Relationships between placenta weight and fatness of body weight of high-pregnant sows and the selected reproduction indicators

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The aim of the studies was to determine the relationship between the placenta weight and fatness of the sows in late pregnancy, their body weight and reproduction indices. The evaluation covered 89 F1 sows (PLW x PL) and their progeny. The high-pregnant sows (104 ±2 days) were weighed; fatness of animals (points: P1, P2, P3 and P4) and height of *musculus longissimus dorsi* (MLD) was determined (P4M). The reproduction results were controlled: the number of totally born, still born and alive piglets, weight of litter and piglet at birth and weight of placenta. Depending on the placenta weight (group I ≤3.2 kg, II – 3.3-4.1 kg and III ≥4.2 kg), the results of reproduction performance of the sows were compared. In group III as compared to II and I, fatness and body weight of the sows and reproduction results, expressed as number of the piglets in the litter and weight of the litter, were significantly higher (P≤0.05 or P≤0.01). The correlation coefficients between placenta weight and fatness, height of MLD and body weight of high-pregnant sows were positive but statistically insignificant. Significant positive correlations (P≤0.01) were demonstrated between the placenta weight and the number of piglets born in total and born alive in the litter and their weight. It was determined that the lower the placenta weight per one piglet born in total was, the higher was the number of still born piglets (r =−0.325, P>0.05). The results of own studies indicate the role of the placenta weight in shaping the number of piglets born and the weight of the newborn animals.

KEY WORDS: sows / placenta weight / body weight / backfat thickness / reproduction

Fatness and body weight of the sows are subject to dynamic changes in reproduction cycle; lipid reserves decrease and body weight becomes increased [2, 16]. The relationships between fatness, body weight and reproduction functions and reproduction parameters were confirmed in many studies [1, 2, 3, 4, 6, 8, 9, 10, 12, 15, 17]. Mesa et al. [11] and van Rens et al. [21] showed also the relationship between body weight, degree of blood supply and area of placenta and the number and quality of the piglets born in the litter. As it was reported by Mesa et al. [11], the mentioned relationships constituted, in some coun-

tries, the premise for introduction of the traits connected with the placenta, i.e. its weight and degree of blood supply into selection indices. When evaluating the degree of blood supply, 5-score scale was used; the lowest degree of blood supply in this scale is expressed as 1 and the highest one – as 5. In Poland, there are scarce studies concerning the relationship between the weight of placenta and production results of the sows [7, 20]. During the recent years, the reproduction potential and real fertility and fecundity of the sows have been considerably changed [14, 23]; therefore, it seems that determination of physiological--productive relationships in the presently managed sows of maternal breeds is justified.

The aim of the research was to determine the relationship between the placenta weight and fatness of high-pregnant sows, their body weight and basic reproduction parameters.

Material and methods

The evaluation included 89 multiparous sows, F1 crossbreds of Polish Large White and Polish Landrace breeds and their progeny, being managed according to the requirements of welfare [5] and fed according to the standards [13]. During the research period, i.e. since 104th day of gestation up to weaning of piglets on 21st day, the sows were kept in three-part pens and were fed the full-ration mixture for suckling sows; 1 kg of the mixture contained 12.7 MJ ME, 17% of protein and 1% of lysine. Since the 5th day of life, the piglets were additionally fed the prestarter mixture (13.5 MJ ME, 19.9% of protein, 1.53% of lysine). The sows and the piglets were covered with the veterinary supervision and prophylactic programme.

On the 104th day of gestation (±2 days), the sows were weighed and then, backfat thickness on the back and height of loin "eye" was measured, using ultrasonic apparatus Pig-log 105. The backfat was measured in the following points: P1 – over the shoulder, in distance of 3 cm from medial line of the back; P2 – on the height of the last rib, in distance of 3 cm from medial line of the back; P3 – on sacrum, 3 cm from medial line of the back; P4 – on the height of the least rib, in distance of 8 cm from medial line of the back. The height of loin "eye" (point P4M) was measured behind the least rib at the distance of 8 cm from the medial line of the back. The following reproduction results were controlled: the number of totally born, alive and still born piglets, weight of the litter and piglet at birth and placenta weight. Depending on the placenta weight, the sows were classified in three groups: group I – placenta weight ≤3.2 kg; group II – 3.3-4.1 kg and group III ≥4.2 kg.

The results were statistically developed, using the single-factor variance analysis with the utilization of the least square method. For calculations, statistical package SPSS was employed [19]. Pearson's correlations between placenta weight and fatness of the sows and their body weight, height of loin "eye" and the selected reproduction indicators were calculated. The tables contain the least square means and standard errors and the selected significant correlations.

Results and discussion

Body weight of the high-pregnant sows was found within the range of 200.4-254.7 kg; backfat thickness was as follows: point P1 – 27.0-36.0 mm; P2 – 17.1-23.0 mm; P3 –

20.2-30,0 mm; P4 – 20.3-26.2 mm and height of loin "eye" 36.5-45.7 mm. Significant differences (P≤0.05; P≤0.01) in reproduction performance were recorded between the particular groups (Table 1). The number of the piglet born in total and born alive was higher in group III vs. I and II. Weight of the litter differed significantly between groups I, II and III (P≤0.01); it was the highest in group III. The number of the piglets still born was higher in group I as compared to group II (P≤0.05) and III (P≤0.01). The weight of the litter per unit of placenta weight and the number of the piglets per 1 kg of placenta weight were significantly higher (P≤0.01) in group I in comparison to groups II and III.

Table 1

Body weight and fatness of the sows and reproduction results in groups of females differing in the weight of placenta

Specification	Placenta weight (kg)			Se
	≤3.2	3.3-4.1	≥4.2	
	groups			
	I	II	III	
	number			
	24	44	21	
Placenta weight (kg)	2.6	3.8	4.6	0.094
Sow weight (kg)	213.5	215.9	231.3	5.554
Backfat thickness (mm):				
P1	27.42	30.16	31.57	1.120
P2	17.96	19.36	22.14	0.945
P3	22.96[a]	22.84[a]	27.86[b]	1.066
P4	20.83	21.64	23.43	1.042
Height of MLD − P4M (mm)	43.50	42.48	45.52	0.781
Number of born piglets in total (heads)	9.29[A]	10.68[B]	11.43[B]	0.082
Number of alive born piglets (heads)	8.87[A]	10.59[Ba]	11.43[Bb]	0.076
Number of still born piglets (heads)	0.42[aA]	0.09[b]	0.00[B]	0.120
Litter weight − alive born piglets (kg)	14.3[A]	16.7[B]	19.1[C]	0.342
Weight of alive piglet at the day of birth (kg)	1.62	1.59	1.69	0.095
Placenta weight per 1 born piglet in total (kg)	0.29[A]	0.37[aB]	0.41[Bb]	0.010
Litter weight per 1 kg of placenta (kg)	5.54[A]	4.33[B]	4.15[B]	0.138
Number of piglets per 1 kg of placenta (heads)	3.65[A]	2.78[Ba]	2.49[Bb]	0.091

a, b – P≤0.05; A, B – P≤0.01

A positive significant (P≤0.01) correlation between placenta weight and the number of the totally born and alive born piglets and their weight was demonstrated (Table 2). The lower was the weight of placenta per one totally born piglet, the higher the number of the still born piglets was (r=−0.325; P≤0.05).

Table 2

Coefficients of correlation between placenta weight and body weight, fatness (P1, P2, P3 and P4) and musculature (P4M) of the sows and reproduction parameters

Specification	Placenta weight
Body weight of the sows in high pregnancy	0.139
Thickness of backfat of the sows in high pregnancy:	
P1	0.204
P2	0.149
P3	0.168
P4	0.040
Height of MLD of sows in high pregnancy – P4M	0.085
Weight of alive born piglets in litter	0.622**
Number of born piglets in total	0.501**
Number of alive born piglets	0.572**
Number of still born piglets	−0.325

**P≤0.01

In own studies, the relationships between the weight of placenta and the weight and number of the piglets born were demonstrated. The correlation coefficients, as calculated by Gajewczyk et al. [7] indicate that placenta weight may have an influence on weight of the litter and number of born piglets and their growth rate since birth until the age of 3 weeks. The authors revealed positive and significant (P≤0.05) correlations between placenta weight and sow weight before parturition and on the 21st day of lactation. The results of own studies do not confirm univocally the mentioned relationships; the calculated correlation, although being positive, was statistically insignificant. The correlation coefficients between placenta weight and number of the still born piglets, as being reported by Gajewczyk et al. [7] are different than those ones, obtained in own studies. A negative value of correlation coefficient, as being obtained in own studies, indicates that the higher the placenta weight is, the lower the number of the still born piglets is. As it was given by Chen and Dziuk (1993) and Ryan and Vandenbergh (2002), cit. after Rekiel and Wojtasik [18], the necrosis of fetuses decreases together with the increasing life space in uterus. Own and cited results are supplementing each other and are approximate. On the other hand, in the studies of Gajewczyk et al. [7], the number of the totally born and still born piglets was increased together with the increasing weight of placenta. Correlation coefficient between

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placenta weight and the number of the still born piglets, as calculated by the cited authors, was significant and (P≤0.01) was equal to r=0.603. Differences in own results and those ones of Gajewczyk et al. [7] could result from different handling with females during parturition. In the own experiment, deliveries of the sows were found under supervision whereas Gajewczyk et al. [7] did not supply any information on this subject. Management of the sows was also differentiated; in the own experiment, the pregnant sows were kept in individual pens and in the experiment of Gajewczyk et al. [7], the pregnant females were kept in groups (13 animals in pen) The described circumstances could have the effect on index of still births in the comparable experiments and different values of correlation coefficients between placenta weight and the number of still born piglets.

Placenta weight is connected with the weight of the sow at the first mating [11, 22]. It is increased together with age and growing body weight of the sows during the period of performance [7]. In consequence, the increase of body weight and dimensions of reproduction system of multiparas as compared to primiparas is recorded [16]. In the opinion of Gajewczyk et al. [7], the management of the sows has the influence on development and increase of body weight and placenta. Maintaining of the piglets in the industrial farms has more favourable effect on the weight of placenta and the number of the piglets born in the litter as compared to the traditional ones. The cited researchers showed that placenta weight of the sows, coming from industrial management was higher than from the traditional one.

To sum up, it may be stated that fatness and body weight of the sows and reproduction indicators, being expressed as the number of the piglets in the litter and the weight of the litter were significantly higher in group III versus II and I (P≤0.05; P≤0.01). Correlation coefficients between placenta weight and fatness, height of the loin"eye" and body weight of high-pregnant sows were positive but statistically insignificant. Significant (P≤0.01) positive correlations were demonstrated between the weight of placenta and the number of the totally born and alive born piglets in the litter and the weight of the piglets in the litter. The lower was the weight of placenta per one totally born piglet, the higher was the number of the still born piglets (r=−0.325; P>0.05). The results of own studies indicate a significant role of the placenta weight of the sows in shaping the number of the born piglets and the weight of the newborn animals.

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