

**EFFECT OF LEVEL OF FEEDING ON REPRODUCTIVE
PERFORMANCE OF PRIMIPAROUS SOWS****K. Suomi, T. Alaviuhkola, H. Siljander-Rasi****Abstract**

Mainly Yorkshire primiparous sows (160) were fed on two energy levels from 25 kg to mating: 1.0-2.7 kg (L) or 1.4-3.0 kg/d (H). In group L the daily feed (11.8 MJ ME/kg) allowance was 2.4, 3.5 and 6.4 kg during early and late gestation and lactation. The rations of H-sows were 0.3 kg/d larger. Feeding from weaning to oestrus was 3.7 (L) and 6.7 kg/d (H). In comparison with L-sows, H-sows grew faster (878/720 g/d; $p < 0.001$) before testing (90 kg) and their backfat was thicker (11.7/10.3 mm, $p < 0.001$). The culling rate was higher in the H-group (48.8/37.5 %), the primary cause being leg weakness (H 32.5/L 21.3%). H-sows were younger at puberty than L-sows (199/225 d; $p < 0.001$). Age at puberty correlated negatively with daily weight gain ($p < 0.001$) and fat index (FI, backfat/weight) at testing ($p < 0.01$). Age at mating was (H 209/L 232 d; $p < 0.001$). Litter size and piglet performance were similar in both groups. During lactation H-sows consumed 2 kg less feed than L-sows. After weaning they tended to be fatter than L-sows (P_2 15.9/14.4 mm), but no differences were found in their returning to oestrus. FI at weaning was positively correlated ($p < 0.001$) with that at testing. Based on these data it is suggested that abundant feeding during the rearing period leads to early puberty and farrowing and exhibits the sows' affinity to leg weakness. The total feed intake (25 kg-weaning) was 5.4% higher in H-sows.

Introduction

It is well known that the age of puberty of gilts can be affected by the energy level of feeding during growth. Abundant feeding up to five months of age followed by feed restriction delays oestrus in gilts and decreases the conception rate as compared to gilts fed liberally for the whole growing phase (Hartog and Verstegen, 1990). According to Hartog and Noordewier (1984), a delay was observed in the first oestrus if the restriction was more than

Paper presented at 46th Annual Meeting of European Association for Animal Production, Prague, Czech Republic, September 4-7, 1995.

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30% ad libitum level. High feed consumption during gestation leads to lowered appetite during lactation (Mullan & Williams, 1989). On the other hand, high feed consumption had a favourable effect on the length of the interval between weaning and the next oestrus.

The purpose of the present experiment was to examine how abundant feeding throughout the growing time up to the first gestation and lactation affects the reproductive performance of gilts.

Material and methods

A total of 160 female piglets, with a live weight of about 25 kg, were divided into four groups according to a design of randomized blocks. The treatments were arranged 2x2 factorially. The factors were dietary energy levels, low (L) and high (H), and digestible crude protein levels, 14 and 15%. One piglet per litter was randomly allotted to the four groups. Fifty two per cent of the piglets came from Yorkshire litters, 26% from Landrace litters, and 22% were crossbred. The feed mixtures contained barley and oats (50-50), 2% fish meal, and minerals and vitamins according to Finnish recommended quantities. The two protein levels were achieved by including different amounts of SBM in the diet (14 vs. 17%). The lysine content of the two feeds was 8.3 and 8.5 g/kg, and the energy content was 11.8 MJ ME/kg.

The gilts were fed twice a day. Water was freely available.

The gilts in group L were fed 2.1 times the maintenance requirement, and those in group H received 2.5 times more energy daily than is needed for maintenance. Feed rationing in group L was 1.0 kg daily ration was 2.4 kg, and thereafter 3.5 kg up to farrowing. After farrowing the ration was increased gradually to 6.4 kg/gilt with 10 piglets). After weaning the ration was increased in three days from 2.9 kg to 4.4 kg, this level being maintained until the next oestrus.

The daily ration of the gilts in group H was 0.3 kg higher during each period. However, after weaning, until the next oestrus, the feed allowance was kept at the same level as during lactation.

An on-farm test was done at 90 kg to 4.4 kg, this level being maintained until the next oestrus. The daily ration of the gilts in group H was 0.3 kg higher during each period. However, after weaning, until the next oestrus, the feed allowance was kept at the same level as during lactation.

An on-farm test was done at 90 kg live weight. The index was calculated using on ultrasonic measurements and the age and weight of the gilt. At testing the leg condition and the teats were evaluated, and the gilts with serious defects were culled. Ultrasonics was used after weaning to determine mid back fat thickness of the gilts. Most of the gilts were served. In group L 75.6% of the gilts were served at the first detected heast, and the corresponding figure for group H being 76%.

The farrowings were not supervised. The piglets were weaned at the age of five weeks.

The data was statistically analysed using the GLM procedure of SAS. The effects of the energy and protein levels of the block (litter) and their interaction were used as independent variables in the analysis of variance.

Results and discussion

At no phase were there any differences in performance between gilts fed the 14% dcp diet and those fed the 15% dcp diet. Nor was any protein level x energy level interaction was found either. Below, the results are shown only according to the energy level.

The on-farm test results are shown in Table 1. The gilts in group H had a better daily gain than those in group L ($p < 0.001$), but their back fat was thicker ($p < 0.001$). In any case, the selection index of the H-gilts was slightly better on average than that of group L.

The culling rate was higher in group H than in group L (48.8 vs. 37.5%).

Leg weakness was more frequent in group H (32.5%) than in group L (21.3%). This result agrees with work reported by Nielsen and Danielsen (1984).

Table 1. - THE EFFECT OF FEEDING LEVEL ON GROWTH AND FAT THICKNESS OF GILTS

Feeding level	Low	High	SEM	Significance
Nuber of gilts	80	80		
Daily gain, g	720	878	9.09	***
Backfat thickness, mm	10.3	11.7	0.17	***
Test index	106.3	107.8	0.39	**

SEM=standard error of mean

Statistical significance: *($p < 0.05$); **($p < 0.01$); ***= ($p < 0.001$)

H-gilts reached puberty earlier than L-gilts ($p < 0.001$). The age at puberty was negatively correlated with daily gain ($r = -0.4$; $p < 0.001$). In group H the backfat thickness of the gilts was also negatively correlated with age at puberty ($r = -0.3$; $p < 0.05$), but in group L such a relationship was not found. This is in accordance with results of Hartog and Noordewier (1984), who found, using similar energy levels, a significant negative correlation between fat thickness and age of puberty of gilts fed at a high energy level. At a low level no correlation was observed.

Beltranena et al. (1991) did not notice any negative correlation between fat thickness and the age of gilts at puberty in spite of ad libitum feeding. They found, however, a significant ($p < 0.001$) negative correlation between fat index (FI=backfat thickness/live weight) and the age of the gilts at puberty. They

concluded that gilts come into heat when a certain fat thickness is reached. They also found that restricted feeding or fast weight gain in ad lib. Feeding can slow down the fat accretion of gilts.

Similarly, in the present experiment, a significant correlation was found between FI and the age of gilts at puberty ($r=0.3$; $p<0.01$).

In both groups the number of gilts showing no heat was the same as the number of gilts that did not become pregnant. Six (14.6%) of a total of 41 gilts that farrowed in group H did not become pregnant at first mating. The corresponding figure in group L was 4 (8%). This tendency towards lowered fertility was also noticed by Hartog (1984) in gilts fed at more than 2.5 times the maintenance level.

The litter performance results are shown in Table 2. Energy level did not influence the litter sizes, born or weaned. There were no differences between the groups in the weight of the piglets at birth or at five weeks of age.

The feed consumption of the H-gilts was 18 kg more than that of the L-gilts during the growth period, but 30 kg more during gestation. During lactation the H-gilts did not eat all the feed offered, and they consumed two kilograms less feed than the gilts in the L-group. At weaning the average live weight of the gilts in group H was 7 kg higher than in group L ($p<0.05$). This is in agreement with other reports. Dourmad (1991) reported lower appetite, especially during the first week of lactation, in gilts fed 2.7 kg daily during gestation as compared to gilts fed 1.8 kg daily.

Table 2. - THE EFFECT OF FEEDING LEVEL ON THE REPRODUCTIVE PERFORMANCE OF GILTS

Feeding	Low	SEM	High	SEM	Significance
Number of gilts	50		41		
Age at puberty, d	225	3.318	199	3.756	***
Weight at puberty, kg	130	2.191	131	2.491	NS
Piglets/litter, born alive	10.5	0.498	10.8	0.566	NS
Piglets/litter, at weaning	9.1	0.467	9.4	0.530	NS
Weight of piglet, at birth, kg	1.56	0.037	1.51	0.042	NS
Weight of piglet, at weaning, kg	10.4	0.267	10.0	0.304	NS
Backfat thickness, mm after weaning	14.4	0.542	15.9	0.593	NS
Weight of gilts at weaning, kg	171	2.270	178	2.568	*
Time from weaning to oestrus, d	12.2	1.678	8.4	1.903	NS

SEM=standard error of mean

Statistical significance: NS=non-significant; *=($p<0.05$); **=($p<0.05$); ***=($p<0.001$)

In the present study, weight loss of the gilts during lactation was 12.8 % in group L and 13.6% in group H. Vesseur et al. (1994) have reported delayed

oestrus of gilts that have lost more than 7.5% of their weight during lactation. In the present trial the number of days between weaning and the next heat was quite acceptable and there was no significant difference between groups.

The backfat thickness of the gilts in the H-group was slightly higher than that in the L-group ($p < 0.08$). Whittemore and Morgan (1990) have found that gilts with high fat thickness showed heat sooner after weaning than leaner gilts. In this experiment, the correlation between fat thickness and the number of empty days was not statistically certain. After weaning, the gilts in group H could not eat all their feed, and the total feed consumption from 25 kg weight to weaning was 5.4% higher than that of the gilts in group L.

The results showed that abundant feeding during the growing period promoted the onset of puberty, but also led to leg weakness. High feeding intensity during gestation negatively affected appetite during lactation, and this led to higher weight loss. The weight gain during gestation (H=92 kg, L=85 kg) influenced the weight loss during lactation (H=27 kg, L=25 kg; $r = 0.2$; $p < 0.08$), but the effect did not reach statistical significance.

The results of the present experiment would seem to indicate that abundant energy feeding of gilts is appropriate during the growth period.

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DJELOVANJE RAZINE HRANJENA NA PROIZVODNU PERFORMANCU KRMAČA PRIMIPARA

Sažetak

Uglavnom su jorkširske krmače primipare (160) hranjene na dvije energetske razine od 25 kg do parenja: 1.0-2.7 kg (L) ili 1.4-3.0 kg/d (H). U skupini L dnevna količina hrane (11.8 MJ ME/kg) iznosila je 2.4, 3.5 i 6.4 kg u ranoj i kasnoj suprasnosti na početku i kraju suprasnosti i u laktaciji. Obroci H-krmača bili su za 0.3 kg/d veći. Hranjenje od odbijanja do estrusa bilo je 3.7 (L) i 6.7 kg/d (H). U

usporedbi s L-svinjama H-svinje su rasle brže (878/720 g/d; $p < 0.001$) prije testiranja (90 kg) i njihova leđna slanina bila je deblja (11.7/10.3 mm, $p < 0.001$). Stopa izlučenja bila je viša u H-skupini (48.8/37.5 %), a glavni je uzrok bila slabost nogu (H 32.5/L 21.3%). H-krmače su bile mlađe u pubertetu nego L-krmače (199/225 d; $p < 0.001$). Starost u pubertetu bila je u negativnoj vezi s dnevnim prirastom ($p < 0.001$) i indeksom masti (FI, leđna slanina/težina) kod testiranja ($p < 0.01$). Starost kod parenja bila je (H 209/L 232 d; $p < 0.001$). Veličina legla i performanca praščića bili su slični u obje skupine. Za vrijeme laktacije H-krmače trošile su 2 kg manje hrane od L-krmača. Nakon odbijanja obično su bile deblje od L-krmača (P_2 , 15.9/14.4 mm), ali nije primijećena nikakva razlika u njihovom povratku u estrus. FI kod odbijanja bio je u pozitivnoj vezi ($p < 0.001$) s FI kod testiranja. Na osnovi tih podataka pretpostavlja se da obilno hranjenje za vrijeme uzgoja dovodi do ranog puberteta i prasnja, te pokazuje sklonost krmača slabosti nogu. Ukupno uzimanje hrane (25 kg-odbijanje) iznosilo je 5.4% više u H-krmača.

Primljeno: 15. 2. 1997.