

# Effect of lecithin supplementation in standard diet for weaned pigs on growth performance and blood cholesterol level

**Maryia Todorova<sup>1</sup>, Maia Ignatova, Mariana Petkova**

*Institute of Animal Science – Kostinbrod, 2232, Bulgaria*

## SUMMARY

The objective of this experiment was to study the effect of lecithin addition to the diets on the performance and blood cholesterol in weaned pigs.

Sixteen weaned pigs cross-breed Youna half male and half female (initial body weight  $13.15 \pm 0.05$  kg) with two replicates were randomly allocated to two experimental groups for three weeks. The experimental design consisted of two dietary treatments: 1) control diet – unsupplemented; 2) experimental diet – supplemented with lecithin, at a level of 1% in the diet. Individual pigs' body weights were recorded weekly. Feed intake and feed conversion rate were determined at the end of the trail per group. At the end of the trail blood samples were collected from the pigs to determine total serum cholesterol concentrations.

The results of this study have shown that lecithin supplementation enhances average daily gain by 10.6%. The addition of lecithin had higher effect during the first two weeks after weaning. The lecithin supplementation reduced the serum cholesterol by 20%.

Keywords: piglets, weaning, lecithin supplementation, performance

## INTRODUCTION

The ban about the use of antibiotics as growth promoters led to necessity of them adequate replacement with harmless substance. To achieve these effects researches are focused on different bio-active additives like probiotics, prebiotics, plant extracts, nutritional emulsifiers and etc.

The main use of emulsifiers is to improve fat solubility in water. It was found that emulsifiers and especially lecithin have different beneficially actions in pigs. Positive effect of additional lecithin in feed on digestibility and

---

<sup>1</sup> Corresponding author email: mariq\_todorova\_1@abv.bg

utilization of nutrients was observed at different studies (Jones et al., 1992; Overland et al., 1993; Rodas et al., 1995; Heughten and Odle, 2000; Xing et al., 2004; Smulders, 2008). The main action of lecithin on digestion and utilization of fats, but it was observed that lecithin supplementation enhance digestibility of other nutrients too (Xing et al., 2004).

Several studies show positive effect of lecithin addition on average daily gain and feed conversion ratio (Rodas et al., 1995; Heughten and Odle, 2000; Xing et al., 2004; Daněk et al., 2005; Smulders, 2008).

Lecithin decrease serum concentration of total cholesterol, nonesterified fatty acids and triglycerides (Jones et al., 1992; Rodas et al., 1995).

The aim of this study was to investigate the effects of supplementation of sunflower lecithin in pigs' compound feed on growth performance and total serum cholesterol level.

#### MATERIAL AND METHODS

The experiment was conducted in the experimental base of the Institute of animal science – Kostinbrod, on pigs from our own farm. Sixteen weaned pigs Youna × Musclar half male and half female (initial body weight  $13.15 \pm 0.05$  kg) with two replicates were randomly allocated to two experimental groups. The experimental period was three weeks. During the trial pigs were fed with standard compound feed with crude protein content 18%. The experimental design consisted of two dietary treatments:

- 1) Control diet – unsupplemented;
- 2) Experimental diet – supplemented with 1% sunflower lecithin.

The feeding was *ad libitum* for the whole period. Pigs had free access to water by nipple watering trough.

During the experiment the following characteristics have been observed:

- 1) Individual pigs' body weights were recorded weekly;
- 2) Feed intake and feed conversion ratio were determined at the end of the trial per group;
- 3) Total serum cholesterol level at the end of the trial – by the method of Mrskos and Tovarek as described by Ibrishimov and Lalov (1987).

On the basis of these data was calculated average daily gain - weekly and feed conversion rate for all the treatment period.

The research data analysis was made by the usual variation statistics methods and Student's t-test was used to compare means.

## RESULTS AND DISCUSSION

The data characterizing pigs' body weight are presented in Table 1. Pigs from the trail group had higher body weight for the whole experimental period. This rise in body weight was by 6, 6.5 and 5% at the end of the 1<sup>st</sup> week, of the 2<sup>nd</sup> week and at the end of the trail, respectively, the improvement was however statistically insignificant.

Table 1: Body weight of pigs, kg

Period	Control group, $\bar{x} \pm SD$	Experimental group, $\bar{x} \pm SD$	%
At the beginning of the trial	13.90 ± 1.39	14.18 ± 1.65	
At the end of the first week	16.96 ± 1.17	17.98 ± 1.53	106
At the end of the second week	19.46 ± 1.15	20.72 ± 1.34	106.5
At the end of the trial	22.40 ± 0.72	23.58 ± 1.62	105

Table 2: Average daily gain of pigs, kg

Period	Control group, $\bar{x} \pm SD$	Experimental group, $\bar{x} \pm SD$	%
During the first week	0.437 ± 0.05*	0.543 ± 0.10*	124.3
During the second week	0.357 ± 0.01	0.391 ± 0.11	109.5
During the third week	0.420 ± 0.10	0.408 ± 0.18	97.1
During the whole trial	0.405 ± 0.04*	0.448 ± 0.05*	110.6

\*P&lt;0.05

The results for average daily gain are presented in Table 2. Pigs from the experimental group had significantly higher average daily gain by 24.3% compared to the control for the first week of the trail (P<0.05). It confirms the hypothesis, that the effect of lecithin is higher at the first two weeks after weaning. Our dates are in agreement with the results of Daněk and Paseka et al. (2005) and Soares and Lopez-Bote (2002). In the following weeks there were no differences between the groups. At the weaning the alimentary tract of the piglets is adapted mainly for milk feeding. Sows' milk contains high levels of fat - 40% of dry matter, with digestibility coefficient of 95%. The explanation of this high digestibility is that the fat in sow milk is already in an emulsified form ready for digestion. This suggests that the inability of the weaned pig to digest fat may be related to inefficient emulsification of dietary fat (Heugten and Odle, 2000). The addition of emulsifiers to fat in the feed can improve the digestibility of nutrients in weaned pigs. After pigs' adaptation to plant feed their bodies begin to produce enough digestive enzymes to fully absorb not emulsified vegetable fat. Average daily gain for all experimental period was higher for the treatment group then the control by 10.6% (P<0.05).

Data about feed intake and feed conversion ratio are shown in Table 3. Feed consumption was higher in experimental group compared to control by 2.7%. Similar results for slightly increase in feed intake is reported by other authors (Rodas et al., 1995; Overland et al., 1993). In the group received addition of lecithin was observed improvement in feed conversion ratio by 7.6%. The improvement in feed intake and feed conversion ratio was statistically insignificant.

Table 3: Feed intake kg/day and feed conversion ratio kg/kg gain

Indices	Control	Experimental	%
Average daily feed intake	0.691	0.71	102.7
Feed conversion ratio	1.71	1.58	92.4

Smulders (2008) established positive effect of food emulsifiers on feed utilization and carcass weight of pigs. When emulsifiers were added to the diet of weaned pigs improvement in the final body weight was from 5 to 9% and in feed conversion ratio from 2.6 to 5.8%. In other study Daněk and Paseka et al. (2005) observed increase in final body weight and average daily gain in treatment group compared to control by 4 to 9%. Feed utilization was improved too.

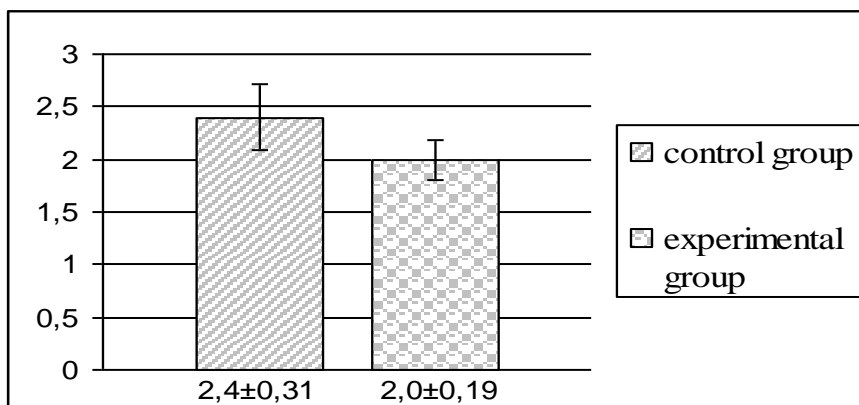


Figure 1: Total cholesterol concentration in pigs' blood at the end of the trial (mmol/l)  $P < 0.05$

Figure 1 shows data about total cholesterol content in blood. Total serum cholesterol content was significantly decreased in experimental group by 20% compared to the control ( $P < 0.05$ ). Total serum cholesterol content was  $2.4 \pm 0.31$  mmol/l in control group and  $2.0 \pm 0.19$  mmol/l in experimental group. It was found that the addition of lecithin in feed reflects on the amount of triglycerides, nonesterified fatty acids and serum cholesterol, helping to reduce them. According to Jones et al. (1992) this is due to increased digestibility of

fat as a result of which chylomicrons (lipoproteins, which are synthesized and secreted by the small intestine responsible for transport of absorbed dietary fatty acids, fat-soluble vitamins and exogenous cholesterol) is also rapidly cleared from the blood or secreted into the blood at a slower speed.

#### CONCLUSIONS

The results of this study have shown that lecithin supplementation has positive effects on final body weight by 5%. Lecithin addition increased feed intake by 2.7% and improved feed conversion ratio by 7.6%. Lecithin supplementation improved average daily gain by 10.6%. The addition of lecithin had higher effect during the first two weeks after weaning. The lecithin supplementation reduced the serum cholesterol by 20%.

#### REFERENCES

- Daněk, P., A. Paseka, J. Smola, J. Ondráček, R. Bečková, M. Rozkot. 2005. Influence of lecithin emulsifier on the utilization of nutrients and growth of piglets after weaning. *Czech J. Anim. Sci.*, 50, (10): 459-465
- Heugten, van E., J. Odle. 1998-2000. Evaluating of lysolecithin as an emulsifier for weanling pigs. Departmental Report, Department of Animal Science, ANS Report No.248
- Ibrishimov, H., X. Lalov, 1987. *Clin. Lab. Invest., Vet. Medicine – Zemizdat, Sofia*, 144
- Jones, D. B., J. D. Hancocks, D. L. Harmon, C. E. Walker. 1992. Effects of exogenous emulsifiers and fat sources on nutrient digestibility, serum lipids and growth performance in weanling pigs. *J Anim Sci.* 70:3473-3482
- Overland, M., M. D. Tokach, S. G. Cornelius, J. E. Pettigrew, J. W. Rust. 1993. Lecithin in swine diets: Weanling pigs. *Journal of Animal Science*, vol 71, issue 5 1187-1193
- Overland, M., M. D. Tokach, S. G. Cornelius, J. E. Pettigrew, M. E. Wilson. 1993. Lecithin in swine diets: Growing-finishing pigs. *Journal of Animal Science*, 71:1194-1197
- Rodas, B. Z. de, C. V. Maxwell, K. S. Brock. 1995. Exogenous emulsifiers in early weaned pig diet. [www.ansi.okstate.edu/research/1995RR/](http://www.ansi.okstate.edu/research/1995RR/)
- Smulders, Dennis. 2008. Nutritional emulsifiers make most of feed energy. *Feed International*. May
- Soares, M., C. J. Lopez-Bote. 2002. Effect of dietary lecithin and fat unsaturation on nutrient utilization in weaned piglets. *Animal Feed science and Technology*, vol 95, issue 3-4, pages 169-177

Xing, J. J., E. van Heugten, D. F. Li, K. J. Touchette, J. A. Coalson, R. L. Odgaard, J. Odle. 2004. Effects of emulsification, fat encapsulation, and pelleting on weanling pig performance and nutrient digestibility. *J Anim Sci* 82:2601-2609