

Effect of diets differing in fibre content fed during the early growth stage of pigs on subsequent energy and nutrient digestibility*

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ABSTRACT

The digestibility of energy and nutrients was determined in piglets weaned at 10 kg and fed a standard diet B, with a fibre (F) content of 37.9 g/kg, or diets with the F content increased to 53.5, 60.6 and 76.4 g/kg (diets GM10, GM15 and GM20, respectively). The diets were fed until 25 kg BW and then were replaced by diet B fed to all pigs for 14 days. During the last 5 days the digestibility of diet B was measured in pigs previously fed on diets with increased F contents. In diets with a higher F content, the digestibility of energy and nutrients, except F, was lower, whereas the digestibility of F was higher than in diet B. Consequently, the energy value of these diets was lower by 0.9-1.1 MJ ME. The energy and nutrient digestibilities of diet B fed after diets with a higher F content were not affected by the preceding diet except NDF and F digestibilities, which were digested better. The energy value of diet B fed to pigs pre-fed on high-fibre diets was from 0.15 to 0.21 MJ ME greater as compared with that of diet B fed continuously.

KEY WORDS: piglets, compensatory growth, fibre, digestibility

INTRODUCTION

Feeding high fibre diet decreases the growth rate of pigs and for this reason is often applied to induce compensatory growth of pigs fed on a standard diet during the following period.

The aim of the study was to evaluate the effects of feeding weaned piglets on diets with an increased fibre content on the digestibility of energy and nutrients

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of a standard commercial diet fed later. The digestibility of diets differing in fibre content was also determined.

MATERIAL AND METHODS

The experiment comprised two periods: feeding standard and experimental diets from 10 to 25 kg body weight and feeding a standard diet during the following 14 days.

Twenty piglets with a 10 kg mean BW were allotted to four groups and until 25 kg BW were fed *ad libitum* on a standard commercial diet B (12.3 MJ ME, 201 g crude protein, 37.9 g crude fibre per kg) (group 1), or on diets GM10, GM15 and GM20 with fibre contents increased to 53.5, 60.6 and 76.6 g/kg (groups 2, 3 and 4, respectively). The fibre content was increased by mixing diet B with 10, 15 or 20% grass meal. At 25 kg BW, the digestibilities of gross energy, crude protein, ether extract, ash, crude fibre and ADF and NDF fractions of all diets were measured. Thereafter, the pigs from groups fed on diets GM10, GM15 and GM20 were transferred to diet B and after 9 days of feeding, the energy and nutrient digestibilities of diet B were determined, except in pigs fed diet B continuously (group 1). In both periods digestibility was determined using Cr_2O_3 added to the diets as an indicator. Analysis of variance was performed using Statgraphics version 6.0 Plus software.

RESULTS

The increased fibre content negatively affected energy and protein digestibility in the first period of the experiment (from 10 to 25 kg BW) and tended also to lower fat digestibility (Table 1). Digestibility of crude fibre was substantially increased due to the increased fibre content, while the effect on digestibility of NDF and ADF was not significant and rather irregular. The content of digestible and metabolizable energy in diets with an increased fibre content was about 1 MJ lower than in the standard B diet.

It was assumed that the digestibility of diet B fed continuously did not change during the relatively short period between two digestibility trials and for group 1 the values found for period 1 are given for period 2 (Table 1). The digestibility of energy and all nutrients except NDF did not differ significantly among the groups. NDF digestibility was higher ($P < 0.001$) in pigs previously fed high fibre diets, the same tendency was found for crude fibre. The ME content in diet B fed to pigs previously fed on diet GM10 and GM15 was greater ($P < 0.076$) by 0.21 and 0.15 MJ, while in pigs fed diet GM20 with the greatest fibre concentration, it was slightly lower.

Table 1. Digestibility of energy and nutrients (%) and energy value of the diets (MJ/kg diet)

Group	Diet	Digestibility							Energy value	
		gross energy	protein	extract ether	ash	crude fibre	NDF	ADF	DE	ME
Period 1 (10-25 kg BW)										
1	B	82.5	79.6	38.5	34.2	12.5	63.8	40.7	12.78	12.3
2	GM10	78.0	73.2	30.7	30.0	17.8	64.6	27.6	11.89	11.4
3	GM15	76.2	72.2	32.9	36.6	16.9	68.5	31.3	11.74	11.2
4	GM20	75.5	72.4	34.0	33.4	31.2	75.0	35.8	11.71	11.2
	SEM	0.3	0.5	2.0	2.2	3.0	0.2	3.0	0.06	0.062
	P value	<0.001	<0.01	0.582	0.606	0.075	0.134	0.458	<0.001	<0.001
Period 2 (14 days)										
1	B	82.5	79.6	38.5	34.2	12.5	63.8	40.7	12.78	12.26
2	B	83.8	80.7	41.4	39.6	25.6	79.5	40.3	13.03	12.47
3	B	83.4	80.9	39.5	37.4	23.1	77.7	39.0	12.96	12.41
4	B	82.1	79.7	32.4	35.9	24.8	74.9	27.5	12.71	12.19
	SEM	0.3	0.4	2.1	0.5	1.9	1.1	3.1	0.050	0.045
	P value	0.159	0.530	0.326	0.150	0.083	<0.001	0.207	0.083	0.076

DISCUSSION

A decrease of protein and energy digestibility as a response to an increased fibre content was found also in earlier works (Fernandez et al., 1986). The highest supplement of grass meal to diet B lowered energy and protein digestibility to a greater extent than the 20% supplement of lucerne meal in the study by Moore et al. (1988), which confirms the effect of fibre source on the digestibility of nutrients related to, among other factors, faster transit along the digestive tract (Jørgensen et al., 1996). Better digestion of crude fibre by pigs from groups 2, 3 and 4 fed the higher fibre diet than group 1 was probably due to more extensive microbial fermentation in the hindgut. However, Fernandez et al. (1986) reported that digestibility of crude fibre in pigs was not greatly influenced by a fibre content ranging from 3 to 11%, while Roth et al. (1985) showed that increasing the crude fibre content significantly decreased its digestibility. These differences might result from different contents of soluble dietary fibre, which stimulates microbial fermentation (Wenk, 2001).

During the period following feeding diets with different fibre contents, the digestibility of energy and nutrients of diet B was not affected by the diet fed previously. A tendency towards better digestion of crude fibre and NDF by pigs fed earlier on diets with a greater fibre content was probably caused by higher activity of microflora in the hindgut.

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STRESZCZENIE

Strawność energii i składników pokarmowych u odsadzonych prosiąt w okresie niedożywiania, spowodowanego zwiększonym pobraniem włókna, oraz podczas realimentacji

Oznaczono strawność energii i składników pokarmowych na prosiątach odsadzonych przy m.c. 10 kg i żywionych standardową dietą B zawierającą 37,9 g włókna/kg, oraz dietami zawierającymi 53,5; 60,6 i 76,4 g włókna/kg (odpowiednio dieta GM10, GM15 i GM20). Po osiągnięciu 25 kg m.c. wszystkie świny żywiono dietą B przez 14 dni i w ciągu ostatnich 5 dni oznaczono strawność energii i składników pokarmowych diety B, podawanej świniom żywionym uprzednio dietami o podwyższonej zawartości włókna. Strawność energii i składników pokarmowych, z wyjątkiem włókna, diet zawierających więcej tego składnika była niższa niż diety B, natomiast strawność włókna była wyższa. Wartość energetyczna diet o podwyższonej zawartości włókna była o 0,9 do 1,1 MJ ME niższa niż diety standardowej. Strawność energii i składników odżywczych diety B podawanej zwierzętom żywionym uprzednio dietami o wyższej zawartości włókna nie różniła się, natomiast strawność włókna i frakcji NDF była wyższa. W konsekwencji wartość energetyczna diety B podawanej tym zwierzętom była o 0,15 do 0,21 MJ wyższa niż diety B, oznaczonej na zwierzętach żywionych nią od odsadzenia.