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Original scientific paper

EFFECT OF PROBIOOTIC "ZOOVIT" ON PRODUCTIVITY OF RABBITS

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The experiments included 50 does and 36 weaned rabbits of the White New Zealand breed. The animals were divided into two groups – experimental and control. The exeprimental group was supplemented with probiotic "ZOOVIT". The addition of "ZOOVIT" probiotic increases the fertility rate , which is 85,71 % in the experimental and 66,66% in the control group. The number of the live born rabbits is also higher in the experimental animals. In the experimental group is recorded a 10.8% lower mortality rate before weaning and a 10.9% higher average daily growth rate than in the control one. In rabbits for fattening, the experimental group has a 11.11% lower mortality rate. The additive used reliably increases live weight in the test group. Further studies are needed to establish the optimal doses of "ZOOVIT" in rabbit does, growing rabbits and rabbits for fattening.

Key words: probiotic; rabbit does; growing rabbits; fattening rabbits; live weight

ВЛИЈАНИЕ НА ПРОБИОТИКОТ „ЗООВИТ" ВРЗ ПРОДУКТИВНОСТА НА ЗАЈАЦИТЕ

Експериментите опфаќаат 50 женки и 36 зајаци во растеж од расата White New Zealand. Животните беа поделени во две групи – експериментална и контролна. Експерименталната група беше со додаден пробиотик „ЗООВИТ". Додавањето на пробиотикот „ЗООВИТ" ја зголемува стапката на фертилитет, која изнесува 85,71% во експерименталната и 66,66% во контролната група. Бројот на живородени зајаци е исто така поголем кај експерименталните животни. Во експерименталната група е забележана стапка на смртност пред одбивање пониска за 10,8% и за 10,9% повисока просечна дневна стапка на прираст во однос на контролната група. Кај зајаците за гоење експерименталната група има пониска стапка на смртност за 11,11%. Адитивот кој се користеше со сигурност ја зголемуваше живата маса во тестираната група. Потребни се понатамошни испитувања за да се утврдат оптимални дози на „ЗООВИТ" кај женките, зајаците во ратеж и зајаците за гоење.

Клучни зборови: пробиотик; зајаци женки; зајаци во растеж; зајаци за гоење; жива маса

INTRODUCTION

Rabbit meat is interested with its dietary and nutritional characteristics and the biosafety for the consumer. By intensifying production systems and simultaneously exposing various stress factors, antibiotics at subtherapeutic levels have been widely introduced in rabbits as growth promoters for a long time.

Their proven risk has led to banning the use of antibiotics in feeding rabbits and increased interest in the use of alternative natural products that will allow to maintain high fertility and reduce disease and mortality on farms.

Probiotics are defined as 'a live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance' (Fuller, 1989). Due to the unique physiology of digestive tract, rabbits usually show a fragile balance in their gut function and frequently suffer from post-weaning alimentary disturbances and probiotics may contribute to improve their health status (Trocino et al., 2005; Kritas et al. 2008, according to Bhatt et al., 2017).

The model of action of probiotics has not yet been well studied. In contrast to antibiotics, probiotics have no intention of destroying pathogenic bac-

teria but have a barrier effect against pathogens, prevent their development and colonization and ensure optimal feed utilization (Maertens et al., 1994). They improve digestion through the production of enzymes and vitamins such as these and thus enhance non-specific immunological protection (Kustos et al., 2004).

According to Nicodemus et al. (2004), the reduction of pathogenic microorganisms in the intestine is likely due to the direct action of the probiotics or the indirect stimulation of the useful bacteria population.

Falcao et al. (2007) reviewed results of probiotics in rabbits reporting a positive effect on average daily gain (ADG), feed conversion ratio and a lower mortality in most of the experiments (Bhatt et al. 2017).

Probiotics as a food supplement have great potential to improve the balance of intestinal microorganisms.

Products containing mainly bacteria of the genera *Lactobacilli, Bifidobacteria, Lactococcus, Bacillus* and *Pediococcus*, and yeasts (*Saccharomyces* strains) are used in rabbits.

The object of the present study is to determine the effect of the probiotic product "ZOOVIT" on conception rate and fertility, of does as well as the weight development and health status of suckling rabbits and rabbits for fattening.

MATERIAL AND METHODS

Pregnant, lactating and suckling rabbits

The experience was conducted in the Experimental farm of the Agricultural Institute, Stara Zagora, with two groups of 26 and 24 does from the White New Zealand breed. During the experiment, the following indicators were monitored: fertility (%), live born (%), dead born (%), mean breeds of 1 female (live + stillborn), weaned rabbits of 1 bunch and health.

Rabbits for fattening

Two groups were formed – experimental and control, with 18 rabbits in each, equalized by sex, live weight and age. During the experiment, the health status of the rabbits was checked daily in terms of vitality, digestive disorders and mortality. The weighing of the animals was monitored by individual weighing in 14 days. The experiment lasted 87 days.

The following parameters were monitored: weight at weaning (g), live weight over 15 days, average daily gain (g), live weight at 12 weeks.

The experimental results were analyzed using one-way ANOVA, covariance and correlations tests, and significant differences between groups were determined with the Duncan's multiple range test. Differences were considered significant at $P \leq 0.05$. The Statistica for WindowsTM software package version 8.0 (STATSOFT INC., 2007) was used for the data evaluation.

RESULTS AND DISCUSSION

Pregnant, lactating does and suckling rabbits

The composition and nutritional value of the feed was the same both for the control and experimental rabbits (Table 1), the difference consisted only in the addition of 0.5% probiotic in the test group.

Table 1

Ingredients and nutritional value of granulated feed for pregnant and rabbit does with and without added probiotic

Ingredients	%
Wheat	46.320
Lucerne hay	25.000
Sunflower meal	25.000
Dicalcium phosphate	0.500
Limestone	1.500
Salt	0.500
Micofix	0.200
Biotronik	0.250
Lysine -98%	0.230
Premix Rabbits	0.500
Probiotic	–/+
Total	**100**
Dry matter	89.100
Crude protein	17.433
Crude fiber	11.658
Ca	1.183
P	0.595
Lysine	0.848
Methionine + cystine	0.692
ME, kcal/kg	2176.720

The results showed that fertility was 19.05% higher in the experimental group (Table 2).

Table 2

Effect of a 0.5% probiotic on conception rate, fertility and the development of rabbits during the lactating period

Items	Control group	Experimental group
Number of rabbit does	24	28
Fertility, %	66.66	85.71
Born live rabbits, %	142/100	200/140.84
Born dead, %	3	11
Mean number of born rabbits per mother (live + born dead)	9.06	8.79
Weaned rabbits, %	66.20	77.00
Average number weaned rabbits from 1 litter	5.87	6.42
Live weight at weaning, g	741.30	777.01
Mortality before weaning, %	33.8	23.0

The average number of born rabbits per doe was 2.98% higher in the control group. The average number of weaned rabbits in the control and experimental groups was 5.87 and 6.42 respectively. On average, one rabbit is weaned by 9.34% more rabbits than the experimental group.

Similar results were reported by Abdel-Samee (1993) in experiments with probiotic “Lacto-Sacc”, where the number of liveborn rabbits increased by 16% and the number of the weaned by 11%.

Weaned rabbits from the test group had 35.41 g higher live weight than the ones from the control group. The probiotic used reduced the mortality by 10.8%.

Lower mortality in experimental group is probably due to increased IgA secretion (immuneglobulin A) and prevention of E. coli enteritis due to the action of *Lactobacilli* bacteria found by Ogawa et al. (2001).

Rabbits for fattening

The composition and nutritional value of the feed was the same for control and experimental rabbits (Table 3), the difference consisted only in the addition of 0.5% probiotic.

Table 3

Composition (g/kg) and nutritive value of basal diet feed for fattening rabbits with and without a probiotic additive

Ingredients	%
Barley	42.150
Wheat	10.000
Lucerne hay	25.000
Sunflower meal	20.000
Dicalcium phosphate	0.400
Limestone	0.800
Salt	0.500
Micofix	0.200
Biotronic	0.250
Lysine -98%	0.200
Premix Rabbits	0.500
Probiotic	–/+
Total	**100**
Dry matter	89.100
Crude protein	17.307
Crude fiber	12.170
Ca	1.183
P	0.599
Lysine	0.853
Methionine + cystine	0.690
ME, kcal/kg	2076.255

Table 4 provides data on weight development, feed consumption and mortality rate in growing rabbits with or without a probiotic in the ration. The average daily gain for the study period was 24.50 g in the control group to 26.80 g in the test group. Rabbits supplemented with probiotics had a 9.39% higher growth rate. It was found that the differences in growth rate were statistically reliable at $P < 0.05$.

Similar results were obtained by Abdel-Samee (1993), in White New-Zealand rabbits, where the average daily gain was 24.3 g and 26.3 g in the control and trial groups, and the probiotic increased the growth by 11%.

The average daily gain in our study was lower than that observed in earlier studies by Surdzijska et al. (2004), where the average daily growth in the groups was in the range of 32.5 – 37.2 g.

Regarding the utilization of the feed, it can be seen that the feed rate per 1 kg increase in weight was higher in the control group compared to the test one by 8.59%.

During the experiment, animals were monitored for possible gastrointestinal disorders caused by pathogenic microorganisms.

At Table 4 it can be seen that the established mortality rate during the test period in numbers and percentage by groups was 27.78% for the control one and 16.67 for the experimental, respectively. The addition of probiotic in the ration significantly reduces the mortality in the test animals and reliably increases the live weight at the 6th control weighing ($p<0.001$) (Table 5).

Despite the lower cost of feed in the trial group, this is a trend, because the differences can not be statistically processed due to the group feeding of the rabbits. The results obtained are higher than those of Kritas et al. (2008) where the rabbits has 4.7% higher live weight and 6.7% higher average daily gain.

Addition of a probiotic in the diet significantly reduced the mortality in the test animals and significantly increased the live weight at the 5th ($p < 0.05$) and the 6th ($p < 0.01$) control weighing (Table 5).

Table 4

Growth, feed consumption, and mortality of growing rabbits with and without a probiotic in the ration

Items	Control group	Experimental group
Number of animals in the group	18	18
Age at start of experience, days	36	36
Experimental period, days	84	84
Initial live weight, kg	693.16±12.79	696.67±31.29
Final live weight, kg	2754.81±47.62	2947.83±34.87
Average daily weight gain, g	24.50±0.53*	26.80±0.60*
in %	100	109.39
Average feed intake, g/day	142.66	142.50
Feed utilization, in % relative to the control group	100	91.41
Mortality, %	27.78	16.67

* – significance $P < 0,05$

Table 5

Weight development of fattening rabbits during the experimental period

Items	Live weight in the beginning, g	I weighing	II weighing	III weighing	IV weighing	V weighing	VI weighing
	x ± Sx	x ± Sx	x ± Sx	x ± Sx	x ± Sx	x ± Sx	x ± Sx
Experimental group							
Average daily gain, g	–	24.92±3.87	43.99±3.86	26.19±2.46	26.50±8.74	18.84±1.48	19.17±2.51
Live weight, g	691.11±34.09	1040.00±44.30	1699.78±41.46	2261.47±58.61	2454.33±39.11	2737.00±37.24^{c}	3005.33±42.39^{b}
Control group							
Average daily gain, g	–	22.22±63.79	47.24±7.49	22.31±5.53	23.41±2.23	16.00±1.63	15.19±3.50
Live weight, g	693.33±12.79	1004.44±73.33	1702.86±63.79	2171.43±75.77	2347.69±74.40	2587.69±66.17^{c}	2800.39±58.12^{b}

b – significance at $p < 0.01$; **c** – significance at $p < 0.05$

Probiotics containing lactic acid bacteria have a positive effect on health, feed costs and average daily gain. Kustos et al. (2004) found that the probiotic BioPlus 2B significantly reduced mortality by 17% and tended to decrease feed consumption and increased the average daily gain in rabbits for fattening.

The efficacy of a commercial probiotics (Bio-Plus 2B®; B. licheniformis, B. subtilis) on weekly growth performance of rabbits found similar feed intake and BW gain with non-significant difference in feed conversion rate (Kustos et al., 2004; Matusevičius et al. 2006). It has been shown that feeding of probiotics may have a growth promoting

activity by competing with harmful gut flora and stimulating the immune system (Kritas et al., 2008). A higher growth rate in probiotic supplemented rabbits may also suggest a better health status, more importantly the gastrointestinal health of the rabbits (Falco-e-Cunha et al., 2007; Kritas et al.2008,).

CONCLUSIONS

The following conclusions can be drawn, based on the results of the study: probiotic "ZOOVIT" has a positive influence on the conception and fertility rate of does, on the health status of the suckling rabbits and reduces the mortality before weaning by 10.8%. The rabbits from the test group have a 10.9% higher average daily gain.

In rabbits for fattening, the experimental group has a 11.11% lower mortality rate. The additive used reliably increases the live weight in the test group.

Further studies are needed to establish the optimal doses of "ZOOVIT" in pregnant does, growing rabbits and rabbits for fattening.

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