

## Differences in piglets sex proportion in litter and in body weight at birth and weaning and fattening results

## Różnice w proporcji płci prosiąt w miocie i masie ciała przy urodzeniu a efekty ich odchowu i wyniki tuczu

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### Abstract

The aim of the study was presentation the differences in piglets sex proportion in litter and its effect weaning and fattening results. The study was carried out on 133 piglets belonging to 10 litters being progeny of PLW breeding sows and PL boars. Individual piglets growth rate from 1 to 28 day and also during fattening period were recorded. Obtained results were statistically analysed including sex proportion. It was showed that in litters was born more gilts (54.89%) than boars (45.11%). Results of weaning piglets to 28 day of life showed higher survival rate of gilts during the weaning period (87.67% vs. 76.67%). Gilts were born heavier as compared to boars (1.35 kg vs. 1.23 kg) and during fattening they achieved higher body weight than barrows (104.48 kg vs. 101.17 kg) ( $P \leq 0.05$ ).

**Keywords:** birth weight, fattening performance, piglet, pigs, sex, survival rate

### Streszczenie

Celem badań było wykazanie różnic w proporcji płci prosiąt w miocie i masie ciała przy urodzeniu na efekty ich odchowu i wyniki tuczu. Badania przeprowadzono na 133 prosiątach z 10 miotów loch zarodowych rasy wbp i knurów rasy pbz. Określano indywidualny wzrost prosiąt od 1 do 28 dnia oraz później w trakcie tuczu. Uzyskane wyniki zestawiono i opracowano statystycznie z uwzględnieniem proporcji płci. Wykazano, iż w miotach więcej rodziło się loszek (54.89%) niż knurków (45.11%). Wyniki odchowu prosiąt do 28 dnia życia wykazały wyższą przeżywalność loszek w okresie odchowu (87.67% vs. 76.67%). Loszki w porównaniu z knurkami rodziły się z wyższą masą ciała (1.35 kg vs. 1.23 kg) i osiągnęły wyższą masę ciała w okresie tuczu niż wieprzki (104.48 kg vs. 101.17 kg) ( $P \leq 0.05$ ).

**Słowa kluczowe:** masa ciała, płeć prosiąt, przeżywalność, świnie, tucz

### Streszczenie szczegółowe

W tabeli 1 przedstawiono liczbę ocenianych prosiąt ich płci i przeżywalność w okresie do odsadzenia. Łącznie oceniono 133 prosiąta, w tym 73 loszki (54.89%) i 60

wieprzków (45.11%). Do odsadzenia w 28 dniu życia pozostało 64 loszki (58.18%) i 46 wieprzków (41.82%), łącznie 110 prosiąt. Wyższą przeżywalnością od urodzenia do odsadzenia cechowały się loszki (87.67%) wobec wieprzków (76.67%).

Masę ciała prosiąt i tempo wzrostu w okresie odchowu przedstawia tabela 2. Loszki w porównaniu z wieprzkami cechowały się wyższą masą ciała przy urodzeniu (odpowiednio: 1.35 kg vs. 1.23 kg;  $P \leq 0.05$ ). Masa ciała przy odsadzeniu była zbliżona u prosiąt obu płci.

W tabeli 3 przedstawiono wyniki masy ciała i tempo wzrostu w okresie tuczu. Masa ciała zwierząt przy rozpoczęciu tuczu była wyrównana między grupami loszek (22.02 kg) i wieprzków (21.30 kg). Wykazano statystycznie istotne różnice pomiędzy loszkami a wieprzkami w masie ciała po 1 miesiącu tuczu (odpowiednio: 44.59 kg vs. 43.00 kg) i po 2 miesiącach tuczu (odpowiednio: 71.22 kg vs. 69.30 kg) ( $P \leq 0.05$ ). Na końcu tuczu loszki osiągnęły wyższą masę ciała niż wieprzki (odpowiednio: 104.48 kg vs. 101.17 kg) ( $P \leq 0.05$ ). Różnice dla danej cechy pomiędzy loszkami a wieprzkami na początku tuczu wynosiły tylko 0.71 kg i zwiększyły się do 3.31 kg na końcu tuczu. Średnie przyrosty dobowe loszek i wieprzków w okresie tuczu, jak i przyrosty od urodzenia do końca tuczu u obu grup były zbliżone. Loszki w okresie tuczu wykazywały nieco lepsze tempo wzrostu niż wieprzki (od 10 g/dzień do 48 g/dzień). Tucz trwał średnio 93.81 dni i kończył się przy osiągnięciu wieku około 154 dni życia.

## Introduction

The number of born gilts in litter is the significant factor in assessing of sows' reproductive performance, because it is more profitably when is born more gilts than boar piglets in litters (Rekiel and Wojtasik, 2010). Orzechowska, et al. (2002) attributed the more gilts in litter to mothers' properties, which have been born in litters with a greater participation of gilts. While Górecki (2003) provides that on sex ratio affect litter size, because in large litters is born more gilts. Significant influence may also have a season of year at birth the sows. Females born from March to August farrowed more gilts in their litters (Górecki, 2003).

Rekiel, et al. (2011) and Walkiewicz, et al. (2000) have demonstrated that gilts which are from the litter with a greater female sex proportion than 50%, received better results in reproduction. Bocian, et al. (2010a) have demonstrated that more gilts was born in litters of primiparous than multiparous sows. In other research there have been observed a higher percentage of gilts born in Landrace's litters than in Polish Large White (Bocian, et al., 2010b).

The benefits issued from predominance of gilts over the barrows are the result of higher fattening value and higher slaughter value of gilts and these raise the efficiency of pig production (Knecht, et al., 2009).

The aim of the study was to determine the effects of sex ratio in litter and of birth weight on rearing until weaning and on fattening results.

## Material and methods

The study was conducted on 133 piglets, two-breed hybrids (PLW x PL), including: 73 gilts and 60 barrows. Piglets were from 10 litters of Polish Large White breeding sows and Polish Landrace boars. Piglets were weighed individually at birth and at weaning on 28 days. From 7<sup>th</sup> day of life piglets have permanent access to the

complete food mix (13,44 MJ ME and 17,15% digestible protein in 1 kg of feed). The survival of piglets were calculated from birth to weaning (28 days).

The weaned piglets remained for next 7 days in farrowing pens, then they have been moved to collective pens for 20-30 individuals where they were for entire fattening period. Controlled fattening of animals have been started in age of 60 days. Weaner piglets and fatteners were fed *ad libitum* from automatic feeder using complete mix which used in the farm according to Standards of Pigs` Feed (1993). Pens were equipped with automatic drinkers. Fattening course was controlled by individual monthly weighing until the end of fattening (about 154 days).

The results have been assessed statistically, when calculating for each features the arithmetic mean ( $\bar{x}$ ) and standard deviation ( $s$ ). Significance of differences between groups has been estimated using test  $t$ . The calculation was carried out with the aid of a computer program STATISTICA 8 PL (2008).

## Results and discussion

Table 1 presents sex and the number assessed piglets and their survival in the rearing period. Overall assessed 133 piglet, including 73 gilts (54.89%) and 60 borrows (45.11%). At weaning on day 28 life remained 64 gilts (58.18%) and 46 borrows (41.82%), overall 110 piglets. Gilts received higher survivability from birth to the weaning gilts (87.67%) towards barrows (76.67%).

Table 1. Number of pigs at birth and at weaning and piglet survival (%)

Tabela 1. Liczebność prosiąt (n) i ich przeżywalność w trakcie odchowu (%)

Item - Cecha	Sex - Płeć		Differences ♀- ♂
	♀	♂	Różnice ♀- ♂
Number of pigs (n)			
Liczba prosiąt (n)			
- at birth (1 day)	73 (54.89%)	60 (45.11%)	13 (9.78%)
- przy urodzeniu (1 dzień)			
- at weaning (28 day)	64 (58.18%)	46 (41.82%)	18 (16.36%)
- przy odsadzeniu (28 dzień)			
Piglet survival (%)	87.67 %	76.67 %	11.00 %
Przeżywalność prosiąt (%)			

Likelihood of sex determination at the time of fertilization is the same for gilts and boar piglets. In carried out by Orzechowska, et al. (2002) an analysis of breeding documentation of Polish Large White sows and of 990 line sows, they have proved that 90 to 95% of litters was characterized by similar gender proportion 1:1. However, in conditions of large intrauterine crowding density of fetuses caused by a large number of ovulated eggs and insufficient uterus space, lead to death of the embryos

and fetuses (Foxcroft, et al., 2006; Vallet and Freking, 2005). Chen and Dziuk (1993) have demonstrated that male sex individuals are more susceptible to death as the fetuses because they require for development more uterus space than females. A dominance of gilts over boar piglets increases together with an increase of litter size.

Table 2 present body weight of piglets and growth rate during the rearing period. Gilts as compared to the barrows had higher body weight at birth (respectively: 1.35 kg vs. 1.23 kg;  $P \leq 0.05$ ). Body weight at weaning was similar for both gender.

Table 2. Body weight (kg) and growth rate until weaning (g/day)

Tabela 2. Masa ciała (kg) i tempo wzrostu w okresie odchowu prosiąt (g/dzień)

Item - Cecha	Sex - Płeć		Differences ♀-♂ Różnice ♀-♂
	♀	♂	
Body weight (kg)			
Masa ciała (kg)			
- at birth (1 day)	1.35 <sup>a</sup> ± 0.31	1.23 <sup>b</sup> ± 0.33	0.12
- przy urodzeniu (1 dzień)			
- at weaning (28 day)	6.90 ± 1.21	6.68 ± 1.31	0.22
- przy odsadzeniu (28 dzień)			
Av. daily gain (g/day)			
Średnie przyrosty dobowe (g/dzień)			
- from 1 – 28 day	196 ± 37	192 ± 40	4
- od 1 do 28 dnia			

Means in the same row with different letters are significantly different: a, b ( $P \leq 0.05$ )

Wartości w wierszach oznaczone różnymi literami różnią się istotnie: a, b przy  $P \leq 0,05$

According to Kuhn et al. (2002), Rehfeldt and Kuhn (2006) and Roehe (1999) the average weight piglets at birth should be from 1.3 to 1.5kg. In that research we have been obtained a similar result for gilts, while the weight at boar piglets at birth was substantially lower.

In many research (Bocian, et al., 2011; Milligan, et al., 2002a, 2002b; Rehfeldt and Kuhn, 2006) there was shown a negative relationship between low body weight of piglets at birth and their survival ability to weaning. The results obtained in this research are similar to those data and pointed out a negative effect of low body weight of piglets at birth on their subsequent growth and the efficiency of fattening. The impact of piglets' body weight at birth remains visible until the slaughter of animals (Roehe, 1999) and involves also a poorer quality of carcass and meat (Gondret, et al., 2005; 2006).

In Table 3 are presented the results of body weight and the growth rate in the fattening period. Body weight of animals at the start fattening was similar between groups of gilts and barrows.

Table 3. Increase of body weight during fattening period (kg) and daily gain (g/day)  
Tabela 3. Przyrost masy ciała w trakcie tuczu (kg) i przyrosty dobowe (g/dzień)

Item - Cecha	Sex - Płeć		Differences ♀-♂ Różnice ♀-♂
	♀	♂	
Number of pigs (n) Liczba tuczników (n)	64	46	18
Body weight (kg) Masa ciała (kg)			
- at beginning the fattening (60 days) - przy rozpoczęciu tuczu (60 dni)	22.02 ± 3.20	21.30 ± 3.28	0.72
- after 1 mo (90 days) - po 1 m-cu tuczu (90 dni)	44.59 <sup>a</sup> ± 3.83	43.00 <sup>b</sup> ± 4.09	1.59
- after 2 mo (120 days) - po 2 m-cu tuczu (120 dni)	71.22 <sup>a</sup> ± 4.08	69.30 <sup>b</sup> ± 4.65	1.92
- at finish (153-154 days) - (po zakończeniu tuczu (153-154 dni)	104.48 <sup>a</sup> ± 7.72	101.17 <sup>b</sup> ± 9.79	3.31
Av. daily gain (g/day) Średnie przyrosty dobowe (g/dzień)			
- fattening 1 mo - za 1 m-c tuczu	753 ± 83	723 ± 79	30
- fattening 2 mo - za 2 m-c tuczu	887 ± 81	877 ± 76	10
- fattening 3 mo - za 3 m-c tuczu	1110 ± 180	1062 ± 269	48
- total fattening period - za cały okres tuczu	878 ± 72	856 ± 96	22
Growth rate from birth to slaughter (g) Przyrosty od urodzenia do końca tuczu (g)	669 ± 47	651 ± 61	18

Fattening period, days Okres tuczu, dni	94.13 ± 2.60	93.37 ± 2.65	0.76
Age at finish, days Wiek w dniu zakończenia tuczu, dni	154.22 ± 2.63	153.47 ± 2.64	0.75

Means in the same row with different letters are significantly different: a, b ( $P \leq 0.05$ )

Wartości w wierszach oznaczone różnymi literami różnią się istotnie: a, b przy  $P \leq 0,05$

Significant differences of body weight in gilts and barrows groups appeared already after the first month of fattening and lasted until its end. Gilts were characterized by greater final body weight as compared to barrows ( $P \leq 0.05$ ). The growth rate expressed by daily weight gain, however, was not statistically significantly different for both groups of animals. Fattening period for gilts and barrows, as well as the age at slaughter, was the same.

Most of researchers present the differences in the fattening period between gilts and barrows as a rule. Gilts at feeding *ad libitum* have better feed conversion rate, show somewhat smaller live weight increase and lower final body weight. They are characterized by lower fatness and greater musculature (Eckert and Orzechowska, 2002; Knecht, et al., 2009). However, in this experiment an animal material were from large size litters and piglets had low weight at birth, particularly in the group castrated boars, and these facts, might to affect the results of rearing and fattening period.

## Conclusions

In summary, it should be stressed that in large size litters more gilts was born than boars. Concomitantly, all piglets had low birth weight, but males had lower body weight than females, and they had lower survival ability till weaning.

During the same fattening period the females attained higher body weight than male castrates.

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