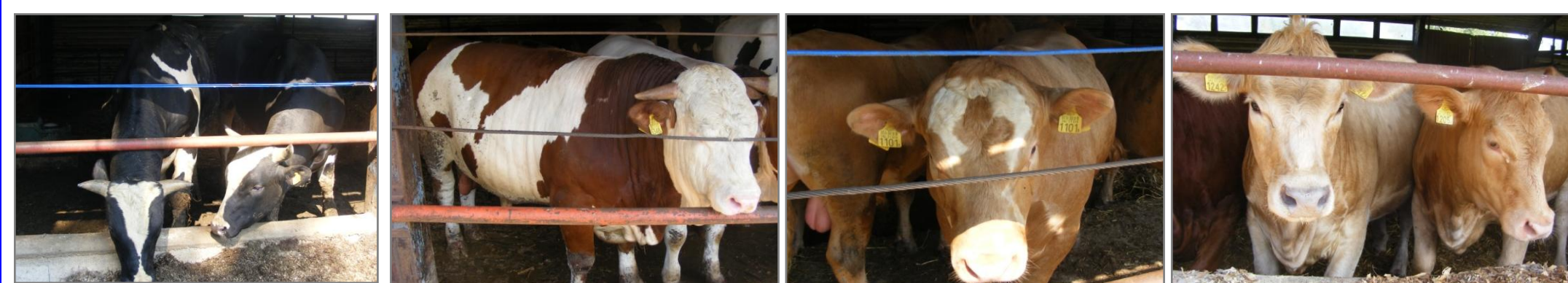
Methods

In vivo ultrasound fat thickness (USFT) were measured between 12-13th rib, over backfat reference point, on the right side with Aniscan 100 (ANIVET) portable US device
After slaughtering, kidney fat samples were collected for CT evaluation (CTFD)
After 24 h chilling, rib samples were taken from between the 11-13th rib and right carcass side were dissected in to lean, fat and bone
CT investigations were made at the Institute of Diagnostic Imaging and Radiation of University of Kaposvár
On the CT pictures of rib samples, longissimus dorsi muscle area (CTA) (1), width (CTW) (2) and density (CTD) (3) were evaluated
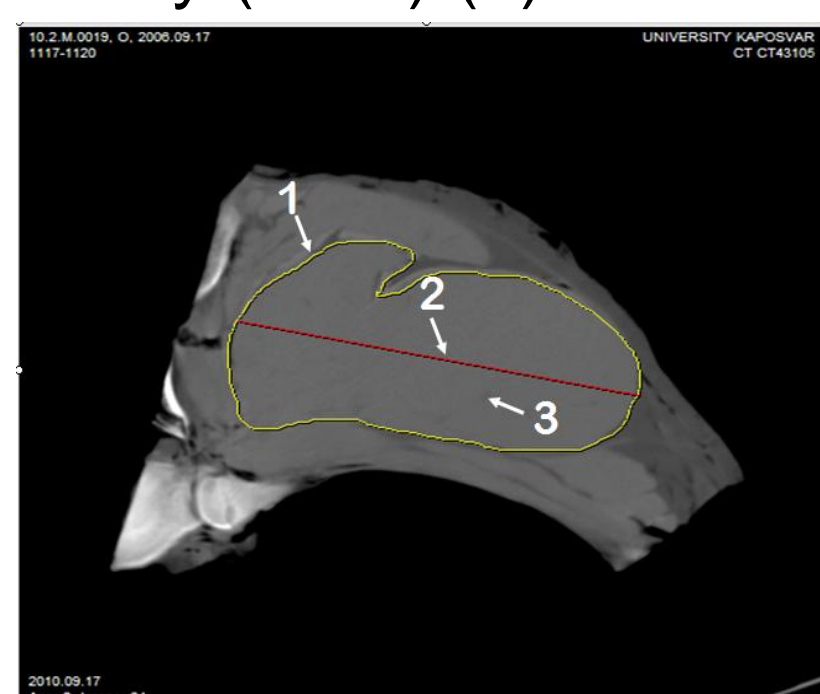
For statistical analysis SAS 9.1 version, means, corr and stepwise procedure were used

Results

Means of the US, CT data and carcass muscle and fat characteristics

	USFT, cm	CTA, cm^2	CTW, cm	CTD, HU	CTFD, HU
Mean	0.90	71.29	14.20	62.89	-74.15
SD	2.95	11.50	1.04	4.47	16.16
Max	1.50	101.75	16.93	69.30	-50.08
Min	0.50	46.30	11.99	51.16	-100.74

HU: Hounsfield unit

	Right carcass muscle, kg	Right carcass muscle, %	Right carcass fat, kg	Right carcass fat, %
Mean	99.03	64.78	17.22	11.66
SD	17.04	5.31	7.59	5.94
Max	131.46	73.08	32.26	24.27
Min	64.13	53.51	6.76	4.42

Pearson correlation coefficients between US, CT data and carcass muscle and fat properties

	USFT	CTA	CTW	CTD	CTFD
Right carcass muscle, kg	-0.47	0.72	0.83	0.66	0.57
	0.0005	<0.0001	<0.0001	<0.0001	0.0002
Right carcass muscle, %	-0.67	0.56	0.76	0.79	0.80
	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Right carcass fat, kg	0.82	-0.09	-0.48	-0.85	-0.88
	<0.0001	0.5099	0.0005	<0.0001	<0.0001
Right carcass fat, %	0.81	-0.27	-0.63	-0.88	-0.88
	<0.0001	0.0627	<0.0001	<0.0001	<0.0001

Stepwise model equations to predict carcass muscle and fat properties

Dependent variable	Independent variables	Model R^2	SE
Right carcass muscle, kg	CTW+CTD+CTA	0.78	20.46
Right carcass muscle, %	CTD+USFT+CTA	0.80	8.81
Right carcass fat, kg	CTFD+CTD+USFT	0.92	11.40
Right carcass fat, %	CTFD+CTD+CTW+USFT	0.93	9.24
Right carcass muscle, %*	CTD+CTW	0.77	6.09
Right carcass fat, kg*	CTFD+CTD	0.87	13.33
Right carcass fat, %*	CTFD+CTD+CTW	0.91	9.43

*: USFT not included among independent variables

Conclusions

According to our results, using US and CT data, right carcass fat content and proportion can be predict slightly precisely, than right carcass muscle content and proportion
The combined use of US and CT techniques resulted more accurate estimations by right carcass muscle proportion, fat content and fat proportion, thereby led to more accurate slaughter value estimation