

EFFECT OF TRIACYLGLYCEROLS OF CAPRYLIC AND CAPRIC ACID ON PERFORMANCE, MORTALITY AND DIGESTIBILITY OF NUTRIENTS IN GROWING RABBITS

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ABSTRACT

Medium-chain fatty acids, as consequence of their antimicrobial activity, may represent an alternative to in-feed antibiotics. The aim of our study was to examine effects of an oil containing triacylglycerols of caprylic and capric acid on growth, mortality and digestibility of nutrients in growing rabbits. Akomed R (Karlshamns, Sweden) containing caprylic, capric and lauric acid at 60.8, 38.7 and 0.3 g per 100 g of fatty acid methylesters, respectively, was used. In a field experiment, 216 rabbits weaned at 35 days of age were divided into two groups and fed a pelleted feed supplemented with Akomed R at 0 or 10 g/kg till 11 weeks of age. Rabbits of both groups gained more than 40 g per day, on average. There was no effect of Akomed R on the rate of growth. Mortality of rabbits of the treated group (15.7%) was significantly lower than that of rabbits of the control group (27.8%). The second experiment was carried out in an animal facility of the Czech University of Agriculture. Twenty rabbits (10 per group) were fed the same diets, with or without Akomed R. Digestibility measurements were performed in the 9th week of age. Digestibility of nutrients was not significantly affected. Carcass yield and feed conversion were not significantly different in treated and control rabbits. It can be concluded that medium-chain fatty acids supplied as triacylglycerols decreased high mortality of growing rabbits under field condition, but had no effect on other zootechnical parameters investigated.

Key words: rabbit, antibiotics alternative, performance, mortality, digestibility.

INTRODUCTION

Antimicrobials are used on commercial rabbit farms first and foremost to control infections and, consequently, to decrease mortality of young rabbits. In the Czech Republic the combination of virginiamycin (a feed antibiotic) and salinomycin (an ionophore coccidiostat) was successfully used on all rabbit farms for some time (SKŘIVANOVÁ *et al.*, 1999). Over the recent years, however, the use of antibiotics has been viewed critically and various strategies for improvements in animal health and

production have been explored (probiotics, addition of enzymes, organic acids, herbal extracts, bacteriocins). In our previous experiments, the effect of caprylic acid on performance and mortality of growing rabbits was examined (SKŘIVANOVÁ and MAROUNEK, 2002). It was concluded that caprylic acid added to a pelleted feed at 5 g/kg had no significant effect on the rate of growth, but significantly decreased mortality. The use of caprylic acid was more efficient on a farm where rabbit mortality was high. The purpose of this study was to determine the effect of a commercially available oil containing triacylglycerols of caprylic and capric acid (C₈ and C₁₀, respectively) on performance, mortality and digestibility of nutrients in growing rabbits. Both acids are efficient antimicrobials (MAROUNEK *et al.*, 2002), and are present in the rabbit milk (CAÑAS-RODRIGUES and SMITH, 1966). Whereas medium-chain fatty acids (MCFA) are presumably absorbed in the upper digestive tract, the action of MCFA in the gut may be protracted when supplied as triacylglycerols.

MATERIAL AND METHODS

First experiment

Two hundred and sixteen weaned rabbits of both sexes (Hyplus genotype), 35 days of age at the beginning of the experiment, were divided into two groups. Rabbits, born in a commercial rabbitry were kept in all-wire cages, four per cage. Environmental conditions were as follows: temperature *ca* 18 °C, relative humidity *ca* 65%, 12 : 12 h light : dark daily photoperiod cycle. Rabbits of the control group were fed a basal pelleted diet *ad libitum* (Table 1). Rabbits of the experimental group were fed the same diet supplemented with Akomed R at 10 g/kg. The oil used in this study contained caprylic, capric and lauric acid at 60.8, 38.7 and 0.3 g per 100 g of fatty acid methylesters, respectively. Rapeseed oil concentration in the feed was correspondingly decreased. The weight of rabbits was recorded weekly. Dead rabbits were examined using standard pathological and bacteriological methods.

Second experiment

Twenty Hyplus rabbits, weaned at 5 weeks of age, were penned individually in wire cages in the animal facility of the Czech University of Agriculture in Prague. Rabbits were fed the control or the experimental diet (10 rabbits per diet), as described above. During the 9th week of age, total faeces were collected to determine the apparent digestibility of nutrients according to PEREZ *et al.* (1995). Rabbits were slaughtered at the age of 11 weeks and the carcass yield determined.

Analyses

Contents of protein, fat and fibre in the feed and faeces were determined employing instruments Kjeltac Auto 1030 Analyser, Soxtec 1043 and Fibertec 2010 from Tecator AB Comp. (Sweden), respectively. Other analyses were performed using standard AOAC (1980) procedures. Effect of Akomed R supplementation on mortality of rabbits was statistically analyzed using the Fisher's test. Effect of Akomed R on other parameters was evaluated by the *t*-test.

Table 1. Ingredients and determined chemical composition of the diet^A.

Ingredients	(%)	Composition	(g/kg)
Alfalfa meal	28.5	Dry matter	923
Barley	19	Crude protein	170
Wheat bran	17.7	Crude fibre	169
Oats	16	Crude fat	37
Extracted sunflower meal	5.5	Starch	189
Extracted soyabean meal	4	Ash	71
Yeast	3		
Sugarbeet pulp	2.5		
Rapeseed oil	1.5		
Mineral supplement ^B	1.3		
Vitamin supplement ^C	1		

^AExperimental diet was supplemented with 10 g of Akomed R per kg.

^BComposition (/kg): Ca – 222 g, P – 62 g, Na – 34 g, Fe – 5.6 g, Mg – 4.6 g, Zn – 4.1 g, Cu – 710 mg, I – 22 mg, Se – 9 mg.

^CComposition (/kg): Vitamin A – 1200.000 IU, Vitamin D₃ – 100.000 IU, Vitamin E – 5 g, Niacin – 5 g, Pantothenate – 2 g, Riboflavin – 0.7 g, Thiamine – 0.2 g, Pyridoxine – 0.2 g, Folic acid – 30 mg, Biotin – 20 mg, Cobalamin – 2 mg, Choline – 60 g, Lysine – 25 g, Methionine – 10 g, Antioxidant – 10 g.

RESULTS AND DISCUSSION

First experiment

Rabbits of both groups gained more than 40 g per day, on average (Table 2). There was no effect of Akomed R on the rate of growth. Akomed R, however, significantly decreased mortality of rabbits from 27.8 to 15.7% ($P = 0.047$). Examination of dead rabbits revealed enteritis and pathological changes of organs (hyperaemia of liver, kidney and spleen, catarrh of the small intestine, bronchopneumonia), often also poor nutritional status. Effects of caprylic acid, the main Akomed R constituent, were similar in our previous study (SKŘIVANOVÁ and MAROUNEK, 2002).

Oils containing MCFA were tested under practical field conditions by DIERICK *et al.* (2002) in pigs. Oils were added at 25 g/kg to diets with or without an exogenous lipase. The authors concluded that piglets on diets containing MCFA oil performed better than piglets on control diet or a diet with common organic acids (citric, fumaric and Ca-formate). DIERICK *et al.* (2003) also reported a 25% increase of growth gains of piglets fed a diet with MCFA-containing seeds of *Cuphea (lanceolata and ignea)*, a plant from the central region of America.

Second experiment

No rabbit died in the digestibility trial (Table 3). Performance parameters and carcass yield were not significantly different in control and treated rabbits. Digestibility of nutrients was similar in both groups.

Table 2. Effect of Akomed R on performance and mortality of growing rabbits. Results of the 1st experiment (means \pm SD).

	Akomed R (g/kg)	
	0	10
Number of rabbits	108	108
Live weight (g)		
Initial ^A	933 \pm 89	920 \pm 78
6 wk of age	1232 \pm 131	1228 \pm 102
7 wk of age	1392 \pm 177	1373 \pm 165
8 wk of age	1707 \pm 244	1705 \pm 209
9 wk of age	2069 \pm 263	2035 \pm 278
10 wk of age	2375 \pm 247	2381 \pm 272
Final ^B	2671 \pm 275	2626 \pm 268
Weight gain (g)		
Total	1738 \pm 259	1706 \pm 254
Per day	41.4 \pm 6.1	40.6 \pm 6.0
Mortality	30 (27.8%)	17* (15.7%)

^AAt 35 days of age

^BAt 77 days of age

*Significantly different from the control (P<0.05).

Table 3. Performance, carcass yield and digestibility of nutrients in rabbits fed a control diet and a diet supplemented with Akomed R. Results of the 2nd experiment (means \pm SD).

	Akomed R (g/kg)	
	0	10
Number of rabbits	10	10
Initial live weight ^A (g)	1080 \pm 80	1045 \pm 82
Final live weight ^B (g)	2963 \pm 188	3063 \pm 307
Weight gain (g)		
Total	1883 \pm 181	2018 \pm 272
Per day	44.8 \pm 4.3	48.0 \pm 6.5
Feed conversion (kg/kg)	3.53 \pm 0.97	3.31 \pm 0.66
Mortality	0	0
Carcass yield (%)	60.9 \pm 1.8	61.4 \pm 0.9
Digestibility ^C (%):		
Dry matter	61.0 \pm 2.1	63.1 \pm 1.7
Crude protein	72.6 \pm 2.4	74.6 \pm 2.0
Crude fibre	15.7 \pm 5.6	11.4 \pm 3.9
Crude fat	85.9 \pm 1.4	86.7 \pm 1.5
N-free extract	71.7 \pm 2.7	74.4 \pm 1.3
Ash	48.5 \pm 2.9	53.3 \pm 3.2

^AAt 35 days of age

^BAt 77 days of age

^CDigestibility was measured in the 9th week of age.

CONCLUSION

Medium-chain fatty acids supplied as triacylglycerols decreased high mortality of growing rabbits under practical field conditions, but had no effect on the rate of growth.

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