

Short communication

A note on the effect of dietary supplementation with herbal extracts on sow and litter performance

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Abstract

The aim of this study was to assess the efficacy of the phytogetic product, Ruchamax® (Ayurved, India), on the productivity of sows and the performance of their first litters. Ruchamax® contains a blend of herbal extracts from *Adrographis paniculata*, *Phyllanthus emblica*, *Curcuma longa*, *Zingiber officinale* and *Allium sativum*. It was incorporated into a lactation concentrate mixture (E) at an inclusion rate of 1 kg per 1000 kg. A total of 40 primiparous sows (PIC) were allocated to two equal groups: untreated (control (C)) and herb-supplemented (E). Treatments were from day 1 to 28 of lactation. Nursing sows fed the herb-supplemented diet had significantly increased average daily feed intake (5.84 vs. 5.46 kg) and milk output (7.58 vs. 6.71 kg). The experimental factor had a positive effect on the condition of sows (lower reduction of thickness during lactation). Changes in backfat thickness (farrowing-weaning) were significantly different (-6.45 vs. -9.40 mm). There were no differences in initial litter size and litter birth weight (BW) between groups. The average BW of piglets was similar (ca. 1.6 kg) in both groups. The herb-supplemented diet affected 28-day litter weight (69.95 vs. 63.40 kg), average piglet body weight (7.27 vs. 6.74 kg) and daily litter growth rate (1.79 vs. 1.68 kg) significantly compared with the control. It can be concluded that the sows receiving an herb-supplemented diet were characterized by better productivity indices than the control group.

Keywords: Herbal extract, primiparous sows, piglets, performance

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Feed intake after farrowing is important for milk production and piglet survival. The average daily feed intake (ADFI) of sows increases progressively during the first week of lactation to reach a maximum in the second and third week after farrowing (Guillement *et al.*, 2006; Mosnier *et al.*, 2009).

Feed intake levels in lactating sows are determined by a variety of factors. Deficient feed intake during the lactation period may prolong the drying-off process, reduce fertility and reproductive performance, decrease body weight and lower milk production, and are directly related to piglet survival and growth. Several studies have reported that a lactational weight loss of above 10% to 12% decreases reproductive performance in the subsequent parity (Clowes *et al.*, 2003; Thaker & Bilkei, 2005). The best period for a sow to recover from lactational losses may be early pregnancy (Dourmad *et al.*, 1996; Guillement *et al.*, 2006; Mosnier *et al.*, 2009). Approaches to the feeding strategy of sows over that period vary. As shown by Heving *et al.* (2011), an increase in feed intake during the first month of gestation improves sow development and increases litter size. On the other hand, the negative effects of an elevated feeding level during early pregnancy are questioned, even in gilts (Quesnel *et al.*, 2010).

Stimulation of feed intake in sows during early lactation remains a topical issue. One of the options could be the use of phytogetic products such as feed additives. Phytogetics – a relatively new class of feed additives – are plant-derived compounds incorporated into diets to improve the performance of livestock. Windisch *et al.* (2008) stressed their antioxidant properties, antimicrobial activity, growth-promoting efficacy, and effects that are partially associated with enhanced feed consumption, probably owing to an improvement in diet palatability. The group of phytogetic products is inclusive of herbs, whose bioactive substances have a wide range of effects on living organisms, including appetite stimulation, enhancement of digestion

processes and salivary secretion, increased feed intake and productivity improvement (Namkung *et al.*, 2004; Windisch *et al.*, 2008; Hashemi & Davoodi, 2011; Lipiński *et al.*, 2011).

The objective of this study was to determine the effect of lactation diets supplemented with a blend of herbal extracts on the performance of (primiparous) nursing sows and their first litters (d 1 to 28). The investigation was carried out with the approval of the local ethical committee (LEC 33/BZ/09).

The experiment was conducted in a commercial pig farm in north-eastern Poland, under standard housing and management conditions. All facilities (mating, sow and farrowing units) were fully equipped, including adequate ventilation and heating systems. Housing conditions were compliant with the current veterinary standards. Forty primiparous sows of the same genetic line (PIC) were used. The animals were divided into two equal groups, control (C) and experimental (E). The study covered the period from farrowing to weaning (28 lactation days).

The diet consisted (/kg) of 300 g triticale, 248 g barley, 200 g naked oat, 50 g wheat bran, 127 g soybean meal (ca. 46% CP), 20 g fish meal (ca. 64% CP), 10 g soybean oil, 40 g Globalmix LK HER, 3 g limestone and 2 g acidifier Agrocid. The nutritional value of the concentrate was 13.1 MJ metabolizable energy (ME)/kg and 170 g crude protein, 9.7 g lysine, 6.3 g Met+Cys, 6.1 g threonine, 2.2 g tryptophan, 10.3 g calcium, 4.1 g phosphorus and 2.4 g sodium/kg.

The experimental additive was a dry phytonogenic product, Ruchamax (Ayurved, India), containing a blend of herbal extracts from *Adrographis paniculata*, *Phyllanthus emblica*, *Curcuma longa*, *Zingiber officinale* and *Allium sativum*. Ruchamax was incorporated in the experimental diet (E) at the time of mixing at an inclusion rate of 1 kg per 1000 kg. The animals were fed *ad libitum* and had free access to water. The composition and nutritional value of lactation diets met the nutrient requirements of modern pig genotypes (NRC, 1998).

The following parameters were monitored throughout the study: Sow performance: average daily feed intake (ADFI), daily milk production, backfat thickness (P2), measured at farrowing and at weaning with a Renco Lean–Meater backfat scanner. Milk output was determined based on an increase in litter weight, assuming that piglets needed 4 L of milk per kg body weight gain (Close & Cole, 2001). Piglet performance: number of piglets born alive, average birth body weight, litter size, litter growth rate, mortality rates.

The results were verified statistically by one-way analysis of variance and Duncan's test. Arithmetic means (\bar{x}), standard errors of the mean (SEM) and significance levels (P) were determined. The results were processed with the use of STATISTICA software.

Average daily feed intake of sows differed significantly between dietary treatments ($P \leq 0.05$) (Tables 1 and 2). Daily feed consumption was 7% higher in primiparous sows fed the herbal-supplemented diet than the control group (5.84 vs. 5.46 kg). The experimental factor had no effect on backfat depth at weaning. However, lactating sows fed a diet supplemented with the herbal extract had higher backfat thickness at weaning (18.1 vs. 16.4 mm). The difference in backfat thickness (10.4%) between groups was found to be statistically non-significant.

Table 1 Effect of herb-supplemented diet (E) on sow performance

Item	Control	E [*]	SEM	P-value
Number of sows, n	20	20		
ADFI, kg	5.46 ^a	5.84 ^b	0.084	0.019
Backfat (P2) thickness, mm				
Farrowing	25.80	24.55	0.554	0.271
Weaning	16.40	18.10	0.547	0.123
Change in backfat thickness	-9.40 ^A	-6.45 ^B	0.506	0.001
Daily milk production, kg	6.71 ^A	7.58 ^B	0.179	0.004

^{*} Basal diet supplemented with 1 g Ruchamax/kg.

^{a, b} Within rows, means with different superscripts are significantly different at $P \leq 0.05$;

^{A, B} Within rows, means with different superscripts are significantly different at $P \leq 0.01$.

SEM: standard errors of the mean.

ADFI: average daily feed intake.

Higher feed intake had a beneficial influence on the body condition of the sows, based on changes in backfat depth at point P2, thus preventing the depletion of energy reserves. Changes in backfat thickness (farrowing-weaning) between treatments were significantly different (-6.45 vs. -9.40 mm; $P \leq 0.01$). The 13% difference in milk output in the experimental group (7.58 vs. 6.71 kg) was statistically significant ($P \leq 0.01$).

There were no differences in initial litter size and litter body weight (BW) at birth between dietary treatments (Table 2). The average BW of piglets was similar (*ca.* 1.6 kg) in the two groups. The piglets were characterized by high body condition scores and high body weights. At 28 days the herb-supplemented diet affected ($P \leq 0.01$) litter weight (63.40 vs. 69.95 kg), average piglet body weight ($P \leq 0.05$) and daily litter growth rate ($P \leq 0.01$). In the experimental group, the average litter weight on lactation at day 28 was 6.55 kg higher compared with the control group. The inclusion of Ruchamax at the rate of 1 g/kg diet for lactating sows had no significant effect on the survival rate of piglets.

Table 2 Performance of first-litter sows with diet supplemented with an herbal supplement (E)

Item	Control	E [*]	SEM	P-value
Lactation length, d	28	28		
Litter response criteria				
1st day				
Litter size, n	10.30	10.40	0.221	0.828
Litter weight, kg	16.40	16.90	0.437	0.581
Birth weight, kg	1.59	1.63	0.020	0.409
28th day				
Litter size, n	9.40	9.70	0.185	0.432
Litter weight, kg	63.40 ^A	69.95 ^B	1.455	0.008
Average piglets (BW), kg	6.74 ^a	7.27 ^b	0.131	0.019
Daily litter growth rate, kg	1.68 ^A	1.89 ^B	0.045	0.004
Survival rate until 21st day, %	91.36	93.64	1.087	0.309

Basal diet supplemented with 1g Ruchamax/kg.

^{a, b} Within rows, means with different superscripts are significantly different at $P \leq 0.05$;

^{A, B} Within rows, means with different superscripts are significantly different at $P \leq 0.01$.

SEM: standard errors of the mean.

BW: body weight.

Numerous studies (Clowes *et al.*, 2003; Thaker & Bilkei, 2005; Sulabo *et al.*, 2010) showed that greater pre-weaning growth rates in sucking piglets can be achieved by improving the milk output of the sows receiving high-density lactation diets, or maximizing lactation ADFI. In the present experiment, an increase ($P \leq 0.05$) in feed intake was noted in sows fed a diet supplemented with a blend of herbal extracts. Attention should be paid to higher milk production in the experimental group and an improvement in the body condition of lactating sows, leading to reduced weight losses. This could be because of dietary supplementation with the Ruchamax® herbal product containing *Curcuma longa*, *Zingiber officinale* and *Allium sativum* during early lactation. Glycosides, tannins, essential oils and saponins and other active ingredients of a wide range of species, herbs, and their extracts may naturally increase appetite, stimulate peristalsis and secretion of gastric acid, and modulate the gut microflora (Namkung *et al.*, 2004; Windisch *et al.*, 2008; Hashemi & Davoodi, 2011). According to Windisch *et al.* (2008), plant species of the family Zingiberaceae (e.g. ginger and curcuma) possess antioxidant properties. *Curcuma longa* and *Zingiber officinale*, contained in Ruchamax®, are known for their antioxidant activity. It seems that the active substances of Ruchamax® can stimulate appetite, enhance digestive processes and salivary secretion, increase feed intake, and improve sow productivity. Studies conducted by Polish researchers (e.g. Lipiński *et al.*, 2011) indicate that the beneficial influence of herbal extracts is also observed after weaning.

Optimal nutrient and ME intakes during early lactation, determined by ADFI, support litter growth and increases piglet survival rate. The researchers' data (Table 2) confirm the influence of ADFI on milk production and the performance of first-litter sows. The well-known relationship between milk production and piglet performance until weaning was noted in the present study. The difference in litter weight at weaning

(d 28) reached 6.55 kg, while litter size was similar in the two groups. Similar trends were reported for litter weight gains. Schinckel *et al.* (2010) analysed the relationship between feed intake and ME intake to measure sow lactation efficiency. The authors found that ADFI and ME intake was more strongly correlated with litter weight than with the number of piglets weaned on d 21. Despite the small group size, such a correlation was observed in this study.

The present study demonstrated that the supplementation of diets fed to nursing sows with a blend of herbal extracts (Ruchamax®) had a beneficial influence on their productivity indices and body condition. At weaning, the herb-supplemented diet was shown to have affected the pre-weaning performance of piglets.

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