J. Agric. Sci. Mansoura Univ., 25 (12): 7529 - 7543, 2000.

INFLUENCE OF DIETARY LACTIC ACID BACTERIA WITH OR WITHOUT ENZYMES SUPPLEMENTATION TO BROILER DIETS ON CHICK PERFORMANCE, CARCASS CHARACTERISTICS AND MEAT QUALITY

Ibrahim, S. A.[1] and Manar T. Ibrahim[2]

1- Poultry Production Department, Fac. of Agric., Ain Shams Univ. Cairo, Egypt.

2- Food Science Department, Fac. of Agric., Ain Shams Univ. Cairo, Egypt.

ABSTRACT

Two hundreds and twenty-five male Hubbard broiler chicks at one day old were divided into five groups (45 chicks each.). Each group was assigned for one of five experimental diets. The first group was fed starter diets (0-2 week), grower diets (2-4 week) and finisher diets (4-7 week) as a control diets. However, the groups 1,2,3 and 4 were fed on the control diet with the addition of Micro-Bac (LA), Avi-Bac (LAE), LA + LAE and LAE + LA respectively. At the 7th week of age, nine birds of each group (Three per each replicate) were slaughtered and blood samples were taken at slaughtering to determine serum cholesterol. Representative samples of fresh white breast meat were analyzed for chemical composition. The pH and plasticity of meat (breast and thigh) were determined after slaughtering at 0.5, 2, 4, 6, 24, and 48 h during storage at 4°C and cooking loss of meat was determined after 24 h. Contents of digestive tract were collected to determine the total bacterial count, total lactic acid bacterial count, *L.acidophilus* count, Coli form bacteria, Salmonella viable count and Staphilococcal viable count. Supplementing the basal diet with either LA or LAE gave no significant differences in body weight gain, feed intake and feed conversion at 2, 4 and 7 weeks of age. However, there were improvement in body weight gain and feed conversion in chicks fed LA+LAE at 2, 4 and 7 weeks of age by 9.0, 4.7, 2.8% and 1.5, 8.2 and 10.6, respectively.

On the other hand, LA supplementation and/or LAE to broiler has been shown to decrease the mortality rate compared to the control group. No significant differences were observed in the percentage of dressing, and abdominal fat between chicks fed basal diet (control group) and these of other treatments.

The meat of supplemented treatments were lower tender as indicated by lower plasticity values when compared with control diet. The lowest value of cooking loss was that of the control supplemented treatments tended to decrease the total cholesterol, triglycerides, HDL, and LDL in meat and serum cholesterol. All supplemented treatments inhibited bacterial growth of pathogenic bacteria.

Keywords: Lactic acid bacteria, basal diet, Hubbard broiler, meat quality, total cholesterol, triglycerides, HDL, LDL.

INTRODUCTION

The pioneering evidence of the competitive exclusion concept was obtained from poultry chicken by Nurmi and Rantala (1973). The newly hatched birds do not obtain the normal gut flora of the adult, because of modern management methods. Since normal flora is lacking, the intestines of

the birds are easily colonized by pathogens, most often by salmonella or coliform. It is rare that the infected broilers get sick due to Salmonella, or even show decreased growth, but as opportunistic organisms salmonella might contaminate poultry food products. Direct –fed microbial or probiotics and/or enzymes are important natural, non-antibiotic product options for the producer to reduce the use of antibiotics. The use of lactobacillus as beneficial bacteria provides a valuable option for use as a probiotic. Primarily lactobacillus, to test their effects on growth and performance (Jernigan *et al.*, 1984).

The mechanism by which probiotics affect animal health was conclusively reviewed by Sissons (1988) and Makled (1991). They concluded that probiotics enabled the host animal to return to normal through increasing normal gut flora on the expense of pathogenic organisms and decrease intestinal pH and decrease intestinal pH.

Several investigations have been conducted to find out the effect of lactobacillus on broilers, Hussien and El-Ashary (1991) reported that supplementation of Lactobacillus concentrate to broiler diet improved their growth performance. Similar results were found by Francis *et al* (1978) using *Lactobocillus,* Owings *et al.* (1990) using *streptococcus paecium* M-74 , Ali (1994) using Lacto – Sacc and Omar (1996) using Yea-Sacc, Lacto – Sacc and Fermaeto as a source of *Lactobacillus*. However, Potter *et al*. (1979), Damron *et al.* (1981) and Watkins *et al.* (1982) found no significant differences in growth performance when *Lactobacillus acidophilus* culture was added to the broilers diets.

On the other hand, enzymes supplementation to broiler diets has been shown to improve the growth performance and mortality rate (Lyons and Jacques , 1987 , Zatari and Ferket, 1990 and El-Faham *et al*, 1994).

Lactobacillus acidophilus and/or enzymes have the capability of assimilating cholesterol from the growth medium. This property made *Lactobacillus acidophilus* a good bacteria that produces many health benefits as well as reducing serum cholesterol (Sinha *et al*., 1980, Gilliland *et al.,* 1985 and Danielson *et al.,* 1989).

L. acidophilus AR, was found to produce a proteinic inhibitor which showed inhibitory activity against pathogenic and non – pathogenic bacteria belonging to both Gram–positive and Gram–negative type (Mehta *et al.*, 1984). Lactobacilli play a distinctive role in the microbial balance of the chicken gut. In experiments simulating the chicken crop, the antagonism of lactobacilli against *Enterobaeteriaceae* and *S. typhimurium* was demonstrated and was attributed to lactic acid production – (Van de Voorde *et al.*, 1991)

The present study aimed to investigate the effect of dietary lactic acid bacteria with or without enzymes supplementation on live performance, carcass characteristics and meat quality.

MATERIALS AND METHODS

This study was performed at the poultry farm of the Poultry Production Department, Faculty of Agriculture, Ain Shams University, Shoubra El-Kheima, Cairo, Egypt. The experiment started in August, 1999 for 7 weeks.

A total numbers of 225 male broiler chicks (Hubbard) one day old were allocated randomly to 5 dietary treatments. The birds were kept in wire floor batteries and were randomly allocated into three replicate cages of 15 birds for each treatment.

The birds were weighed, wing - banded and placed into cages according to the average groups weights. Daily photoperiod was 23 hrs. Feed and water were provided ad-libitum during the experimental period. Starter, grower and finisher experimental diets (table 1) were formulated to meet nutrient requirements of the broiler chicks according to NRC, (1994). The control birds fed starter diets (0 – 2 week), grower diets (2 – 4 week) and finisher diets (4 – 7 week) without any supplement.Micro – Bac –(LA)* and Avi – Bac – (LA + E)**were add to control diets in the treatments 1, 2, 3 and 4 as follows:

Treatment No.	Diets		Abbreviation
	Starter +Grower	Finisher	
1	LA-500 ppm feed	LA-250 ppm feed	LA
2	LAE-500 ppm feed	LAE-250 ppm feed	LAE
3	LA-500 ppm feed	LAE-250 ppm feed	LA+LAE
4	LAE-250 ppm feed	LA-500 ppm feed	LAE+LA

*** Micro – Bac – LA is a lactic acid bacteria (*Lactobacillus acidophilus* NLT 8 x 10^8 cfu /gm).**

**** Avi – Bac – LA + E is a lactic acid bacteria NLT 1.6 X 10^9 cfu /gm plus commercial enzymes containing α - amylase (220 units/g), B – Gloconase (140 units/g) and Hemicellulase (15 units/g) . Micro – Bac – LA and Avi – Bac – LA + E registered trademark of Pro – Byn international Inc. USA.**

Body weight, feed intake and mortality rate were recorded.

At 7 weeks of age, nine birds of each dietary treatment (three per each replicate) were randomly taken and slaughtered to determine the percentage of dressed weight, and giblets weight (liver, gizzard and heart) as well as abdominal fat.

Carcasses were sub scalded at 60°C, manually defeathered and eviscerated. The carcasses were thoroughly washed by cold water. Then nine birds of each dietary treatment (Three per each replicate) were taken to determine the pH and plasticity of meat (breast and thigh) after slaughtering at 0.5 , 2, 4, 6, 24, and 48 h cold storage (4°C±1) and Cooking loss of stored meat was determined after 24 h.

Table (1): The composition of the basal diets

Ingredients	Basal diets (%)		
	Starter (0-2) week	Growing (2-4) week	Finisher (4-7) week
Yellow corn	٦٠,٠٠	٦٠,٠٠	٦٤,٠٠
Soy bean meal (48%)	٣٦,٠٠	--	--
Soy bean meal (44 %)	--	٣٥,٠٠	٣٠,٠٠
Bone meal	٣,٠٠	٢,٩٠	٢,٨٠
Maize oil	٠,٣٥	١,٥٥	٢,٦٥
Vit . + Min. Premix(١)	٠,٣٠	٠,٣٠	٠,٣٠
NaCl	٠,٢٥	٠,٢٥	٠,٢٥
DL-Methionine (99%)	٠,١٠	٠,١٠	٠,١٠
Total	١٠٠	١٠٠	١٠٠
Calculated analysis:(٢)			
Metabolitable energy (Kcal / Kg)	٢٩٦١	٢٩٦٧	٣٠٨٤
Crude Protein %	٢٢,٨	٢٠,٩	١٩,١
Methionine %	٠,٤٨	٠,٤٥	٠,٤٣
Meth + Cyst%	٠,٨٣	٠,٧٨	٠,٧٣
Lysine %	١,٢٩	١,١٧	١,٠٣
Calcium %	١,٠٣	١,٠٠	٠,٩٥
Av. phosphorus %	٠,٥٢	٠,٥٢	٠,٥٠

(1)Vitamins and minerals premix at 0.30% supplies the following per Kg broiler diet: vit A: 12.000 IU, Vit D3: 2.000 IU Vit E: 40 mg; Vit K3: 4 mg; riboflavin: 6 mg; pantothinic acid: 10 mg; Niacine : 30 mg ; calpan : 12 mg ; Vit B1 : 3 mg ; Vit B6 : 4 mg ; Folic acid : 1.5 mg ; Vit B12 : 30 mcg ; Blotin : 80 mcg ; Choline Chloride (50%) : 700 mg ; Mn : 80 mg ; Zn : 70 mg ; Cu : 10 mg ; Fe : 40 mg ; I : 1.5 mg ; Co : 0.25 mg ; Se : 200 mcg.

(2)According to NCR (1994)

Meat quality was examined by plasticity of meat (breast and thigh) as described by Soloviev (1966) and presented as cm^2/gm.n.

The pH of meat was measured by using laboratory pH meter with a combined electrode model 3305 pH meter as described by Aitekn *et al.,* (1962). Cooking loss of meat was determined by dividing the difference in weight before and after cooking by the initial weight (X 100) according to Papnaho and Fletcher (1996). Representative samples of fresh white breast meat were analyzed for moisture, ash, protein and ether extract content according to standard methods of A.O.A.C. (1990). Cholesterol and

triglycerides of fresh breast meat were determined enzymatically according to Richmond (1973) and Fossatip (1982).

In fresh meat, the high – density Lipoproteins (HDL) and low – density Lipoproteins (LDL) were determined enzymatically according to Fruchart, (1982).

Blood samples were collected from three birds of each treatment at the 7th week of age then centrifuged for 15 minutes (6000 rpm) and stored at -20 °C until used- Serum cholesterol was determined enzymatically (Richmond, 1973) using cholesterol kit. This method is based on developing pink color reactions of cholesterol with the cholesterol esterase, cholesterol oxidase, and peroxidase respectively and absorbency at 500 n m was measured spectrophotometrically. Contents of digestive tract were collected to determine the microbiological flora as follow: Total bacterial counts were determined on standard plate count agar at 32°C for 48h as suggested by American Public Health Association (Marshall, 1992). Total lactic acid bacterial counts were determined using MRS agar according to De Man et al (1960). *Lactobacillus acidophilus* count was determined using modified MRS agar supplemented with 0.2% oxagal according to Gilliland and Walker (1990). Coliform bacteria were enumerated according to Marshall (1992) using Violet Red Bile Agar (VRBA). Salmonella viable count was enumerated according to Roberts *et al* (1995). Staphylococcal viable count was enumerated on Baird-Parker medium and incubated at 32°C for 48 h according to Blair *et al.* (1967).

Data was examined statistically using the computerized analysis of variance and Duncan's multiple range test procedures within the statistical analysis system, SAS (1994).

RESULTS AND DISCUSSION

Productive performance of broiler:

Table 2 shows the productive performance of broiler chicks fed different dietary treatments at different periods of age.

Supplementing the basal diet containing corn-soy bean with either Lactobacillus (LA) or Lactobacillus with enzymes (LAE) gave no significant differences ($P > 0.05$) in respect of body weight gain, feed intake and feed conversion at 2, 4 and 7 weeks of age.

However, birds fed corn - soybean diet supplemented with LA significantly ($P \leq 0.05$) decreased both of body weight gain (2 and 4 weeks) and feed intake (2, 4 and 7 weeks).

There were some improvements in body weight gain by 9.0, 4.7and 2.8% and feed conversion by 1.5, 8.2 and 10.6% were observed in the chicks fed LA + LAE at 0 - 2, 0 - 4 and 0 - 7 weeks of age, respectively (Table 2).

Similar results were obtained by Buenrostro and Kratzer (1983) and Roth and Kirchgebenr (1986) who found no significant influence of probiotic supplementation to broiler diets. They found lower body weight in chicks fed probiotic compared to the control group. Recently Owings (1992) and El-Deeb and Makled (1993) studied the effect of corn - soy bean diet containing 5% of plain yogurt as a source of lactobacillus on some growth indicators of broiler chicks. They found no significant differences in body weight, feed

conversion and mortality rate as compared to the control group at the marketing age (7 weeks of age). On the contrary, some improvements in live body weight and body weight gain up to 7 weeks of age were obtained by Kociova *et al.* (1990) using Yea-Sacc, Gippert and Bodrogi (1992), Ali (1994) using lacto – Sacc and Omar (1996) using Yea – Sacc, Lacto – Sacc and fermacto.

Mortality rate was higher in the control group than the other experimental groups at different periods of age.The results of microbiological examination may be explain these results later on . Similar results were found by Carlson *et al.,* (1979), Owings *et al.* (1990), Hussein and El-Ashry (1991) and El-Deeb and Makled (1993). The beneficial bacteria, Lactobacillus in gut compete with pathogenic *E. coli* for-space and stimulate other types of bacteria to stimulate the intestinal villi which extracts nutrients from feed stuffs during digestion (Watkins *et al.*, 1982). The enzymes supplementation to corn-soy diet could be explained the improvement in performance by the improvement in digestibility of necessary nutrients (Hashish *et al.,* 1992).

Carcass characteristics and chemical composition:

Average carcass characteristics and chemical composition of white breast meat of broiler chicks fed lactic acid bacteria with or without enzymes at 7 weeks of age are shown in table (3). In general, there were no significant ($P > ٠.٠٥$) differences in the percentages of dressing, and abdominal fat between chicks fed basal diet (control group) and other treatments (*Lactobacillus* with or without enzymes). Similar results have been reported by El-Deeb and Makled (1993), El-Faham *et al*. (1994) and Ali (1999).

There were no significant difference ($P > ٠.٠٥$) in moisture and protein percentages of white breast meat among treatments (Table 3). However, there were significant differences ($P < ٠.٠٥$) in ether extract and ash percentages between LA + LAE and LAE + LA treatments which were nearly similar and the other three experimental groups.

It was observed that the highest value of total cholesterol in breast meat was recorded in the control being 222.09 mg / dl and tended to decrease in the other groups .On the other hand, the LAE+LA group recorded the lowest value of triglycerides, HDL and LDL. Table (3) show that the dietary treatment had significant effect on serum cholesterol and the lowest value of it was recorded in LAE + LA group 121.84 mg/dl compared to 166.79 mg/dl which obtained for the control group. Similar results were obtained by Danielson *et al* (1989).

Table (2): The productive performance of broilers fed lactic acid bacteria with or without enzymes supplements to the diet at different periods of age.

Items	Basal diet	Basal diet plus			
		LA	LAE	LA+LAE	LAE + LA
Initial body weight (gm)	47.1± 1.47	46.9± 1.03	47.9± 1.33	49.17± 0.96	47.8± 1.04
Average body weight gain (g) from day- old up to :					

2 week	233.3ab ±7.8	216.7 a ±9.5	259.0 a ±9.5	254.3 a ±3.3	243.0 a ±7.5
4 week	624.0 a ±27.6	487.3 b ±56.5	539.3 ab ±36.5	653.1 a ±19.3	563.7 a ±48.2
7 week	1694.7a ±86.0	1538.3 a ± 96.2	1588.7 a ±90.4	1742.6 a ±62.3	1616.0 a ±82.2
Average cumulative feed intake (g) from day- old up to :					
2 week	٢٥٥.٣ab± ١٣.٢	٢٢٦. ٠b ±١٤.٥	٢٦٠. ٣a ±١٧.٣	٢٨٦. ٣ a±١٣.٣	٢٧٢. ٧a ±١٩.١
4 week	٨٣٥. ٠a ±٣٠.٣	٧٤٢. ٣b ±٤١.٢	٧٩٦. ٧ab ±٣٠.٩	٨٧٧.٣a ±٣٠.٣	٨٣٤. ٣a ±٤٤.٢
7 week	3090.0 a± 151.9	٢٧٩٨. ٧ b±١٦١.٢	٢٨٥٢.0 ٠a ±١٥٠.٤	٢٩٨٨. ٣ ±١٤٠.٩	٢٨٩٤.٧a ±١٦٠.٢
Average feed conversion (g feed / g gain) from day- old up to :					
2 week	١. ٣٧a ±٠.٠٧	١. ٣٣a ±٠.٠٨	١.٢٤a ±٠ .١٠	١.٣٩a ±٠.٠٧	١. ٤٠a ±٠٠٨
4 week	١. ٤٦a ±٠.٠٩	١. ٧٠a ±٠.١٠	١. ٦٣a±٠ .١١	١.٣٤a ±٠.٠٩	١. ٦٢a ±٠.٠٩
7 week	١. ٨٩a ±٠.٠٩	١. ٨٨a ±٠.٠٩	١. ٨٦a ±٠.١٠	١. ٦٩a ±٠.٠٩	١. ٧٩a ±٠.٠٩
Mortality ratio from day- old up to :					
2 week	3/30	1/30	0/30	0/30	0/30
4 week	3/30	1/30	0/30	0/30	0/30
7 week	5/30	1/30	0/30	0/30	0/30

Meat quality

The results for pH and plasticity are illustrated by (Fig. 1, 2). The pH values of breast and thigh meat of all treatments decreased significantly during the first 6 h post-mortem (Fig. 1) Anaerobic glycolysis is proceeding with subsequent lactate accumulation and decrease in muscle pH, because of the muscle fiber's inability to expel the lactate into the blood stream. The accumulation of lactic acid in the meat during post – marten glycolysis is in accordance with Lawrie (1991) and Smith and Fletcher (1992) from 6 to 48h post-mortem, the pH values started to increase in all treatments. Breast muscles had less values of pH than those of thigh muscles .This finding was consistent with the observation of Amato *et al* (1989).

The pH values of both breast and thigh after 30 minutes of slaughtering and during subsequent cold storage at 4^{o}C ± 1^{o}C were significantly less than those values of the control group. At the end of cold storage period after 48 h at 4^{o}C $\pm$ 1^{o}C the lowest values of pH were that of the LAE + LA group and the highest values of pH were that of the control .

Results of (Fig. 2) show that toughness, as indicated by low plasticity values developed due to the attack of rigor mortis in the control group and other treatments during the early periods of cold storage. The toughness in all treatments appeared to be related to pH decline. This finding is in agreement with Khan, (1971). Progressive decrease in plasticity values remained until 6 h in the control and other treatments .This may be due to the low pH which causes extensive protein denaturation in the muscle (Briskey, 1964).

The results indicated that, the thigh meat was tender than breast meat. After 6 h of cold storage till the end of cold storage period (48 h) at 4^{o}C $\pm$ 1^{o}C the plasticity started to increase in control and treatments.

Statistical analysis shows that, in comparison to the control , the treatments had significant effects on plasticity. The treatments were always less tender as indicated by lower plasticity values when compared with control. The results indicated that the highest tenderness in basal diet was in both thigh and breast meat at the end of storage, and the lowest tenderness in treatment LAE + LA was found in the breast and thigh meat at the end of storage period.

The results illustrated by (Fig. 3) show that cooking loss values of breast and thigh meat (after 24 h post – mortem) and the cooking loss of breast muscles was lower than thigh muscles in control group and all treatments. The highest values of cooking loss were recorded for the treatment LA + LAE and treatment LAE + LA while the lowest value of cooking loss was in control group .

Table (3): Average carcass characteristics (%) and chemical composition (%) of white breast meat of broiler chicks fed lactic acid bacteria with or without enzymes at 7 weeks of age.

Items	Basal diet	Basal diet plus			
		LA	LAE	LA+LAE	LAE+LA
Carcass characteristics (%)					
- Dressing	66.22 a ± 1.50	65.79 a ± 1.62	64.07 a ±1.48	66.38 a ± 1.56	66.34 a ± 1.60
- Giblets	4.35 a ±0.23	3.66 a ± 0.29	4.23 a ± 0.30	4.10 a ± 0.29	3.42 a ±0.29
-Abdominal Fat	1.22 a ± 0.27	1.30 a ± 0.32	1.28 a ± 0.22	1.40 a ± 0.28	1.36 a ± 0.26
Chemical composition of blood and white breast meat :					
A-chemical composition of serum cholesterol (mg/dl)					
	166.79a ± 1.37	149.61b ± 0.65	140.90c ± 0.75	140.13c ± 0.095	121.84d ± 1.57
B-chemical composition of white breast meat					
Moisture %	74.21 a ±0.20	73.62 a ± 0.19	74.27 a ± 0.29	73.90 a ± 0.25	73.58 a ± 0.27
Ether Extract %	1.26 a ± 0.02	1.28 a ± 0.02	1.20 a ± 0.03	1.39 b ± 0.04	1.38 b ± 0.03
Protein %	23.22 a ± 0.24	23.84 a ± 0.22	23.23 a ± 0.29	23.57 a ± 0.24	23.88 a ± 0.29
Ash %	1.31 a ± 0.03	1.26 a ± 0.02	1.30 a ± 0.02	1.14 b ± 0.04	1.16 b ± 0.02
Total cholesterol (mg/dl)	222.09a ± 3.46	155.08b ± 5.17	152.21b ± 7.84	137.39c ± 4.13	132.85c ± 3.31
Triglycerides (mg/dl)	238.57a ± 5.87	241.14a ± 7.65	236.87a ± 5.75	208.43c ± 5.37	224.50b ± 5.58
HDL(mg/dl)	88.30a ± 5.03	35.49b ± 2.66	31.11b ± 1.91	27.78b ± 2.49	34.32b ± 8.19
LDL(mg/dl)	86.07a ± 2.30	71.36b ± 4.84	73.72b ± 7.11	67.92b ± 2.16	53.63c ± 4.67

means with the same litter in the same row are not significantly different (P < 0.05).

Microbiological tests:

The results presented in Table (4) show the effects of treatments on count of total bacteria, *Staphylococcus*, Coliform, *Salmonella*, lactic acid bacteria, and *L. acidophilus* in both of small intestine and cecum (mean log 10 cfu). The results indicated that all supplements inhibited bacterial growth compared to the control group . This effect is in agreement with Mehta *et al.* (1984), who stated that the *L. acidophilus* was found to produce a proteinic inhibitor which showed inhibitory activity against pathogenic bacteria belonging to both gram – positive and gram – negative types .

Gupta *et al*. (1996) found that the antagonism shown by this organism against different pathogens was not due to acid production alone. This activity may also be attributed to elaboration of antibiotic like-compounds by this organism. Treatment LA + LAE and treatment LAE + LA gave the highest effect on total bacterial count, *Staphylococcus*, coliform and *Salmonella* in comparison to the control group in both small intestine and cecum. It's clear that, all supplemented treatments increased significantly the mean of log 10 cfu/g of Lactic acid bacterial count and *L acidophilus* compared to control group.

Fig 1+2

Table 4+ Fig 3

In conclusion, it could be recommended that, the use of dietary lactic acid bacteria with or without enzyme supplementation to the diets of broiler chicks is promising and needs further investigations.

REFERENCES

Aitken, A.; J. C. Casey; I. F. Penny and C. A. Voyle (1962). Effect of drying temperature in the accelerated freeze drying of pork. J. Sci. Fd. Agric., 13: 439-442.

Ali, A. Mervat (1999). Effect of probiotics addition to broiler rations on performance and some blood constituents. Egypt. Poult. Sci., 19: 161 – 177.

Ali, M. E. (1994). The effect of some nutritional additives on feeding broiler. M. Se. Thesis, Fac. Agric. Zagazig University.

Amato , P. M. , D. D. Hamann, H. R. Ball , and E. A. Foegeding (1989). Influence of poultry species, muscle groups, and NaCl level on strength, deformability and water retention in heat – set muscle gels. J. Food Sci., 54 : 1136 – 1140 , 1157 .

A. O. A. C. (1990). *Official Methods of Analysis*, 15th ED. Association of Official Analytical Chemists Published by the Association of Official Analytical chemists, Inc. USA. P. 931, and P 935.

Blair, E. B.; J. S. Emerson, and A. H. Tull (1967). American Journal of Clin. Path. 47: 30 – 39 (Cited from Oxoid Manual 1982).

Briskey, E. J. (1964). Etiological status and associated studies of pale, soft, oxidative porcine musculature. Adv. Food Res., 13: 89 - 105.

Buenrostro, J. S. and F. H. Kratzer (1983). Effect of lactobacillus inoculation and antibiotic feeding of chickens on availability of dietary biotin. Poult. Sci., 62 : 2022 – 2029 .

Carlson, C. W.; R. A. Nelson and A. B. Kashani (1979). Effect of probiotics on turkeys and laying hens. Proceeding of the 11th South Dakota State University Poultry day, Brookinges, SD.

Damron, B. L.; Wilson, H. R.; Voite, R. A. and R. H. Harms (1981). A mixed lactobacillus culture in the diet of Broad Breasted Large white turkey hens. Poult. Sci., 60: 1350 – 1351.

Danielson, A. D.; Peo, E. R.; K. M. Shahani; P. J. Lewis; J. Whalen and M. A. Amer (1989). Anti cholesteromic property of *Lactobacillus acidophilus* Yoghurt fed to mature boars, J. Anim. Sci., 67: 966.

De Man . J. C., M. Rogosa and M. E. Sharp (1960). A medium for cultivation of lactobacilli J. Appl. Bacteriol., 23: 130.

El-Deeb, M. A.; and M. N. Makled (1993). Preliminary study on the effect of yoghurt as natural probiotic supplement on some growth parameters of broiler chicks, Egypt. Poult. Sci.,13: 411– 427.

El- Faham, A. I.; Ibrahim , S. A. and N. A. Hattab (1994). Effects of Kemzyme or biosavor on the performance of growing chickens. The second scientific Conf. On Poultry. Kafr El-Sheikh, Egypt.

Fossatip, P. (1982). Enzymatic determination of triglycerides. Clin. Chem., 28, 2077.

Francis, C.; Janky, D. M.; Arafa, A. S. and R. H. Harms (1978). Interrelationship of lactobacillus and zinc bacteriocin in the diets of turkey poults , Poultry Sci., 57 : 1687 - 1689 .

Fruchart, J. C. (1982). Phospholipides, HDL Cholesterol separation of low – density Lipoproteins and determination of cholesterol and phospholipids bound to these fractions, Rev. Fr. des Laboratoires , (103) 7 – 17 .

Gilliland, S. E.; C. R. Nelson, and C. Maxwell (1985). Assimilation of cholesterol by *Lactobacillus acidophilus.* Applied and Environmental Microbiology, 4992: 377– 381.

Gilliland, S. E. and D. K. Walker (1990). Factors to consider when selecting a culture of L. acidophilus as a dietary adjust to produce a hypocholesterolaemia effect in humans. J. Dairy Sci., 37: 905 - 911.

Gippert, T. and G. Bodrogi (1992). Lacto–sacc in the feeding of broiler duck. Proceed 9th Int. Symp. On waterfowl, Pisa. Italy, 16 - 18.

Gupta, P. K.; B. K. Mital and S. K. Garg (1996). Antagonistic activity of *L.acidophilus* fermented milk against different pathogenic bacteria. Indian J. Exp. Biol., 34: 1245.

Hashish, M. A. Samia; J. M. Gropp and R. T. B. Doris (1992). Nutrient digestibility of 30% ryeseed broiler diet as influenced by carbohydrate splitting enzyme. Egypt. Poult. Sci., 12: 399.

Hussein, H. H. and M. A. El-Ashry (1991). Some studies on the beneficial effects of lactobacillus concentrate supplementation on broiler performance. Egypt. J. Amin. Prod. , 28 (1): 85 – 93.

Jernigan, M. A.; R. D. Miles and A. S. Arafa (1984). Probiotic in poultry nutrition. A review word's Poult. Sci., 12: 99 – 107.

Khan, A. W., 1971. Effects of temperature during post – mortem glycolysis and dephosphorylation of high energy phosphates on poultry meat tenderness J. Food Sci., 36: 120 – 121.

Kociova, Z.; S. Horovsky; T. Wertheimer; S. Koci; R. Hiadlovska and V. Gergelyiova, (1990). Efficiency of probiotic thepax in fattening broiler chickens. Hydimarstvo, Cezechoslovakia, 25: 37 – 46.

Lawrie , R. A. , (1991) . *Meat Science*, 5th ed pergamon press, New York, NY.

Lyons, T. P. and K. Jacques (1987) . Biological tools improve poultry performance. Poult. Misset., 3 (4).

Makled, M. N. (1991). The potentials of probiotics in poultry feeds. A review. Proceeding of 3rd Scientific Symposium for Animal, Poultry and Fish Nutrition. II: 54 – 68, Kafr El-Shaikh , Egypt.

Marshall, R. T. (1992). Standard methods for the examination of dairy products. American Public Health Association (APHA), Washington, D.C., USA.

Mehta , A. M. ; K. A. Patel and P. J. Dave (1984) . Purification and some properties of an inhibitory protein isolated from *L. acidophilus* ARI. Milchwissenschaft, 39: 86.

NRC. (1994). Nutrient Requirements of poultry. 9th Edition. National Academy Press, Washington D.C., USA.

Nurmi, E., and M. Rantala (1973). New aspects of salmonella infection in broiler production, Nature, 241:210.

Papnaho, P. A. and D. L. Fletcher (1996). The effects of stunning amperage and deponing time on early rigor development and breast meat quality of broilers. J. Poultry Science, 75: 672 – 676.

Potter, L. M.; L. A. Newbern; C. M. Parsons; J. R. Shelton and J. S. Grawford (1979). Effect of protein, poultry by product meal and dry lactobacillus acidophilus culture additions to diets of growing turkey Poult. Sci., 58: 1095 (Abst.).

Omar, A. S. (1996). Bioprotein in feeding broiler chicks. M. Se. Thesis . Fac . Agric. Zagazig University.

Owings, W. J. (1992). Nutritive effects of a direct fed microbial preparation on growing turkey toms. Poult. Sci., 71: 932 – 935.

Owings, W. J.; D. L. Reynolds; R. J. Hasiak and P. R. Ferket (1990). Influence of dietary supplementation with *Streptococcus faecium* M-74 on broiler body weight, feed conversion, carcass characteristics, and intestinal microbial colonization Poult. Sci., 69: 1257 – 1264.

Richmond, W. (1973). Enzymatic determination of cholesterol. Clin – Chem. 19, 1350 – 1356.

Roberts, D. W. Hooper and M. Green wood (1995). *Practical food microbiology*. Public Health Laboratory Service, London, UK.

Roth, F.X. and M.K. Kirchgebner (1986). Nutritive effects of *Streptococcus faecium* strain M-74 in broiler chicks. Arch. Geflűgelkd, 50: 225-228.

SAS Institute (1994). SAS / STAT User's Guide: Statistics. Ver 6.04, Fourth Edition SAS Institute Inc., Cary, NC.

Sinha, D. K.; K. Dam, and K. M. Shahami (1980). Evaluation of the properties of a non- fermented acidophilus milk. J. Dairy Sci., 62: 52 – 53.

Sissons, J. W. (1988). The potential of probiotic organisms to prevent diarrhea and promote digestion. Proceed. 4th Int. Seminar. Poland, 370 – 457.

Smith, D. P. and D. L. Fletcher (1992). Post – Mortem Biochemistry of pekin duckling and broiler chicken pectoralis muscle . Poultry Science 71: 1768 – 1772.

Soloviev, V. E. (1966). Meat aging Food industry Pub. , Moskow , 53 – 81 , 82– 164 .

Watkins, B. A.; B. F. Miller and D. H. Neil (1982). In vivo inhibitory effects of *Lactobacillus acidophilus* against pathogenic Escherichia coli in gnotobiotic chicks. Poult. Sci., 61: 1298 –1308.

Van de voorde, L.; H. Christiaens and W. Verstraete (1991). Invitro appraisal of the probiotic value of intestinal lactobacilli- World J. Microbiol, Biotechnol, 7: 587.

Zatari, I. and P. R. Ferket (1990). The effect of enzyme supplementation of corn – soy diets on the performance of broilers. Poult. Sci. 69 (1): 149.

تأثير اضافة بكتريا حامض اللاكتيك مع أو بدون الإنزيمات الى علائق بدارى التسمين على الأداء الإنتاجي وتركيب الذبيحة وجودة اللحم

سيد عبد الرحمن ابراهيم[١] و منار توفيق ابراهيم[٢]
١- قسم إنتاج الدواجن كلية الزراعة جامعة عين شمس – شبرا الخيمة – القاهرة – مصر .
٢- قسم علوم الأغذية كلية الزراعة جامعة عين شمس – شبرا الخيمة – القاهرة – مصر .

أستخدم في هذه التجربة ٢٢٥ كتكوت تسمين هبرد عمر يوم قسمت إلى خمسة مجموعات تشمل كل مجموعة ٤٥ كتكوت وزعت المجموعات على خمسة معاملات غذائية. المجموعة الأولى غذيت على عليقه بادئ (يوم –٢ أسبوع) ثم عليقه نامي(٢-٤أسبوع) ثم عليقه ناهي(٤-٧أسبوع) واعتبرت معاملة كنترول. بينما الأربعة مجموعات التالية فقد غذيت على عليقه الكنترول مضاف إليها ميكرو-باك (LA)، واقي - باك (LAE) ، وغذيت الكتاكيت على عليقة بها LA خلال فترة البادى والنامى ثم LAE خلال فترة الناهى (LA + LAE) ، وغذيت الكتاكيت على عليقة بها LAE خلال فترة البادى والنامى ثم LA خلال فترة الناهى (LA + LAE) طول فترة التجربة على التوالي. وفى عمر ٧ أسابيع ذبحت ٩ طيور من كل مجموعة (٣ لكل مكرر) وأخذت عينات دم لتقدير الكوليستيرول.وتم تقدير التركيب الكيماوى للحم الصدر بعد الذبح مباشرة وكذلك تقدير الرقم الهيدروجينى وطراوة اللحم بعد نصف ساعة ، ٢ ، ٤ ، ٦ ، ٢٤ ، ٤٨ ساعة بالتخزين بالتبريد على ٤مْ وكذلك الفقد أثناء الطبخ في اللحم بعد ٢٤ ساعة من التخزين بالتبريد أيضا تم تقدير الميكروفلورا المختلفة داخل الأمعاء والأعور.

أوضحت النتائج إن إضافة (LA) أو (LAE) إلى عليقه الكنترول ليست لها تأثير معنوي على وزن الجسم والعليقه المستهلكة ومعامل التحويل الغذائي عند عمر ٢و ٤, ٧ أسبوع. ولكن لوحظ في المعاملة الرابعة إضافة (LA + LAE) إلى عليقه الكنترول حسن وزن الجسم المكتسب بمقدار ٩, ٤٫٧ , ٢٫٨% وكذلك معامل التحويل الغذائي بمقدار ١٫٥ , ٨٫٢ , ١٠٫٦% على التوالي عند عمر ٢, ٤, ٧ أسبوع . إضافة (LA) مع أو بدون (LAE) إلى عليقه الكنترول حسن معدلات النفوق بالمقارنة بمعاملة الكنترول .

لم تتأثر الأوزان النسبية للذبيحة والأجزاء المأكولة (ذبيحة +الحوائج الكلية +الرقبة) و دهن البطن بالمعاملات المختلفة مقارنة بمعاملة الكنترول . أعطت المعاملات المختلفة لحماً اقل طراوة مقارنة بالكنترول وان اقل قيم للفقد في الطبخ كانت في الكنترول . أدت المعاملات المختلفة إلى النقص في الكوليسترول الكلى والجليسريدات الثلاثية و قيم HDL ، LDL في اللحم. واقل قيم للكولسترول في الدم كانت في العينة المضاف لها (LA + LAE). أوضحت النتائج أن المعاملات المختلفة ثبطت من نمو البكتريا المرضية وزيادة في إعداد بكتريا حامض اللاكتيك .

٧٥٤٤

7543

7543

7543