

Preliminary results of *ad libitum* feeding of diets containing a high amount of fibrous components on the reproductive performance of sows

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ABSTRACT

The experiment was carried out on 33 sows fed low energetic feeds *ad libitum*. Control sows (group I n = 3) were fed restricted with a standard mixture, while up to the 100th day of pregnancy, the sows in groups II (n=10) and III (n=10) received *ad libitum* low energy diets containing a high amount of sugar beet pulp (50%), wheat bran (20%) and grass meal (10%). Animals in group III received the feed mixture for farrowed and nursing sows between days 28-56 of pregnancy.

The reproductive parameters of groups II and III were similar to those of control animals, although daily feed intake during early pregnancy of these sows was higher by about 1 kg (40.6-42.2%, respectively for groups II and III), their energy intake in this period was higher by 15.8-27.9%, while during whole experimental period, only by 5.2-9.3% in comparison with control sows. The sow feeding system did not influence the number of piglets born and weaned or their rearing performance.

The results of the experiment suggest that *ad libitum* feeding of sows using mixtures containing high amounts of dried sugar beet pulp, wheat bran and grass meal can be an alternative to the traditional system of feeding.

KEY WORDS: sows, *ad libitum* feeding, energy concentration

INTRODUCTION

In recent years an increase in sow productivity and improvement in their welfare is observed. Though restricted feeding covers an animal's nutrient requirements, it does not give them satiety because the digestive tract is only 40-60% filled (Petheric and Blackshaw, 1989; Brouns et al., 1995). The permanent feel-

ing of hunger manifests itself in higher activity, aggression, and stress tendencies (Terlouw and Lawrence, 1993). These undesired signs during pregnancy can be much decreased by *ad libitum* feeding with diets containing high amounts of fibre, which prevents excessive energy intake by sows. Much better filling of the digestive tract and satiety are also obtained (Danielsen and Vestergaard, 1999).

Dried sugar beet pulp, the volume of which grows about 4-4.5 times in the digestive tract, seems to be the best source of crude fibre for sows (Danielsen and Vestergaard, 1999). Sugar beet pulp positively influenced glucose and insulin profiles in blood in comparison with grass meal, wheat bran or oat husks (Danielsen and Vestergaard, 1999).

Increased energy intake by sows between days 25-50 of pregnancy can improve the number of muscle fibres in the piglets originating from these sows, which positively influences body weight gain and feed efficiency of fatteners (Dwyer et al., 1994; Penny and Varley, 2000).

In the present experiment, the effect of feeding sows *ad libitum* with diets containing a high amount of dried sugar beet pulp, wheat bran and grass meal on their reproductive performance was estimated.

MATERIAL AND METHODS

Multiparous sows (Polish Landrace x Polish Large White) were divided into 3 groups:

- I – control (13 sows) – restricted feeding between day 1 and 100 day of pregnancy using a diet (M1) containing 11.66 MJ ME, crude protein 12.7%, crude fibre 5.7% and lysine 0.56%. Daily feed intake ranged from 2.5 kg (days 1-90) to 3.5 kg (days 90-100),
- II – experimental (10 sows) – from days 1-100 of pregnancy, the sows were fed *ad libitum* with a diet (M3) containing 9.6 MJ ME, crude protein 12.2%, crude fibre 13.7% and lysine 0.57%,
- III – experimental (10 sows) – from days 1-100 day of pregnancy, the sows were fed *ad libitum* with M3, except between days 28 - 56 of pregnancy, when diet M4 containing, 12.5 MJ ME, crude protein 15.8%, crude fibre 7.2% and lysine 0.77%, was used.

During days 100-114 of pregnancy and then lactation, sows from groups II and III were fed *ad libitum* with diets with similar nutritive values (12.5-12.9 MJ ME and crude protein 15.8-16.5%). Sows from group I received limited amounts of the same feeds.

During the first 28 days of pregnancy the sows were housed in individual cages and then in group pens. All farrowed and nursing sows were kept in farrowing crates.

One-way analysis of variance and multiple range test were used to assess the results.

RESULTS

The results of sows' reproductive performance (Table 1) indicate that experimental sows fed *ad libitum* with low energy diets until day 100 of pregnancy achieved reproductive indexes similar to those of the control group.

After weaning piglets, the average body weight of sows did not significantly differ between groups and ranged from 215 kg in the controls to 224 kg in group III. Body weight gain from mating to weaning ranged from 22 to 27 kg. Significant differences were observed in body weight lost during lactation: 28, 19, and 40 kg, respectively for groups I, II and III.

TABLE 1

Results of reproductive performance of sows

Item	Groups			SEM
	I	II	III	
Body weight at mating, kg	191	191	202	3.61
Body weight at 100 day of pregnancy, kg	244	238	262	5.05
Body weight after farrowing, kg	243	238	264	4.36
Body weight after weaning, kg	215	219	224	4.27
Average body weight gain, kg				
mating – farrowing	52	47	62	2.76
mating – weaning	24	28	22	2.48
Body weight lost during lactation, kg	28 ^{AB}	19 ^A	40 ^B	1.86
Average daily feed intake, kg				
1-100 day of pregnancy	2.56 ^A	3.60 ^B	3.64 ^B	0.04
100-114 day of pregnancy	3.97	4.21	3.87	0.11
1-114 day of pregnancy	2.78 ^A	3.70 ^B	3.66 ^B	0.04
lactation	4.59 ^{bB}	4.06 ^{aAB}	3.74 ^{aA}	0.07
total	3.11 ^A	3.77 ^B	3.67 ^B	0.03
Average daily energy intake, MJ				
1-100 day of pregnancy	29.86 ^{aA}	34.57 ^{bB}	38.19 ^{cB}	0.44
100-114 day of pregnancy	51.20	52.56	52.21	1.06
1-114 day of pregnancy	33.00 ^A	37.18 ^B	40.16 ^B	0.40
lactation	59.26 ^B	50.75 ^A	47.23 ^A	0.85
total	37.93 ^A	39.90 ^{AB}	41.46 ^B	0.32

^{a, b} – P<0.05; ^{A, B} – P<0.01

Sows in groups II and III fed *ad libitum* had a higher daily feed intake in comparison with the control group: by 1.04 kg and 1.08 kg during 100 days of pregnancy, and by 0.66 kg and 0.56 kg over the entire experimental period ($P < 0.01$). During lactation sows from the control group consumed the highest amount of feed (4.59 kg), while the smallest consumption was by sows in group III (3.74 kg). The mean values were significantly different. The biggest difference in energy intake, in comparison with the control group (29.15 MJ/d), was observed between days 28 and 56 of pregnancy and amounted to 32.6% in group II and 74.2% in group III.

Ad libitum feeding of sows did not influence the number of piglets born and weaned or their rearing performance (Table 2).

TABLE 2

Results of piglets rearing, 1-28 days

Item	Groups			SEM
	I	II	III	
Litter size, no	10.1	9.5	10.2	0.38
Mortality, no, %	9.16	5.26	8.82	
Number of weaned piglets in litter	9.16	9.00	9.30	
Average body weight of piglet, kg				
at 1 day	1.59	1.54	1.66	0.04
at 21 day	5.51	5.68	5.64	0.16
at 28 day	6.84	7.03	6.59	0.19
Average daily weight gains, g/d				
1-21 day	196	207	197	6.79
21-28 day	195	194	139	13.29
1-28 day	192	204	180	6.96

DISCUSSION

Sows in groups II and III, fed *ad libitum* with experimental diets, achieved reproductive parameters similar to the control group. The daily feed intake of these sows during early pregnancy was about 1 kg higher (40.6-42.2%, respectively for group II and III), though the energy intake in this period was higher by 15.8-27.9% and during whole experimental period by 5.2-9.3% only in comparison with the control animals.

The obtained results are consistent with the observations of Stewart et al. (1993), Brouns and Edwards (1994), Sadler et al. (1994), Brouns et al. (1995), and Whitaker et al. (2000) who fed sows *ad libitum* using diets with a 50% or higher content of sugar beet pulp.

The significantly lower feed intake observed during advanced pregnancy in group III and during lactation in groups II and III is unexpected. A similar effect was also noticed by Whittaker et al. (2000). This could be a possible result of excess energy intake between days 28 and 56 of pregnancy in comparison with control sows.

In the present experiment, intensive feeding of sows between weeks 4-8 of pregnancy (Dwyer et al., 1994; Penny and Varley, 2000) improved the body weight of the piglets that were born and weaned, but caused undesired weight gain of sows during pregnancy (62 kg) and weight lost during lactation (40 kg), which increased feeding cost.

CONCLUSIONS

The results of the present experiment showed that *ad libitum* feeding of sows in early pregnancy using low energy diets with a high amount of sugar beet pulp, wheat bran and grass meal can be an alternative to the traditional feeding system.

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STRESZCZENIE

Wstępne wyniki badań nad wpływem żywienia loch do woli mieszankami z dużym udziałem pasz włóknistych na wskaźniki reprodukcyjne

W doświadczeniu, przeprowadzonym na 33 lochach, badano wpływ żywienia do woli niskoenergetycznymi mieszankami na wskaźniki reprodukcyjne. Lochy kontrolne (grupa I) żywiono systemem dawkowanym mieszankami pełnoporcjowymi, a doświadczalne (grupy II i III) do 100 dnia ciąży do woli mieszanką niskoenergetyczną o dużej zawartości wysłodków buraczanych (50%) oraz otrąb pszennych (20%) i suszu z zielonek (10%). Maciorom grupy III od 28 do 56 dnia ciąży podawano mieszankę przeznaczoną dla loch wysokoprosnych i karmiących.

Lochy grupy II i III, otrzymujące do 100 dnia ciąży mieszanki doświadczalne, w większości uzyskały wskaźniki reprodukcyjne zbliżone do kontrolnych. Wprawdzie lochy żywione do woli pobrały do 100 dnia ciąży średnio o około 1 kg paszy więcej (40,6-42,2%, odpowiednio w grupach II i III) i zużycie energii w tym okresie było większe o 15,8-27,9%, a w całym okresie doświadczalnym o 5,2-9,3% w porównaniu z kontrolnymi. Sposób żywienia loch nie wpłynął istotnie ani na liczbę urodzonych i odchowanych prosiąt, ani na wskaźniki odchowu.

Na podstawie uzyskanych wyników można sądzić, że mieszanki paszowe o dużej zawartości suchych wysłodków buraczanych, otrąb pszennych i suszu z zielonek, skarmiane do woli, mogą stanowić alternatywę dla tradycyjnego systemu żywienia loch.