

# DEVELOPMENT OF NOVEL FEED CONCENTRATES SUPPLEMENTED WITH SALINOMYCIN AND LACTO-SACC FOR GROWING RABBIT NUTRITION IN SMALL SCALE FARMS

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**Abstract** - To reduce the cost of feeding, two types of rabbit feed concentrate were developed. Concentrate I was rich in protein but poor in energy and fibre so it must be fed together with fiber feedstuffs and grains. Concentrate II was rich in energy and protein but poor in crude fibre so it needs roughage supplementation. Concentrates were supplemented with either salinomycin or probiotics Lacto-Sacc<sup>®</sup>. Salinomycin (Sacox<sup>®</sup>) supplementation of concentrate II had negative effect on weight gain in Group 3 as compared to Group 4 (35.1 g vs 36.8 g). The protease, amylase, cellulase and yeast culture contained in Lacto-Sacc<sup>®</sup> in Group 4 increased significantly ( $P < 0.05$ ) the daily weight gain as compared to Group 2 (36.8 g vs 30.9 g) and the feed conversion rate as compared to Group 2 and Group 5 (2.76 kg/kg vs 3.02 and 3.09 kg/kg) in young rabbits. Most of the rabbits preferred to consume the pelleted rabbit feed concentrate to the grains. Moreover, the rabbits preferred oats and then barley (33.4 g vs 29.5 g). It could be concluded that feeding costs due to the more favourable feed conversion rate could be reduced by 20-30 % if concentrates together with hay and grains are used in small scale farming.

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## INTRODUCTION

According to a survey the annual production of rabbit meat in Hungary has been estimated in 19 000 tons. 73.7 % (14 000 tons) of this amount are produced in small scale farms as secondary activity (LEBAS, 1992). Concentrated feed is used by 40 % of the producers to complete a basic diet of grains (barley, wheat, oat and maize). Feed consists almost exclusively of hay and farm and domestic by-products (KUSTOS, 1992; YAMANI *et al.*, 1994). Nevertheless, the excessive dilution of expensive commercial rabbit feed with by-products can cause deficiency of nutrients.

Cost of feeding is the most significant expense in rabbit production and reaches the 60-70 % of the total cost. For rabbit production to be profitable, it is necessary to reduce the cost and to increase the survival of born kits to market age. Disease such as enteritis, mainly after weaning is a major cause of economic losses in commercial rabbit production. Most authors agree that the etiology of the disease is complex (so-called "enteritis complex") and includes viruses, bacteria and coccidia. Dietary factors such as crude fiber content of feed and mycotoxin contamination also play a main etiological part in the digestive diseases of rabbits (PEETERS *et al.*, 1984, SINKOVICS, 1984). The prevention of enteritis has been attempted by different ways. The diet could be supplemented with a number of antibiotics (VÖRÖS, 1992), chemotherapeutic, coccidiostats (SINKOVICS *et al.*, 1990, 1991). Wooden hutches (with solid floor) are used by more than 40 % of farmers (KUSTOS, 1992) and are difficult to clean and disinfect. Particularly in small scale farming the diet needs to be supplemented with coccidiostats. Because of hepatic coccidiosis, 54 % of rabbit liver coming from small scale producers were condemned at the slaughterhouse (VARGA, 1982).

The Lacto-Sacc<sup>®</sup> preparation contains microencapsulated lactic acid-producing bacteria (*Streptococcus faecium* and *Lactobacillus acidophilus*), enzymes (protease, amylase and cellulase) and yeast culture. According to an experiment by ROSELL (1987), Lacto-Sacc<sup>®</sup> improves the health status, body weight gain and feed utilization, and decreases mortality of fattening rabbits.

Feed concentrate is a pelleted feed, which contains the basic nutrients at appropriate level, essential amino acids, minerals, vitamins and should be supplemented with preventive drugs and other additives. Moreover, it can be fed together with grain and/or roughage to satisfy the needs of nutrients at different ages of rabbits. By feeding this concentrate only a smaller part of the feedstuff requires industrial preparation (drying, grinding, mixing and granulation), while the larger part can be fed in natural form (hay, grain). The main purpose of present work was to develop rabbit feed concentrates supplemented with either coccidiostats or probiotics Lacto-Sacc<sup>®</sup> to improve economics of nutrition in small scale farming.

## MATERIAL AND METHODS

Two types of rabbit feed concentrate were developed. Concentrate I was rich in protein but poor in energy and crude fibre so its feeding needed supplementation of diet with grains (barley, wheat, oat) and roughage (alfalfa, mixed grass). Concentrate II was rich in energy and protein but poor in crude fibre so it needed only roughage supplementation. The ingredients of the diets are shown in Table 1 and the nutrient contents of the diets are shown in Table 2.

**Table 1 : Ingredient composition of diets**

Diets	Concentrate I	Concentrate II	Commercial diet
Oat (%)	18.00	16.00	
Barley (%)		10.00	
Wheat (%)		10.00	15.00
Corn (%)			30.00
Wheat bran (%)	20.00	20.00	5.00
Extracted sunflower meal 40% (%)	45.00	28.00	10.00
Alfalfa meal 19% (%)			35.00
Molasses (%)	4.50	4.00	
Beet slices (%)	10.00	10.00	
Limestone (%)	2.00	1.50	
Vit.-Min. premix (%)	0.50	0.50	5.00
Total (%)	100	100	100

**Table 2 : Nutrient content and cost of experimental diets**

Diets	Concentrate I	Concentrate II	Commercial diet
Dry matter (%)	87.52	87.23	86.0
Crude protein (%)	23.2	18.2	21.8
Crude fibre (%)	11.1	9.8	11.5
Ether extract (%)	3.0	3.4	2.5
Ca (%)	1.2	0.9	1.47
P (%)	0.7	0.7	1.0
Lys (%)	0.92	0.68	0.85
Met (%)	0.32	0.26	0.54
Met + Cys (%)	0.83	0.65	0.94
DE (MJ/kg)	11.2	11.8	11.4
Costs (%)	85.5	102	100

costs of experimental diets supplemented with hay and grains in per cent of commercial diet

A total of 120 New Zealand White (NZW) weanling rabbits of 6 weeks of age were kept in individual cages and randomly divided into five groups (n=24/group; 12/12 male/female) according to diets:

*Group 1* : concentrate I supplemented with salinomycin (Sacox<sup>®</sup>, Hoechst, Frankfurt) at a level of 25 mg/kg of feed (30-35 %), mixed grains (50 %), roughage (15-20 %),

*Group 2* : concentrate I supplemented with probiotics Lacto-Sacc<sup>®</sup> (Alltech, Nicholasville) at a level of 1 mg/kg of feed (30-35 %), mixed grain (50 %), roughage (15-20 %),

*Group 3* : concentrate II supplemented with salinomycin at a level of 25 mg/kg of feed (80 %), roughage (20 %),

*Group 4* : concentrate II supplemented with probiotics Lacto-Sacc<sup>®</sup> at a level of 1 mg/kg of feed (80 %), roughage (20 %),

*Group 5* : commercial diet as a control.

The feeding trial lasted 42 days when rabbits were 12 weeks old

Daily weight gain, feed intake, feed conversion and mortality were recorded. During this experiment feed choice was also investigated.

The rabbits were kept in individual wire cages. The commercial diet, the hay and water were given *ad libitum*. The rabbit feed concentrates were added in equal ratio of mixed grains (oat, barley and wheat).

Performance of animals was statistically evaluated as a completely randomized design scheme by analysis of variance and Chi-square test using Microsoft Excel 4.0 software to determine the least significant differences between means.

## RESULTS

Body weight gain of rabbits between 6-12 weeks of age in Group 1 and Group 2 was significantly ( $P<0.05$ ) lower (31 g and 30.9 g) than in Group 3 (35.1 g), Group 4 (36.8 g), Group 5 (34.8 g). Salinomycin supplementation of the concentrate II caused a no significant lower daily weight gain in Group 3 as compared to Group 4 (35.1 g vs 36.8 g). A significant ( $P<0.05$ ) difference was found in feed conversion rate among the groups. Moreover, the Lacto-Sacc<sup>®</sup> supplementation of concentrate II significantly ( $P<0.05$ ) increased the daily weight gain and feed conversion rate of growing rabbits (Table 3).

**Table 3 : Effect of different diets on the average production traits of growing rabbits**

Groups	Group 1	Group 2	Group 3	Group 4	Group 5
Body weight					
at 6 weeks of age (g)	985 <sup>a</sup>	948 <sup>a</sup>	949 <sup>a</sup>	946 <sup>a</sup>	943 <sup>a</sup>
at 12 weeks of age (g)	2286 <sup>b</sup>	2246 <sup>b</sup>	2425 <sup>a</sup>	2490 <sup>a</sup>	2406 <sup>a</sup>
Weight gain (g/day)	31 <sup>b</sup>	30.9 <sup>b</sup>	35.1 <sup>a</sup>	36.8 <sup>a</sup>	34.8 <sup>a</sup>
Feed intake (g/day)	93 <sup>b</sup>	93 <sup>b</sup>	102 <sup>a</sup>	108 <sup>b</sup>	107 <sup>a</sup>
Feed conversion (kg/kg)	3.01 <sup>a</sup>	3.02 <sup>a</sup>	2.9 <sup>ab</sup>	2.76 <sup>b</sup>	3.09 <sup>a</sup>

Group 1: concentrate I + salinomycin (30-35 %), mixed grains (50 %), roughage (15-20 %),

Group 2: concentrate I + Lacto-Sacc<sup>®</sup> (30-35 %), mixed grain (50 %), roughage (15-20 %),

Group 3: concentrate II + salinomycin (80 %), roughage (20 %),

Group 4: concentrate II + Lacto-Sacc<sup>®</sup> (80 %), roughage (20 %),

Group 5: commercial diet

Values in the same row marked with different letters are significantly different: ( $P<0.05$ )

The rabbits consumed first the concentrates and then the grains. Most rabbits preferred the peltable rabbit feed concentrate to the grains ( $P<0.05$ ). The rabbits preferred oats better than barley (Table 4).

**Table 4 : Feed preference of growing rabbits**

Diets	Concentrate I (n=30)	Wheat (n=30)	Barley (n=30)	Oat (n=30)	Hay (n=30)
Concentrate I (g)	89.7 <sup>a</sup>				
Concentrate I + wheat (g)	76.7 <sup>b</sup>	16.2 <sup>d</sup>			
Concentrate I + barley (g)	63.2 <sup>b</sup>		29.5 <sup>c</sup>		
Concentrate I + oat (g)	59.8 <sup>b</sup>			33.4 <sup>c</sup>	
Concentrate I + hay (g)	81.2 <sup>a</sup>				16.3 <sup>d</sup>

Values in the same row marked with different letters are significantly different: ( $P<0.05$ )

## DISCUSSION

Salinomycin (Sacox<sup>®</sup>) supplementation of concentrates had a negative effect on weight gain. This is in agreement with VÖRÖS *et al.* (1984) because it caused significantly decrease in feed intake due to its bitter flavour (NOGRADI *et al.*, 1988). In our experiment the beneficial effect of Lacto-Sacc<sup>®</sup> on production performances was primarily attributed to the enzymes and yeast culture content of the preparation. Weanling rabbits have difficulties in digesting feeds rich in carbohydrates and protein due to insufficient enzyme activity (CHEEKE, 1988). The protease, amylase and cellulase content of Lacto-Sacc<sup>®</sup> improved the digestibility of feed and consequently the weight gain and the feed conversion rate (GIPPERT *et al.*, 1992). Feeding of the roughage in large particle size form is more favourable to stimulate the ileo-caecal motility, reducing the risk of digestive tract disorders than the meal form in the pelleted feed as the physical structure of fibre may be damaged. The rabbits preferred oats and barley to wheat as found by HALL *et al.* (1976) and CHEEKE (1974). Due to the feed preference of growing rabbits it could be recommended to feed the concentrate in the morning and the grains in the afternoon.

In conclusion, rabbit feed concentrates due to the more favourable feed conversion rate can be used to complete basic diet of grains (oat, barley, wheat and maize), by giving dietary supply and ensuring profitable production in the Hungarian small scale farm units, as it was proposed in the present study.

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