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Comparison of Different Pig Breed Combinations by Using Data from Piglog 105

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Abstract

Aim of research was to investigate effect of foreign breeds on local breeds, to compare meat traits in live pigs between different breed combinations. 6538 pigs were tested with ultrasound equipment Piglog 105 in 1996-1997. Seven groups of breed combinations were used in research: purebred – Large White (LW), Estonian Landrace (EL) and Hampshire (H); crossbred – H♂ x LW♀, LW♂ x EL♀, EL♂ x LW♀, LW♂ x (EL/LW)♀. The traits taken under observation were testing weight, backfat thickness at last (X1) and 10th (X3) rib, diameter of loin eye (X2) and lean meat percentage (Y). Least-square means were calculated for all breed combinations, years and seasons. Highest backfat thickness and lowest lean meat percentage were calculated for EL (X1=18.7mm, X3=18.1mm, Y=55.7%) and LW♂ x EL♀ (X1=18.5mm, X3=17.7mm, Y=56.0%). Largest influence on backfat thickness was observed in EL sows. However diameter of loin eye was the same in both breeds. Low backfat thickness, large diameter of loin eye and high lean meat percentage showed H breed (X1=10.8mm, X3=10.8mm, X2=49.6mm, Y=62.4%) and its combination H x LW (X1=13.0mm, X3=13.9mm, X2=47.8mm, Y=59.8%). Year had a significant influence on all traits. Significantly lower backfat thickness, larger diameter of loin eye and lean meat percentage were observed in autumn. To improve local pig's carcass quality, coloured breeds must be use.

Introduction

Whether the acceptable pig carcass is fat or lean depends much upon national predilection. As industrialisation develops, the desire for lean meat appears to dominate the definition of carcass quality (Whittemore, 1996).

Different methods to estimate meat content of breeding stock have been used during the times. One way is ultrasonic measurements on the live animal, which is now being used as an aid in selection in several countries (Stern, et al., 1997, Džiaugys et al., 1998). In Estonia the measuring of live pigs meat characters ultrasonically started in 1994, since then a discussion about objectivity of ultrasound measuring is being discussed amongst pig breeders. As ultrasound equipment (Piglog 105) is in use for breeding purposes, it is necessary to analyse results by using biometrical methods.

This study is a basis for a more detailed investigation of meat characters of live pigs and carcass quality in different breeds. Purpose of this work was to compare meat characters of live pigs (by Piglog 105) in different breeds and crosses and investigate the effect of year and season on meat characters.

Material and Methods

6538 gilts reared at 40 farms over Estonia were measured by using ultrasound equipment Piglog 105 during 1996...1997. The breeds taken under observation were: Estonian Landrace (EL), Large White (LW), Hampshire (H) and their crosses: H♂ x LW♀, LW♂ x EL♀, EL♂ x LW♀, LW♂ x (EL/LW)♀. The following traits were measured by ultrasonically backfat thickness at last (X1) and 11...10th (X3) rib, 7 cm from midline (mm), and diameter of loin eye (X2), 7 cm from midline (mm) (Figure 1).

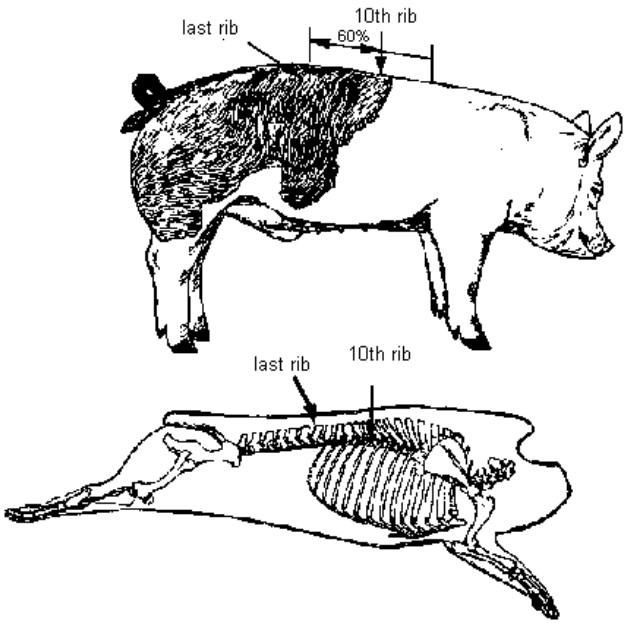

Figure 1. Points to measure backfat

Lean meat percentage (Y) was calculated by formula:

$$Y = 64.39 - 0.28X1 + 0.14X2 - 0.55X3$$

In addition, there were registered gilts weight, testing date and farm, where testing weight was 85...115 kg. The testing year was divided into four parts: spring - March, April, May, summer - June, July, August, fall - September, October, November and winter - December, January, February.

Table 1. Overall means and standard deviations for growth and meat traits in live pigs

Variable	Unit	Mean	Standard deviation
Testing weight	kg	98.43	9.37
X1	mm	15.6	3.03
X2	mm	46.9	5.32
X3	mm	15.7	2.91
Y	%	57.8	2.46

Least-square means were calculated for all breed combinations, years and seasons. The General Linear Model (GLM) procedure was used for analysing the dataset by analyses of variance (SAS Inst. Inc., 1988). Following model was used:

$$Y_{ijkn} = \mu + B_i + A_j + S_k + e_{ijkn}$$

where

Y_{ijkn} = dependent variable
μ = general mean
B_i = effect of breed (1...7)
A_j = effect of year (1, 2)
S_k = effect of season (1...4)
e_{ijkn} = random residual effect

Level of significances is expressed conventionally : a, b, c, d - least-square, within each effect with one letter in common do not differ significantly.

Results and Discussion

Means and standard deviations for the analysed traits are presented in Table 1. Live weight at testing was 98.43 kg and lean percentage in live pigs averaged 57.8 %.

Highest backfat thickness and lowest lean meat percentage were calculated for EL (X1=18.7 mm, X3=18.1 mm, Y=55.7 %) and LW♂ x EL♀ (X1=18.4 mm, X3=17.7 mm, Y=56.0 %) (Table 2). The strongest influence on backfat thickness was observed in EL sows. However diameter of loin eye was the same in both breeds. Low backfat thickness, large diameter of loin eye and high lean meat percentage showed H breed (X1=10.8 mm, X3=10.8 mm, X2=49.6 mm, Y=62.4 %) and its combination H x LW (X1=13.0 mm, X3=13.9 mm, X2=47.8 mm, Y=59.8 %).

Table 2. Least-square means for meat characters in live pigs

Traits	Breed combination (♂ x ♀)						
	LW x LW	EL x EL	H x H	H x LW	LW x EL	EL x LW	LW x (EL/LW)
	n= 5597	722	6	10	38	143	22
X1 mm	15.9^{a}	18.7^{b}	10.8^{c}	13.0^{c}	18.5^{b}	17.0^{d}	16.4^{ad}
X2 mm	45.8^{a}	46.4^{ab}	49.6^{b}	47.8^{ab}	46.6^{ab}	47.0^{b}	47.7^{b}
X3 mm	16.3^{a}	18.1^{b}	10.8^{d}	13.9^{d}	17.7^{bc}	17.5^{bc}	16.5^{ac}
Y %	57.4^{a}	55.7^{b}	62.4^{d}	59.8^{d}	56.0^{bc}	56.6^{cd}	57.4^{ad}

The majority of investigations into carcass characters have shown that these - to the extent that they are hereditary - largely depend on additive gene action. Thus, they show in general intermediate inheritance. Most researchers have agreed that meat characters are hardly influenced by inbreeding and crossbreeding (Skarman, 1965). As shown in Table 2, there is only slight difference between pure- and crossbreed pigs on backfat thickness. Except for Hampshire breed, which is known as a meatiness type of pigs (Whittemore, 1996). Crossing with Hampshire will decrease backfat, but it does not have large influence on diameter of loin eye. Due to lower backat thickness we found significantly higher lean meat percentage (59.8 %) in HxLW cross. Skarman (1965) also reported, that only slight and generally not significant differences between purebred and crossbred pigs existed. Sometimes the crossbred and sometimes the purebred pigs were slightly better.

Year had a significant influence on all traits. As shown in Figure 2, during the years backfat has been decreasing, whereas loin eye and lean meat percentage has been increasing. These results were achieved by using ultrasound data as one part in selection program of breeding stock. Large influence on improving local pig meat characteristics had also imported superior pigs. Lean meat percentage was 1.2 % higher in 1997 than in '96.

According to Pearson (1981), the backfat decreasing by 1 mm increases lean meat 1.25...2.00 %. Timmi and Mölder (1995) and Džiaugys et al. (1998) reported, that Piglog 105 could be effectively used to estimate meat characters.

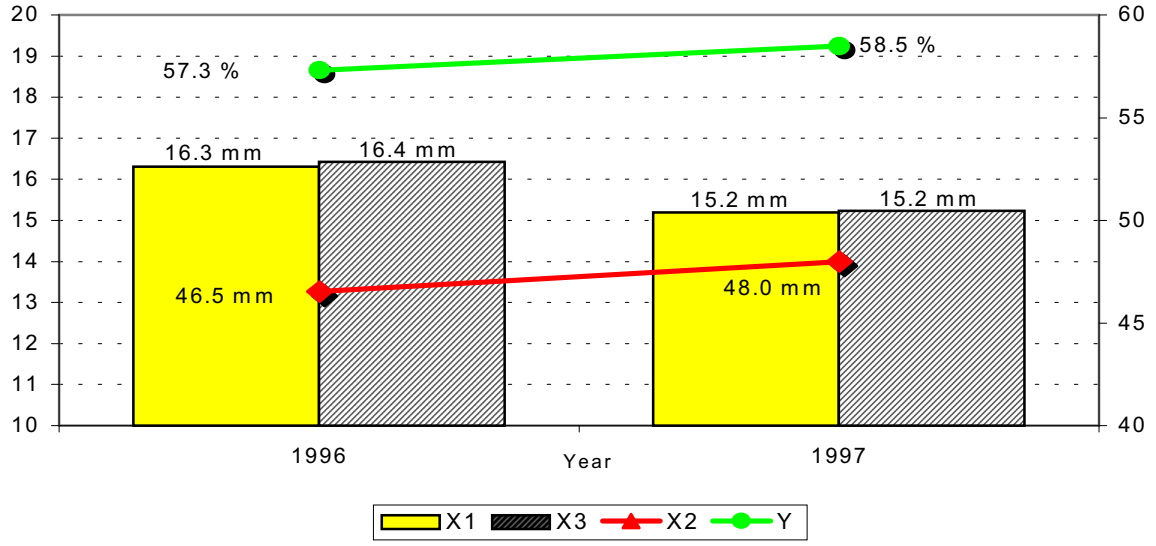

Figure 2. Trend of meat characters in 1996...97

Significantly lower backfat thickness, larger diameter of loin eye and higher lean meat percentage were found in autumn (Table 3).

Table 3. Effect of season on meat characters of pigs

Traits	Season			
	winter	spring	summer	fall
	n= 1564	1493	1439	2042
X1 mm	15.8[a]	15.8[a]	16.0[a]	15.4[b]
X2 mm	46.8[c]	47.2[a]	47.3[a]	47.7[b]
X3 mm	15.9[a]	15.9[a]	16.0[a]	15.5[b]
Y %	57.8[a]	57.8[a]	57.8[a]	58.2[b]

Reasons for such kind of effect could be warmer climate or insufficient feeding in rearing period. This question should be taken under consideration in following research projects.

Conclusions

Crossbreeding had only slight effect on meat characters, compared with purebred ones. Most traits were intermediate, compared with used breeds.

To improve local pig's meat characters' quality, coloured breeds must be used as third breed in crossbreeding.

Using ultrasound data in selection and imported pigs for breeding has decreased backfat thickness and increased leanness of local breeds.

More studies are needed to explain significantly lower backfat and higher leanness in fall.

Complete study must take place to find relationships between meat characters taken by ultrasound equipment and carcass traits.

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