THE EFFECT OF GENOTYPE, LACTIC ACID BACTERIA AND THEIR INTERACTION ON PERFORMANCE OF TWO LOCAL LAYER HENS

Kout El-Kloub M.El. Mostafa and KH, Roushdy

Animal Prod. Res. Inst., Agric. Res. Center, Ministry of Agric, Doki, Giza, Egypt.

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Abstract: *This study was conducted to investigate the effect of genotype , dietary supplementation of probiotic (pronifer) and their interaction during the laying period elapsed between 36 and 48 weeks of age on performance of Bandara and Dokki4 local strains. A total number of 264 birds from the two strains (i.e.132 Bandara and 132 Dokki4) at 36 weeks of age were used in this study .Four groups from each strain having nearly equal initial live weights were randomly assigned to 4 treatments. Each group was subdivided into three replicates of 11 birds each (10 hens and 1 cock). The first group served as a control fed on corn-soy basal diet (T_1), while the other groups were fed diets supplemented with 0.1 % Lactic acid bacteria (T_2), 0.15% Lactic acid bacteria(T_3) and 0.20% Lactic acid bacteria (T_4). Birds were fed on the experimental diets along with 12 weeks experimental period. Criteria of response were recorded in terms of productive performance, egg quality, fertility and hatchability percentages, some physiological parameters and some blood constituents.*

This trial led to the following results:

Strain *had significant effect on egg weight, egg mass and feed conversion in favorite to Bandara strain. Also strain had significant effect on shell weight percentage, shell thickness (mm) and egg shape index , giblets percentage and liver percentage in favorite to Dokki4 . While, Strain had no significant effect on total egg production , egg production percentage and total feed intake . Bandara strain had significantly better plasma cholesterol values than Dokki4. While, Dokki4 strain decreased significantly in plasma total lipids. Bandara significantly recorded higher hatchability and chick weight than Dokki4. Dokki4 significantly better than Bandara strain in fertility percentage.*

Treatment *had significant effect for all dietary treatments studied on total plasma protein and albumin compared to the control group . Total plasma lipids were decreased significantly by the addition of probiotic levels compared with the control group. The group of T2 was the best* *supplemented level for significantly lowering total lipids compared to the other treatments. The group of T3 revealed significant increase in total egg production ,egg production percentage and egg mass than the control group and the other treatments.*

***The interaction** between strain and treatments indicated that egg production percentage was significantly improved by probiotic supplementation at 0.15% (T_3) in both strains. While, egg weight , egg mass and feed conversion were significantly improved up to 0.15% (T_3) pronifer inclusion level in Bandara compared with the other treatments. Also, the interaction had significant differences among all dietary treatments for shell weight %, shell thickness and egg shape index. The best level for decreasing total lipids was 0.10 % inclusion level of probiotic in both strains. The total count of micro-organisms increased by increasing probiotic up to T_3 dietary treatment in colon of hens compared with the control group. Colon pH decreased as the level of pronifer increased .*

Conclosion:

It could be concluded that strain has effect in utilizing probiotic present in laying hens ration, where 0.15% (T3) inclusion level of probiotic in both strains gave the best laying performance results.

ITRODUCTION

Dietary supplementation of non-nutritional additives may be an alternative way to improve protein utilization . Fermentation products such as pronifer is a bacterial cocktail of specific lactic acid producing bacteria. The probiotic strains of micro-organismis most often encountered in practice are mainly lactic acid bacteria. As a probiotic agent, it may act through improvement of the balance of the intestinal microflora.

Probiotic are non nutritional additives containing beneficial microbial cultures and /or ingredients that includes growth of desirable gastrointestinal microbes of the host animal **(Fuller,1988)**.

Probiotic supplementation stimulate the activity of bacteria in the digestive processes, protein synthesis and nutrient absorption in the gastrointestinal tract (**Stockland,1993**). Moreover, **Sissons (1988), Hollister *et al*., (1989) and Makled (1991)** reported that probiotic supplementation prevent diarrhea .

Sellars, (1991) reported that probiotic improved feed conversion and suggested that presence of high numbers of Lactobacilli might increase the motility of gut content and improve nutrient availability or absorption. Egg number , egg weight **(Nahashon *et al*.,1996)** and egg mass **(Haddadin *et al*.,1996)** in layers and in quail **(Ghazalah and Ibrahim,1998)** were significantly higher for birds fed diets supplemented with probiotics.

Probiotic supplementation may also reduce cholesterol concentration in blood **(Haddadin *et al*.,1996)** and in egg yolk **(Mohan *et al*., 1995)**. They attributed this reduction to decrease the absorption and/or synthesis of cholesterol in the gastrointestinal tract. They also, added that it is possible that some of the organisms present in the probiotic could assimilate cholesterol present in gastrointestinal tract for their own cellular metabolism, thus reduced the amount absorbed.

The addition of probiotic had positive effect on egg yield and some traits of egg quality **(Thayer *et al.*, 1978; Abd El-Rahman, 1988; Mohan and Christopher , 1988; Mohan *et al*.,1995 and Mervat Yossef *et al*., 2001).**

The present study was designed to evaluate the effect of probiotic (lactic acid bacteria) commercially named pronifer as a feed additive on the performance of two local layers strains. Strain differences, dietary supplementation of probiotic and interaction between them have been taken into consideration.

MATERIALS AND METHODS

This study was carried out at Seds Poultry Station, Animal Production Research Institute, Ministry of Agriculture.

A total number of 264 bird from two improved local strains (i.e.132 Bandara and 132 Dokki4) at 36 weeks of age were used in this study. Birds from each strain having nearly equal initial live weights were randomly assigned for 4 groups. Each group was sub-divided into three replicates of 11 birds each (10 hens and 1 cock). All birds were kept under similar management conditions in laying pens for each replicate where fresh water was supplied all time and all birds were fed on the experimental diets *ad-lib* for 12 weeks. The birds were fed on corn-soy basal diet (BD) supplemented with different levels of lactic acid bacteria (Pronifer) to produce four experimental diets for each strain as follows:

T_1 : Basal diet (BD)

T_2 : BD + 0.1 % Lactic acid bacteria (LAB)

T_3 : BD + 0.15% LAB

T_4 : BD + 0.20% LAB

The experimental basal diet was formulated as shown in Table (1). Birds were weighted at 36 weeks of age (the beginning of the experiment, IBW) and then every 4 weeks till the end of the experiment (FBW) after 12 weeks of beginning. Egg number (EN) and egg weight (EW) were recorded during the whole experimental period (12 weeks). Feed intake (FI) was recorded and feed conversion (FC) was determined. Egg quality was measured each four weeks, five eggs from each replicate were collected, weight, broken and separated into shells, yolks and albumin. The weights of yolk (YW), albumin(AlW) and shell (SHW) were recorded and calculated as percentages of egg weight. For evaluating egg fertility (Fer) and hatchability (Hat), three hatches of eggs were made every 4 weeks of the experimental period. Fertility was calculated as fertile eggs percentage to total incubated eggs . Hatchability was calculated relative to total fertile eggs. Weights of healthy chicks (ChW) were also recorded.

At the end of the experiment , six birds from each treatment were weighed and slaughtered , then scalded and defeathered. Carcasses were manually eviscerated (EVW) and weighed. Liver (L) , heart (H), gizzard (G) and abdominal fat (AF) were removed, weighed and recorded as a percentage of live body weight (LBW).

Colon content samples were collected by pressing the outer wall of cut ileum to push its content into sterile glass bottle . Colon samples were determined for pH value then frozen until used for microbiological examination.

Blood constituents including total protein (TP), albumin (Al), globulin (Gl), cholesterol (Ch) and total lipids (TL) were determined by colorimetric methods using the suitable commercial kits.

Perior to analysis the data taken as percentages were transformed using arc sin transformation according to **Winer (1971).** Statistical analysis was done by using the general linear models (GLM) procedure of **SAS (1999)** . Duncan's multible range test **(Duncan,1955)** was used to determine the differences between treatment means.

RESULTS AND DISCUSSION

Live body weight:

The effect of strain, dietary treatments and their interaction on the performance of Bandara and Dokki4 laying hens during the experimental period are presented in Table (2). Results showed that strain had significant effect on live body weight. This is may due to that Bandara strain has bigger size and weight than Dokki4. While , treatments had no significant effect on body weight.

However, the interaction between strain and treatments showed that BWG improved in T_4 for both strains. Increased body weight gain with pronifer may be due to larger lactobacilli population which favorably changed the balance of enteric flora intestines or the availability of nutrients as reported by **Adler and DaMassa,(1980).** These results agreed well with those reported by **Ezzat *et al*.,(1988)** who found significant improvement in body weight by increasing the level of lactobacillus acidophilus from 0.01 to 0.09% for 12 weeks period. Also, **Ali (1999)** reported that the superiority of probiotic may be due to the favorable effects that provide live yeast culture and natural lactic acid producing bacteria to the chicks digestive tract. However, the lactic acid bacteria help to maintain an optimum low pH to inhibit growth of undesirable bacteria.

Egg Production:

Strain had no significant effect on TEP , EP% and TFI . Bandara had higher significant effect on EW and EM than those of Dokki4. While, Dokki4 had significantly improved in FC. The reason for the previous results probably due to the bigger size of Bandara which produces larger egg and consumes more feed than Dokki4. Treatment had significant effect on TEP, EP% , EW% , EM and TFI between dietary treatments and control group. Furthermore, T_3 achieved significantly increase in TEP, EP% and EM than the control and other treatments. While, dietary treatments had no significant effect on FC.

Concerning the interaction between strains and dietary treatments (Table 2) the following results were observed:

1-Egg production percentage :

The interaction between strain and treatments indicated that EP% was significantly improved by probiotic supplementation at 0.15% (T_3) in Both strains. **Sellars (1991)** suggested that presence of high numbers of lactobacilli may increase motility of gut contents and improved nutrient availability or absorption. **Watkins *et al*., (1982)** reported that continuous lactobacillus dosing lowered the pH in the crop, caecum and rectum. They also added that particular strain of Lactobacillus acidophilus was capable of competing with E.Coli in gut. Also, **Savage *et al*., (1968)** found that lactobacilli stimulate the intestinal villi which extracts nutrients from feedstuffs during digestion. All these effects may cause an alternation in the absorption of most nutrients and this may accounted for improving efficiency of feed utilization.

2-Egg weight and egg mass:

Egg weight was significantly improved up to 0.15% (T_3) pronifer inclusion level in Bandara compared with the other treatments. Similar result was reported in Bovine White by **Salwa *et al*.,(2004)** and in quails by **Ghazalah and Ibrahim (1998)**.Same trend was observed for EM which T_3 significantly surpassed all other treatments. **Salwa *et al*., (2004)** found that egg mass increased by about 18.2, 17.0 and 15.6% when Bovine White fed diets containing either lactobacillus or mixture from lactobacillus and Bifoid bacterium bifidum or Bifoid bacterium alone for 10 weeks, respectively.

3-Feed conversion:

As shown from Table (2), feed conversion significantly improved by increasing probiotic level up to 0.15% (T_3) in Bandara strain. This improvement may due to that intestinal pH may alter both microbial populations and nutrient absorption and this may improve efficiency of feed utilization **(March, 1979).** Similar results was found by **Haddadine *et al*.,(1996); Nahashon *et al*. (1994 , 1996) ; Ghazalah and Ibrahim (1998) and Mohan *et al*. (1995)** who observed that the addition of some probiotics improved significantly feed conversion.

Egg quality :

Results obtained from Table (3) indicated that strain had significant effect on SHW%, shell thickness (SHTmm) and egg shape index (ESI) in favorite to Dokki4 strain. While, treatments had no significant effect on egg quality. As shown from Table (3) the interaction between strain and treatments had no significant differences among all dietary treatments for YW%, ALW % and HU in both strains. While, there were significant differences between treatments for SHW %, SHT and ESI.

Mona, (2003) reported that the inclusion levels of probiotic up to 4 g/kg had no significant effect on either SHT or HU but had a significant increase in ESI. In this respect, **Abdulrahim *et al*.,(1996)** did not observe differences in SHT as using lactobacillus acidophilus in laying hens diets compared with the control group.

The previous results suggest that addition of probiotic plays an important role in elevating egg quality parameters as demonstrated by the results of **Mohan *et al*., (1995) ; Samanta and Biswas, (1997) and Pheko *et al*.,(1998)**. This indicated that the probiotic may be more critical on the external and internal characteristics of egg quality.

Fertility and hatchability :

Results obtained in Table (4) declared that Dokki4 significantly higher than Bandara strain in fertility percentage. On the contrary, Bandara was significantly higher in hatchability and chick weight than Dokki4 . However, treatments had no significant effect on fertility percentage, hatchability and chick weight. Concerning the interaction effect between strain and treatments, the higher significant effect on fertility percentage in T_4 for Dokki4 strain compared with all dietary treatments in Bandara strain. On the contrary, ChW significantly increased for T_3 in Bandara compared with all dietary treatments in Dokki4.

Carcass traits:

As shown form Table (5) strain had significant effect on giblets percentage (GB%) and L% in favorite to Dokki4 which surpassed Bandara strain. There were no significant differences between the two strains in G %, H % , EVW % and total edible parts % (TEDP%).While, there were no significant differences among all dietary treatments studied. Statistically the same trend obtained from the interaction between strain and treatments except, T_3 in Bandara and T_4 in Dokki4 for GB% had significantly differences in favorite to Dokki4 strain. Also, T_4 in both strains had significant effect on EVW% in favorite to Bandara strain. Similarly, **Abou-Zeid *et al*., (2000)** found that Lacto Sacc or N-FAC probiotic supplementation had no significant effect on carcass traits of quail chicks. Also, **Zeweil (1997)** showed that different supplementation of Yea Sacc did not affect carcass traits of growing Japanese quail.

Microbial determination :

The total count of pronifer was determined on specific media. Data presented in Table (6) showed that the count of micro-organisms increased with increasing probiotic up to 0.15% (T_3) dietary treatments in colon of laying hens fed dietary treatments compared with the control group. It was 23.9 X 10^7 for control group , 20.9 X 10^7 for T_2 and 32.7 X 10^7 for T_3 in colon.

Recently, Research has focused on the ability of probiotic bacteria to ferment oligosaccharides (as prebiotic) which bypass metabolism and absorption in the small intestine and may have a major influence on the selective growth of probiotic bacteria **(Fooks *et al*., 1999 and Shain *et al*., 2000)** . Most often lactic acid is a metabolite of microbial metabolism , the low pH resulting from acid production caused an unfavorable environment for certain pathogenic bacteria and the normal intestinal flora help to control or eliminate any invading pathogen **(Fox,1988)**. **Al-Talawy *et al*., (2005)** mentioned that the products containing prebiotics and probiotics are known as symbiotic. Concerning the antimicrobial effect of pronifer, it was attributed to increase the immune status of the host through activation of the macrophages , increase phagocytic activity or secretion of lysosomal enzymes or by their ability to produce oxygen radical **(Sato , 1984 and Miake *et al*., 1985).**

Shoeib *et al*., (1996) reported that lactobacilli produce some compounds as H_2O_2 , organic acids (lactic and acetic acids) and other complex materials as lactolin , acidolin and bulgarican. All these substances are powerful antibacterial agents specially against gram negative bacteria. Moreover , H_2O_2 is a part of peroxidase enzyme which plays a role in raising the host immunity and protect the host against infection.

The results obtained from Table (6) showed that pH values decreased as the level of pronifer increased . **Ali (1999)** reported that the superiority of probiotic may be due to the favorable effects that provide live yeast culture and natural lactic acid producing bacteria to the chicks digestive tract. However, the lactic acid bacteria help to maintain an optimum low pH to inhibit growth of undesirable bacteria . **Watkins *et al*., (1982)** reported that continuous Lactobacillus dosing lowered the pH in the crop, caecum and rectum. They added also that particular strain of lactobacillus acidophilus was capable of competing with E.Coli in gut. It could be declared that decreasing pH may increase the beneficial bacteria and decrease the harmful one.

Blood Parameters:

It is clear from Table (7) that Bandara strain had significantly better cholesterol and higher abdominal fat values than Dokki4. However, Dokki4 had insignificantly increase in total protein , albumin and globulin compared to Bandara strain. Treatment had significant effect for all dietary treatments studied on total protein and albumin compared to the control group. Total lipids were decreased significantly by the addition of probiotic levels compared with control group. Group of T_2 was the best supplemented level for significantly lowering total lipids than other treatments. On the contrary, there were no significant effect for dietary treatments on globulin and cholesterol.

The interaction between strain and treatments reveled that although the probiotic supplementation resulted in some changes in the levels of the studied traits of blood constituents (Table 7), the differences among dietary treatments were not significant for both strains except for total lipids where it was improved significantly than the control group. These reduction may be due to the inhibition of their synthesis **(Ghazalah and Ibrahim, 1998)** or due to that some of the organisms present in the probiotic preparations could assimilate the cholesterol present in gastro-intestinal tract for their own cellular metabolism, thus reducing the amount absorbed **(Nelson and Gilliland, 1984).**

The best level for decreasing total lipids was 0.10 % inclusion level of probiotic in both strains , although the other levels also significantly decreased total lipids compared with control group.

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

Ingredients	**%**
Corn yellow	63.14
Soybean meal (44%)	27.10
Dicalcium phosphate	1.50
Limestone	7.60
Sodium chloride	0.30
Premix [1]	0.30
DL-Methionine	0.06
Total	100
Calculated values [2]	
Crude protein %	16.81
M.E. kcal/kg	2722
Methionine %	0.36
Lysine	0.95
Calcium %	3.30
Available P	0.41

[1] Each 3 Kg of vitamins and minerals premix contained : 10000000 IU Vit. A, 10000 mg Vit. E, 1000 mg Vit. K_3 , 2000000 IU Vit. D3, 1000 mg Vit. B_1 , 10000 mg Pantothenic acid, 10 mg Vit. B_{12} , 1500 mg Vit. B_6 , 5000 mg Vit. B_2 , 30000mg Niacin, 300000 mg Choline chloride, 1000 mg Folic acid, 50 mg Biotin , 300 mg I, 60000 mg Mn, 50000 mg Zn, 30000 mg Fe, 4000 mg Cu, 100 mg Se and 100 mg Co.

[2] According to **Feed Composition Tables for animal & poultry feedstuffs used in Egypt (2001).**

Table (2): Effect of strain , dietary treatments and their interaction on the productive performance of Bandara and Dokki4 laying hens during the experimental period.

Item		IBWgm	FBWgm	BWGgm	TEP	EP%	EWgm	EM kg	TFI kg	FC
Strain effect										
Bandara(B)		1536.83 ±6.04^{a}	1639.00 ±21.65^{a}	102.17 ±3.38^{a}	60.08 ±0.78	71.53 ±0.93	52.26 ±0.33^{a}	3.14 ±0.05^{a}	9.27 ±0.18	2.97 ±0.06^{b}
Dokki4(D)		1336.67 ±20.40^{b}	1396.00 ±18.58^{b}	59.33 ±1.38^{b}	58.95 ±1.17	70.18 ±1.39	46.86 ±0.38^{b}	2.76 ±0.05^{b}	8.87 ±0.25	3.24 ±0.09^{a}
Treatment effect										
T1		1494.33 ±15.55	1558.67 ±12.24	64.33 ±2.49	58.18 ±1.29^{b}	69.26 ±0.53^{b}	49.08 ±0.46^{bc}	2.86 ±0.08^{bc}	9.13 ±0.24^{ab}	3.22 ±0.09
T2		1421.33 ±14.5	1477.17 ±16.17	55.83 ±0.48	54.95 ±1.03^{c}	65.42 ±1.22^{c}	49.90 ±0.78^{ab}	2.74 ±0.06^{c}	8.36 ±0.17^{b}	3.08 ±0.10
T3		1423.00 ±19.18	1504.50 ±10.62	81.50 ±2.64	64.48 ±1.11^{a}	76.76 ±0.32^{a}	50.79 ±0.05^{a}	3.27 ±0.08^{a}	9.72 ±0.47^{a}	3.00 ±0.17
T4		1408.33 ±18.69	1529.67 ±17.07	121.33 ±3.99	60.46 ±1.19^{b}	71.98 ±1.42^{b}	48.48 ±0.80^{c}	2.93 ±0.06^{b}	9.07 ±0.22^{ab}	3.12 ±0.08
Interaction										
B	T1	1548.67 ±5.49^{a}	1650.67 ±10.68^{a}	102.00 ±9.5^{ab}	61.26 ±0.84^{ab}	72.93 ±1.00^{ab}	50.65 ±0.35^{b}	3.10 ±0.03^{b}	9.66 ±0.34^{a}	3.12 ±0.11^{ab}
	T2	1532.67 ±5.49^{a}	1624.00 ±11.95^{a}	91.33 ±9.03^{ab}	55.70 ±1.65^{c}	66.31 ±1.96^{c}	51.81 ±0.27^{b}	2.89 ±0.08^{bc}	8.57 ±0.22^{ab}	2.99 ±0.11^{ab}
	T3	1529.00 ±9.26^{a}	1605.00 ±14.76^{a}	76.00 ±7.82^{ab}	64.71 ±0.97^{a}	77.03 ±1.15^{a}	55.04 ±0.27^{a}	3.56 ±0.04^{a}	9.67 ±0.53^{a}	2.73 ±0.16^{b}
	T4	1537.00 ±19.94^{a}	1676.33 ±12.94^{a}	139.33 ±11.81^{a}	58.67 ±0.92^{bc}	69.84 ±1.10^{bc}	51.56 ±0.50^{b}	3.03 ±0.06^{bc}	9.15 ±0.21^{ab}	3.03 ±0.09^{ab}
D	T1	1340.00 ±16.82^{b}	1366.67 ±18.48^{b}	26.67 ±4.15^{ab}	55.10 ±1.99^{c}	65.59 ±2.37^{c}	47.52 ±0.39^{c}	2.62 ±0.10^{de}	8.60 ±0.23^{ab}	3.32 ±0.14^{a}
	T2	1310.00 ±12.12^{c}	1330.33 ±8.82^{c}	20.33 ±2.21^{b}	54.20 ±1.28^{c}	64.53 ±1.52^{c}	47.98 ±1.27^{c}	2.60 ±0.07^{e}	8.15 ±0.27^{b}	3.16 ±0.15^{ab}
	T3	1317.00 ±17.47^{c}	1404.00 ±10.78^{bc}	87.00 ±5.98^{ab}	64.24 ±2.06^{a}	76.49 ±2.46^{a}	46.54 ±0.38^{cd}	2.99 ±0.09^{bc}	9.74 ±0.81^{a}	3.28 ±0.28^{a}
	T4	1279.67 ±11.84^{c}	1383.00 ±14.46^{bc}	103.33 ±4.04^{ab}	62.26 ±2.10^{ab}	74.12 ±2.50^{ab}	47.39 ±0.30^{d}	2.83 ±0.10^{cd}	8.99 ±0.40^{ab}	3.20 ±0.14^{ab}

Means in the same column having different letters are significantly different ($p \leq 0.05$).

IBW= initial body weight, FBW=final body weight, BWG=body weight gain, TEP=total egg production, EP=egg production, EW=egg weight, EM=egg mass, TFI=total feed intake, FC=feed conversion.

Table (3): Effect of strain , dietary treatments and their interaction on egg quality parameters for Bandara and Dokki4 laying hens during the experimental period.

Item		EWgm	SHW%	YW%	AlW%	SHTmm	HU	ESI
Strain effect								
Bandara(B)		53.72±0.43 ^{a}	12.58±0.06 ^{b}	33.14±0.18	54.72±0.20	0.42±0.01 ^{b}	78.36±0.86	75.45±0.21 ^{b}
Dokki4(D)		45.40±0.83 ^{b}	14.40±0.67 ^{a}	35.18±1.61	55.18±2.71	0.49±0.02 ^{a}	80.22±0.99	76.92±0.32 ^{a}
Treatment effect								
T1		49.17±0.78a ^{b}	13.43±0.31	33.54±0.30	53.02±0.53	0.49±0.03 ^{a}	78.19±1.35	76.41±0.57 $^{a b}$
T2		47.91±2.03 ^{b}	14.29±1.37	36.88±0.19	58.65±0.35	0.44±0.01 $^{a b}$	81.37±1.31	76.77±0.23 ^{a}
T3		51.02±1.18 ^{a}	13.15±0.16	33.12±0.31	53.73±0.32	0.44±0.01 ^{b}	78.33±1.29	76.06±0.38 $^{a b}$
T4		50.13±1.12a ^{b}	13.10±0.14	33.11±0.29	53.50±0.48	0.44±0.01a ^{b}	79.29±0.31	75.51±0.38 ^{a}
Interaction								
B	T1	52.12±0.61^{a}	12.55±0.07^{b}	32.86±0.43	54.57±0.45	0.42±0.01^{c}	77.55±1.73	75.60±0.50^{ab}
	T2	52.84±0.80^{a}	12.54±0.12^{b}	33.71±0.25	53.76±0.30	0.41±0.01^{c}	79.18±1.75	76.32±0.18^{ab}
	T3	55.74±0.44^{a}	12.61±0.13^{b}	33.40±0.33	53.99±0.37	0.41±0.01^{c}	79.00±1.60	75.05±0.67^{b}
	T4	54.20±1.03^{a}	12.63±0.15^{b}	32.60±0.32	54.77±0.43	0.44±0.01^{bc}	77.71±2.04	74.84±0.38^{b}
D	T1	46.22±0.16^{b}	14.30±0.47^{a}	34.22±0.28	51.48±0.63	0.56±0.05^{a}	78.84±2.16	77.21±0.99^{a}
	T2	46.32±0.42^{b}	13.37±0.09^{ab}	33.58±0.24	52.92±0.25	0.49±0.02^{b}	82.38±0.89	77.22±0.39^{a}
	T3	46.31±0.43^{b}	13.69±0.13^{ab}	32.84±0.53	53.47±0.52	0.46±0.01^{bc}	77.66±2.11	77.07±0.38^{a}
	T4	46.07±0.41^{b}	13.56±0.08^{ab}	33.61±0.44	52.22±0.61	0.45±0.01^{bc}	80.85±1.60	76.19±0.61^{ab}

Means in the same column having different letters are significantly different ($p \leq 0.05$).

EW=egg weight, SHW=shell weight, YW=yolk weight, ALW=albumin weight, SHT=shell thickness, HU=haugh unite, ESI=egg shape index

Table(4): Effect of strain , dietary treatments and their interaction on the fertility(Fer), hatchability(Hat), and hached chick weights(ChW) of Bandara and Dokki4 laying hens.

Item		Fer%	Hat%	ChWgm
Strain effect				
Bandara(B)		88.83±1.17 [b]	74.87±2.26 [a]	33.09±0.88 [a]
Dokki4(D)		94.73±0.75[a]	69.03±1.37 [b]	28.44±0.18 [b]
Treatment effect				
T1		93.34±0.95	74.65±2.64	30.25±0.32
T2		90.01±1.67	70.58±2.99	31.64±1.88
T3		90.29±2.01	71.48±2.88	31.20±0.75
T4		93.49±1.27	71.09±2.43	29.97±0.55
Interaction				
B	T1	94.15±1.00[ab]	80.98±4.16[a]	31.17±0.31[abc]
	T2	85.53±2.03[c]	73.43±0.32[ab]	34.17±0.19[a]
	T3	85.30±2.88[c]	76.95±4.85[ab]	35.01±0.49[a]
	T4	90.35±0.90[bc]	68.12±4.33[b]	32.03±0.38[ab]
D	T1	92.53±1.63[ab]	68.33±1.58[b]	29.33±0.35[bc]
	T2	94.50±1.63[ab]	67.72±4.15[b]	28.27±0.22[bc]
	T3	95.28±1.61[ab]	66.02±2.06[b]	28.23±0.41[bc]
	T4	96.63±0.88[a]	74.06±2.04[ab]	27.91±0.28[c]

Means in the same column having different letters are significantly different ($p \leq 0.05$).

Table (5): Effect of strain , dietary treatments and their interaction on the carcass yield and some slaughter traits for Bandara and Dokki4 laying hens.

Item		LBWg	L%	G%	H%	AF%	GB%	EVW%	TEDP%
Strain effect									
Bandara(B)		1698.42 ±16.56 ^{a}	2.04 ±0.08 ^{b}	1.81 ±0.09	0.55 ±0.03	3.13 ±0.34 ^{a}	4.4 ±0.13 ^{b}	66.50 ±1.51	70.90 ±1.59
Dokki4(D)		1436.67 ±12.77 ^{b}	2.93 ±0.18 ^{a}	1.91 ±0.09	0.47 ±0.04	1.65 ±0.16 ^{b}	5.31 ±0.19 ^{a}	63.54 ±0.97	68.84 ±0.95
Treatment effect									
T1		1548.33 ±15.77	2.40 ±0.29	1.82 ±0.13	0.56 ±0.08	2.73 ±0.59	4.78 ±0.23	64.88 ±0.54	69.66 ±0.69
T2		1487.17 ±12.14	2.53 ±0.26	1.93 ±0.10	0.49 ±0.03	1.94 ±0.26	4.95 ±0.21	63.77 ±0.83	68.72 ±0.74
T3		1562.17 ±13.45	2.47 ±0.20	1.65 ±0.14	0.46 ±0.04	2.42 ±0.46	4.59 ±0.30	66.03 ±1.61	70.61 ±1.41
T4		1636.50 ±14.92	2.53 ±0.37	2.04 ±0.09	0.53 ±0.06	2.47 ±0.60	5.09 ±0.43	65.40 ±1.44	70.5 ±1.54
Interaction									
B	T1	1669.33 ±28.99 ^{ab}	1.97 ±0.19	1.84 ±0.11 ^{ab}	0.56 ±0.06	3.91 ±0.59 ^{a}	4.36 ±0.18 ^{bc}	64.32 ±0.81 ^{ab}	68.68 ±0.76
	T2	1627.33 ±18.09 ^{ab}	2.00 ±0.14	1.94 ±0.21 ^{ab}	0.55 ±0.03	2.21 ±0.34 ^{ab}	4.49 ±0.07 ^{abc}	64.34 ±0.51 ^{ab}	68.84 ±0.55
	T3	1684.333 ±15.86 ^{ab}	2.13 ±0.17	1.51 ±0.13 ^{b}	0.51 ±0.07	3.14 ±0.44 ^{ab}	4.14 ±0.21 ^{c}	67.13 ±2.29 ^{ab}	71.27 ±2.24
	T4	1812.67 ±20.04 ^{a}	2.05 ±0.24	1.95 ±0.19 ^{ab}	0.60 ±12	3.25 ±1.08 ^{ab}	4.60 ±0.07 ^{abc}	70.22 ±5.69 ^{a}	74.82 ±6.12
D	T1	1499.33 ±16.53 ^{bc}	2.82 ±0.43	1.81 ±0.27 ^{ab}	0.57 ±0.18	1.54 ±0.05 ^{b}	5.20 ±0.24 ^{abc}	65.44 ±0.69 ^{ab}	70.64 ±0.91
	T2	1347.00 ±19.48 ^{c}	3.05 ±0.22	1.91 ±0.09 ^{ab}	0.45 ±0.01	1.67 ±0.39 ^{b}	5.41 ±0.12 ^{ab}	63.20 ±1.68 ^{ab}	68.60 ±1.56
	T3	1440.00 ±15.19 ^{bc}	2.82 ±0.24	1.79 ±0.25 ^{ab}	0.42 ±0.03	1.71 ±0.61 ^{b}	5.03 ±0.46 ^{abc}	64.92 ±2.56 ^{ab}	69.95 ±2.10
	T4	1460.33 ±9.95 ^{bc}	3.01 ±0.64	2.12 ±0.04 ^{a}	0.46 ±0.03	1.69 ±0.19 ^{b}	5.59 ±0.67 ^{a}	60.59 ±1.89 ^{b}	66.18 ±2.55

Means in the same column having different letters are significantly different ($p \leq 0.05$).
LBW=live body weight, L=liver, G=gizzard, H=heart, AF=abdominal fat, GB=giblets, EVW=eviscerated weight, TEDP=total
edible parts.

Table (6): Effect of strain , dietary treatments and their interaction on the pH and total count of microbs in colon for Bandara and Dokki4 laying hens .

Performance criteria	**Experimental diets**			
	T1	**T2**	**T3**	**T4**
	Bandara			
pH	6.40	6.13	5.81	5.46
Total count	$23.9*10^{7}$	$20.9*10^{7}$	$32.7*10^{7}$	$28.3*10^{7}$
	Dokki4			
pH	6.40	6.13	6.16	5.83
Total count	$25.4*10^{7}$	$38.2*10^{7}$	$34.7*10^{7}$	$38.6*10^{7}$

Table (7): Effect of strain , dietary treatments and their interaction on some blood parameters for Bandara and Dokki4 laying hens fed the dietary treatments.

Item		**TP** g/dl	**Al** g/dl	**Gl** g/dl	**Ch** mg/dl	**TL**g/l
Strain effect						
Bandara		3.50±0.30	2.38±0.25	1.13±0.21	78.86±292 ^{b}	18.05±2.47 ^{a}
Dokki		4.10±0.30	2.96±0.25	1.14±0.11	101.77±4.28 ^{a}	13.09±0.87 ^{b}
Treatment effect						
T1		2.73±0.24 ^{b}	1.89±0.22 ^{b}	0.84±0.17	83.49±3.87	23.53±3.07 ^{a}
T2		4.02±0.42 ^{a}	2.94±0.24 ^{a}	1.07±0.25	82.19±2.51	9.04±0.71 ^{c}
T3		4.23±0.15 ^{a}	2.97±0.29 ^{a}	1.26±0.35	92.56±3.07	15.58±1.51 ^{b}
T4		4.22±0.53 ^{a}	2.87±0.50 ^{a}	1.35±0.13	103.01±3.71	14.14±1.15 ^{b}
Interaction						
B	T1	2.69±0.22 ^{c}	2.07±0.32 ^{bc}	0.62±0.23	86.17±13.38 ^{ab}	30.29±0.92 ^{a}
	T2	3.47±0.70 ^{abc}	2.59±0.37 ^{abc}	0.88±0.36	73.70±0.35 ^{b}	7.83±0.63 ^{e}
	T3	4.34±0.20 ^{ab}	2.71±0.59 ^{abc}	1.63±0.66	68.93±11.86 ^{b}	18.59±0.79 ^{b}
	T4	3.50±0.52 ^{abc}	2.13±0.77 ^{bc}	1.37±0.26	86.63±0.19 ^{ab}	15.49±1.44 ^{bc}
D	T1	2.77±0.48 ^{bc}	1.70±0.33 ^{c}	1.06±0.22	80.81±17.34 ^{ab}	16.77±0.71 ^{b}
	T2	4.57±0.32 ^{a}	3.30±0.13 ^{ab}	1.27±0.38	90.68±14.48 ^{ab}	10.25±0.83 ^{de}
	T3	4.12±0.24 ^{abc}	4.23±0.09 ^{a}	0.89±0.16	116.18±5.44 ^{a}	12.56±1.32 ^{cd}
	T4	4.94±0.46 ^{a}	3.61±0.36 ^{ab}	1.33±0.10	119.40±9.29 ^{a}	12.79±1.67 ^{cd}

Means in the same column having different letters are significantly different ($p \leq 0.05$).

TP=total protein, Al=albumin, Gl=globulin, Ch=cholesterol, TL=total lipids.

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الملخّص العربى

تأثير السلاله ومستوى بكتريا حامض اللاكتيك والتداخل بينهما على آداء سلالتين من الدجاج البياض المحلى

قوت القلوب مصطفى السيد مصطفى ، خالد رشدى

معهد بحوث الإنتاج الحيواني – الدقي ، جيزة ، مصر.

أجريت هذه الدراسةِ لمعرفة تأثيرِ التركيب الوراثى والاضافه الغذائيه بالبروبيوتيك (بكتريا حامض الاكتيك ، برونيفير) والتداخل بينهم أثناء فترة أنتاج البيض من 36 –48 أسبوع من العمر على الآداء الانتاجى لسلالتين من الدجاج المحلى وهما البندره ودقى 4 . استخدم من كل سلاله 132 طائر(العدد الكلى 264 طائر من السلالتين) وزعت عشوائيا على اربعة مجموعات متساويه تقريبا فى وزن الجسم الاساسى. كل مجموعه او معامله قسمت الى ثلاث مكررات (كل مكرر 10اناث وذكر) . المجموعه الاولى كانت للمقارنه بدون اضافات (م$_1$) بينما المجموعات اثلاثه الاخرى مضاف اليها بكتريا حامض الاكتيك(برونيفير) بنسب 0.1 (م$_2$)، 0.15% (م$_3$)، 0.20% (م$_4$) .

غذيت الطيور على علائق التجربه لمدة 12 أسبوع وتم تسجيل بيانات الآداء الانتاجى وجودة البيض ونسبة الخصوبه والفقس وبعض القياسات الفسيولوجيه وبعض قياسات الدم.

وكانت النتائج كالاتى :

تأثير السلاله: كان هناك تاثير معنوى للسلاله على كل من وزن البيض ، كتلة البيض ، والتحويل الغذائى وذلك فى صالح سلالة البندره . أيضا هناك تاثير معنوى للسلاله على النسبه المئويه لوزن القشره ، سمل القشره ، دليل شكل البيضه ، النسبه المئويه للكبد ، النسبه المئويه للحوائج فى صالح دقى4 . بينما لم يكن للسلاله تاثير معنوى على كل من انتاج البيض الكلى و النسبه المئويه لانتاج البيض وكذلك كمية الغذاء المستهلك. كان لسلالة البندره تاثير معنوى افضل من الدقى4 فى كوليستيرول الدم بينما سلالة دقى 4 كانت اقل معنويا من البندره فى الدهون الكليه للدم. كذلك زادت النسبه المئويه للفقس وزاد وزن الكتكوت معنويا فى البندره عن دقى 4 بينما الدقى4 زاد معنويا عن البندره فى النسبه المئويه للخصوبه.

تأثير المعامله: كان للمعاملات تأثير معنوى على كل من البروتين الكلى والالبيومين فى بلازما الدم مقارنة بالكنترول. كذلك انخفضت معنويا الدهون الكليه للبلازما باضافة البروبايوتيك مقارنة بالكنترول وكانت (م2) أفضل معامله ادت للانخفاض المعنوى للدهون الكليه عن باقى المعاملات.حققت المعامله(م3) زياده معنويه عن الكنترول وباقى المعاملات الاخرى فى انتاج البيض الكلى والنسبه المئويه لانتاج البيض وكتلة البيض.

تاثير التداخل بين السلاله والمعامله :

تحسنت النسبه المئويه لانتاج البيض فى كلا من السلالتين باضافة البروبيوتك بمستوى 0.15 % (م3) ، بينما تحسن كل من وزن البيض وكتلة البيض والتحويل الغذائى باضافة البروبيوتك حتى مستوى 0.15 % (م3) فى البندره مقارنة بباقى المعاملات. أيضا كان هناك تاثير معنوى للتداخل بين كل المعاملات فى النسبه المئويه لوزن القشره وسمك القشره ودليل شكل البيضه . وكان أفضل مستوى اضافه للبروبيوتك لخفض الدهون الكليه فى البلازما فى كلا السلالتين هو 0.1 % (م2). زاد العدد الكلى للكائنات الحيّة الدقيقه فى القولون بزيادة البروبيوتيك حتى مستوى 0.15% (م3) مقارنة بالمجموعه القياسيه بينما انخفض الاس الهيدروجينى بزيادة البروبيتيك.

الخلاصه:

السلاله لها تاثير فى الاستفاده من البروبايوتيك (بكتريا حامض اللاكتيك ، برونيفير) الموجود فى علائق الدجاج البياض حيث ان أفضل آداء إنتاجى للدجاج البياض يمكن الحصول عليه من اضافة مستوى 0.15%(م3) بروبايوتك فى كلا السلالتين.