

Effect of different levels of faba bean in diets on growth performance of young pigs*

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ABSTRACT

Forty crossbred pigs of an initial body weight of about 14 kg were divided into 4 groups and placed in individual pens. The control animals (group K) were fed *ad libitum* a mixture containing soyabean meal (SBM), whereas in the case of diets fed to experimental groups, 25% (group 1), 50% (group 2) and 75% (group 3) of the soya protein was replaced by the protein of faba bean cv. Kodam. Diets were balanced on the basis of apparent ileal amino acid digestibility. The experiment ended when the animals reached a body weight of 36 kg. The average daily gain (ADG) of animals from the control group was 586 g, the feed:gain ratio (F/G) was 2.59 kg. In the experimental groups, the ADG was: 577 g (group 1), 629 g (group 2) and 637 g (group 3) and F/G was: 2.35, 2.28 and 2.17 kg/kg, respectively. In comparison with the control group, the feed conversion ratio was significantly better ($P < 0.05$) in groups 2 and 3 than in groups K and 1.

KEY WORDS: faba bean, pigs, growth performance

INTRODUCTION

Attempts to replace post-extraction soyabean meal (SBM) in mixtures for pigs by cheaper domestic feeds have been going on for years. Faba bean cv. Kodam is a new cultivar registered recently and is characterized by good agrotechnical (high seed and protein yields per ha) and nutritional (high protein and lysine, low fibre content) properties in comparison with other modern cultivars of this feedstuff. However, seeds of the Kodam cv. contain considerable quantities of tannins and, when compared with soyabean meal, are characterized by significantly lower apparent ileal digestibility of amino acids, except arginine and proline. In addition, the content and digestibility of methionine is particularly low, which poses a real danger of a considerable deficit of this amino acid (Kasprowicz and Frankiewicz, 2003a,b; 2004).

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Formulation of pig diets containing faba bean seeds cv. Kodam as a substitute for SBM basing on apparent ileal amino acid digestibility and supplementation with crystalline amino acids should improve nutritional efficiency of the diets and allow obtaining results similar to those observed when growing pigs are fed an SBM diet.

The objective of the performed investigations was to determine the effect of inclusion of various levels of faba bean seeds cv. Kodam, as a substitute for soyabean meal in diets, on body weight gain and feed utilization by young pigs.

MATERIAL AND METHODS

The experimental animals comprised 40 crossbred pigs initially of 14 kg body weight divided into 4 groups of 10 animals each and placed in individual pens. The control animals (group K) were fed *ad libitum* a standard diet containing soyabean meal, whereas animals from the experimental groups 1, 2 and 3 were fed diets in which 25, 50 and 75% of the SBM protein was replaced by the protein of faba bean cv. Kodam, respectively. The dry matter of faba bean seeds contained: 29.5% crude protein, 7.2 mg/g tannins, while 100 g protein contained 6.00 g lysine, 0.74 g methionine and 3.53 g threonine (Kasprowicz and Frankiewicz, 2003a,b). Diets (Table 1) were formulated on the basis of apparent ileal digestible amino acid content according to NRC (1998) recommendations (own data). For faba bean and SBM, apparent ileal digestibility coefficients were: lysine 76.4 and 87.1%,

Table 1. Feed components and chemical composition of mixtures, %

Item	K	1	2	3
Maize meal	15.00	15.00	15.00	15.00
Wheat meal	55.40	49.38	43.06	37.44
Soyabean meal	25.00	20.50	16.00	11.60
Faba bean meal	-	10.20	21.00	31.00
Soya oil	1.10	1.50	1.50	1.50
Calcium phosphate	0.50	0.50	0.50	0.50
Acidifier	0.30	0.30	0.30	0.30
Limestone	1.50	1.50	1.50	1.50
L-Lysine	0.30	0.20	0.20	0.15
DL-Methionine	-	0.02	0.04	0.06
Premix	0.40	0.40	0.40	0.40
NaCl	0.50	0.50	0.50	0.50
Metabolizable energy*	13.55	13.56	13.47	13.37
Crude protein	18.38	18.30	18.38	18.37
Digestible lysine*	0.81	0.77	0.79	0.77
Digestible methionine*	0.22	0.21	0.20	0.20
Digestible threonine*	0.47	0.46	0.46	0.45

* calculated amounts

methionine 53.8 and 87.3%, and threonine 68.7 and 82.0%, respectively (Kasprowicz and Frankiewicz, 2004). The experiment was carried out until the animals reached a body weight of about 36 kg and included the control of body weight gain and feed consumption. The results were subjected to statistical analysis of variance and the significance of differences between groups was calculated by Duncan's test (STATGRAPHICS program).

RESULTS

The average daily gain (ADG) in the control group reached 586 g, while in the experimental groups the gains increased as the percentage of faba bean seeds in the diets increased; in groups 2 and 3, they exceeded the values of the control group by 7.3 and 8.8%, respectively (Table 2). The observed differences were not confirmed statistically ($P>0.05$). The feed:gain ratio (F/G) was 2.59 kg in the control group, whereas in the experimental groups, it was lower by 9.3 ($P>0.05$), 12, and 16.2% ($P<0.05$).

Table 2. Body weight, average daily gain (ADG) and feed:gain (F/G) ratio

Item	K	1	2	3
Initial body weight, kg	14.2 ± 2.1	14.1 ± 1.7	14.2 ± 2.0	14.2 ± 1.2
Final body weight, kg	36.7 ± 1.0	36.5 ± 0.8	36.9 ± 0.6	36.4 ± 1.4
ADG, g	586 ± 28	577 ± 16	629 ± 27	637 ± 40
%	100.00	98.52	107.29	108.76
F/G, kg/kg	2.59 ± 0.12	2.35 ± 0.06	2.28 ± 0.05	2.17 ± 0.09
%	100.00 ^a	90.73 ^{ab}	88.03 ^b	83.78 ^b

^{ab} - means in the rows with different letters differ significantly at $P<0.05$

DISCUSSION

The replacement of up to 75% of SBM protein by faba bean protein did not deteriorate the growth performance of young pigs. The significantly better F/G in the groups fed the highest proportion of faba bean (groups 2, 3) can probably be attributed to adequate diet composition based on the content of digestible amino acids. As was demonstrated in our earlier studies (Kasprowicz and Frankiewicz, 2003a, 2004), faba bean seeds cv. Kodam, in comparison with SBM, are characterized not only by a significantly lower methionine content, but also by its lower digestibility in the pig small intestine, which confirms the observations of Sauer et al. (2001). Another cause of the obtained results could be attributed to the fact that the SBM used in digestibility trials and in the growth experiment derived from different batches and could, therefore, be characterized by somewhat worse protein

quality and amino acid digestibility. It is probable that the high amount of tannins in faba bean seeds cv. Kodam, 7.2 mg/g, did not have a negative effect on the growth performance of young pigs, which is in agreement with results obtained by Flis et al. (1999) and Grala et al. (1993).

CONCLUSIONS

Our results indicate that faba bean cv. Kodam can replace up to 75% of soya-bean protein in diets for young pigs, formulated on the basis of ileal digestible amino acid content and supplemented according to pig requirements with crystalline amino acids.

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STRESZCZENIE

Wpływ różnych poziomów bobiku w mieszankach na wyniki odchowu świń

40 warchlaków mieszańców o początkowej masie ciała około 14 kg przydzielono do 4 grup i umieszczono w indywidualnych kojcach. Zwierzęta kontrolne (grupa K) żywiono *ad libitum* mieszanką z udziałem poekstrakcyjnej śruty sojowej (SBM), a w mieszankach dla grup doświadczalnych zastąpiono odpowiednio 25% (grupa 1), 50% (grupa 2) lub 75% (grupa 3) białka SBM białkiem bobiku odmiany Kodam. Mieszanki przygotowano uwzględniając pozorną jelitową strawność aminokwasów. Doświadczenie zakończono po uzyskaniu przez zwierzęta 36 kg m.c. Świnie grupy kontrolnej przyrastały średnio po 586 g dziennie zużywając na przyrost 1 kg masy ciała 2,59 paszy. Dzienny przyrost w grupach doświadczalnych wynosił średnio 577 (grupa 1), 629 (grupa 2) oraz 637 g (grupa 3), a zużycie paszy na przyrost 1kg m.c. odpowiednio 2,35; 2,28 i 2,17 kg. Wykorzystanie paszy w grupach 2 i 3 było istotnie lepsze ($P < 0,05$) niż w grupie kontrolnej.