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EFFECT OF SUPPLEMENTATION TIME OF PROBIOTIC IN DRINKING WATER ON NEW ZEALAND WHITE RABBIT PRODUCTIVE PERFORMANCE

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ABSTRACT: This experiment was conducted to study the effect of different times of probiotic supplemented on performance and some blood characteristics of New Zealand White (NZW) rabbits. A total of 40 NZW rabbits weaned at six weeks of age were divided equally into five treatment groups. Each group contained four replicates with two rabbits each. The experimental period, extended from 6 to 14 weeks of age. Five treatment groups were tested: 1), the control diet (without probiotic; 2) supplemented probiotic in drinking water from 6 to 10 weeks of age; 3), supplemented probiotic in drinking water from 8 to 12weeks of age; 4) supplemented probiotic in drinking water from 10 to 14weeks of age; 5) supplemented probiotic in drinking water from 12 to 14weeks of age. The experimental diets were formulated to be iso-nitrogenous (17.25% CP) and iso-caloric (2568 kcal DE/kg diet).
Results obtained could be summarized as follow:

The final live body weight and total body weight gain were significantly (P<0.01) affected by experimental treatment groups. The highest (P<0.01) values of live body weight and total body weight gain were recorded with rabbits that supplemented probiotic in drinking water during 8-12 weeks period (2187.75 g and 1451.50 g).

Feed intake was insignificantly (P<0.05) with rabbits that supplemented probiotic in drinking water during interval 10-14 weeks and the whole 6-14 weeks period. The best (P<0.01) feed conversion value was recorded with rabbits that supplemented probiotic in drinking water during 8-12 weeks period (2.87g feed/g gain).

The lowest (P<0.05) value of dressing wt.% was recorded with rabbits that supplemented probiotic in drinking water during(10-14) weeks period (51.72 %) compared with the other experimental treatments. Rabbits supplemented with probiotic during (6-10) recorded the highest (P<0.01) value of total giblets wt. % (66.96 %) compared with the other experimental treatments.

Key Words: Rabbits, probiotic, growth performance, carcass traits, economical efficiency.

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The lowest (P<0.05) value of serum cholesterol was recorded with rabbits that supplemented probiotic in drinking water during (12-14) weeks period (73.557 g/dl). Supplemented probiotic during (6-10 or 8-12) weeks period and control showed the lowest (P<0.05) values of aspartic transaminase (AST) and creatinine compared with the other experimental treatments and improving liver and kidney function.

The best economical efficiency and relative economical efficiency values had been recorded with rabbits that supplemented probiotic during 8-12 wks.(3.39 and 120 %) followed by rabbits that supplemented probiotic during 6-10 wks. (3.30 and 119 %), respectively.

Conclusively, it could be concluded that supplementation time of probiotic during 8-12 weeks of age in drinking water recorded the highest growth performance, feed utilization and the best economical efficiency and relative economical efficiency of NZW rabbits.

INTRODUCTION

A probiotic, which means "for life" in Greek (Gibson and Fuller, 2000), has been defined as "a live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance" (Fuller, 1989). Probiotics are known to possess physiological functions such as inhibition to pathogens, assisting digestion, immunoregulatory activity and antitumor activity (Parvez, et al., 2006). Weaning, a crucial period for all young animals, is associated with a lot of stress and increased sensitivity to diseases (Kritas et al., 2008). Several studies have been shown the positive effect of probiotics on the control of certain pathogens in animals, where they appear to control enteric diseases associated with Escherichia coli or other enteric pathogens (Kritas et al., 2008). Probiotics can alter the physical microenvironment of the intestinal tract in such a manner that opportunistic pathogens cannot survive (Chichlowski et al., 2007). Changes in the physical microenvironment inhibit pathogen growth in two ways. First, probiotic organisms compete with pathogens for nutrients thus preventing them from acquiring energy to grow and function in the gut environment (Cummings and Macfarlane, 1997). Second, probiotics produce a variety of organic acid end products, such as volatile fatty acids and lactic acid as a part of their metabolism of nutrients in the gut digest (Gibson, 1999). These weak organic acids lower the pH of the gut environment below that essential for the survival of such pathogenic bacteria as E. coli and Salmonella (Marteau et al., 2004). On the other hand, digestive canal of 1-month old rabbits is still not fully developed enzymes is scarce (Han, 1999; Li Changzhong, 2003; Yu Xihua, 2004).Especially, weanling could depress the activity of pancreatic lipase, trypsinase, amylopsin and chymotrypsin and at the same time the activity of lactase, sucrase and maltase is also depressed (Zhang and Luo,. 2005; Zhang, et al., 2002). Therefore, young, animal being in a stressful is more sensitive to the illnesses of digestion process and the animal grows slowly (Fuller, 1989).

Probiotics can improve the condition of digestive canal that is short of digestive enzymes (Wang et al., 2008). Moroever, probiotics were also shown to improve growth performance and mortality in rabbit farms with high mortality rates throughout the fattening period (13-22%) (Kustos et al, 2004 and Trocino et al., 2005). Supplementation of probiotic, improvements in growth performance and feed efficiency has been reported in rabbits (Wang et al., 2008; Kritas et al., 2008 and El-deek et al., 2013). Increased serum total protein, albumen and total lipids while reduced serum cholesterol with supplementation of probiotic in feeding rabbits, (El-deek et al., 2013). Furthermore, Greppi et al., (1992) showed that plasma cholesterol was slightly reduced with added probiotics in rabbits fed.

The objective of the present experiment is to investigate the impact of supplementation time of probiotic in drinking water on rabbit performance and blood characteristics

MATERIALS AND METHODS

The present study was carried out at Maryot Research Station belonging to Desert Research Center (DRC), Egypt.

Experimental animals and feeding treatments:

A total of 40 NZW rabbits weaned at six weeks of age were divided equally into five treatment groups. Each group contained four replicates with two rabbits each. The experimental period, extended from 6 to 14 weeks of age. Five treatment groups were tested: 1), the control diet (without probiotic; 2) supplemented probiotic in drinking water{Probax (Each 1Kg contains Lactobacillus Sporogenas - not less than 1 x 10^{10} CFU Dextose … a. s. 1 Kg)} from 6 to 10 weeks of age; 3), supplemented probiotic in drinking water from 8 to 12weeks of age; 4) supplemented probiotic in drinking water from 10 to 14weeks of age; 5) supplemented probiotic in drinking water from 12 to 14weeks of age.

The experimental diets were formulated to be iso-nitrogenous (17.25% CP) and iso-caloric (2568 kcal DE/kg diet). All diets were pelleted and formulated to meet recommended nutrient requirements of rabbits according to NRC (1977). Composition and calculated analysis of the experimental diet are presented in Table 1. The experimental animals were housed in galvanized wire cages batteries (60X55 X40cm), in a well ventilated building (natural through the window). Feed was provided ad libitum.

Table (1): Composition and calculated analysis of the basal experimental diet.

Ingredient	%
Clover hay	31.00
Wheat bran	38.50
Soybean meal , 44%	12.50
Yellow Corn	5.70
Barley	8.40
Molasses	3.00
Salt (NaCl)	0.30
Vit.& Min. premix[1]	0.30
Limestone	0.20
DL-Methionine	0.10
Total	100
Calculated analysis	
DE, Kcal/kg	2568.00
CP(%)	17.25
CF(%)	13.23
EE(%)	2.91
Ca (%)	0.55
Total P (%)	0.67
Lysine (%)	0.86
Methionine + Cystine(%)	0.63
Prices /kg diets	1.814

[1]Each 3 Kg from Vit. and Min. Premix mixture containt: Vit. A 100000 IU, Vit. D3 200000 ICU, Vit. E 10000IU, Vit. B_1, 1000 mg, Vit. B_2 5000 mg, Vit. B_6 1500 mg, Vit. B_{12} 10 mg, Pantothenic acid 1000 mg , Folic acid 1000 mg, Niacin 3000 mg ,Biotin 50 mg, Cu 40000mg ,I, 300mg Fe 30000mg, Mn, 6000 mg, Zn 50000 mg and Se 100mg

Fresh water was available from automatic drinkers with nipples for each cage. All rabbits were observed daily, kept under the same managerial, hygienic and environmental conditions, and vaccinated against common diseases.

Live body weights were recorded individually at the beginning of the experiment (6 weeks of age) and every four weeks till the end of the experiment (14 weeks of age). Body weight gains were calculated. Feed intake was recorded biweekly, while feed conversion ratios (g feed /g gains) were calculated as the amount of feed intake divided by body weight gains.

Carcass traits:

At the end of the feeding trial (14 weeks of age), four rabbits were randomly chosen from each treatment. All rabbits were fasted for approximately 12 hours before slaughtering and then individually weighed (to record the pre-slaughter weight). After complete bleeding and skinning, the empty carcass without head, liver, kidneys, heart and spleen were weighed separately according to Cheeke (1987).

Blood characteristics:

At the end of the experiment, three blood samples from each treatment were taken during slaughtering process in test tubes and centrifuged at 3000 rpm for 15 minutes, the serum was collected and preserved in deep freezer at -18°C until the time of analysis. Serum total protein and albumin were measured according to Doumas et al. (1971), respectively. The concentration of serum globulin was calculated by subtracting serum albumin from serum total protein. Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) were measured according to Reitman and Frankel (1957). Serum creatinine concentration was determined according to Bartels (1971).

Economical efficiency:

Economical efficiency (E.E.) for meat production was calculated as follows:

Total feed cost/ rabbit (LE) = Total feed intake X price/kg feed (LE).

Total revenue/rabbit (LE) = Total weight gain/rabbit (g) X price/kg live body weight (LE).

Net revenue/rabbit (LE) = (Total revenue/rabbit (LE) - (Total feed cost / rabbit (LE).

Economical efficiency (E.E.) = (Net revenue/rabbit (LE) / (Total feed cost/ rabbit (LE).

Statistical analysis:

Data were analyzed by the Computer Program, SAS (2003), using the General Linear Model (GLM) procedure. All the data were subjected to one way analysis of variance model. The significant differences among treatment means were measured by Duncan's Multiple Range-Test (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance and feed utilization:

Results in Table 2, shown that the final live body weight and total body weight gain were significantly ($P<0.01$) affected by experimental treatments. The highest ($P<0.01$) values of live body weight and total body weight gain were recorded with rabbits that supplemented probiotic in drinking water during 8-12 weeks period (2187.75 g and 1451.50 g) followed by those supplemented by probiotic during 6-10 weeks period (2176.25g and 1443.75g), respectively compared with the other experimental treatments

Table (2): Growth performance and feed utilization (Mean ± SE) of NZW rabbits as affected by different times of probiotic supplementation.

Parameters	Times of supplementation (Wks)					Sig.
	Control	6-10	8-12	10-14	12-14	
Live body weight(g)						
6 weeks	738.75±19.96	732.50±17.87	730.00±18.64	736.25±14.73	727.50±19.50	NS
10weeks	1496.25^{b} ±21.41	1611.25^{a} ±18.10	1601.13^{a} ±29.56	1504.63^{b} ±14.33	1492.50^{b} ±22.49	**
14weeks	1997.00^{c} ±23.93	2176.25^{a}±16.71	2187.75^{a} ±18.89	2015.63^{b} ± 21.48	2010.88^{b} ±20.99	**
Total body weight gain(g)						
6-10 weeks	762.50^{c} ±14.18	878.75^{a}±16.88	864.88^{a} ±14.70	768.38^{b} ±13.51	765.00^{b} ±9.92	**
10-14weeks	500.75 ±7.17	565.00±10.79	586.75 ±11.62	511.00±5.24	518.38±12.92	NS
6-14 weeks	1263.25^{c}±11.14	1443.75^{a} ±7.77	1451.50^{a} ±13.55	1279.38^{b} ±12.13	1283.38^{b} ±10.01	**
Total feed intake(g)						
6-10 weeks	2181.0^{a} ±18.41	2099.13^{b} ±11.37	2095.13^{b} ±18.41	2193.38^{a} ±15.63	2198.13^{a} ±18.73	**
10-14weeks	2040.75 ±14.46	2037.00 ±15.01	2041.50 ±11.38	2016.75 ±12.42	1979.25 ±13.42	NS
6-14 weeks	4222.00 ±10.76	4136.25±12.16	4136.63±19.30	4210.00 ±14.29	4177.38 ±11.06	NS
Feed conversion(g feed/g gain)						
6-10 weeks	2.90^{ab} ±0.06	2.43^{b} ±0.07	2.50^{ab} ±0.06	2.93^{ab} ±0.07	2.96^{a} ±0.08	*
10-14weeks	4.20^{a}±0.09	3.66^{b} ±0.05	3.55^{b}±0.03	4.01^{a}±0. 06	3.98^{ab} ±0.07	*
6-14 weeks	3.36^{a} ±0.04	2.88^{b}±0.08	2.87^{b} ±0.04	3.34^{a} ±0. 09	3.27^{a}±0.08	**

a, b .... Means in the same row in each classification bearing different letters differ significantly ($P\leq0.05$).

NS = Not significant *= ($P\leq0.05$) **= ($P\leq0.01$)

While, the lowest (P<0.01) live body weight and total body weight gain were recorded with control group (1997.00 g and 1263.25 g) respectively. Improvement growth performance may be attributed to mode of action of probiotic including the maintaining a beneficial microbial population by competitive exclusion and antagonism (Fuller, 1989), improving feed intake and digestion (Nahanshon et al., 1993), and altering bacterial metabolism (Jin et al., 1997). Probiotic cultures consisting primarily of different species of Lactobacillus have been shown to improve feed intake, enhance growth, and aid in preventing some bacterial infections when added to poultry feed or water (Jin et al., 1998 and Huang et al., 2004). Moreover, Maertens et al., (1994) showed that the relatively better daily weight gain (43.4 vs 42.3 g/d) and final body weight of rabbits (2418 vs 2387 g) at 70d were obtained with supplementation probiotic under optimal housing conditions (18°C, 3 rabbits/m2). Daily weight gain of rabbits was improved with probiotic inclusion (36.8 vs 34.8 g/d), (Gippert et al., 1996). In the same trend, Kritas et al., (2008) found that average daily gain of rabbits was significantly improved by diets supplementation with probiotic during fattening from 4 days post weaning until 5 days before the slaughter age. Moreover, El-deek et al., (2013) reported that final body weight, daily weight gain, and performance index of rabbits at 14 weeks of age were significantly improved (P≤0.05 or 0.01) by diets supplementation with probiotic. Rabbits were fed BioMos, Bio-Plus or their mix early of period (at 3 weeks of age) lead to higher (P<0.05) daily weight gain as compared with those were fed experimental diets later of period (at 5 weeks of age) (Amber et al., 2014).

Feed intake was insignificantly (P<0.05) with rabbits that supplemented probiotic in drinking water during interval 10-14 weeks and the whole 6-14 weeks period. The lowest (P<0.01) values of total fed intake was recorded with rabbits that supplemented probiotic in drinking water during 8-12 weeks period (2095.13g) followed by those supplemented by probiotic during 6-10 weeks period (2099.13g), respectively compared with the other experimental treatments, (Table 2). These results are in agreement with those obtained by Pascula et al., (2008) who found that the dietary inclusion of the probiotic did not affect feed intake during the fattening period. On the other hand, several studies by Qota et al., (2002), in broilers and El - deek et al., (2013) in rabbits, they reported that feed consumption were significantly improved by the probiotic supplementation in diets. Moreover, Amber et al., (2014) found that rabbits fed with supplementing BioMos, Bio-Plus or their mix of early period (at 3 weeks of age) in diets increased (P<0.05) feed intake. Probiotic have an important role in leptin hormone produced by adipose tissue. Several studies reported a decrease of leptin by probiotic administration. In high-fat fed mice, Lee et al., (2006) confirmed that Lactobacillus rhamnosus PL60 exhibited a reduction in leptin level and antiobesity effect due to production of conjugated linoleic acid. In addition, Friedman (2002) reported that leptin has been shown to regulate body weight by controlling feed intake and energy expenditure. For this reason, an increased or decreased feed intake with probiotic supplementation in drinking water or diet of rabbits depending on the dose and time of supplementation that effect on serum leptin level.

Feed conversion ratio was significantly (P<0.05) affected by the experimental treatments. The best (P<0.01) feed conversion values were recorded with rabbits that supplemented probiotic in drinking water during 8-12 weeks period (2.87g feed/g gain) followed by those supplemented by probiotic during 6-10 weeks period (2.88 g feed/g gain), respectively compared with the other experimental treatments, the same groups showed the best daily weight gain and lowest fed intake. Probiotic can improve the condition of the intestines and absorption of nutrients. Moreover, the presence of normal gut microflora may improve the metabolism of the host bird in various ways, including absorptive capacity (Yokota and Coates, 1982), protein metabolism (Salter; et al.,1974), energy metabolism and fiber digestion (Muramatsu; et al,1994) and gut maturation (Furuse; et al.1991). Furthermore, Maertens; et al., (1994) reported that probiotic can improve the condition of the intestines and enhances the average daily weight gain and digestibility. Both probiotics (2×106/l Bacillus subtilis) and Nanometer implement improved the average daily gain and remarkably enhance the digestibility (Wang; et al., 2008). Kritas; et al., (2008) found that the feed conversion ratio was significantly improved by diets supplementation with probiotic during fattening rabbits from 4 days post weaning until 5 days before the slaughter age.

Carcass traits:

The lowest significantly (P<0.05) value of dressing wt.% was recorded with rabbits that supplemented probiotic in drinking water during (10-14) weeks period (51.72 %) compared with the other experimental treatments. However, there were not significant differences in dressing wt % among control and rabbits supplemented with probiotic during (10 - 6), (8 - 12) and (12 - 14) weeks periods.

Rabbits supplemented with probiotic during (6-10) recorded the highest (P<0.01) value of total giblets wt. % (66.96 %) compared with the other experimental treatments. There were significant (P<0.05) effect on liver and heart % wt.. However, there were not significant effect on kidneys and abdominal fat%, (Table 3). Similar results were obtained by El-deek et al., (2013) who observed that total giblets weight was insignificantly affected with probiotic supplementation. Amber et al., (2014) found that carcass percentage was significantly increased (P<0.01) by supplementing Bio-Mos, BioPlus or their mix in diets. Giblets percentage did not significantly affected by supplementing Bio-Mos, Bio-Plus or their mix in diets. However, Qota et at. (2002) found that the carcass data did not differ significantly between treatment upon feeding diets with or without probiotics.

Table (3): Carcass characteristics (Mean ± SE) of NZW rabbits as affected by different times of probiotic supplementation.

Parameters	Times of supplementation (Wks)					Sig.
	Control	**6-10**	**8-12**	**10-14**	**12-14**	
Pre-slaughter wt. (g)	1823.33^{bc} ±12.01	1890.00^{ab} ±13.26	1666.67^{c} ±12.01	2016.67^{a}±28.48	1830.00^{bc} ±26.60	**
Dressing wt. %	56.03^{a}±0.44	56.85^{a}±1.23	57.67^{a}±0.946	51.72^{b} ±0.91	56.08^{a}±1.27	*
Total giblets wt. %	64.33^{ab}±0.20	66.96^{a}±0.36	65.47^{ab} ±1.08	63.62^{b}±0.53	65.52^{ab}±0.80	**
Liver wt. %	5.02^{ab}±0.37	6.04^{ab}±0.13	5.94^{b}±0.17	7.36^{a} ±1.08	5.94^{ab}±0.57	*
Heart wt.%	0.44^{b}±0.03	0.71^{a}±0.09	0.70^{a}±0.10	0.69^{a} ±0.02	0.67^{a}±0.03	*
Kidneys wt. %	1.23±0.04	1.49±0.09	1.42±0.11	1.50±0.04	1.53±0.12	NS
Fat wt. %	1.62±0.03	1.86±0.54	1.46±0.10	2.34±0.09	1.29±0.33	NS

a, b .... Means in the same row in each classification bearing different letters differ significantly (P≤0.05).
NS = Not significant *= (P≤0.05) **= (P≤0.01)

Blood characteristics:

The highest ($P<0.05$) total protein values were obtained with rabbits that supplemented probiotic during (10-14) weeks period (9.10 g/dl) followed by those rabbits supplemented with probiotic during (12-14) weeks period (7.96 g/dl). In this connection, El-deek et al., (2013) reported that the concentration of serum total protein, albumen and total lipids were significantly ($P\leq 0.01$) higher in groups fed diets supplemented with probiotic. Amber et al., (2014) reported that serum total protein, albumin and globulin significantly increased ($P<0.01$ & $P<0.05$, respectively) with supplementing Bio-Mos, Bio-Plus or their mix in diets.

Serum cholesterol content was significant affected by supplementing probiotic in drinking water of rabbits. The lowest ($P<0.05$) cholesterol value was recorded with rabbits that supplemented probiotic in drinking water during (12-14) weeks period (73.557 g/dl). Lye et al., (2010) showed that there existed five possible probiotic mechanisms including assimilation of cholesterol during growth, binding of cholesterol to cellular surface, disruption of cholesterol micelle, deconjugation of bile salt and bile salt hydrolase (BSH) activity. Moreover, Sridevi et al., (2009) showed that Lactobacillus buchneri ATCC 4005 exhibited a great cholesterol-lowering property through an optimal condition of bile salt hydrolase production. Furthermore, Helal and Mohamed (2001) showed that probiotics had a significant effect on lowering the level of serum cholesterol of either chickens or rabbits and this effect was positively related to the level of probiotic in the diet. El-deek et al., (2013) observed that serum cholesterol was significantly ($P\leq 0.01$) deceased in groups fed diets supplemented with probiotic. Amber et al., (2014) reported that serum cholesterol and triglycerides were significantly decreased ($P<0.01$ & $P<0.05$, respectively) by supplementing Bio-Mos, Bio-Plus or their mix in diets.

Supplemented probiotic during (6-10 or 8-12) weeks period as well as the control showed the lowest ($P<0.05$) values of aspartic transaminase (AST) and creatinine compared with the other experimental treatments and improving liver and kidney function. Amber et al., (2014) reported that were not significant differences among treatments in liver function enzymes (AST, aspartate aminotransferase and ALT, alanine aminotransferase) or kidney function (urea and creatinine), due to probiotic supplementation.

Table (4): Total serum analysis as affected by different times of Probiotic supplementation.

Parameters	Times of supplementation (Wks)					Sig.
	Control	6-10	8-12	10-14	12-14	
Total Protein(g/dl)	7.947^{b}±0.013	7.656^{b}±0.010	7.360^{b}±0.008	9.100^{a}±0.009	8.190^{ab}±0.011	*
Albumin(g/dl)	2.753^{b}±0.007	2.850^{ab}±0.009	3.340^{ab}±0.012	3.587^{a}±0.011	3.113^{ab}±0.008	*
Globulin(g/dl)	5.193^{a}±0.007	4.810^{ab}±0.006	4.023^{b}±0.004	5.520^{ab}±0.005	5.077^{ab}±0.003	*
Cholesterol(g/dl)	89.55^{ab}±0.012	80.44^{bc}±0.013	81.78^{bc}±0.011	101.11^{a}±0.007	73.557^{c}±0.005	**
ALT(U/I)	9.00±0.009	9.00±0.011	10.00±0.009	11.00±0.006	9.00±0.007	NS
AST(U/I)	6.667^{c}±0.003	6.667^{c}±0.004	5.333^{c}±0.006	8.000^{b}±0.005	12.000^{a}±0.0023	*
Creatinine(mg/dl)	76.67 ^{b} ±0.03	73.33 ^{b} ±0.03	76.00 ^{b} ±0.03	85.33 ^{a} ±0.03	84.00 ^{a} ±0.03	*

a, b .... Means in the same row in each classification bearing different letters differ significantly (P≤0.05).

NS = Not significant *= (P≤0.05) **= (P≤0.01) ALT, alanine transaminase; AST, aspartic transaminase

Economical efficiency:

Data in Table (5) shown that the best economical efficiency and relative economical efficiency values had been recorded for rabbits supplemented with probiotic during 8-12 wks.(3.39 and 120 %) followed by rabbits supplemented with probiotic during 6-10 wks. (3.30 and 119 %), respectively compared with the other experimental treatments. This finding was in agreement with that obtained by Abdo (1998) who reported that addition of probiotic in broiler diet increased the economical efficiency %. El-deek et al., (2013) found that the highest economical efficiency value was recorded with group fed diet supplemented with probiotic. However, Qota et al., (2002) reported that probiotic supplementation insignificantly affected the economical efficiency of broilers up to 42 days of age.

Conclusively, it could be concluded that supplementing probiotic during 8-12 wks of age in drinking water of rabbits recorded the highest growth performance, feed utilization and the best economical efficiency values.

Table (5): Input and output analysis and economical efficiency of different treatments during the experimental period

Parameters	Times of supplementation (Wks)				
	Control	**6-10**	**8-12**	**10-14**	**12-14**
Price/kg feed (LE)	1.814	1.864	1.839	1.839	1.827
Total feed intake/rabbit (g)	4.222	4.136	4.136	4.210	4.177
Total feed cost/rabbit (LE)	7.66	7.71	7.61	7.74	7.63
Price/kg weight gain (LE)	23	23	23	23	23
Total weight gain/rabbit (g)	1.263	1.443	1.451	1.279	1.283
Total revenue/rabbit (LE)	29.05	33.19	33.37	29.42	29.51
Net revenue/rabbit (LE)[2]	21.39	25.48	25.77	21.67	21.88
Economical efficiency (E.E)	2.79	3.30	3.39	2.80	2.84
Relative of economical	100	119	120	101	102

1- price of kg probiotic = 50 LE

2- Net revenue per unit of total feed cost.

3- Relative economical efficiency% of the control, assuming that relative E.E of the control = 100.

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الملخص العربي

تاثير وقت أضافة البروبيوتك فى مياه الشرب على الأداء الإنتاجى للأرانب النيوزيلاندى

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أجريت هذه التجربة بغرض دراسة تأثير أختلاف وقت أضافة البروبيوتك على معدل الأداء الإنتاجى وبعض خصائص الدم للأرانب النيوزيلاندى. قسم أربعون أرنب نيوزيلاندى مفطومة عمر ستة أسابيع على خمس مجاميع تجريبية، كل مجموعة تحتوى على أربع مكررات بكل منها عدد أثنين أرنب. فترة التجربة كانت من ستة إلى أربعة عشر أسبوع. الخمس مجاميع تجريبية كانت : ١) مجموعة الكنترول (بدون بروبيوتك). ٢) أضافة البروبيوتك فى ماء الشرب من ٦-١٠ أسبوع .٣) أضافة البروبيوتك فى ماء الشرب من ٨-١٢ أسبوع. ٤) أضافة البروبيوتك فى ماء الشرب من ١٠-١٤أسبوع. ٥) أضافة البروبيوتك فى ماء الشرب من ١٢-١٤ أسابيع. جميع العلائق التجريبية كانت مكونةعلى أساس ١٧.٢٥ % بروتين خام و ٢٥٦٨ كيلوكالورى طاقة مهضومة لكل كيلوجرام عليقة.

تتلخص أهم النتائج المتحصل عليها كالتالى:

- تأثر وزن الجسم النهائى ومعدل الزيادة الوزنية الكلى معنويا بالمجاميع التجريبية.وأعلى قيمة معنوية لوزن الجسم ومعدل الزيادة الوزنية الكلية كان عند أضافة البروبيوتك فى ماء الشرب خلال الفترة من ٨-١٢ أسبوع من العمر (٢١٨٧.٧٥جم و ١٤٥١.٥٠ جم) .
- لم يتأثر أستهلاك الغذاء معنويا بإضافة البروبيوتك فى ماء الشرب خلال الفترات من ١٠-١٤ أسبوع وطول الفترة الكلية من ٦-١٤ أسبوع. سجلت أفضل قيمة معنوية لمعامل التحويل الغذائى مع أضافة البروبيوتك فى ماء الشرب للأرانب خلال الفترة من ٨-١٢أسبوع (٢.٨٧جم غذاء لكل جم زيادة وزنية).
- سجلت أقل قيمة معنوية للذبيحة كنسبة مئوية من الوزن عند أضافة البروبيوتك فى ماء الشرب للأرانب خلال الفترة من (١٠-١٤) أسبوع من العمر (٥١.٧٢%) مقارنة مع باقى المجاميع التجريبية. عند أضافة البروبيوتك خلال الفترة من (٦-١٠) أسبوع سجلت أفضل قيمة معنوية للأجزاء المأكولة الكلية (٦٦.٩٦%) مقارنة مع باقى المجاميع التجريبية.
- سجلت أقل قيمة معنوية لكوليسترول السيرم مع أضافة البروبيوتك فى ماء الشرب للأرانب خلال الفترة من (١٢-١٤) أسبوع (٧٣.٥٥٧جم لكل لتر). أضافة البروبيوتك خلال الفترات من (٦-١٠ أو ٨-١٢) أسبوع والكنترول أظهرت أقل قيم معنوية لأنزيمات الكبد والكرياتنين مقارنة مع باقى المجاميع التجربية وتحسنت وظائف الكبد والكلي.
- سجلت أفضل كفاءة أقتصادية وكفاءة أقتصادية نسبية لأضافة البروبيوتك خلال الفترة من ٨-١٢ أسبوع (٣.٣٩ و١٢٠%) يتبعها الأرانب التى تم أمدادها بالبروبيوتك خلال الفترة من ٦-١٠ أسابيع (٣.٣٠ و١١٩%) على التوالى.

يتضح من هذة النتائج أن أضافة البروبيوتك خلال الفترة من ٨-١٢ أسبوع من العمر فى ماء الشرب للأرانب سجل أعلى معدل نمو، وأستفادة من الغذاء وأفضل كفاءة أقتصادية وكفاءة أقتصادية نسبية.