FACTORS AFFECTING PERFORMANCE OF GILTS

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Introduction

The number of piglets in litter is an important trait to achieve economic success. Different breeds vary by litter size; breeders must carefully select breeds to realize heterosis. To select breeding gilts, it is important to consider all information a breeder has because the characteristic data about gilts are limited.

The aim of the research was to analyse different factors affecting the litter size of gilts.

Material and Methods

2389 gilts were raised in 41 farms over Estonia at 1998 to 2003. The gilts average litter size at birth was 10.45 piglets and length of pregnancy 115.78 days. The gilts were inseminated at 180 to 290 days of age. Paterson (1989) recommended management strategy, by witch gilts are mated at about 200 days of age with a body weight of >100 kg.

Table 1. Characterization of the analyzed dataset (n = 2389)

Traits	Mean	Std. Dev.	Min.	Max.
Piglets born alive, no.	10.45	1.83	5.00	14.00
Mating age, days	233.62	23.79	180.00	290.00
Gestation length, days	115.78	1.69	110.00	122.00
Live weight at test, kg	100.55	8.95	85.00	125.00
Gilt X1, mm	13.36	2.48	7.00	20.00
Gilt X2, mm	52.92	5.25	39.00	69.00
Gilt X3, mm	13.45	2.28	7.00	21.00
Gilt Y, %	60.66	2.09	54.08	68.24

Dataset was obtained from of Animal Recording Centre and included breed, sex, birth and testing date, weight, backfat thickness, area of loin eye and lean meat percentage, insemination and fertility data on gilts and their parents which was collected by PC program DB-Planer.

Gestation length was divided into three classes - 110…114, 115…117 and 118…122 days.

Meat traits were measured by ultrasonic equipment Piglog 105. Meat traits recorded were: backfat thickness at last (X1) and 11...12th (X3) rib, 7 cm from midline (mm), and diameter of loin eye (X2), 7 cm from midline (mm). Lean meat percentage (Y) was calculated using the formula (Piglog 105, 1991).

Calculating the effect of breed combination and gestation length on litter size of gilts, the following general linear model (GLM) was used (SAS, 1991):

$$\mathbf{Y_{ijkem}=\mu+T_i+M_j+K_k+S_e+A_m+P_n+e_{ijkem}},$$

Y= dependent variable;
μ = general mean;
T_i = breed combination (n=1...5);
M_j = insemination year (n=1...6);
K_k = insemination season (n=1...4);
S_e = gestation length classes (n=1...3);
e_{ijkem} = random residual effect

Calculating the effect of insemination traits and gilt breed on gestation length, the following GLM model was used:

$$\mathbf{Y_{ijkem}=\mu+T_i+M_j+K_k+S_e+A_m+P_n+e_{ijkem}},$$

Y= dependent variable;
μ = general mean;
T_i = gilt breed (n=1...3);
M_j = insemination year (n=1...6);
K_k = insemination season (n=1...4);
S_e = insemination method (n=1...2);
e_{ijkem} = random residual effect

Calculating the effect of breed and technician on meat traits of live gilts, the following GLM model was used:

$$\mathbf{Y_{ijklemn}=\mu+T_i+M_j+K_k+S_e+A_m+P_n+e_{ijklemn}},$$

Y= dependent variable;
μ = general mean;
T_i = gilt breed (n=1...3);
M_j = technician (n=1...7);
K_k = test year (n=1...6);
S_e = test season (n=1...4);
F_l = farm (1...41);
W_m = weight at test;
$e_{ijklemn}$ = random residual effect

The results are given as least-square means (Parring *et al.*, 1997). Level of significances expressed conventionally: *** - P<0.001, ** - P<0.01, * - P<0.05, # - P<0.1. a, b, c … – least square, within each effect with one letter in common do not differ significantly.

Results and Discussion

Usually farmers feed gilts intensively to prepare them for lactation period. According to the results, this could slightly decrease the litter size on the first parity as backfat thickness and number of live piglets in litter are negatively correlated (Table 2). Rozeboom's (1996) results agreed with these results, where body composition at first mating did not affect litter size of primiparous sows. As expected, meat traits were significantly correlated. Gilts with thin backfat had somewhat larger loin eye. Cleveland (1988) concluded, that selection for lean growth should have little effect on litter size, but may have beneficial effect on carcass traits.

Table 2. Phenotypic correlations between meat and fertility traits

Traits	Gilt Y	Gilt X3	Gilt X2	Gilt X1
Piglets born alive	0.041*	-0.036#	-0.005	-0.064**
Gilt X1	-0.827***	0.725***	-0.165***	
Gilt X2	0.511**	-0.172***		
Gilt X3	-0.904***			

Due to heterosis effect, achieved through crossbreeding, significantly larger litters were found on EL and ELW gilts crossed with white boars (Tabe 3). Number of piglets in purebred litters of EL and ELW gilts was about same – 10.43 and 10.36 respectively. Significantly smaller litters were found in purebred P gilts.

Gestation length does not affect litter size significantly, although somewhat larger litters were found on gestation length 115...117 days.

Gestation length was highly influenced by insemination method, being longer in artificial insemination (Table 4). Significant breed effect was calculated on gestation length as well. Pietran gilts had shorter gestation period (115.03 days) than white breeds, whose gestation was shorter in Estonian Landrace breed (115.66 days). Gilts, inseminated in fall, had much longer gestation, than those inseminated in other seasons and shortest gestation was found in spring and summer.

Table 3. Effect of breed combination and gestation length on litter size of gilts

Traits	n	piglets born alive, no.
Piglets breed		
EL	656	10.43a
ELW	1150	10.36a
P	39	8.99c
EL♀ x ELW♂	404	10.69b
ELW♀ x EL♂	140	10.76b
Gestation length, days		
110…114	511	10.19a
115…117	1538	10.32a
118…122	340	10.22a

Table 4. Effect of insemination traits and gilt breed on gestation length

Traits	n	Gestation length, days
Insemination method		
Artificial	560	115.94a
Natural	1829	115.22b
Gilt breed		
EL	797	115.66a
ELW	1553	116.04b
P	39	115.03c
Insemination season		
Winter	699	115.62a
Spring	671	115.34b
Summer	487	115.47ab
Fall	532	115.89c
Insemination year		
1998	67	114.82a
1999	474	115.41b
2000	559	115.65c
2001	618	115.69cd
2002	548	115.87de
2003	123	116.03e

Gestation length increased from 114.82 days in 1998 to 116.03 days in 2003. One reason for this could be wider use of artificial insemination of pigs.

Pietran and Estonian Landrace gilts, whose lean meat percentage was over 6% had superior meat quality (Table 5).

Table 5. Breed effect on meat traits of gilts

Traits	Gilt breed		
	EL	ELW	Pi
n	797	1553	39
X1, mm	13.36a	13.83b	13.85a
X2, mm	50.70a	50.16a	56.81b
X3, mm	13.16a	14.02b	13.51ab
Y, %	60.51a	59.83b	61.04a

Landrace pigs had thinner fat, but showed modest results in diameter of loin eye, compared with Pietrain gilts who were a little fatter, but with large loin eye. The worst results were shown by Estonian Large white breed. Superiority of Landrace breed was found also by Tummaruk *et al.* (2000).

Lean meat percentage, measured by different technicians, differed about 4% (Table 6).

Table 6. Technician effect on meat traits of gilts

Traits	Technician						
	A	B	C	D	E	F	G
n	776	488	373	582	143	18	9
X1, mm	13.66abc	12.02ac	15.49bd	13.34ab	14.10cd	11.88ac	15.25abc
X2, mm	55.03a	53.57ac	50.99ad	55.29a	53.88bcd	48.32bd	50.82bcd
X3, mm	13.74abc	11.40ac	16.05b	13.63abc	13.85ab	11.19c	15.10b
Y,%	60.71a	62.26a	58.36b	60.90a	60.37ab	61.67ac	58.93bc

Technician F measured the thinnest backfat and the smallest diameter of loin eye. Fatter were the gilts with technician C and loin eye was larger with technicians A and D.

Conclusions

Meat traits (backfat thickness and diameter of loin eye) do not affect litter size of gilts and they are not closely related to each other.

Large difference between white and colour breeds on litter size, whereas crossing white breeds give larger litters in the first parity.

Insemination method and gilt breed affect gestation length highly. Gestation length increases year by year.

Differences between colour meat type breeds and white breeds will decrease.

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