EFFECT OF PROBIOTIC BIOPLUS 2B® ON PERFORMANCE OF GROWING RABBIT

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ABSTRACT

The aim of this work was to study the efficacy of probiotic BioPlus 2B® dietary inclusion on performance of growing rabbits in summer conditions. One hundred and twenty Pannon White rabbits were weaned and randomly divided into two groups with respect to litter size and body weight at 35 days of age. Control group was fed a commercial and antibiotic-free diet (C). In the treated group (B) the C feed was supplemented with 400 mg/kg of BioPlus 2B®. The diets were provided *ad libitum* until 77 days of age. The probiotic inclusion corresponded to $1.28x10^6$ colony forming units (CFU) per g feedstuff, i.e. $6.4x10^5$ CFU/g of *Bacillus licheniformis* and $6.4x10^5$ CFU/g of *Bacillus subtilis* after pelletization. Rabbits were housed individually in wire-mesh flat-deck cages (30x61x28 cm) under controlled conditions (16L:8D photoperiod). The inside temperature was 18-23°C, however, due to the hot summer, it could reach sometimes 23-26°C. The treatment did not affect 77d body weight and 35-77d daily weight gain (2427 g and 34.4 g/day in the B group, while 2434 g and 34.4 g/day in the C group, respectively). Feed efficiency was similar for the different groups. The supplementation had a beneficial effect on the sanitary risk (3.3% and 23.3% in B and C groups, respectively), primarily due to the lower mortality between 35 and 49 days of age (0% and 71% of all lossess occurred in this period in the B and C groups, respectively). With a dose of 400 mg/kg BioPlus 2B®, the morbidity was by 3% and the mortality rate by 17% lower ($P<0.002$) compared to the C group, resulting in a 20% decrease ($P<0.001$) in sanitary risk (morbidity+mortality) during the fattening. In conclusion, it could be advantageous to supplement the diet of growing rabbits with BioPlus 2B® in summer conditions, primarily aiming to reduce the sanitary risk during the fattening period. Nevertheless, further studies are needed to assess the efficacy of BioPlus 2B® inclusion in different environmental and housing conditions in rabbits.

Key words: rabbit, probiotics, *B. licheniformis, B. subtilis*, growth.

INTRODUCTION

In relation to the importance of caecal microbial fermentation, the digestive process is very complex and fragile in rabbits. That is why rabbits are rather sensitive to enteric diseases and especially when they are exposed to negative impacts, e.g. weaning or heat stress, causing high losses. This problem can be avoided by antibiotics. However, because of the general intention to limit antibiotics in animal feed as growth promoter

concerning side-effects, resistance and recent public perception about healthy food, new alternatives to antibiotics are needed (MARZO, 2001).

Probiotics that contain yeast, live bacteria or bacterial spores can also prevent enteric diseases of rabbits. Instead of growth promoters with antibiotics that kill some of the rabbit's own gastrointestinal flora, probiotics promote gut colonisation and stabilize eubiosis by competitive growth against harmful microorganisms, reducing the intestinal pH with production of lactic acid and encouraging digestion by producing enzymes and vitamins. These functions strengthen the animal's own non-specific immune defence (FORTUN-LAMOTHE and DROUET-VIARD, 2002). Dietary administered probiotic bacteria decreased the frequency of E. coli translocation (LEE *et al*., 2000) and were effective in preventing the growth of E. coli O157:H7 in the intestine of neonatal rabbits (TACHIKAWA *et al*., 1998). HAMRANY *et al*., (2000) found a dose-dependent positive effect of a probiotic bacterium on E. coli occurrence in the caecum and small intestine in young rabbits. Several studies reported the beneficial effect of dietary addition of bacteria (SZABÓ-LACZA *et al*., 1988, JENSEN and JENSEN, 1989, VÖRÖS and VÖRÖS, 1998, HAMRANY *et al*., 2000), bacteria+yeast (AQUILAR *et al*., 1999), bacteria+yeast+enzyme (DUPERRAY, 1991, TAWFEEK *et al*., 1991, VÖRÖS and GAÁL, 1992, GIPPERT *et al*., 1992 and 1996, MAERTENS *et al*., 1994, ABDEL-SAMEE, 1995, KAMRA *et al*., 1996., KERMAUNER and ŠTRUKLEC, 1997) and bacteria+herb extract (GOBY *et al*., 2000, EL-ADAWY *et al*., 2002, ZANATY, 2002) on health status and zootechnical traits in rabbits.

Probiotic BioPlus 2B® (Chr. Hansen A/S Hørsholm, Denmark) consists of *Bacillus licheniformis* and *Bacillus subtilis*. The advantage of these spore-forming bacteria is that they are able to survive the pelletization process (BOSCH, 1995) and the transit through the stomach, they germinate in the intestine and use a large number of sugars (carbohydrates) for their growth and they produce a range of relevant digestive enzymes (amylase, protease, lipase).

The aim of this study was to investigate the efficacy of dietary inclusion of probiotic BioPlus 2B® on the performance of growing rabbits under summer conditions.

MATERIAL AND METHODS

The study was carried out in a rabbit farm jointly operated by Lab-Nyúl Ltd. and the institute, between June and July 2002. Rabbits were kept individually in wire net flat-deck cages (30x61x28 cm) in a closed and air-temperated building (18-23°C) with forced ventilation and regulated photoperiod (16L:8D). However, in the hot summer, the inside temperature reached 23-26°C from June 15. Involving 120 Pannon White rabbits born in one reproduction cycle, the animals were divided into two groups considering litter size at birth and 35 days body weight at weaning.

A commercial and antibiotic-free diet (C), with 16% crude protein, 2% crude fat, 15.5% crude fibre and 10.3 MJ/kg DE, was fed in the control group. Group B received the C diet supplemented with 400 mg/kg of probiotic BioPlus 2B®. Feeds were provided ad libitum until 77 days of age. The inclusion corresponded to 1.28×10^6 colony forming units

(CFU) per g feedstuff, i.e. $6.4x10^5$ CFU/g of *Bacillus licheniformis CH 200* and $6.4x10^5$ CFU/g of *Bacillus subtilis CH 201* after pelletization (diet was exposed to 75°C for 45 sec. under pelletizing).

Individual body weight and feed intake were weekly measured when morbidity (ill but survival rabbits) and mortality were also registered. Daily weigh gain, feed conversion and sanitary risk (morbidity+mortality) were calculated from the data.

Estimating the effect of feeding, data of body weight, daily weight gain, feed intake and feed efficiency were subjected to analysis of variance, while data of mortality, morbidity and sanitary risk were analyzed using Chi-square test of STATGRAPHIC package 6.0 (1992).

RESULTS AND DISCUSSION

Addition of BioPlus 2B® did not affect significantly the body weight and daily weight gain (DWG) of rabbits between 35 and 77 days of age (Table 1).

In summer, heat-stressed rabbits have higher rectal temperature and respiratory rate, while their feed intake and consequently, their DWG decrease (ABDEL-SAMEE, 1995, KAMRA *et al*., 1996). Conversely to our result, ABDEL-SAMEE (1995) reported that the adverse effect of heat stress could be alleviated by probiotics resulting in a 10% improvement in DWG (26.3-26.9 vs 24.3 g/d). However, GIPPERT *et al*. (1992) found only a 3% increase in DWG in poorer conditions (commercial unit and in summer: 29.5 vs 28.7) but an 8% improvement in more favourable facilities (experimental farm: 31.2 vs 29.3 g/d) with probiotic inclusion compared to the control group. In other study of GIPPERT *et al*. (1996), the DWG of individually kept rabbits was improved with probiotic inclusion (36.8 vs 34.8 g/d). MAERTENS *et al*. (1994) reported also a relatively better DWG (43.4 vs 42.3 g/d) and larger 70d weight of rabbits (2418 vs 2387 g) under optimal housing conditions (18°C, 3 rabbits/m^2), whereas small and not significant differences were detected in DWG (41.8 vs 41.7 g/d) and final weight (2350 vs 2348 g) under less proper housing (14 animals/m^2) in favour of the probiotic treatment. Probiotics did not affect the DWG (33.2 and 32.7 g/d) of rabbits compared to the control with stocking density of 6 rabbits/cage (AQUILAR *et al*., 1999).

Similarly to BONANNO *et al*. (1999), feed efficiency tended (P=0.249) to improve by 1.5% with the treatment (3.38 vs 3.43) that can be connected with the relatively lower (P=0.280) feed intake (Table 1) and better digestibility of the nutrients. In other works the improvement of feed eficiency was due to a higher apparent digestibility of crude fibre and protein when probiotics and enzymes were provided together (GIPPERT *et al*., 1992, KAMRA *et al*., 1996, KERMAUNER and ŠTRUKLEC, 1997). In contrast to our result, ABDEL-SAMEE (1995) reported higher, 8% improvement in feed conversion in young rabbits that were treated with different probiotics in summer period (3.9-4.1 vs 4.3 in the control group).

Table 1. Effect of BioPlus 2B® supplementation on performance traits and sanitary risk in Pannon White growing rabbits

	Age (days)	Control	BioPlus 2B®	P value
Rabbits (n)		60	60	
Body weight, g	35	984±10	983±10	0.925
	42	1274±14	1267±14	0.726
	49	1558±17	1544±15	0.546
	56	1773±19	1759±17	0.580
	63	1999±20	1974±18	0.353
	70	2251±22	2238±20	0.654
	77	2434±23	2427±21	0.814
Daily weight gain, g/day	35-42	41.5±1.3	40.5±1.3	0.614
	42-49	39.3±1.3	39.6±1.2	0.869
	49-56	30.4±1.2	30.7±1.1	0.867
	56-63	31.9±1.2	30.6±1.0	0.413
	63-70	36.1±1.1	37.3±1.0	0.423
	70-77	26.2±1.3	27.3±1.1	0.499
	35-77	34.4±0.5	34.4±0.5	0.835
Feed intake, g/day	35-42	90±2	87±2	0.362
	42-49	105±3	102±2	0.316
	49-56	119±2	118±2	0.850
	56-63	120±2	117±2	0.233
	63-70	147±3	142±3	0.205
	70-77	126±2	128±2	0.687
	35-77	118±1	116±1	0.280
Feed efficiency	35-77	3.43±0.03	3.38±0.03	0.249
Mortality, %	35-77	18.3	1.67	0.002
Morbidity, %	35-77	5.00	1.67	0.311
Sanitary risk, %	35-77	23.3	3.33	0.001

When probiotics are used aiming to replace the antibiotics in the diet, the zootechnical traits are scarcely improved but with promoting the development and maintenance of the caecal flora they result in good health satus of the animals.

BioPlus 2B® inclusion exerted a beneficial effect on the sanitary status of the rabbits, especially due to the lower mortality and primarily between 35 and 49 days of age (0% and 71% of all lossess occurred in this period in the B and C groups, resp.). In the B group, morbidity was by 3% and the mortality rate by 17% lower ($P<0.002$) compared to the C group, resulting in a 20% decrease ($P<0.001$) in sanitary risk (morbidity+mortality) during the fattening (Table 1). Other studies (HOLLISTER *et al*., 1990, TAWFEEK and EL-HINDAWY, 1991, ABDEL-SAMEE 1995, HAMRANY *et al*., 2000) also reported a 2 to 16% better viability of rabbits with probiotic bacteria inclusion. In piglets, in a low health-status farm, providing 10^6-10^7 viable spores of *B. licheniformis* (LSP 122) per g of feed exhibited a better weight gain and feed conversion with reduced incidence and severity

of post-weaning diarrhoes syndrome (PWDS) caused by enterotoxigenic E. coli strains (KYRIAKIS *et al*., 1999).

CONCLUSIONS

On the basis of our results could be advantageous to supplement the diet of young rabbits with BioPlus 2B® in summer conditions, aiming to reduce the mortality and sanitary risk during the fattening. Nevertheless, further investigations are needed to assess the efficacy of BioPlus 2B® inclusion in different environmental and housing conditions in rabbits.

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