INFLUENCE OF LECITHIN EMULSIFIER ON PIGLETS AFTER WEANING

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Abstract

The influence of supplementation of a lecithin emulsifier (0.1%) to the commercial feed mixture for piglets after weaning was studied. Totally 28 piglets in the control group (C - without lecithin) and 28 piglets in an experimental (E) group were monitored in three replications in a 28-day experimental period. The experiment started on the weaning day at the age of 28 days and ended four weeks later. The weight of piglets and feed consumption were monitored in weekly intervals. For digestibility determination the faeces were collected from the floor of pens last two days of every week. The digestibility was determined by calculating the content of nutrients in feed and faeces concerning the content of the marker (insoluble portion of ash). Statistically insignificantly higher was daily average gain (C = 383.3, E = 399.5 g) of experimental groups and statistically significantly lower feed conversion ratio (C = 1.959, E = 1.806 kg/kg, $P<0.01$) were found out. The improvement of increase of weight was registered every week of experiment too.

We observed higher digestibility of monitored nutrients in the experimental group, only differences in crude protein was statistically significant (C = 78.50, E = 82.20% $P<0.01$). Average daily gain weight was 292 g in control and 304 g in experimental group in an additional field experiment (C = 1235, E = 1174 piglets from birth to 81 days of age). According to the results presented in this study we can draw a conclusion that the supplementation of lecithin emulsifier to the commercial mixture for piglets in the period from weaning has a positive impact on the utilisation of dietary nutrients in piglets in the post-weaning period.

Key Words: Lecithin emulsifier, piglet, weaning

The need for natural alternatives to antibiotic growth promoters is an important issue in animal production in this time. The high production level with still increasing demands as well as production sites that have to fulfil high quality standards at low cost result in high stress levels for the animals and will increase the demand for additives with effect on production. Milk fat contains a large amount of short chain fatty acids that are easily consumable and absorbable (Palmquist et al., 1993). The digestibility of milk fat of sows is set to be up to 95% (Heugten and Odle, 2000). In addition, the fat is emulsified and it can be more easily digested in this form. Piglets lose this nutrition source at the moment of weaning and it is a question how to substitute it adequately (Jensen et al., 1997). Heugten and Odle (2000) considered insufficient digestibility to be the major problem of adding fats into feed mixtures for piglets. It may be caused by the size of fat droplets. It was reported that a lecithin emulsifier could help piglets of the weight up to 22 kg to increase weight gains and improve feed conversion (Schwarzer and Adams, 1996). The effect of lecithin emulsifier is higher in days immediately after weaning (Soares et al., 2002). With respect to these experiments the use of lecithin emulsifier in feed mixtures for piglets after weaning can be promising (Desouza et al., 1995; Gu and Li, 2003). The aim of the experiment was to test the effects of lecithin on the efficiency of piglets in the post-weaning period.

Material and methods

Piglets were weaned in age of 28 days and sorted into experimental (E) and control (C) group according to starting weight, sex and origin. In each group were 28 piglets. Piglets were kept in the cages with non-stop access to food and water. The experiment lasted 28 days. The control group was fed with commercial feeding mixture for piglets without growth stimulator. For experimental group was lecithin emulsifier added in amount 1kg/t feeding mixture. The weight of piglets and feed consumption were monitored in weekly intervals.

For digestibility determination the faeces were collected last two days of every week. The digestibility was determined by calculating the content of nutrients in feed and faeces concerning the content of the marker (insoluble portion of ash). In the laboratories of our institute the contents of dry matter, crude protein, crude fat, crude fibre, ash and insoluble portion of ash in HCl were measured. Dry matter was determined by weighing after drying at the temperature of 105°C for 4 hours. The content of crude protein in the sample was calculated after determining the nitrogen content by Coulometric titration according to the formula: crude protein = N × 6.25. Nitrogen in the sample was transformed after mineralization by sulphuric acid while boiling with catalyst to ammonium sulphide and by titration with hydrobromide generated coulometrically from potassium bromide using biamperometric indication its amount was

calculated. Fat was determined by weighing as the residue after extraction by means of diethyl ether. Fibre was determined as the solid residue after acid and alkaline hydrolysis by sulphuric acid and the solution of sodium hydroxide after having estimated the ash by weighing.

Ash was determined as the residue after complete combustion of organic substances at 550°C by weighing. The insoluble portion of ash in HCl was determined as the residue of ash after dissolving ash in diluted hydrochloric acid by weighing. Laboratory analysis of the used feed mixture was performed at the same time.

To confirm the results from experimental conditions an additional experiment was organized on the pig farm. The feed mixture for the experimental group was complete with the same. Weight of piglets was registered after birth and before transport to the fattening station. Feed intake was not registered for technical problems.

The statistical program QCExpert (TriloByte) was used for statistical evaluation.

Results and discussion

Average weight at the beginning of the experiment was almost the same in both groups (C = E = 8.700), but the final weight is about 0.5 kg higher in experimental group (C = 19.446, E = 19.886 kg). Average daily gain was statistically insignificantly about 4% higher in piglets from the experiment group (C = 383.8, E = 399.5 g). Feed consumption was 1.959 kg per 1 kg of weight gain in the control group, while in the experiment one 1.806 kg, which means a statistically significant decrease by 7.8 % – table 1.

The digestibility of nutrients was higher in piglets with the feeding mixture with emulsifier. The lowest increase of digestibility was determined in organic matters – by 1.4 % in comparison to the control; the highest increase was in crude fibre – an increase of 6.3% in comparison to the control.

The same effect was registered at crude fat, crude protein and ash digestibility – an increase of 4.3, 4.7 i.e. 4.2 % in comparison to the control group, but only differences in crude protein was statistically significant (C = 78.50, E = 82.20% P<0.01) – table 2.

The presupposition of a better feed exploitation was confirmed. In piglets from the experiment group there was a lower feed consumption per kg of weight increase in comparison to the control. This conclusion is supported by the fact a higher digestibility of nutrients from feeding mixture. Also Heugten and Odle (2000) arrived at the same conclusion. They found out a better digestibility of fat, energy and N-substances after adding lysolecithin (0.02%) into the feeding mixture for piglets. Our results support the results of the experimental utilisation of phospholipids obtained so far and published by Schwarzer and Adams (1996) and our previous results (Daněk et al. 2005), and supplemented information about influence of lecithin emulsifier on nutrients digestibility. During the whole experiment no changes of the health condition were found out, no diarrhoea in any piglet.

In the field experiment (Table 3) we monitored 1235 piglets to the age of 82.06 days in the control group and 1174 piglets in the experimental group to 82.21 days of age. The average final weight of the experimental piglets was higher (26.371 kg) than in the control (25.308 kg). The average daily weight gain was also higher in the experimental group (control 292 g/day, experimental piglets 304 g/day). These results are analogical to the results in experimental stalls.

Table 1. Results of feeding experiment

		C	E	Index (%) C = 100%
Number of piglets		28	28	
Initial weight kg	x	8.700	8.700	100
	SD	1.256	1.586	
AWG g/day	x	383.8	399.5	104.1
	SD	98.4	95.0	
FCR kg/kg	x	1.959^{A}	1.806^{B}	92.2
	SD	0.063	0.045	
Final weight kg	x	19.446	19.886	102.6
	SD	3.364	3.586	

values marked by different capital letters are statistically highly demonstratively different (P>0.01)

Table 2. Digestibility coefficients (%)

		C	*E*	Index (%)
Crude fat	x	68.42	71.38	104.3
	SD	9.21	9.25	
Crude protein	x	78.50 ^{A}	82.20 ^{B}	104.7
	SD	4.36	2.36	
Crude fibre	x	56.01	59.52	106.3
	SD	13,09	10,54	
Organic matter	x	83.76	84.99	101.4
	SD	2,96	2,77	
Ash	x	64.88	67.59	104.2
	SD	9,32	10,20	

values marked by different capital letters are statistically highly demonstratively different (P>0.01)

Table 3. Results of field experiment

	K	P	P (K = 100%)
Number of piglets	1235	1174	
Initial weight kg	1.3	1,3	
Final weight kg	25.308	26.371	104.2
AWG g/day	292	304	104.1
Age of piglets (days)	82.06	82.21	100.2

Conclusion

According to the results presented in this study we can draw a conclusion that the supplementation of lecithin emulsifier to the commercial mixture for piglets in the period from weaning has a positive impact on the utilisation of dietary nutrients in piglets in the post-weaning period.

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The study was developed within the project of NAZV (National Agency for Agricultural Research) 1G46085