

The energy intake limiting effects of wheat bran and sunflower meal in gestation diets of sows

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1. Abstract

The effect of two levels of wheat bran (WB: 17 sows) and sunflower meal (SFM: 15 sows) on the ad libitum feed intake of pregnant hybrid sows was studied in two separate trials. A control diet, a medium fibre diet with 25% WB or 17% SFM and a high fibre diet with 50% WB or 34% SFM were compared in a Latin square design. All diets had a protein level between 14.5 and 15%. The net energy level of the diets decreased with increasing levels of WB (8.6, 8.0 and 7.4 MJ/kg feed) and SFM (8.6, 7.9 and 7.3 MJ/kg feed). The adaptation and feed intake registration period lasted 14 and 7 days. The average energy intake for the control, medium and high fibre diet was, respectively, for WB 2.2 (s.d. 0.7), 1.9 (s.d. 0.5) and 1.7 (s.d. 0.5) and for SFM 2.0 (s.d. 0.5), 1.8 (s.d. 0.5) and 1.5 (s.d. 0.5) times the daily energy requirement (CVB, 2004). Seventy-six% and 60% of the sows on the medium WB and SFM diets and 71% and 60% of the sows on the high WB and SFM diets ate more than 150% of the energy requirement. In conclusion, WB and SFM are not suited as energy intake restrictors for voluntary fed pregnant sows.

2. Introduction

During pregnancy, sows are usually restrictedly fed, with a gift of about 2.0 to 2.5 kg concentrated feed a day, to control the condition of the sows. The concentrated diets permit also low minimal storage and transport costs. Although this daily ration is sufficient to meet the nutritional requirements of the sows, it doesn't lead to satiation. If the same concentrated diet would be provided ad libitum, the sows would consume two to three times the restricted quantity. Restrictedly fed sows often show repetitive behaviour without an obvious function, also called stereotypical behaviour. Hunger, due to feed restriction during pregnancy, is known as one of the main causes in the development of stereotypical behaviour. Ad libitum feeding with a conventional gestation diet leads to too fat sows, resulting in lowered reproductive performances. A solution could be to supply ad libitum fed sows with fibre enriched diets. Ad libitum feeding of pregnant sows receives a lot of attention recently because of an increasing interest for group housing. This is due to the fact that group housing of sows will be legally obliged in the future in whole Europe, in order to improve the animal welfare status of the sow. In view of the interest and the limited knowledge concerning the potential energy intake limiting characteristics of various fibre rich feedstuffs several trials will be dedicated to this topic.

In this paper two trials with increased levels of wheat bran (WB) or sunflower meal (SFM) in the diets are discussed in relation to the daily voluntary energy intake.

3. Materials and methods

3.1. Animals

The trials consisted of 17 hybrid sows for WB and 15 sows for SFM with an average parity number of respectively 5.6 and 4.0. At the start of the trials the sows were 5 weeks pregnant.

3.2. Treatments

In both trials three dietary treatments were tested for their energy intake limiting characteristics in a Latin square design.

C: control group: Diet without WB and SFM (NE: 8.6 MJ/kg)

M: medium group: Diet with 25% WB (NE: 8.0 MJ/kg) or 17% SFM (NE: 7.9 MJ/kg)

H: high group: Diet with 50% WB (NE: 7.4 MJ/kg) or 34% SFM (NE: 7.3 MJ/kg)

The control diet is the same for both trials. The adaptation period for a new diet lasted 14 days, the registration period of feed intake and water use lasted 7 consecutive days. Water use was only registered for a subsample of 9 sows in each trial. The evolution of the condition, in terms of body weight and P2-fat thickness, was followed for the 21 days on the same diet. The main ingredients of the diets were tapioca, barley, wheat, soybean meal, wheat bran, sugar beet molasses and animal fat. All diets had a crude protein level between 14.5 and 15.0%. The diets were formulated taking into account the digestible lysine requirements and the ideal protein concept.

3.3. Measurements

- Weight and P2 (last rib) backfat thickness evolution of the sows during each dietary treatment of about 21 days.
- Daily feed intake = feed supply - feed waste, during the registration period (7 days).
- Daily water use during the registration period (7 days) for a sub-population of the sows.

3.4. Statistics

The data were registered individually per sow; each sow being an experimental unit. The data were processed statistically by the GLM-procedure in SPSS, with treatment as fixed/independent variable and daily feed intake, daily water use, daily weight gain and daily backfat increase as dependent variables. The results of the dependent variables were compared for significant differences between the treatments by means of the LSD-test. The obtained energy intake was compared with the tabular energy requirements of the sows.

4. Results

4.1. WB-trial

In the WB-trial a control (C), a medium wheat bran (M) and a high wheat bran (H) diet were tested. The daily feed intake decreased (not significantly) from 5.8 kg/day for the C-group to 5.3 kg/day for the M-group and 5.4 kg/day for the H-group (table 1). This corresponded with a net energy intake of on average 50, 42 and 40 MJ/day for respectively the C-, M- and H-group (fig. 1). The net energy intake on the H-diet was significantly different from the net energy intake on the C-diet. In comparison with the daily energy requirement norms of CVB (2004) for pregnant sows (on average 22 MJ/day) a 2.3, 1.9 and 1.8 times higher ad libitum energy intake was obtained with the C-, M- and H-diet than required. Seventy-six% and 71% of the sows on respectively the M and H-diets ate more than 150% of the energy requirement.

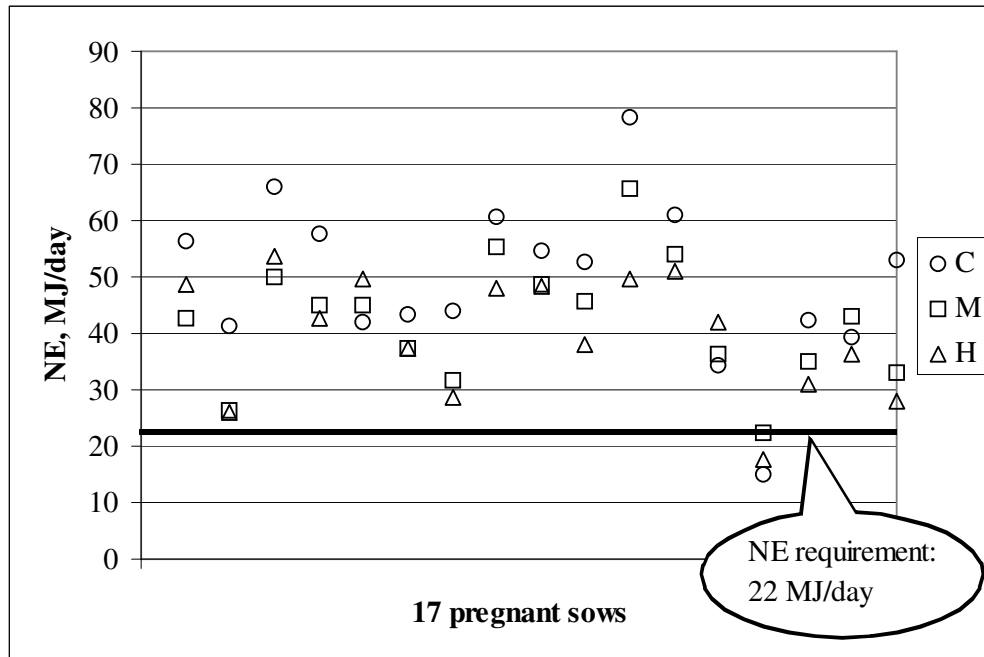


Fig. 1. Net energy intake of the individual sows in function of treatment: WB-trial

The daily water use and the condition of the sows was not significantly affected by the dietary treatments. The daily water use was respectively 30, 24 and 25 l/day for the C-, M- and H-group. The weight increase was respectively 1.3, 0.8 and 1.4 kg/day for the C-, M- and H-group. The P2 fat thickness evolution was respectively 0.11, 0.07 and 0.13 mm/day for the C-, M- and H-group.

4.2. SFM-trial

In the SFM-trial the same control (C) diet as in the WB-trial, a medium sunflower meal (M) and a high sunflower meal (H) diet were tested. The daily feed intake decreased (not significantly) from 5.4 kg/day for the C-group to 5.1 kg/day for the M-group and 4.5 kg/day for the H-group (table 1). This corresponded with a net energy intake of on average 46, 41 and 33 MJ/day for respectively the C-, M- and H-group (fig. 2). The net energy intake on the H-diet was significantly different from the net energy intake on the C-diet. A similar individual variation of the net energy intake (fig. 2) was found as shown in figure 1 for the WB-trial. In comparison with the daily energy requirement norms of CVB (2004) for pregnant sows (on average 22 MJ/day) a 2.0, 1.8 and 1.5 times higher ad libitum energy intake was obtained with the C-, M- and H-diet than required. Sixty% of the sows on the M- and H-diets ate more than 150% of the energy requirement.

The daily water use was not significantly affected by the dietary treatments, with respectively 14, 12 and 11 l/day for the C-, M- and H-group. The weight and P2-fat thickness increase was significantly smaller for the H-group compared with the C-group. The weight increase was respectively 1.4, 1.1 and 0.7 kg/day for the C-, M- and H-group. The P2 fat thickness evolution was respectively 0.16, 0.08 and 0.01 mm/day for the C-, M- and H-group.

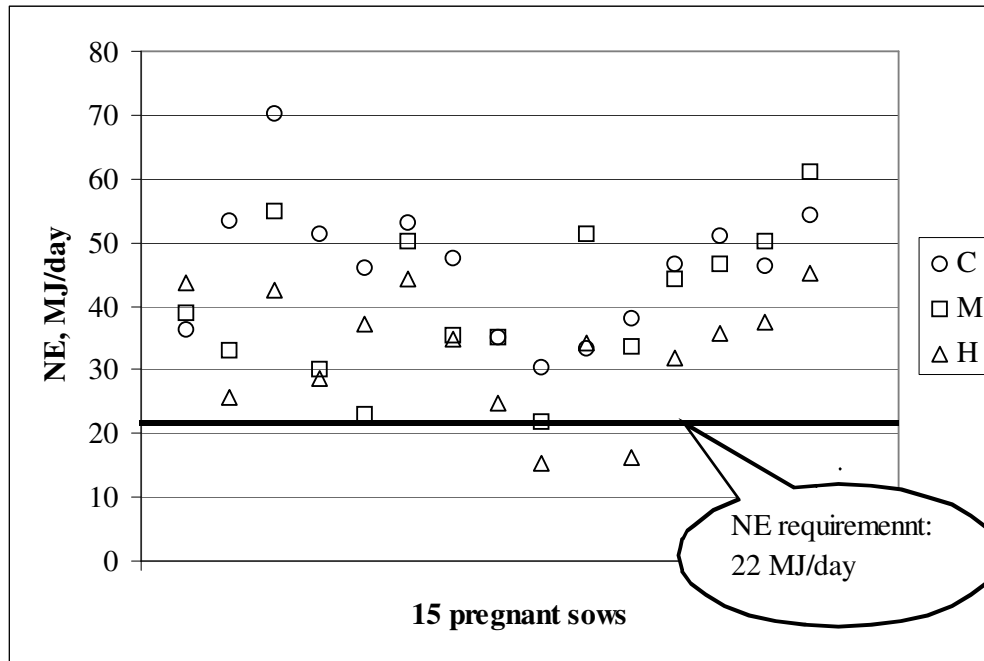


Fig. 2. Net energy intake of the individual sows in function of treatment: SFM-trial

Table 1: Daily feed and net energy intake and the number of times the net energy requirement norms of CVB (2004) are exceeded for both trials

Parameter	Trial	C	M	H
Daily feed intake (kg/day)	WB	5.8 ± 1.7	5.3 ± 1.4	5.4 ± 1.4
	SFM	5.4 ± 1.2	5.1 ± 1.5	4.5 ± 1.3
Daily NE intake (MJ/day)	WB	$50^a \pm 14$	$42^{ab} \pm 11$	$40^b \pm 11$
	SFM	$46^a \pm 10$	$41^{ab} \pm 12$	$33^b \pm 10$
Times x NE norms	WB	$2.2^a \pm 0.7$	$1.9^{ab} \pm 0.5$	$1.7^b \pm 0.5$
	SFM	$2.0^a \pm 0.5$	$1.8^{ab} \pm 0.5$	$1.5^b \pm 0.5$

5. Conclusions

The average energy intake for the high fibre diets was, respectively, for wheat bran 1.7 and for sunflower meal 1.5 times the daily energy requirement (CVB, 2004). Seventy-one % and 60% of the sows on the high wheat bran and sunflower meal diets ate more than 150% of the energy requirement. In conclusion, wheat bran and sunflower meal are not suited as energy intake restrictors for voluntary fed pregnant sows.

6. References

CVB Table, 2004. In *Veevoedertabel*. Edited by Centraal Veevoeder Bureau, Lelystad, The Netherlands.