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Silage in diets for organic sows in gestation

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Abstract

This study was conducted to determine whether the supply of grass silage or grass silage mixed with barley or CCM to organically raised gestating sows allows a reduction of compound feed allowance. Sows fed grass silage or mixed silage compensated for a pre-set reduction of 1 kg or 1.5 kg compound feed, respectively. However, the variation in silage intake between individual sows was large, with a number of mainly young sows consuming less silage than the required amount. These sows showed a net back fat loss during the experimental period from d 7 of gestation to weaning. More feeder space than 1 place for 8 sows is required to allow adequate silage intake in group housed sows. It is unclear whether this would also allow young sows to realise an adequate silage intake. In conclusion, it seems possible to replace 1 kg compound feed by free access to grass silage and 1.5 kg compound feed by mixed barley or CCM silage, provided that variation between sows is reduced and young sows also ingest an adequate amount of silage.

Introduction

The daily ration of organically raised pigs in the EU needs to contain roughage, fresh or dried fodder or silage (Commission Regulation 889/2008). In the Netherlands, during the winter period, pregnant sows kept on organic farms generally are provided with grass silage. In order to reduce feed costs and avoid excessive fatness, the supply of compound feed should be reduced accordingly. However, because the silage intake of individual sows is not well known, it is difficult to establish the amount of concentrate that is additionally required to meet the nutrient standards in gestation. Moreover, by mixing grass silage with cereal grain or corn cob mix (CCM), the silage supply may further reduce the requirements of compound feed. Therefore, this study was conducted to determine the intake of two types of grass silage and grass silage mixed with barley grain or CCM, to determine how much the compound feed allowance could be reduced and and the consequences on body condition of the sows.

Material and methods

Animals, housing and design: This study has been conducted in 38 primiparous and multiparous reproductive sows (Dutch Landrace x GY) at the Research Farm for organic pig production in Raalte, the Netherlands. The experiment comprised five dietary treatments:

1. Grass silage, first cut, harvested in an early stage (early grass silage)
2. Grass silage, first cut, harvested in a late stage (late grass silage)
3. Grass silage, early harvest, ensiled after mixing with barley (barley silage)
4. Grass silage, early harvest, ensiled after mixing with CCM (CCM silage)
5. Control treatment with compound feed only

Each treatment comprised one pen of 7-8 group-housed sows from 7 to 105 days of gestation. All pens were located in one naturally ventilated room for gestating sows. Each pen comprised 8 feeding stalls to temporarily restrict the sows for individual supply of compound feed. The remaining of the pen was a deep litter area with straw bedding. In addition, each pen was connected to a partly covered outdoor area of 4.25 x 4.4 m, half of which had concrete slatted floors. At day 105 of gestation, the sows were placed in farrowing rooms with six pens (2.0 x 3.75 m) each with straw bedding and an outdoor area of 3.5 m^2. Each pen had a covered and heated area for the suckling piglets.

Diets and feeding: Sows in treatments 1 to 4 had free access to silage during daytime between 7 and 105 days of gestation. Silage was provided in a trough with electronic identification of sows, electronic weight registration (RIC, Roughage Intake Control), and one eating place per group of 8 sows, to register silage intake of the sows. This trough was in the covered outdoor area of the pens. Based on prior experience (Van Krimpen et al., 2006), it was assumed that grass silage and mixed CCM or barley silage could replace 1.0 and 1.5 kg of concentrate per day (8.8 and 13.2 MJ net energy (**NE**)), respectively. Therefore, the standard daily allowance of compound feed was adjusted accordingly (Table 1). The compound feed was supplied in

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one meal in the morning while sows were confined in feeding stalls for max. one hour to enable individual feeding. Water was freely available from nipple drinkers.

Table 1: Daily allowance of compound feed in gestation (kg/d)[1)]

Treatment	Early grass silage	Late grass silage	Mixed barley silage	Mixed CCM silage	Control, no silage
Until day 7[2)]	2.5	2.5	2.5	2.5	2.5
Days 0 – 84	1.5	1.5	1.0	1.0	2.5
Days 85 – 105	2.2	2.2	1.7	1.7	3.2
Dag 105 – 112[3)]	3.2	3.2	3.2	3.2	3.2

[1)] In addition, all sows received 0.7 kg/d winter allowance from December to March
[2,3)] sows in mating stalls and in the farrowing rooms, respectively, no silage in the ration

Early and late grass silage was harvested from organic pasture, first cut at May 1 and 21, respectively, at an estimated yield of 2.0 and 3.5 tonnes of dry matter (**DM**) per ha, respectively, and ensiled on the same day. Part of the early cut grass was mixed with approximately 30% ground CCM or barley prior to ensiling to increase the starch and energy content of the silage and allow the replacement of a larger amount of compound feed. A standard organic compound feed (8.8 MJ NE, 4.9 g digestible lysine/kg) for gestating sows was supplied to sows of the control treatment. Because of the lower daily allowance of compound feed in silage fed sows, the vitamin and mineral content was increased accordingly to allow the same daily intake of these micronutrients in all treatments. In addition, the protein and amino acid content was increased in the compound feed (8.8 MJ NE, 6.4 g digestible lysine/kg) for mixed silage fed sows to compensate for the low amino acid content in barley and CCM.

Management and observations: Feed allowance, feed refusals of compound feed and intake of silage during gestation were registered daily. Body weight (**BW**) and backfat (**BF**) of the sows was registered on day 7, 42, 77, and 105 of gestation, after farrowing and at weaning. Reproductive performance of the sows was registered, i.e. litter size, still birth, birth weight, cross fostering, mortality, number of weaned pigs and intake of creep feed. Cross fostering was allowed within treatment group and piglets were weaned at 42 days of age. The animals were routinely controlled for any health disturbances and required medical treatments and death of animals was registered.

Statistical analysis: Feed intake, BW and BF, and reproductive performance were analysed with ANOVA for a randomised block design with sow as experimental unit, using Genstat statistical software. $P<0.05$ was regarded as significant.

Results

Silage composition: The composition and estimated NE content of the silages is presented in Table 2. Late cut grass silage had a lower crude protein content and higher crude fibre content than early cut silage. Barley and CCM silage had a higher starch and NE content than early and late grass silage. The calculation of NE intake of the sows was based on the values in Table 2.

Table 2: Analysed composition of grass silage and barley and CCM silage (g/kg DM)

	Early grass silage	Late grass silage	Mixed barley silage	Mixed CCM silage
Dry matter (as fed)	258	259	346	326
Crude protein	165	129	170	145
Crude fat (HCl)	45	45	37	44
Crude fibre	227	287	171	173
Crude ash	131	108	100	93
Starch	< 10	< 10	136	134
Sugar	70	25	70	35
Net energy (MJ/kg)[1)]	7.5	7.0	8.5	8.8

[1)] NE calculated on the basis of CVB (2007) and digestibility of grass silage in sows according to Van der Peet-Schwering et al. (2010).

Silage intake: The mean daily NE intake (Table 3) was 10-12 MJ from grass silage, 18 MJ from barley silage and 26 MJ from CCM silage. The higher energy intake from mixed silage was caused by a higher DM intake and a higher NE content per kg DM. Consequently, the silage fed sows were able to compensate for the reduction in compound feed supply as described in Table 1. However, results per sow in Figure 1 show a large variation in individual silage intake of the sows, from less than 0.1 to over 6 kg DM/d.

Table 3: Effect of type of silage on feed intake of sows in gestation

	Early grass silage	Late grass silage	Mixed barley silage	Mixed CCM silage	SEM[1]	P-value
Number of sows	8	7	8	7		
Time spent eating silage (min/d)	42	54	42	66	17	0.72
Silage intake/visit (kg)	0.31[ab]	0.22[a]	0.44[c]	0.36[bc]	0.04	0.008
Silage intake (kg/d)	6.1	6.1	6.1	8.9	2.1	0.72
Silage intake (kg DM/d)	1.57	1.52	2.12	2.90	0.62	0.45
Silage intake (MJ NE/d)	11.8	10.6	18.1	25.5	5.1	0.19
Total feed intake (MJ NE/d)	32.2	28.8	34.3	40.3	5.1	0.48

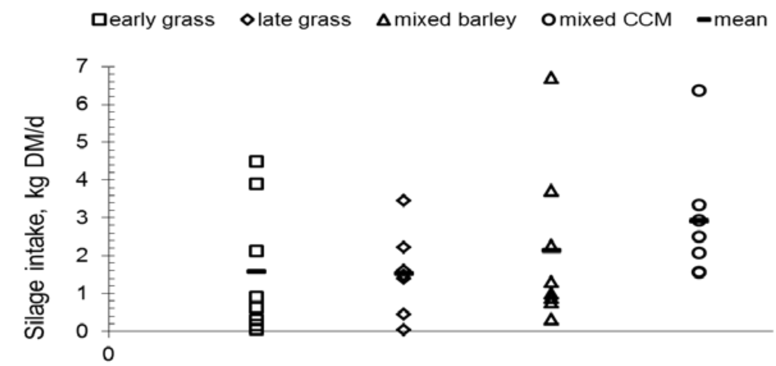

Figure 1. Mean daily silage intake of individual sows during gestation

Body condition of sows: The mean body weight gain of the sows in gestation (days 7-105) was 68 kg and was not affected by dietary treatment. The increase in BF was higher (P<0.001) for sows fed CCM silage (5 mm) as compared to the sows of the other silage groups (2-3 mm) (Figure 2). During the full cycle of gestation and lactation, the sows of the grass silage group tended to loose BF whereas the sows fed CCM silage gained in BF thickness.

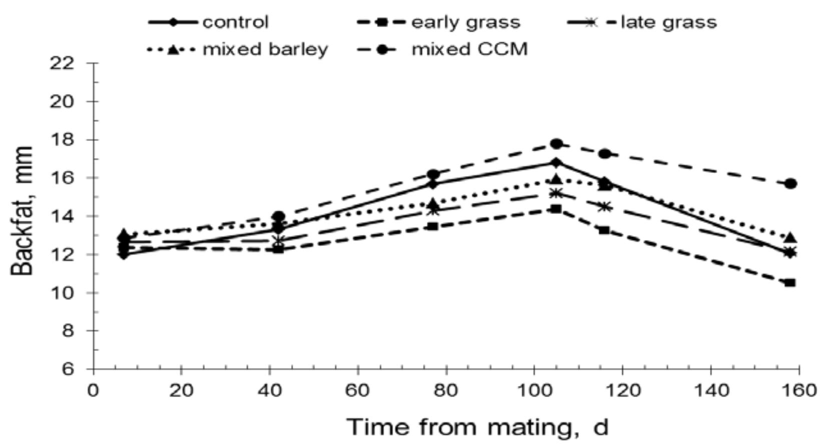

Figure 2. Effect of silage intake on development of BF in gestation and lactation

As illustrated in Figure 3, the development in BF was largely affected by the individual NE intake from silage of the sows. Results in Figure 3 illustrate a significant relationship between energy intake from silage and BF gain (or loss) from day 7 of gestation to weaning.

Reproductive performance

The mean litter size was 16.2 live born and 1.1 still born piglets. The mean birth weight of live born piglets was 1.21 kg and the weaning weight 11.4 kg. Reproductive performance was not significantly affected by dietary treatment, although the weaning weight of piglets tended to be lower (10.4 kg, P=0.07) for sows receiving CCM silage in gestation.

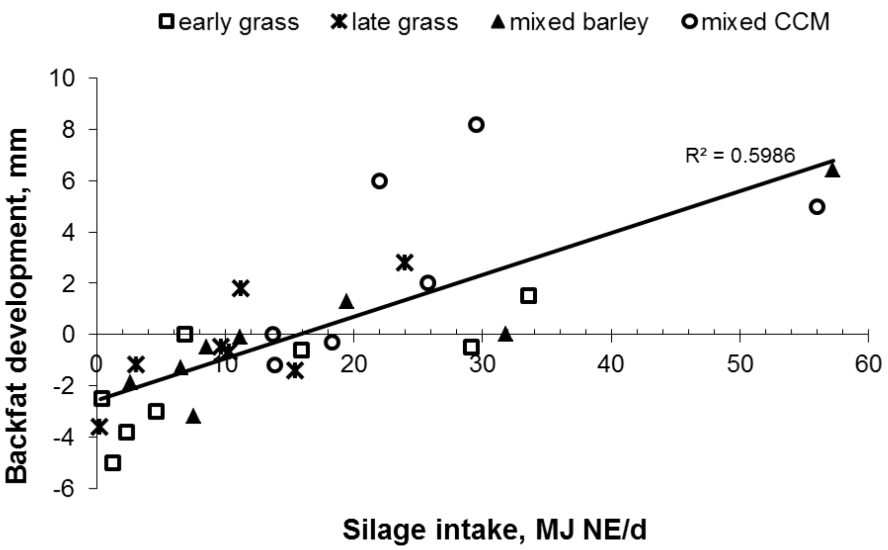

Figure 3 Relationship between NE intake from silage and BF gain from d 7 of gestation to weaning

Discussion

This experiment was conducted to determine whether the supply of grass silage alone or mixed with CCM or barley could replace a proportion of the compound feed in gestating sows. The allowance of compound feed was reduced for silage fed sows to stimulate silage intake. The mean daily intake of grass silage, mixed barley and CCM silage confirmed that on average the sows were able to compensate for the reduced compound feed allowance. Nonetheless, the individual silage intake of sows drastically varied between individual animals with a lower mean intake in young sows than in older sows. This may have been caused by competition between sows because of limited feeder space and/or because of a lower ingestive capacity of young sows. As a result, a number of sows was not able to consume an adequate amount of feed required for a constant BF thickness. More feeder space is required to allow adequate silage intake in group housed sows. We cannot derive whether that would also allow young sows to realise an adequate silage intake. In conclusion, it seems possible to replace 1 kg compound feed by free access to grass silage and 1.5 kg compound by mixed barley or CCM silage, provided that variation between sows is reduced and young sows would also be able to ingest an adequate amount of silage.

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