Danish Pig Production

Formi and formic acid for weaners

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Abstract

The effect of adding Formi and formic acid to weaner feed was studied in one herd. The products were added to diet 1 and diet 2 in doses of 0.6% Formi and 0.6% formic acid. The addition of Formi and formic acid was compared with a control group. The aim of the trial was to document the effect of Formi and formic acid on weaner productivity. The trial comprised 32 blocks and 364 pigs/group.

There were no differences in treatments for diarrhoea or mortality between the pigs given the two diets. However, these were secondary parameters, and the trial was not designed to analyse differences in mortality or treatments for diarrhoea.

Feed analyses revealed good agreement between the calculated and the analysed content of nutrients.

On the basis of the production results, a production value was calculated based on the same feed prices in both groups.

When Formi and formic acid were added to the feed in the entire trial period, the production value tended ($p=0.087$) to be 5% higher compared with the control group and was 40% higher for diet 1, which was significant.

Overall, there was a positive effect of adding the acid to diet 1 the first two weeks post-weaning as the increased feed price, including the price of Formi and formic acid, was outweighed by an improved productivity. However, there was no advantage in adding the combination of Formi and formic acid to the feed seen over the entire trial period.

Background

BASF would like to document the effect of Formi and formic acid on weaner productivity.

The aim was to analyse the effect of weaner diets to which Formi and Formic acid were added. The effect was measured on the production results daily gain, feed intake, and feed conversion as the primary parameters. As secondary parameters, mortality and treatments for diarrhoea were recorded.

Materials and method

The trial was conducted at Experimental Station Grønhøj with SPF weaners with Mycoplasma bought for the trial.

The trial design is shown in table 1.

Table 1. Trial design		
Group	1	2
Company	-	BASF
Diet 1	Control	Control + 0.6% Formi[1] and 0.6% formic acid
Diet 2	Control	Control + 0.6% Formi[1] and 0.6% formic acid
[1)] See Appendix 2 for a description of Formi and formic acid.		

The weaners had an average weight of 8.0 kg at the start and 30.7 kg at the end of the trial.

Blocks

The trial comprised 24 pens of approx. seven pigs (approx. 168 pigs per group) and eight pens of approx. 25 pigs (approx. 200 pigs per group) in each treatment. There were two groups (treatments) and 32 blocks (replicates) in the trial. Upon transfer to the trial, the weaners were sorted according to gender to obtain an even number of blocks with female pigs and castrates. The pigs were also sorted according to weight, so that the average start weight was the same in each of the two pens constituting a block.

Feed

The composition of the feed and a description of the product are shown in Appendices 1 and 2.

The pigs were fed according to start weight (see table 2). In the first period of one or two weeks post-weaning, diet 1 was used. There was a one-week gradual switch to diet 2, which was used in the remaining part of the trial. All pigs were fed ad lib. They were given zinc oxide prescribed by the vet (2500 ppm Zn) the first 14 days post-weaning regardless of start weight, which was added manually to the feed upon feeding.

Table 2. Feeding strategy			
Start weight	Diet 1	Switch	Diet 2
< 8 kg	2 weeks	1 week	3 weeks
8-9 kg	1 week	1 week	4 weeks
> 9 kg	0 week	1 week	6 weeks

Recordings

Daily gain, feed conversion, treatments for diarrhoea and mortality at pen level were recorded. The pigs were weighed upon transfer to the trial, two weeks into the trial (intermediate weighing) and at the end of the trial. However, pigs weighing more than 9 kg were not subjected to intermediate weighing as they were not transferred to the trial until after intermediate weighing. Upon transfer, intermediate weighing and transfer from the weaner facility, the amount of feed used was calculated. Furthermore, mortality and the number of days spent on treatments for diarrhoea and other diseases were recorded.

Production value

The production value is based on an average of the last five years' weaner prices (September 2001 - September 2006) and was calculated as: (kg gain x DKK per kg gain) – (number of analysed FUgp x DKK per FUgp). The production value was calculated for the entire trial period for each pen.

Price of a pig weighing 7 kg:	DKK 200 per pig ± DKK 8.50 per kg
Price of a pig weighing 30 kg:	DKK 340 per pig ± DKK 4.90 per kg (15-30 kg)
Diet 1:	DKK 2.72 per FUgp
Diet 2:	DKK 1.47 per FUgp

Actual production value

In the calculation of the actual production value, an average price of pigs and feed was used of the last five weeks (weeks 41-45, 2007) including the price of the products, which was provided by BASF (see Appendix 2).

Price of a pig weighing 7 kg:	DKK 152 per pig ± DKK 8.00 per kg
Price of a pig weighing 30 kg:	DKK 280 per pig ± DKK 4.40 per kg (15-30 kg)
Diet 1:	DKK 3.42 per FUgp
Diet 2:	DKK 2.08 per FUgp

Data analyses and statistical analysis

The production value was calculated on the basis of daily gain and feed conversion per pig. The actual production value was calculated on the basis of the current prices of the product and the pigs. The calculation of the feed conversion included the analysed content of FUgp for each of the diets. The production value was tested as the primary parameter, while treatments for diarrhoea and mortality were included as secondary parameters. Data were subjected to an analysis of normal distribution and prevalence of outliers to ensure that no pens deviated significantly from the others. Data were subjected to an analysis of variance in SAS under the GLM procedure. Significant differences were stated at five per cent level. Statistics were not calculated on the actual production value.

Results and discussion

Feed

In Appendix 3, the nutrient content of the diets is shown. The declared and analysed content corresponded in all the diets.

Productivity

The productivity data are shown in table 3. The production results are calculated in a production value that, at fixed prices and identical feed prices, summarises the obtained production data.

For the entire trial period, there was a tendency (p=0.087) to a higher production value of DKK 3.1 per pig corresponding to 5 index points in the group given Formi and formic acid in the feed (see table 3). This was caused by a combination of a significantly higher daily gain and feed conversion for the pigs given diet 1 for one or two weeks post-weaning. If the production value is calculated solely on the basis of the productivity for these pigs, ie. the period before intermediate weighing, the production value was DKK 2.4 per pig corresponding to 40 index points higher when Formi and formic acid were added to the feed, which was significant.

In the trial, eight blocks (four on each treatment) stood out from the rest as the pigs' start weight averaged 10.1 kg. The pigs in the remaining blocks had an average start weight of 7.3 kg. Thus, the heavy pigs were not included in the trial until intermediate weighing. Their production results were identical regardless of whether they were given feed including Formi and formic acid. The light pigs that were given diet 1 for one or two weeks showed a positive effect of Formi and formic acid. This indicates that the positive effect of adding Formi and formic acid to feed is greatest among the smallest pigs. The smallest pigs are probably less robust against the bacterial pressure seen at weaning in a new facility.

The calculation of the actual production value including current prices and the price of the product demonstrated that when the price of the product was added to the feed price, the actual production value was level with the control group (see table 3). However, for the pigs given diet 1 the increased price of the feed including the products was outweighed by an improved productivity as the actual production value increased from DKK 4.2 per pig to DKK 5.8 per pig.

Table 3. Effect on production results of adding Formi and formic acid

Group	**1. Control**	**2. Formi & formic acid**
Start weight	8.0	8.0
Weight at the end of the trial	30.3	31.1
Diet 1 (24 blocks)		
Daily gain, g/day	240	287*
Daily feed intake, FUgp per pig	0.35	0.39
Feed conversion, FUgp per kg gain	1.52	1.41*
Production value (5 years' prices), DKK per pig	6.1	8.5*
Production value, index	100	140
Diet 2 (32 blocks)		
Daily gain, g/day	568	577
Daily feed intake, FUgp per pig	1.05	1.07
Feed conversion, FUgp per kg gain	1.87	1.86
Production value (5 years' prices), DKK per pig	58.2	59.6
Production value, index	100	102
Entire trial period (32 blocks)		
Daily gain, g/day	500	516
Daily feed intake, FUgp per pig	0.90	0.92
Feed conversion, FUgp per kg gain	1.81	1.79
Production value (5 years' prices), DKK per pig	62.7	65.8
Production value, index [1]	100	105
Actual production value (5 weeks prices), DKK per pig	42.5	41.7
Actual production value, index	100	98.2

* Significant difference of P<0.05 compared with control.
[1] For the entire period there has to be a minimum difference of 6 index points between the groups in order for the difference to be significant.

Health

There were no differences in mortality or treatments for diarrhoea between the two groups. The pigs were treated for diarrhoea for an average of 1.5 days, and mortality averaged 0.8%. 1.0% pigs were moved to a hospital pen. The trial was designed to test differences in productivity and not any effect on health. To be able to test an effect on health, significantly more pigs in each group is required.

Conclusion

The production value was significantly higher for pigs given feed including 0.6% Formi and 0.6% formic acid the first two weeks post-weaning. This was caused by an increased gain and an improved feed conversion.

There was a tendency in the entire trial period to an increased production value for the pigs given Formi and formic acid in the feed. The main effect was seen in the period when the pigs were given diet 1.

The combination of Formi and formic acid can be recommended as an addition to diet 1 the first two weeks post-weaning as the increased feed price including the price of Formi and formic acid was outweighed by an improved productivity. However, there was no advantage in adding the combination of Formi and formic acid to the feed seen over the entire trial period.

Participants

Technician Jens Ove Hansen
Statisticians Mai-Britt Nielsen and Jens Vinther

Appendix 1

Ingredients, %, diet 1

Group	1. Control	2. Trial
Wheat	45.31	43.42
Barley	20.00	20.00
Fishmeal	7.35	7.50
HP soybean meal, dehulled	6.00	6.00
Dried whey/Perlac	6.00	6.00
Antigene free soy protein HP 300	4.97	5.15
Potato protein Protastar	3.00	3.00
Vegetable fat (Scanfedt S)	3.00	3.40
Mono calcium phosphate	1.04	1.03
Molasses	1.00	1.00
Feed lime	0.76	0.75
AaA Vitamin Gysse	0.35	0.35
Dietary salt	0.16	0.15
L-Lysine hydrochloride	0.41	0.40
L-Tryptophan 15	0.36	0.36
L-Threonine	0.10	0.10
DL-Methionine	0,09	0.09
Vitamin E 25,000	0,09	0.09
Valine 98.5 %	0.01	0.01
Formi	-	0.60
Formic acid	-	0.60

Ingredients, %, diet 2

Group	1. Control	2. Trial
Wheat	55.24	53.01
Barley	15.00	15.00
Fishmeal	4.00	4.00
HP soybean meal, dehulled	15.37	16.03
Potato protein	2.45	2.36
Vegetable fat (Scanfedt S)	2.82	3.28
Mono calcium phosphate	0.74	0.75
Molasses	1.50	1.50
Feed lime	1.54	1.53
AaA Vitamin Gysse	0.26	0.26
Dietary salt	0.32	0.32
L-Lysine hydrochloride	0.38	0.38
L-Tryptophan 15	0.20	0.20
L-Threonine	0.10	0.10
DL-Methionine	0.08	0.08
Formi	-	0.60
Formic acid	-	0.60

Appendix 2

Information provided by BASF on the product

Name	**Formi and formic acid**
Supplier	BASF E-MEE/LT – J 550 67056 Ludwigshafen Germany
Content	Formi in doses of 0.6% Formic acid in doses of 0.6%
Price	Formi: 1.125 Euro per kg corresponding to DKK 8.39 per kg. Formic acid: 0.875 Euro per kg corresponding to DKK 6.52 per kg (exchange rate: 7.4548).

Appendix 3

Calculated and analysed content of nutrients, diet 1

Group	**1. Control**		**2. Trial**	
	Analysis	Calculated	Analysis	Calculated
Crude protein, %[1)]	21.4	21.2	21.7	21.2
Crude fat, %[1)]	5.8	5.6	6.2	5.9
Ashes, %[1)]	5.2	5.9	5.6	6.0
Water, %[1)]	9.9	10.7	10.1	11.0
FUgp, per 100 kg[1)]	121	119	120	119
Calcium, g/kg[2)]	9.2	8.4	9.2	8.3
Phosphorus, g/kg[2)]	7.9	7.2	7.9	7.2
Lysine, g/kg[2)]	14.8	15.0	15.0	15.0
Methionine, g/kg[2)]	4.7	4.8	4.8	4.8
Cystine, g/kg[2)]	3.7	3.4	3.6	3.4
Met+cyst, g/kg[2)]	8.4	8.2	8.4	8.2
Threonine, g/kg[2)]	9.2	9.2	9.3	9.2
[1] Average of four analyses [2] Average of two analyses				

Calculated and analysed content of nutrients, diet 2

Group	**1. Control**		**2. Trial**	
	Analysis	Calculated	Analysis	Calculated
Crude protein, %[1)]	20.9	20.0	20.8	20.0
Crude fat, %[1)]	5.2	5.1	5.8	5.6
Ashes, %[1)]	4.9	5.7	5.3	5.9
Water, %[1)]	9.9	11.8	10.3	12.0
FUgp, per 100 kg[1)]	119	116	119	116
Calcium, g/kg[2)]	8.9	9.3	9.3	9.3
Phosphorus, g/kg[2)]	6.5	6.0	6.5	6.0
Lysine, g/kg[2)]	13.9	13.3	13.7	13.4
Methionine, g/kg[2)]	4.3	4.1	4.2	4.1
Cystine, g/kg[2)]	3.7	3.3	3.6	3.3
Met+cyst, g/kg[2)]	8.0	7.4	7.8	7.4
Threonine, g/kg[2)]	8.8	8.3	8.7	8.3
[1] Average of four analyses [2] Average of two analyses				