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Effects of two different feeding concepts on reproductive performance of lactating sows fed 100 % organic diets

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Abstract

The aim of this study was to analyse dietary concepts for lactating sows which were suitable according to EC-Regulation 889/2008. Therefore, in a feeding experiment, the effects of two different types of diets were investigated on performance and physiological indicators over a two years period. The treatments differed in the expected amino acid supply (treatment U=unbalanced amino acid pattern; treatment C=well balanced). Data from 118 litters showed a high feed intake of sows in both treatments with a tendency towards a higher feed intake in sows of treatment C (P=0,071). Live weight and back fat thickness did not show significant differences neither at the time of transition to the farrowing pen nor at the time of weaning. Serum concentration of urea and NEFA were significantly lower in treatment U (P=0,018; P=0,005). Litter size and weight of weaned piglets did not differ significantly, but daily weight gain of piglets was slightly lower in treatment U (P=0,088).

Key words: nutrition, lactating sow, amino acids.

Introduction

High milk yields of modern sows require a sufficient supply with essential amino acids and energy (Whittemore 1998, Clowes et al. 2003). Especially the high lysine content of sow milk stresses the importance of a sufficient dietary lysine concentration in lactating sows (Jeroch et al. 2008). Particularly with regard to conditions of organic production, it is rather difficult to meet amino acids requirements. To formulate a diet consisting exclusively of organically produced components is difficult because suitable feedstuffs are lacking and are expensive (Zollitsch et al. 2004). The main goal of the present study is to contribute to the development of feeding concepts for lactating sows and to support advisors in the implementation of a feeding concept which is in accordance with the concepts and regulations of organic farming.

Material and methodology

During a workshop with advisors, feed manufacturers, organic farmers and scientists, information was collected in order to define diet concepts for lactating sows which are in line with EC-Regulation 889/2008 and which are suitable under the conditions of Austrian organic agriculture. In a feeding experiment two of these diets were investigated in terms of their effects on animal performance and selected physiological indicators. One diet represented a situation in which rations were based on home-grown feedstuffs and would therefore be lower in their protein content and somewhat unbalanced in their amino acid pattern (treatment "U"). The other diet represented a situation in which either a complete feed or protein concentrate was purchased and imported into the system; this diet contained a fairly well balanced amino acid pattern (treatment "C"; Tab. 1). In both diets barley, triticale, pea (*Pisum sativum)* and faba bean (*Vicia faba)* were used. Diet C also contained sunflower seed cake and steam-heated soybeans.

Table 1. Nutrient content of experimental diets

Nutrient and energy content	C	U
ME[a] (MJ kg^{-1} [b])	13,02	12,84
Protein (g kg^{-1} [b])	180	152
Lysine (g kg^{-1} [b])	9,1	7,9
Methionine + Cysteine (g kg^{-1} [b])	5,4	4,0
Threonine (g kg^{-1} [b])	6,1	5,0
Tryptophan (g kg^{-1} [b])	2,0	1,5
Lys:Meth+Cyst:Thr:Try	1:0,59:0,68:0,23	1:0,51:0,63:0,19
Lysine/ME (g MJ^{-1})	0,70	0,62

[a] ME: metabolizable energy
[b] as fed basis

35 crossbred sows (Large White x Landrace) were used in the experiment. They were kept in 8 groups of 4 or 5 sows each in accordance with EC-Regulation 889/2008. The sows were allocated to one of the two treatments at the time of farrowing. Each sow received the same diet for a period of 2 years (i.e. for a maximum of 4 lactations). The following parameters were recorded: individual feed intake (daily) and body weight (four times per lactation), ultrasound measurements of back fat depth (three times per lactation); during lactation three times blood samples were taken to determine the concentration of urea, NEFA and γ-GT2 of serum.

Furthermore, litter size, litter weight, individual body weight of piglets (once a week until weaning) and consumption of creep feed by piglets were recorded.

All statistical analyses were computed using the MIXED procedure of SAS 9.1. For performance levels of sows the model included the random effect of the sow nested within treatment, the fixed effect of treatment, housing system, season and the continuous effect of duration of suckling period. For blood parameters the model consisted of the fixed effect of treatment, season, parity number, date of blood sampling and also the interaction treatment x date of blood sampling. Data are reported as least square means.

Results

Data from 118 litters showed the following results: No significant differences were found between treatments for feed intake, body weight and back fat depth of sows (Table 2). Serum urea concentration was significantly higher (P=0,018) and NEFA content was significantly lower (P=0,005) for treatment U.

Table 2. Feed intake, body weight and back fat depth of sows

	Treatment		S_e	P
	C	U		
Total feed intake (kg d^{-1})	7,4	6,9	1,05	0,071
Body weight at farrowing (kg)	278	279	19,9	0,830
Body weight at weaning (kg)	251	247	13,7	0,600
Back fat depth at farrowing (mm)	13,6	14,7	4,89	0,248
Back fat depth at weaning (mm)	11,8	12,7	3,84	0,286

As shown in Table 3 there were no significant differences in numbers of born and weaned piglets and litter weight. Nevertheless, piglets in treatment U showed a slightly lower weight gain.

Table 3. Selected parameters of piglets

	Treatment		S_e	P
	C	U		
Piglets born alive (n)	10,6	11,1	2,80	0,475
Piglets weaned (n)	7,7	8,4	1,77	0,152
Litter weight after farrowing (kg)	15,2	15,7	3,64	0,484
Litter weight at weaning (kg)	89,6	91,7	21,93	0,641
Daily weight gain per piglet (g/d)	247	232	37,6	0,088

Discussion

Due to the high feed consumption of sows, their energy intake is in line with the recommendations (GfE 2006). In relation to the relatively high body weight losses given here in, serum NEFA contents were lower than reported in an earlier study (Rojkittikhun et al. 1993). This could be an indicator of a sufficiently high supply of sows with nutrients (Neil 1996). Blood urea is within the range of established reference values (Verheyen et al. 2007), but was significantly higher for treatment C. This could be explained by the fact that sows of treatment C consumed considerably more feed and therefore had a higher overall protein intake (Neil 1996). The higher body weight and daily weight gains of weaned piglets in treatment C have to be seen in connection with the smaller litter size in this treatment. The comparatively low number of weaned piglets in treatment C is probably related to the smaller litter size rather than to a treatment effect.

Suggestions to tackle the future challenges of organic animal husbandry

The study shows sows can compensate for reduced dietary energy and amino acid contents. An important prerequisite for this is an optimized feeding management which includes the possibility of high feed intake and analysing feedstuffs for their nutrient contents. Moreover, good care must be taken to maintain a proper body condition of sows before farrowing.

Optimizing the feeding management is therefore seen as a main factor for a successful implementation of diets consisting of 100 % organic feed components for lactating sows.

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