Improving animal well-being with organic minerals and plant extracts

Economic growth in Asia is significantly linked to growth in animal production. Intensification of pig production, however, presents challenges such as higher stocking density, leading to vices like tail-biting and aggressive behaviour.

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Tail-biting can account for considerable economic losses due to secondary infections, pyaemia and carcase condemnations. This makes tail-biting a serious problem with high risks for animal well-being and productivity as well as marketability.

Besides high stocking density, other management-related stressors and a higher physical activity of pigs can be possible causes for tail-biting. Previous studies indicate that the risk of tail-biting increases with a higher physical activity of pigs.

In accordance, Statham et al. (2009) showed that pigs were more active during the days before a tail-biting outbreak as compared to pigs showing no tail-biting. Consequently, reducing the physical activity of pigs may lower the risk of tail-biting.

By decreasing excessive physical activity, supplementation of feed additives may help to decrease the risk of tail-biting in piglets. In this regard, the sedative capacities of hops and magnesium are promising and well-described.

Hops is known for its calming and stress-reducing effects and is used as a traditional natural medicine in humans. The main mechanism is an increased activity of the neuro-transmitter gamma-aminobutyric acid (GABA) in the central nervous system. This improves sleep with an effectively decreased nocturnal activity.

Magnesium in a highly bioavailable form reduces stress-indicators in live pigs and after slaughter and decreases stress-related hormones in pigs during transport. Assumedly, magnesium improves the ability to cope with stress by an inhibitive effect on pathways of the nervous system.

The aim of this study was to investigate whether the supplementation of specially selected hop compounds and highly available magnesium in the feed additive product MagPhyt can reduce tail-biting in piglets.

Materials and methods

A trial was carried out with 156 piglets (81 male, 75 female) from 13 sows at a leading German research institute (Oberer Hardthof, Justus Liebig University Giessen). For the experiment, 12 piglets were taken from each sow. Piglets were weaned at the age of four weeks with a mean weight of 8.4kg (±1.5, SD).

Table 1. Diet composition.

Diet composition	Phase I	Phase II
Energy (MJ ME/kg)	13.8	13.3
Crude protein (%)	18.6	19.2
Lysine (%)*	1.21	1.08
Methionine + Cysteine (%) *	0.74	0.71
Tryptophan (%)	0.22	0.21
Magnesium (%)	0.11	0.18

* ileal digestible

	CON[1] (n=50)	MP 2[1] (n=48)	MP 5[1] (n=46)	P-value (Kruskal-Wallis-Test)
Tail-injury				
Week 1	3,374	3,606	3,460	0.48
Week 2	3,871[b]	2,885[a]	3,967[b]	‹0.05
Week 3	4,188[b]	3,435[ab]	2,818[a]	‹0.05
Week 4	4,024	3,272	3,144	0.07
Week 5	3,705	3,649	3,087	0.37
Week 6	3,856	3,356	3,228	0.22
Week 7	3,376	3,440	3,224	0.36
Partial losses				
Week 1	0	0	0	–
Week 2	3,461	3,557	3,422	0.49
Week 3	3,666	3,621	3,153	0.68
Week 4	3,983[b]	3,854[b]	2,517[a]	‹0.05
Week 5	3,878[b]	3,853[b]	2,710[a]	‹0.05
Week 6	3,554[ab]	3,835[b]	2,752[a]	‹0.05
Week 7	3,734[ab]	3,916[b]	2,731[a]	‹0.05

[ab]Superscripts indicate significant differences between groups within the same week.
[1]CON, Control-diet; MP 2, CON + 0.2 % MagPhyt (Dr Eckel Animal Nutrition GmbH & Co. KG, Niederzissen, Germany); MP 5, CON + 0.5% MagPhyt

Table 2. Tail-injury scores (score 0-3) and partial tail losses.

The piglets of each litter were then divided into 12 pens. The diets were based on wheat, barley and soybean meal and formulated to meet the requirements of the piglets (Table 1) and were fed in a two-phase system (phase I week 5 and 6; phase II week 7-11).

The 12 pens were assigned to three treatment groups with four pens each. Group 1 (CON) received the standard diet without feed additive. Group 2 (MP 2) received the standard diet with the addition of 0.2% of a combination of selected hop compounds and highly available magnesium, Group 3 (MP 5) received the standard diet with the addition of 0.5% of MagPhyt.

The feed was offered in feeding troughs, with three piglets sharing a feeding place. The treatment was supplemented in exchange for wheat, so that the wheat and energy content in the MP 2 and MP 5 diets was slightly lower than in the CON-diet (-0.03, -0.06 MJ ME/kg).

Tail-biting severity was determined according to the Abriel scoring system, classifying tail injuries (0 = no injury, 1 = scratches, slight bite marks, punctual injuries, 2 = small area injuries, 3 = large area injuries) and partial losses of the tail (0 = no partial loss, 1 = ≤ one third partial loss, 2 = ≤ two thirds partial loss, 3 = › two thirds partial loss). Scoring was performed every seven days from week 1-7.

At every scoring, data was used as independent variables. The statistical analysis was carried out using a Kruskal-Wallis rank variance analysis. In order to better localise differences, a U-test with Hochberg adjustment was performed. For consideration of the entire trial period, frequencies were determined for all parameters.

Possible interactions of the groups and the frequency of tail injuries and losses were examined with the Chi2-independence test in contingency

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tables. After the trial period, the piglets were classified in three different groups according to their marketability.

Piglets with no tail-injuries or other indications and a normal body weight were classified as suitable for long-tail fattening. Piglets with a tail-loss up to one third and a normal body weight were categorised as suitable for short-tail fattening.

Those animals with severe indications, a tail-loss of more than one third and a body weight below average were classified as not marketable for fattening.

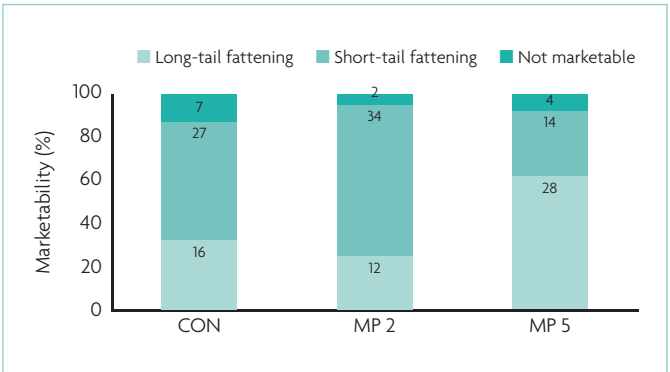

Fig. 1. Marketability at the end of the trial (CON: control diet, MP 2: CON + 0.2% MagPhyt (Dr Eckel Animal Nutrition GmbH & Co. KG, Niederzissen, Germany), MP 5: CON + 0.5% MagPhyt).

Results

Overall, strong tail-biting was observed throughout the experiment. First partial losses of tails due to tail-biting were evident in the second week of the experiment. From the third week onward, partial losses of the tails occurred in over 50% of the animals (Fig. 1).

At the end of the experiment, only a few animals showed no partial losses of the tails. However, the number of animals without partial loss of tails was considerably higher in group MP 5 (13 out of 46 animals) than in groups MP 2 (2 out of 48 animals) and CON (4 out of 50 animals).

The best scores for tail injury and partial losses were observed in the MP 5 group. During week two and three, animals of this group showed significantly lower scores for tail injury than the animals of the CON-group (Table 1).

In week 4, a similar trend was observed (Table 2). In weeks 4 and 5 significantly less animals of group MP 5 were affected by part-tail losses than in the CON- and MP 2 group (Table 2).

In weeks 6 and 7, animals in group MP 5 had significantly lower score values compared to MP 2 group (Table 2). As the piglets in group MP 5 were in general less inflicted by tail-biting, more piglets from this group could be sold for fattening than from the other groups (MP 5: 28 out of 46 vs. CON: 16 out of 50).

Discussion

As was to be expected, tail-biting resulted in tail injuries in the majority of the piglets. In accordance with another study, particularly strong tail-biting activities were observed in the second and third week after weaning, so that from the third week on over 50% of the animals showed partial losses of the tail.

The results show that the feed additive MagPhyt reduced the impact of tail-biting and improved the marketability especially in the higher dosage.

This can be attributed to its calming effect, which was demonstrated in a previous study based on a reduced content of the stress hormone cortisol in the saliva of piglets.

From the reduced impact of tail-biting, including better scores for tail injuries and partial tail losses, a considerably higher amount of piglets was marketable as fattening pigs by the end of the trial.

Conclusion

Overall, results show the efficacy of the tested product in reducing tail-biting in piglets, including a positive effect on the marketability of the animals. Consequently, this enhances the animals' well-being as well as improves economic profitability for the producer. ■

References are available from the author on request