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GROWTH PERFORMANCE, DIGESTIBILITY COEFFICIENTS, BLOOD PARAMETERS AND CARCASS TRAITS OF RABBITS FED BIOLOGICALLY TREATED DIETS

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ABSTRACT

The current study was carried out to investigate the effect of supplemental two levels of effective microorganisms (EM1) in the diet, as a biological treatment, on growth performance, digestibility coefficients, blood parameters and carcass traits of growing rabbits. Total of 45 growing rabbits (7 wk of age) were divided into three groups (15 in each) with five replicates for each group. Rabbits in all experimental groups were fed the same basal diet (20% CP and 16% CF); but differed in level of biological treatment. Rabbits in the 1st group (control) were fed the basal diet without treatment, while those in the 2nd and 3rd groups were fed the basal diet treated with EM1 at levels of 1 (1% EM) and 1.5% (1.5% EM), respectively. Live body weight (LBW), digestibility coefficients (DC), some blood parameters and carcass traits were determined for up to 13 weeks of age. Results showed that 1 or 1.5% EM slightly increased contents of OM and NFE, and decreased EE and ash contents in diet of rabbits. Treatment with 1.5% EM increased CP and decreased CF contents, increased ($P<0.05$) final LBW and total weight gain, decreased ($P>0.05$) feed intake and improved ($P<0.05$) feed conversion ratio as compared to the controls. Digestibility coefficients of all nutrients improved by both levels of dietary EM treatments, being significant ($P<0.05$) only on CP, EE and NFE. Serum concentrations of total protein (TP), albumin (AL), globulin (GL) and glucose as well as activity of AST increased ($P<0.05$) were the highest ($P<0.01$), while activity of ALT was the lowest ($P<0.05$) in 1.5% EM treatment. Biological treatment with EM had no important effects on carcass traits and meat composition of rabbits. From the economic point of view, the observed nearly economic efficiency for both treated groups may suggest that EM at a level of 1.5% was effective in improving growth performance of rabbits without adversely effects on caecal digestion and healthy status of growing rabbits.

Keywords: Rabbits, microorganisms, growth, digestibility, blood constituents.

INTRODUCTION

Rabbits are unique among small animals for food and commerce because they produce highly nutritious, low fat, low cholesterol meat rich in proteins and certain vitamins and minerals (Cheeke, 1980). The negative experiences with the using of antibiotic growth promoters lead to subsequent reduction of their application. It is necessary to replace them by the growth promoters of natural origin, which are able to provide the comparable efficacy and will not contribute to the cumulative contamination of the environment (Bomba *et al*., 2006).

Effect of probiotics on rabbit performances or health was reviewed by Falcăo-Cunha *et al*. (2007). Microorganisms are considered as probiotics, which are one of the main categories of the biotechnological additives being used as natural growth promoters for young animals. They are strains as

Lactobacilli, *Bacilli* and *Styrptococci* or products as Lacto-Sacc. According to El-Desoky *et al*. (2002), effective microorganisms (EM) are a mixture of microorganisms which are useful for man, animal and plant as well as environmental friends. These microorganisms (bacteria and yeasts) produce antioxidants which act against the harmful free radicals (reactive oxygen species, ROS). EM is made up from three main kinds of bacteria – Phototrophic bacteria, yeast bacteria and lactic acid bacteria (Higa, 2003 and Anon, 2004).

The most beneficial effect of yeast supplementation would be on the digestive health in the young rabbit that could be significant under non optimal breeding conditions (Maertens and De Groote, 1992). The main impact of live yeast was supposed on digestive microorganisms, and for mono-gastric animal as rabbit. However, live microorganism will be beneficial provided that they survive to the environmental conditions, such the incorporation in pelleted feed, or the transit through the gastrointestinal tract. Therefore, we aimed to evaluate the effect of supplemental two levels of ME in the diet, as a biological treatment, on growth performance, digestibility coefficients, blood parameters and carcass traits of growing rabbits.

MATERIALS AND METHODS

This study was conducted at rabbit farm of the Agricultural Experiments and Researches Station (AERS), Faculty of Agriculture, Mansoura University, during the period from March to May 2009.

Animals:

A total of 45 New Zealand White (NZW) rabbits (7 wk old and 968±26 g LBW) was assigned to three similar experimental groups according to their live body weight, 15 in each. All rabbits were kept in community battery cages with five replicates (3 rabbits per cage, 50 x 50 x 35 cm), set up in an open-sided rabbit house, and managed under similar conditions.

The tested probiotic:

Effective microorganisms (EM) are a mixture of microorganisms which are useful for man, animal and plant as well as environmental friends. These microorganisms (bacteria and yeasts) produce antioxidants which act against the harmful free radicals (active oxygen). EM_1 consists of: 1) photosynthetic bacteria: *Rhadopseudomonas plustris* (ATCC 17001), *Rhodobacter sphacrodes* (ATCC 17023); 2) Lactic acid bacteria: *Lactobacillus plantaru* (ATCC 8014), *Lactobacillus casei* (ATCC 7469), *Streptococcus lactis* (IFO 12007); 3) Yeasts: *saccharomyces cerevisiae* (IFO 0203) and 4) Others, i.e. Microhiza (El-Desoky *et al*., 2002).

Feeding system:

Rabbits in all experimental groups were fed the same basal diet; but differed in EM level. Rabbits in the 1st group (G1) were fed the basal diet without treatment (C) and served as a control group. Meanwhile, those in the 2nd and 3rd group were fed basal diet supplemented with EM at levels of 1 and 1.5% (w/w) of the basal diet, respectively. The basal diets were formulated in pelleted form at AERS, Faculty of Agriculture, Mansoura University. The chemical composition of the basal diet is shown in Table (1).

Rabbits in all experimental groups were fed *ad. libitum* and water was available through water nipple in each cage. The experimental period lasted from 6 up to 13 wk of age.

Experimental procedures:

Live body weight and feed intake were weekly recorded, then body weight gain and feed conversion ratio was calculated at different week intervals of an experimental period from 6 to 14 wk of age. Also, viability rate was calculated at the end of experimental period.

Dry matter (DM), crude proteins (CP), ether extract (EE), crude fiber (CF) and ash of feeds and faces were analyzed according to the methods of A.O.A.C. (1990).

Table (1): Ingredients of the basal diet fed to rabbits in all experimental groups.

Ingredient	%	Ingredient	%
Yellow Corn	7.0	Limestone	1.0
Soybean meal, 44%	25	Di-calcium phosphate	1.0
Wheat bran	20	Common salt	0.5
Barley	15	Premix*	0.5
Alfalfa hay	30	Total	100

*** Each 3 kg premix contains: Vit. A, 12,000,000 IU; Vit. D, 3,000,000 IU; Vit. E, 10,0 mg; Vit. K, 3,0 mg; Vit. B_1, 200 mg; Vit. B_2, 5 mg; Vit. B_6, 3,0 mg; Vit. B_{12}, 15 mg; Biotin, 50 mg; Folic acid 1 mg; Nicotinic acid, 35 mg; Pantothenic acid 10 mg; Mn, 80 mg; Cu, 8.8 mg; Zn, 70 mg; Fe, 35 mg; Iodine, 1 mg; Co, 0.15 mg and Se, 0.3 mg.**

Digestibility trials and nutritive values:

During the last week of the experimental period, three digestibility trials were undertaken on three animals from each group. The rabbits were housed individually in metabolism cages (40 x 35 x 30 cm) which allowed feces and urine separation 3 days as a collection period. Feed intake was accurately determined and coprophagy was not prevented. Quantitative collection of feces started 24 hours after offering the daily feed, then the feces was dried at 60^{o}C for 12 h. All collected feces for each animal were mixed, ground for chemical analysis. Apparent digestibility of DM, CF, CP, EE, NFE and OM were then determined.

Values of total digestible nutrients (TDN) were calculated according to the classic formula described by Cheeke (1987).

Blood biochemical analysis:

At the end of the experiment (14 wk of age), three rabbits in each experimental group were slaughtered and blood samples were collected into centrifuge tubes without anticoagulant. Blood serum was separated by centrifugation of blood samples at 4000 rpm for 15 minutes and kept frozen at -20^{o}C till assayed. Concentration of total protein (Gornall *et al.,* 1949), albumin (Doumas *et al*., 1971), glucose (Trinder, 1969) and creatinine (Bauch and Seitz, 1985) as well as activity of aspartate (AST) and alanine (ALT) transaminases (Reitman and Frankel, 1957) were determined spectrophotometrically in blood serum using commercial kits (Bio-Merieux, Laboratory Reagents and Products, France). However, concentration of globulin was calculated by subtracting albumin from total protein concentration. Albumin/globulin ratio (AL/GL) and AST/ALT ratio were calculated

Carcass traits:

At the end of the experimental period, three rabbits from each group were randomly taken and weighed before slaughter. After complete bleeding, the head, pelt, viscera, feet and tail were removed. Weight of carcass (dressed weight) was recorded, and then dressing percentage was calculated. Weights of edible and non-edible organs were recorded. Samples from meat from the right caudal side of the carcass were taken for analysis. Rabbit meat was analyzed according to the methods of A.O.A.C. (1990).

Statistical analysis:

The obtained data were statistically analyzed by one way complete design to study the effect of treatment at each time using SAS (2004). However, the significant differences among treatment groups were tested using Multiple Range Test according to Duncan (1955).

RESULTS AND DISCUSSION

Chemical analysis of the experimental diets:

Chemical analysis of different experimental diets revealed that both biological treatments (1 or 1.5% EM) slightly increased contents of OM and NFE, while decreased EE and ash contents in diet of rabbits. However, considerable increase in CP and reduction in CF contents was observed, in particular in diet treated with 1.5% EM (Table 2).

In agreement with the present results, Allam *et al*. (2009) found that the biological treatment of wheat straw with ZAD solution as a probiotic had reduced the fiber content of the straw and improved the protein content. Also, Fayed (2009) noted that CP content was improved in feed formulations amended with pleurotus. These data agree with Vijaya *et al.* (2009), who reported an increase in CP of all treated feeds by wild and mutant strains of *P. ostreatus*.

Table (2): Chemical analysis of different diets fed to rabbits in all experimental groups.

Item	Experimental diet		
	D1 (Control diet)	**D2 (1% EM diet)**	**D3 (1.5% EM diet)**
DM (%)	89.45	89.16	89.39
Chemical analysis (on DM basis, %):			
OM	88.17	88.77	89.54
CP	20.20	20.91	22.23
CF	16.04	15.00	14.27
EE	4.93	4.42	4.71
NFE	47.00	48.44	48.33
Ash	11.83	11.23	10.46

Belewu and Yahaya (2008) recorded the highest CP content of the experimental diet could be due to the addition of microbial protein during the process of biological fermentation. Moreover, Abdelhamid *et al.* (2006)

reported that biological treatments using celluletic fungi are one of the treatments that aimed to improve the utilization of salt plants by increasing hydrolysis of cellulose to glucose and increased its content of crude protein.

Growth performance:

Results presented in Table (3) show that both levels of dietary EM treatments improved final body weight (FBW) and total weight gain (TWG) of growing rabbits as compared to the control one, but the differences were significant (P<0.05) only between 1.5% EM and control groups. It is of interest to note that the increasing FLBW of rabbits in both treatment groups was associated with insignificant reduction in their average daily feed intake (ADFI), reflecting significantly (P<0.05) better feed conversion ratio in both treatment groups as compared to the control one.

Table (3): Effect of dietary biological treatment on live body weight of growing rabbits during the experimental period.

Growth parameter	Experimental group			MSE
	G1 (Control)	G2 (1% EM)	G3 (1.5% EM)	
Initial live body weight (g/h)	968.0	968.3	968.0	26.2
Final live body weight (g/h)	2471^{b}	2524^{ab}	2577^{a}	28.6
Average daily gain (g/h/d)	26.8^{b}	27.8^{ab}	28.7^{a}	0.84
Average feed intake (g/h/d)	94.4	85.1	86.8	18.4
Feed conversion ratio	3.52^{a}	3.06^{b}	3.02^{b}	0.11

a and b: Means denoted within the same row with different superscripts are significantly different at P≤ 0.05.

In accordance with the present results, Trocino *et al*. (2005) found that *Bacillus cereus* var. *toyoi* has positive effect on production of rabbits. Also, El-Sherif *et al*. (2008) reported better results with yeast than with the control in live body weight, daily weight gain, daily feed intake, and performance index of rabbits.

Several authors indicated that contemporary administration of *L. acidophilus, Streptococcus faecium* and *S. cerevisiae* (Lacto-Sacc) increased weight gain and improved feed conversion (Yamani *et al.,* 1992). Also, addition of 0.15% live cells of *S. cerevisiae* to the feedstuff made it possible to increase live weight both at the time of weaning and after 70 d (Maertens and De Groote, 1992). By supplementing the diet with spores from *Bacillus* genus, a slight improvement (2.3%) was detected in the conversion ratio together with higher weight gain in the pre-weaning phase (Maertens *et al*. (1994). Recently, Allam *et al*. (2009) found that the biological treatment of wheat straw with ZAD solution as a probiotic additive improved growth and feed conversion by goats.

On the other hand, Aguilar *et al*. (1996) got a positive effect on growth rate, without effect on FCR; Moureo *et al.* (2004) found the opposite, i.e., no effect on growth rate but a tendency for an improvement in FCR; differently, Lebas (1996) did not get any effect at all. Matusevičius, *et al*. (2006) found that 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. The research results showed that at the end of the research 2 months old New Zealand rabbits, fed with composed feed containing BioPlus 2B®

probiotic, were by 310 g or 18 % (P<0,05) heavier than rabbits in tested group fed with composed feed without an additive.

Digestibility and nutritive values:

Results shown in Table (4) reveal that digestibility coefficients of all nutrients improved by both levels of dietary EM treatments. The effect was insignificant on DM, OM and CF. However, significant (P<0.05) effect of EM treatment was found on digestibility coefficients of CP, EE and NFE, being the highest with 1.5% EM treatment.

Table (4): Effect of dietary biological treatment on nutrient digestibility coefficients of the experimental diets intake by growing rabbits at the end of experiment.

Item	Experimental group			MSE
	G1 (Control diet)	G2 (1% EM)	G3 (1.5% EM)	
Digestibility coefficient (%)				
DM	67.35	72.42	73.47	2.31
OM	69.16	73.93	74.99	3.42
CP	74.9^{b}	79.85^{ab}	81.15^{a}	2.10
CF	61.99	62.51	62.68	3.71
EE	71.41^{b}	81.51^{a}	82.56^{a}	3.07
NFE	68.43^{b}	74.39^{ab}	75.62^{a}	2.13
Nutritive values (%)				
TDN	64.46^{b}	69.23^{a}	70.35^{a}	1.24
DCP	15.37^{b}	15.86^{ab}	16.77^{a}	0.51

a and b: Means denoted within the same row with different superscripts are significantly different at P≤ 0.05.

Regarding the nutritive values of the tested rations, EM treatment markedly improved nutritive values as TDN or DCP as compared to the control, being significantly (P<0.05) the highest with 1.5% EM treatment (Table 4). Similar results were obtained by several authors (Yamani *et al.,* 1992), who found that contemporary administration of *L. acidophilus, Streptococcus faecium* and *S. cerevisiae* (Lacto-Sacc) increased the digestibility of the diet Similarly, Allam *et al*. (2009) found that the biological treatment of wheat straw with ZAD solution as a probiotic additive improved the protein content, digestibility, and nitrogen balance by goats.

It is of interest to note that CP digestibility increased (P<0.03) from 47.5% to 52.3% in horse, only when yeast culture was added to low-quality forage diets (Morgan *et al*., 2007). The action of probiotics is generally ascribed to their ability to stimulate the digestive processes or to improve the gut microbial balance (Falcăo-Cunha *et al*., 2007).

Generally, improving final LBW of rabbits in treated groups was associated with increasing digestibility coefficients significantly (P<0.05) of CP, EE and NFE and insignificantly of CF and OM as well as improving nutritive values as TDN and DCP.

Blood biochemical analysis:

Results in Table (5) show that concentrations of total protein (TP), albumin (AL), globulin (GL) and glucose were significantly (P<0.01) higher in both EM treatment groups than in the control group, being the highest with

1.5% EM treatment. It is worthy noting that the increase in TP concentration in both treatment groups was associated with significant (P<0.05) increases in both AL and GL concentrations, reflecting insignificant changes in AL: GL ratio for all groups. Also, this increase in TP concentration may be due to significant (P<0.05) improvement in CP digestibility and nutritive values as DCP in both treatment groups as compared to the control one, but with insignificant changes in creatinine concentration of all groups.

Table (5): Effect of dietary biological treatment on blood serum parameters of rabbits at the end of the experimental period.

Item	Experimental group			MSE
	G1 (Control diet)	G2 (1% EM)	G3 (1.5% EM)	
Biochemical concentration:				
Total proteins, g/dl	7.90^{b}	8.38^{a}	8.52^{a}	0.11
Albumin (AL), g/dl	4.84^{b}	5.05^{a}	5.22^{a}	0.08
Globulin (GL), g/dl	3.06^{b}	3.33^{a}	3.30^{a}	0.10
AL/GL	1.58	1.55	1.58	0.05
Glucose (mg/dl)	72.33^{b}	75.50^{a}	76.50^{a}	0.97
Creatinin (mg%)	0.82	0.75	0.79	0.03
Transaminases activity (U/L):				
AST	23.24^{b}	26.97^{a}	28.28^{a}	1.04
ALT	14.85^{a}	12.78^{b}	11.90^{b}	0.17
AST/ALT	1.57^{b}	2.12^{a}	2.38^{a}	0.58

a and b: Means denoted within the same row with different superscripts are significantly different at P≤ 0.05.

Results in Table (5) show also that activity of AST significantly (P<0.05) increased, while ALT activity significantly (P<0.05) decreased, yielding significantly (P<0.05) wider AST/ALT ratio in both treatment groups as compared to the control group. The observed increase (P<0.05) in concentration of total proteins and its fractions in this study was mainly due to improving CP digestion and increasing DCP values in diets of treated groups with 1 or 1.5% EM. It is well known that concentrations of total protein and albumin have been reported to be directly responsive to amount of intake and quality of dietary proteins. The noted increase in plasma total proteins and its fractions in treated groups obtained in this study may be attributed to increasing CP digestion and nutritive values as DCP, indicating higher protein metabolism and normal liver function of rabbits in treated groups than in control group.

Carcass traits and chemical composition of rabbit meat:

Data in Table (6) show that, post-slaughter weight (hot weight), and weight of carcass (with head), net carcass, fore and lower portions, total edible meat, fur and full digestive tract were significantly (P<0.05) the highest in 1.5% EM group. However, dressing percentages (based on weight of carcass with or without head and with all edible organs) were significantly (P<0.05) lower only in 1% EM group than in the control group. These results indicated nearly similar characteristics of 1.5% group to that in the control group.

Table (6): Effect of dietary biological treatment on carcass traits of slaughtered rabbits at the end of the experimental period.

Item	Experimental group			MSE
	G1 (Control diet)	**G2 (1% EM)**	**G3 (1.5% EM)**	
Pre-slaughter weight, g	2130.0^{b}	2238.3^{a}	2268.3^{a}	31.47
Post-slaughter weight, g	2064.0^{b}	2156.7^{a}	2197.0^{a}	29.41
Blood weight, g	66.0^{b}	81.7^{a}	71.3^{b}	2.410
Carcass weight, g*	1099.3^{b}	1091.3^{b}	1154.3^{a}	19.58
Dressing percentage (%)*	51.59^{a}	48.74^{b}	50.96^{ab}	0.930
Net carcass weight, g**	909^{b}	901^{b}	963^{a}	0.840
Fore portion	469.00^{b}	465.67^{b}	511.00^{a}	10.25
Lower portion	630.33^{b}	625.67^{b}	643.33^{a}	9.14
Dressing percentage (%)**	42.65	40.21	42.52	1.42
Weight of edible organs (g):				
Head	190.33	190.3	191.33	1.024
Heart	5.67	5.33	6.00	0.980
Testes	5.33	5.67	6.00	0.847
Liver	72.33^{b}	79.33^{a}	76.00^{ab}	2.740
Kidneys	14.33	13.83	14.00	0.831
Adrenal gland	0.88	1.0	0.85	0.047
Total edible organs	288.87	295.5	294.18	1.094
Total edible weight, g***	1388.21^{b}	1386.83^{b}	1448.52^{a}	19.84
Net dressing percentage***	65.14^{a}	61.96^{b}	63.95^{ab}	2.094
Lung weight, g	21.00^{a}	18.3^{b}	17.00^{b}	0.927
Fur weight, g	280.3^{b}	299.3^{a}	298.3^{a}	5.140
Full digestive tract weight, g	374.45^{b}	452.17^{a}	433.15^{ab}	5.142

a, b and c: Means denoted within the same row with different superscripts are significantly different at P≤ 0.05. * With head. ** Without head. * With edible organs.**

Regarding chemical analysis of rabbit meat in different groups, results in Table (7) indicated insignificant effect of EM treatment on chemical composition of meat, although there was slight increase in CP and slight decrease in EE content in meat of rabbits fed 1.5% EM diet, beside slight increase in ash content in those fed 1% EM diet. Dietary energy in particular affects tissue depots in growing animals and, as a result, carcass traits and meat quality are also influenced (Oddy *et al*., 2001 and Purchas *et al*., 2002).

Therefore, given EM at level of 1.5% may be useful at improving dietary energy utilization, it is reasonable to investigate its effects on meat production. Gomes *et al*. (2009) found that yeast increased carcass dressing percentage but there were no effects on hot carcass weight, *Longissimus* area, subcutaneous fat thickness, percentage and weight of retail cut yield and trimmings. In the present study, supplementation of EM had no important effects on carcass traits and on meat quality of rabbits. Similarly, Matusevičius, *et al*. (2006) reported that the analyses of the chemical composition of meat indicated that the feed supplement with BioPlus 2B® did not have any influence on amount of dry matter and ash, but amount of protein increased by 1.8% and 4.1% and fat slightly decreased by 0.2 and 0.7% in comparison with the control group. The change of these indices influences and has a tendency to improve the quality of the rabbit meat.

Table (7): Effect of dietary biological treatment on chemical composition of meat of slaughtered rabbits.

Item	Experimental group			±MSE
	G1 (Control diet)	G2 (1% EM)	G3 (1.5% EM)	
DM (%)	33.19	32.94	32.24	2.41
Chemical analysis (on DM basis, %)				
CP	71.21	70.12	73.01	3.37
EE	17.08	16.43	15.26	1.72
Ash	11.71	13.45	11.73	1.24

Rabbit is one the best of all the short production cycle animals in term of capital input, Space, fecundity and prolificacy (Biobaku and Dosumu, 2003). Rabbit meat is wholesome low in cholesterol, sodium and fat but high in protein (Biobaku and Oguntona, 1997).

Economic efficiency:

Data in Table (8) revealed that economic efficiency of 1 and 1.5% EM groups was higher than the control group (313 and 314 *vs.278*%), respectively. Impact of biological treatment with EM on economic efficiency of rabbits was mainly due to decreasing feed intake and its cost along with increasing weight gain and its price for both treated groups as compared to the control group.

Table (8): Economic efficiency of rabbits as affected by biological treatment.

Growth parameter	Experimental group		
	G1 (Control)	G2 (1% EM)	G3 (1.5% EM)
Daily feed intake (g/h/d)	94.4	85.1	86.8
Cost of daily feed intake (E.L.)	0.212	0.195	0.201
Daily weight gain (g/h/d)	26.8^{b}	27.8^{ab}	28.7^{a}
Price of daily gain (E.L.)	0.589	0.611	0.631
Economic efficiency (%)	278	313	314.
Relative economic efficiency (%)	100	112	113

Price of each kg feed intake was 2.25, 2.30 and 2.32 L.E., respectively.
Price of each kg rabbit was 22.0 L.E.

DISCUSSION

The most beneficial effect of yeast supplementation would be on the digestive health in the young rabbit, that could be significant under non optimal breeding conditions (Maertens and De Groote, 1992), but their action mechanism remained to be elicited. The main impact of EM was supposed on digestive microorganisms, and for mono-gastric animal as rabbit, the targets for EM role would be mainly the hind-gut (caecum or colon). However, live microorganism will be beneficial provided that they survive to the environmental conditions, such the incorporation in pelleted feed, or the transit through the gastrointestinal tract.

Most microorganisms used in probiotics are strains of Gram-positive bacteria of the genera *Bacillus* (*B. cereus*, var. *toyo*i, *B. licheniformis*, *B. subtilis*) *Enterococcus* (*E. faecium*), *Lactobacillus* (*L.* 131). The effect of probiotics on digestibility was addressed by several researchers. While neither Gippert *et al.* (1992) nor Luick *et al.* (1992) found any effect. In the trial of Yamani *et al* (1992), Lacto-Sacc (a complex product containing microorganisms (*Lactobacillus acidophilus*, *Streptococcus faecium* and yeasts and also enzymes such as protease, cellulases and amylase) improved crude fiber digestibility at 8 and 12 weeks. Amber *et al.* (2004), working with Lact-A-Bac (*Lactobacillus acidophilus*), got improvements in the digestibilities of energy and of most analytical fractions (DM, CP, EE), including crude fibre. The probiotic significantly increased cellulolytic bacteria counts (cfu/ml), while at the same time decreased the counts of ureolytic ones. Caecal pH value was unaffected by the probiotic. Also, in the study of Maertens *et al.* (1994), the probiotic Paciflor did not affect either pH value or concentration of volatile fatty acids in rabbit caecum.

Matusevičius *et al*. (2006) found that 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. The research results showed that at the end of the research 2 months old New Zealand rabbits, fed with composed feed containing BioPlus 2B® probiotic, were by 310 g or 18 % heavier (P>0,05) than rabbits in tested group fed with composed feed without an additive.

The use of some organic substances, possessed to improve the growth performance of animals, through enhancing feed efficiency and immune response. One of these substances is EM stands (Effective Microorganisms). This is a combination of various microorganisms normally found in food or which are used in food production. EM is made up from three main kinds of bacteria – Phototrophic bacteria, yeast bacteria and lactic acid bacteria. When the effective combination of these microorganisms makes contact with organic materials, they secrete beneficial substances like vitamins, organic acids, minerals and antioxidants. When applied to the earth, they transform the microflora and macroflora, improving the natural equilibrium in such a way that the bacteria which previously caused problems are converted into bacteria which help to restore the natural health of the soil. All this helps to improve plant growth and serves as an excellent tool when used together with sustainable organic agriculture techniques (Higa, 2003 and Anon., 2004).

The confliction in the effect of biological treatment on performance of mono-gastric can be explained by differences in age and number of animals, hygienic conditions, type and level of treatment. From the economic point of view, the observed nearly similarity in economic efficiency for both treated groups may suggest that EM at a level of 1.5% was effective in improving growth performance of rabbits without adversely effects on caecal digestion and healthy status of growing rabbits.

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آداء النمو، معملات الهضم، قياسات الدم وجودة الذبيجه للأرانب المغذاه على علائق معاملة بيولوجيا

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أجريت هذه الدراسة لتقييم تأثير المعاملات البيولوجيه لعلائق الأرانب على آداء النمو، معاملات الهضم، صفات الدم وجودة الذبيجة لأرانب النيوزيلاندى الأبيض. استخدم في هذه التجربة 45 أرنبا عند عمر 8 أسابيع وقسمت إلى ثلاث مجموعات (15 في كل مجموعة)، وتم تقسيم كل مجموعة إلي خمس مكررات. وتم تغذية الأرانب في جميع المجموعات التجريبية علي عليقة محتوية علي (20 % بروتين خام ، 16 % ألياف خام) ، ولكن اختلفت المجموعات فى المعاملات البيولوجيه. الأرانب في المجموعة الأولي تم تغذيتها علي العليقة بدون معامله، الأرانب بالمجموعة الثانية والثالثة تم تغذيتها علي علائق معامله ب 1% و 2% من مركب ميكروبات فعاله (EM1) على التوالي.

أظهرت النتائج أن كلا المستويين من المعامله ارتفاع محتوى الماده العضويه ومستخلص خالى الأزوت ونقص المستخلص الأثيرى والرماد فى العلائق المعامله عن الكنترول. أرتفع محتوى العلائق من البروتين الخام وانخفض محتوى الألياف الخام بالمعامله ب 1.5% EM . أيضا أدت هذه المعامله الى تحسن معنويً فى وزن الجسم والزيادة اليوميه المكتسبة في الوزن وخفض متوسط الغذاء المأكول معنويا وحسنت الكفاءه الغذائيه معنويا حتى عمر 13 أسبوعا (نهاية التجربه) لم يختلف معنوياً في المجموعة الثانية والأولي. الأرانب بالمجموعة الثالثة أظهرت أعلي كمية غذاء مأكول. أدى كلا المستويين من المعامله الى زياده معنويه فى معاملات هضم البروتين الخام ومستخلص خالى الأزوت والمستخلص الأثيرى. :كانت تركيزات البروتينات الكلية والألبيومين والجلوبيولين والجلوكوز ونشاط الأنزيم الناقل لمجموعة الأمين (AST) الأعلى معنويا، بينما كان نشاط الأنزيم الناقل لمجموعة الأمين (ALT) الأقل معنويا لمجموعة المعامله ب 1.5% EM. لم يكن للمعاملات أى تأثير على خصائص الذبيحه ولكن أظهرت المعملتين أعلى كفاءه أقتصاديه للتغذيه على العلائق المعامله. توصى النتائج الى أن معاملة علائق الأرانب بمعدل (1.5% من مركب EM الميكروبى بعد الفطام أدى الى تحسنفى معدل الأداء الإنتاجي ومعاملات التحويل الغذائى والكفاءه الأقتصاديه في الأرانب النامية في المراحل العمرية بعد الفطام بدون أى تأثيرات عكسيه على صحة الأرانب.

قام بتحكيم البحث

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