Digestibility and net energy value of wheat bran and sunflower meal: pregnant sows versus fattening pigs

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1. Abstract

The nutrient digestibility, digestible energy (DE) and net energy (NE) of wheat bran (WB) and sunflower meal (SFM) for pregnant sows and fattening pigs was studied by means of in vivo trials. Within each animal category, two cross-over design trials were carried out with a control diet and a diet composed of 75% control diet + 25% WB or 25% SFM. In each trial 6 pregnant hybrid sows (on average 2.8th parity, 208 kg for WB and 4.3th parity, 240 kg for SFM) and 6 Piétrain x hybrid pigs (on average 50 kg) were involved. Sows were fed at requirement and pigs at 3 times maintenance level. The nutrient digestibility coefficients are not significantly different between sows and pigs for WB and SFM. The crude fibre digestibility tends to be higher for sows compared to pigs (P = 0.051) for WB. The DE and NE of WB is 7 and 6% higher (not significant) for sows than for pigs, with respectively a DE-value of 10.6 and 9.9 MJ/kg and a NE-value of 6.9 and 6.5 MJ/kg. A similar DE and NE of SFM for sows and pigs is found, with respectively a DE-value of 9.7 and 9.6 MJ/kg and a NE-value of 5.6 and 5.6 MJ/kg.

2. Introduction

The tabular (CVB table, 2004) net energy value of wheat bran (WB) and sunflower meal (SFM) is based on digestibility trials with fattening pigs. From the literature it is known that sows can get more energy out of some fibre rich feedstuffs than fattening pigs. This is related to the lower passage rate of the digesta and a more elaborated fermentation in the colon, because of a much lower feed intake in relation to body weight for sows than for fattening pigs. In order to obtain a net energy value of WB and SFM for fattening pigs as well as for sows, two digestibility trials were carried out. In these trials two dietary treatments were tested: a control diet and a test diet composed of 75% control diet + 25% WB or SFM. The control diet was formulated based on the nutrient and energy requirements of pregnant sows.

3. Materials and methods

Six pregnant hybrid sows (on average 2.8th parity and 208 kg for WB and 4.3th parity and 240 kg for SFM) and 6 Piétrain x hybrid pigs (on average 50 kg) were involved. Sows were fed at requirement and pigs at 3 times maintenance level. The digestibility trial with the sows started at 5 weeks pregnancy.

The control diet contained 24% cassava, 20% barley, 18% wheat, 17% soybean meal, 14% wheat bran meal, 4% beet molasses and 0.8% lard. The chemical composition was as follows: 87.1% dry matter, 14.5% crude protein, 5.0% crude fibre, 2.3% crude fat, 45.5% starch + sugars and 6.0% ash. For the test diet the control diet was used, in which 25% was substituted with WB or SFM. In this way the digestibility and energy value of WB and SFM can be calculated by means of the difference method.

For sows as well as fattening pigs the two dietary treatments (control and fibre diet) were applied according to a cross-over design. For sows, the adaptation to the new diet lasted 15 days in conventional gestation cages and 3 days in digestibility cages, followed by 10 days of total collection of faeces and urine. For fattening pigs, the adaptation period to the new diet lasted 8 days in individual pens and 10 days in digestibility cages, followed by 10 days of total collection of faeces and urine.
The daily feed and water intake was respectively 2.5 kg control diet, 2.6 kg fibre diet and 9 l water for the sows in the WB-trial and 2.6 kg control diet, 2.9 kg fibre diet and 9 l water for the sows in the SFM-trial. The fattening pigs received 1.7 kg control or fibre diet and 6 l water per day in the WB-trial and 1.8 kg control diet, 2.0 kg fibre diet and 6 l water per day in the SFM-trial. The feed and water was provided in two meals a day.

3.4. Statistics

The results were statistically analysed with the GLM procedure (SPSS 12.0). For the excreta production, within each animal category, faeces production, urine production and dry matter content of the excreta were used as dependent variables and dietary treatment as fixed factor. For the digestibility characteristics, the digestibility coefficients and the digestible and net energy value were used as dependent variables and the animal category as fixed factor.

4. Results

Faeces and urine (table 1) – The faeces production was significantly higher for the fibre diets than for the control diet. The dry matter content of the faeces was significantly decreased for the WB-fibre diet versus the control diet. Fattening pigs had a significantly lower urine production for the fibre diets than the control diet. The manure production (faeces+ urine) was not significantly affected by the dietary treatments. The dry matter content of the manure was significantly higher for the fibre diets than the control diet.

Table 1. Faeces and urine production with the control and fibre diets

	Wheat bran				Sunflower meal			
	Fattening pigs		Sows		Fattening pigs		Sows	
	Control diet	Fibre diet	Control diet	Fibre diet	Control diet	Fibre diet	Control diet	Fibre diet
Feed int., kg/day	1.7	1.7	2.5^{a}	2.6^{b}	1.8	2.0	2.6^{a}	2.9^{b}
Faeces, kg/day	1.0^{a}	1.6^{b}	1.3^{a}	2.3^{b}	0.9^{a}	1.4^{b}	1.0^{a}	1.7^{b}
Faeces, % DM	26^{a}	21^{b}	28^{a}	22^{b}	27	28	32	32
Urine, kg/day	3.9^{a}	3.5^{b}	5.3	5.0	4.1^{a}	3.5^{b}	6.2	5.7
Manure, kg/day	4.9	5.0	6.6	7.3	5.0	4.9	7.1	7.4
Manure, %DM	5.3^{a}	6.6^{b}	5.4^{a}	6.7^{b}	4.9^{a}	8.1^{b}	4.4^{a}	7.5^{b}

Digestibility of WB and SFM (table 2) – The digestibility coefficients of the nutrients were not significantly different between pregnant sows and fattening pigs for WB and SFM. Crude fibre digestibility tended to be higher for pregnant sows versus fattening pigs for WB (P = 0.051).
Energy of WB and SFM (table 3) – The digestible energy and net energy of WB was 7 and 6% higher (not significantly) for sows than for fattening pigs. According to the CVB table (2004) the net energy value of WB is 6.13 MJ/kg. The net energy value found in the present digestibility trial for fattening pigs (table 3) was 6% higher than the one in the CVB table.

A similar digestible and net energy value of SFM for sows and fattening pigs was found. According to the CVB table (2004) the net energy value of SFM is 5.04 MJ/kg. The net energy value found in the present digestibility trial for fattening pigs (table 3) was 11% higher than the one in the CVB table.

Table 2. Digestibility coefficients of WB and SFM for fattening pigs and sows (in %)

	WB		SFM	
	Fattening pigs	Sows	Fattening pigs	Sows
Gross energy	59	63	57	56
Dry matter	60	63	57	56
Organic matter	62	66	59	60
Crude protein	67	67	69	71
Crude fibre	7	25	19	16
Crude fat	38	46	59	57
Minerals	14	20	33	16

Table 3. Digestible and net energy of WB and SFM (in MJ/kg fresh matter)

	Wheat bran		Sunflower meal	
	Fatt. pigs	Sows	Fatt. pigs	Sows
Digestible energy (DE)	9.9 ± 0.5	10.6 ± 1.0	9.7 ± 2.3	9.6 ± 2.1
Net energy (NEv)	6.5 ± 0.3	6.9 ± 0.5	5.6 ± 1.1	5.6 ± 1.0

5. Conclusions

This trial showed that the net energy value of wheat bran (on average 6.7 MJ/kg) and sunflower meal (5.6 MJ/kg) was not significantly different between fattening pigs and pregnant sows. However, for wheat bran the net energy value was numerically 6% higher for pregnant sows in comparison with fattening pigs, with respectively 6.9 and 6.5 MJ/kg.

6. References

CVB, 2004. In *Veevoedertabel*. Ed. Centraal Veevoeder Bureau, Lelystad, The Netherlands.