CARCASS TRAITS OF OFFSPRINGS OF TOP BREEDING BOARS IN ESTONIA

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Introduction

Purposeful pig breeding started on 1 March 1923, when the Estonian Pig Breeders' Association was established. The main goal was to arrange pig farming: Herdbook keeping, establishing breeding stations and advisory service. The first pig testing station was founded at Kuremaa in 1931 (Laanmäe, 1994). Since then, breeders' association(s) have become(s) main organizers of pig breeding according to consumer demands. The last pig testing station in Estonia was closed in 2001, and testing of boars was taken over by commercial breeding farms.

Measuring of carcass traits requires good cooperation with meat processing companies that are private companies. The crossbreeding program Marble Pork of the Estonian Pig Breeding Association provides measuring of carcass traits of progeny of top boars in slaughterhouse (EPBA, 2005). Unfortunately, these traits are not used to calculate breeding values, but only for describing the general situation of pig breeding.

The objectives of this study were to estimate offspring carcasses of top breeding boars and to observe trait changes.

Material and Methods

Estonian Landrace (EL), Estonian Large White (EY) and Pietrain (Pi) pigs from four top breeding farms in Estonia were included in study. A total of 1,311 boars were slaughtered in two slaughterhouses during 2002-2005. Average age at slaughter was 186 days and carcass weight 75 kg (Table 1). Carcasses were divided lengthways into halves and hanged into monorail along back leg. Measurements were taken 24 hours after slaughtering by meat technologist of the Estonian Pig Breeding Association. Backfat thickness was measured by measuring-tape from

four points in one half of carcasses (Figure 1). Two carcass lengths were recorded.

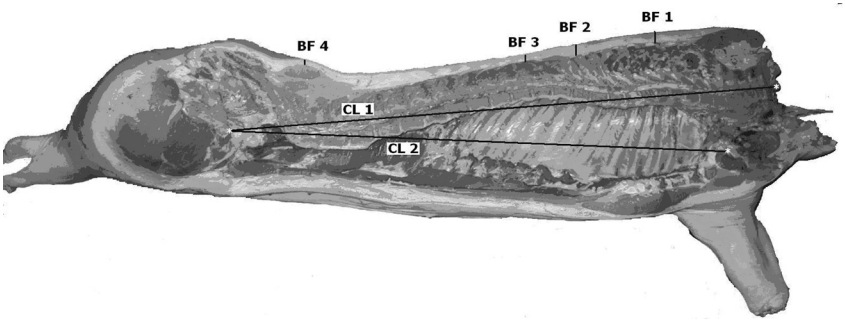

Figure 1. Measuring points of backfat thickness and carcass lengths. Backfat thickness was measured: BF 1 – thicker spot on shoulder; BF 2 – above between 6^{th}-7^{th} rib; BF 3 – thinner spot in dorsum; BF 4 – from the higher spot of *gluteus medius*. Carcass length: CL 1 – from cranial edge of first neck segment to anterior edge of the *symphysis pubis*; CL 2 – from symphysis of rib on the sternum to anterior edge of the *symphysis pubis*.

Table 1. General statistics of carcass measurements (n=1311)

Traits	Mean	Std. Dev.	Minimum	Maximum
Age at slaughter, days	186	17.29	135	200
Carcass weight, kg	75.16	6.73	55.70	102.40
Carcass length 1, mm	100.45	4.59	83.00	114.00
Carcass length 2, mm	84.03	3.71	70.00	96.00
Backfat thickness 1, mm	28.67	4.53	10.00	44.00
Backfat thickness 2, mm	19.31	4.13	8.00	39.00
Backfat thickness 3, mm	15.20	3.55	6.00	33.00
Backfat thickness 4, mm	10.45	1.95	5.00	20.00
Average backfat thickness (BF 1-4), mm	18.40	2.96	8.25	32.50
Average backfat thickness (BF 1, 3, 4), mm	18.19	2.72	7.67	30.33

A least square analysis of variance using GLM of SAS (SAS, 1999) was used to evaluate carcass measurements for sources of variation. The model included fixed effects of breed, year of evaluation, slaughterhouse.

$Y_{ijkl} = \mu + B_i + E_j + S_k + e_{ijkl}$

Y = dependent variable; B_i = breed (n = 1-3); E_j = year of evaluation (n = 1-4); S_k = slaughterhouse (n = 1-2); e_{ijkl} = random residual effect.

Levels of significances are expressed conventionally: a, b, c, d – least square means within each effect with one letter in common do not differ significantly; *** - P<0.001, ** - P<0.01, * - P<0.05. Pearson product-moment correlation (PROC CORR) coefficients were used to analyse relationship between carcass measurements (SAS, 1999).

Results and Discussion

Estonian Large White and Pietrain pigs were slaughtered significantly later than Estonian Landrace. However, lighter carcasses were found in Pietrain boars, and carcasses of Estonian Large White pigs were 2.35 kg heavier than those of Estonian Landrace pigs. Significantly shorter carcasses in Pietrain pigs, compared with white breeds, explain their lighter weight. Carcass lengths in white breeds differed slightly, e.g. carcass length 1 of Estonian Landrace pigs was 2.12 cm and length 2 was 1.35 cm longer, but these variances were significant. However, Pietrain carcasses were 6.06-9.01 cm shorter than those of white breeds (Table 2).

Table 2. Breed effect on carcass traits

Traits	Breed		
	EL	EY	Pi
n	295	872	144
Age at slaughter, days	172^{a}	196^{b}	194^{b}
Carcass weight, kg	73.04^{a}	75.39^{b}	70.96^{c}
CL 1, cm	103.23^{a}	101.11^{b}	94.22^{c}
CL 2, cm	85.78^{a}	84.43^{b}	78.37^{c}
BF 1, mm	28.12^{a}	27.47^{a}	27.42^{a}
BF 2, mm	18.40^{a}	19.11^{b}	19.05^{ab}
BF 3, mm	14.20^{a}	14.84^{b}	15.39^{b}
BF 4, mm	10.67^{a}	10.07^{b}	10.14^{b}
Average BF 1-4, mm	17.86^{a}	17.88^{a}	18.02^{a}

The thickest backfat on shoulder was measured in Estonian Landrace pigs, that of Estonian Large White and Pietrain was similar although significant difference was not found between all breeds. Despite Landrace thicker backfat on shoulder, significantly thinner fat was found in spots between 6^{th}-7^{th} rib and thinner spot in dorsum, compared with other breeds. Similar differences of these two measurements are caused by the fact that these two anatomical spots stand quite close together. According to the results found by K. Eilart and A. Põldvere (1993), the backfat thickness above 6th-7^{th} rib was thinner on Estonian Large White pigs (25.6 mm), compared with that of Estonian Landrace (27.1 mm).

Backfat on the higher spot of *gluteus medius* was .5-.6 mm thicker than in Estonian Large White and Pietrain carcasses. Average backfat thickness of these four points did not differ between breeds. Generally, all breeds had similar backfat thickness, still the fat deposition level in Estonian Landrace boars differed, compared with that of Estonian Large White and Pietrain pigs.

All boars were slaughtered at the same age during 2002-2005 (Table 3). In 2004 the fattening period was two days longer than in 2002 and 2003, and four days longer than in 2005. This did not affect carcass weight, because heavier carcasses were observed in 2005, when animals were slaughtered earlier (185 days). Similar results were achieved also in Germany, where carcass weight did not depend on fattening time (Tänavots, 2002). Main reason for such effect might be the changes in feeding level on different farms, as it depends on a large scale on economical situation in pig meat market. Carcass weight of boars increases during the years, being 5.51 kg heavier in 2005 than in 2002. Similar trends were found in both carcass lengths. Within four years boar carcasses have become more than 3 cm longer. Current results show, that weight of carcasses had increased due to longer carcasses. Estonian Landrace pigs were slaughtered at lighter carcass weights (68.2 to 69.8 kg) in 1994-1996 (Eilart, Põldvere, 1997).

Table 3. Year effect on carcass traits

Traits	Estimation year			
	2002	2003	2004	2005
n	396	377	362	176
Age at slaughter, days	187[a]	187[ab]	189[b]	185[a]
Carcass weight, kg	70.10[a]	72.24[b]	74.56[c]	75.61[c]
CL 1, cm	97.70[a]	98.86[b]	100.41[c]	101.12[d]
CL 2, cm	81.16[a]	82.37[b]	83.62[c]	84.28[d]
BF 1, mm	29.59[a]	27.02[b]	27.73[c]	26.33[b]
BF 2, mm	18.62[a]	18.62[a]	19.48[b]	18.69[ab]
BF 3, mm	14.72[a]	15.03[a]	15.07[a]	14.42[a]
BF 4, mm	10.52[a]	10.85[b]	10.16[c]	9.65[d]
Average BF 1-4, mm	18.39[a]	17.91[b]	18.14[ab]	17.24[c]

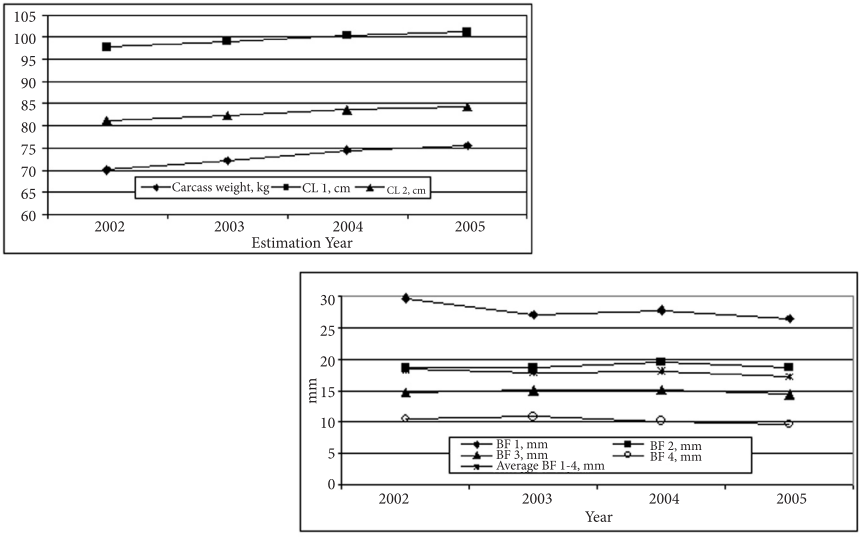

Figure 2. Year effect on carcass traits

As one of the main objectives of pig breeding was the decrease in backfat thickness using intensive selection, this trait showed significant decrement -- backfat measured from shoulder changed 3.26 mm and above spot of *gluteus medius* 1.2 mm. Backfat above

between 6th-7th rib and thinner spot in back did not show considerable change. Similar results found Eilart and Põldvere (1997) in their work, where carcass backfat above between 6th-7th rib of Estonian Landrace pigs did not change considerably (24.7-24.8 mm) in 1994-1996. In general thinning of backfat was considered significant, as average backfat thickness decreased 1.15 mm, being 17.24 mm in 2005.

Correlations between age at slaughter and carcass traits showed no strong relationships. Carcass weight, to the contrary, showed significant correlation with both carcass lengths, whereas relationships with backfat measurements were weak.

Table 4. Correlations between carcass traits

Traits	Average BF 1-4	BF 4	BF 3	BF 2	BF 1	CL 2	CL 1	Carcass weight
Age at slaughter	-.036	-.147***	-.012	-.019	-.011	-.058*	-.063*	.167***
Carcass weight	.269***	.152***	.275***	.313***	.153***	.532***	.481***	
CL 1	-.151***	-.102***	-.159***	-.096***	-.135***	.920***		
CL 2	-.070**	-.060*	-.080**	-.014	-.074**			
BF 1	.825***	.418***	.545***	.612***				
BF 2	.903***	.485**	.811***					
BF 3	.870***	.513***						
BF 4	.642***							

Correlations between backfat measurements showed significant relationship. Backfat measurements above between 6th-7th rib and thinner spot in dorsum were highly correlated (r=.811), as these points were situated closely.

Conclusions

Measuring of carcass traits provide a lot of useful information for pig breeding. Therefore it is essential to include these results in breeding program as one part of estimation of breeding boars. As results have shown, the breeding work up to the present has been successful.

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