High-Oil Oat Groats for Weaned Pigs

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SUMMARY

The interest for weaned pigs of oat groats with high oil content was evaluated. The groats contained 95 g oil, 159 g crude protein and 3.72 Mcal DE/kg DM. Weaned pigs fed for 4 weeks (7 to 22 kg) with diets containing graded levels (0, 15, 30, 45%) of oat groats, incorporated at the expense of wheat (85%) and soybean meal (15%), presented average daily gains similar to those obtained with wheat. In conclusion, high-oil oat groats can replace wheat in diets for weaned pigs.

INTRODUCTION

After weaning, young pigs need highly palatable, digestible diets, devoid of antinutritional factors and with high digestible energy (DE) content. Feed ingredients corresponding to that description are generally expensive and choice is quite limited.

One alternative could be oat groats (dehulled oats) with high oil content. Oat groats are well consumed and digested by young pigs and have the highest lysine content among all the cereal species used in swine nutrition (Van Barneveld et al., 1998; J. Sci. Food Agric. 76, 277). They can substitute corn or wheat in weaned pig diets without any risk of adverse effect (Christison and Bell, 1980; Can. J. Anim. Sci. 60, 465). The DE content of oat groats is not higher than that of wheat or corn.

Dr B. Rossnagel, from the Crop Development Centre of the University of Sakatchewan, has recently developed new oat varieties with high oil content (> 9 % DM) that could become an interesting feed ingredient for weaned pigs, thanks to their presumed high DE content, if their nutritional advantage is confirmed. The present project aimed at determining the nutritional value of high-oil oat groats (HOOG) and their effect on the growth performances of weaned pigs.

"While high-oil oat groats can successfully replace wheat in weaned pig diets, they do not present any advantage over wheat."

MATERIAL AND METHODS

High-oil oats were grown at the Crop Development Centre and then processed with an oat dehuller. They were ground by means of a hammer mill (9/64"). For the digestibility study, a diet composed of oats (94.6%), a mineral/vitamin premix (5%) and an indigestible marker (chromic oxide, 0.4%) was prepared. After adaptation to the diet, the faeces were collected for 3 days and, 4h after the last meal, the pigs were killed and their ileum content was collected and analysed for dry matter, nitrogen, amino acids and acid-insoluble ash. For the growth study, four diets containing 0, 15, 30 or 45% oat groats, were prepared (Table 1). 192 weaned pigs, divided in groups of 4 pigs (2 barrows, 2 gilts), were fed one of the 4 experimental diets (48 pigs/diet) for 4 weeks (starting 1 week after weaning). They were weighed weekly and feed intake was recorded.

RESULTS AND DISCUSSION

Chemical composition, ileal AA digestibility and DE content

The composition of the oat groats was as follows: 90% dry matter and, in g/kg DM: 145 g crude protein, 95 g oil, 98 g NDF, 28 g ADF, 64 g ash, 6.3 g lysine, 2.2 g methionine (6.2 g S-containing AA) and 4.9 g threonine. The ileal digestibility of nitrogen, lysine, methionine, cysteine and threonine was, respectively, 80, 77, 85, 81 and 77%. The DE content was 3.71 Mcal/kg DM.

As compared to wheat, HOOG has a higher lysine content (4.3% of the protein vs 3.9% on average for wheat). On the contrary, the DE content is lower than that of wheat (± 3.90 Mcal DE/kg^{DM}), despite the higher oil content. This can probably be explained by the low oil digestibility of the HOOG: ± 20% only. The grinding was probably not fine enough to allow the release of the drops of oil entrapped within the cell walls.

Growth study

The results of growth performances obtained by the weaned pigs fed with graded levels of HOOG are detailed in Table 2. No significant effect was observed between treatments for the whole period. Feed intakes and feed conversion ratios were not affected either. Thus, HOOG are well ingested by weaned pigs. It must be pointed out here that HOOG mainly replaced wheat but also some soybean meal (Table 1). It is thus possible to take advantage of the high protein content and the relatively good quality of the oat proteins.

An advantage of HOOG over wheat was expected, since the former contain more oil and were supposed to have a higher energy value. As explained above, this is probably to be ascribed to the low oil digestibility.

Table 1. Composition of experimental diets (%/kg)

Ingredient	0%	15%	30%	45%
Wheat	63.0	50.4	37.9	25.3
High-oil Oat Groats	0.0	15.0	30.0	45.0
Soybean Meal	16.0	15.0	14.0	13.0
Fish meal/Whey	2.0/3.5	2.0/3.5	2.0/3.5	2.0/3.5
Canola Oil	4.4	3.1	1.7	0.4
Mineral/Vitamin	3.3	3.3	3.3	3.3
Lysine 78%	0.14	0.12	0.10	0.08
Threonine	0.08	0.06	0.05	0.03
Methionine	0.09	0.06	0.03	
DE (Mcal/kg)	3.61	3.63	3.65	3.67
NE (Mcal/kg)	2.35	2.35	2.35	2.35
CP (g/kg)	22.0	22.2	22.4	22.5
SID Lys (g/kg)	11.1	11.1	11.1	11.1
SID Thr (g/kg)	6.6	6.6	6.6	6.6
SID SAA (g/kg)	6.3	6.3	6.3	6.6
SID Trp (g/kg)	2.1	2.1	2.1	2.2
Ca (g/kg)	8.0	8.0	8.0	8.0
Av. P (g/kg)	4.0	4.0	4.0	4.0

Table 2. Growth performances of weaned pigs fed with graded levels of high-oil oat groats

% High-Oil Oat Groats	0%	15%	30%	45%
Week 1				
ADG (g)	288	254	295	273
ADFI (g)	359	320	353	329
F:C	1.26	1.29	1.20	1.20
Week 2				
ADG (g)	430	431	406	443
ADFI (g)	577	496	529	541
F:C	1.34	1.21	1.31	1.22
Week 3				
ADG (g)	606	617	618	715
ADFI (g)	789	780	815	816
F:C	1.30	1.26	1.23	1.14
Week 4				
ADG (g)	736	730	715	723
ADFI (g)	1,055	1,031	1,033	1,050
F:C	1.43	1.41	1.44	1.46

IMPLICATIONS

HOOG did not present any advantage in the diet of weaned pigs, as compared to wheat. The reason could be the low oil digestibility, explained by an inadequate grinding. Further research is required to find the conditions for an optimal use of HOOG in weaned pig nutrition.

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