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Effect of probiotic and prebiotic supplementation with or without animal protein concentrate on performance of female quails

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Abstract

The aim of this experiment was to determine the effect of supplementation of probiotic and prebiotic in egg production ration with or without animal protein concentrate on production performance of quail females. One hundred and sixty birds 70 days old were randomly distributed to eight treatments (20 bird/ treatment; 5 replicates/ each). T1: basal ration contain 5% animal protein concentrated without supplementation of probiotic or prebiotic; T2: basal ration without animal protein concentrated, probiotic and prebiotic; T3: T1 + 0.10% probiotic; T4: T1 + 0.10% prebiotic (Yeast); T5: T1 + 0.10% probiotic + 0.10% prebiotic; T6: T2 + 0.10% probiotic; T7: T2 + 0.10% prebiotic; T8: T2 + 0.10% probiotic + 0.10% prebiotic. Results showed that no significant differences were found among treatments in egg production (HDP %), egg weight, egg mass, feed intake, feed conversion ratio and energy conversion ratio, but energy consumption in T5 were significantly ($P \leq 0.05$) higher than T7. Significant ($P \leq 0.05$) differences were found between treatments in egg quality (yolk weight (g), albumin weight (%), shell thickness (mm), and shell weight (g and %). Whereat, T1 was significantly ($P \leq 0.05$) higher than T6 in egg specific gravity, also T1 was significantly ($P \leq 0.05$) higher than T2 in shape index. T1 and T2 significantly ($P \leq 0.05$) higher than the other treatments in yolk index. While in albumin index T3 and T4 significantly ($P \leq 0.05$) higher than T6. Albumin weight percentage in T2, T5, T6 and T7 were significantly ($P \leq 0.05$) higher than T1. Egg surface area was significantly ($P \leq 0.05$) higher in T3 compared with T2, T7 and T8. Shell weight (g) was significantly ($P \leq 0.05$) higher in T1 (control) than T6 and T7, while T6 was significantly ($P \leq 0.05$) higher than T8 in shell thickness.

Introduction

Dietary is consider the mainly cost and important in projects breeding and poultry-animal production which takes 60-70% of the cost of meat and egg production projects investment *[1; 2],* inasmuch for use feedstuff vegetable origin materials for 90% of feed ingredients percentage which includes energy sources like grains production residual and Güler et al, (2005) *[3]* reported that feed feedstuff vegetable origin contains lots of Anti Nutritional Factors such as Tannin, Phytic Acid, Non-Starch Polysaccharides (NSPs) and other fiber ingredients. Moreover, the digestive system for poultry lacks of analyst enzymes for Anti Nutritional Factors from one side and promotes detachment enzymes in poultry gut *[4; 5; 6; 7; 8]* which required devoting the scientific looks towards probiotic and prebiotic technics use in poultry dietary. Probiotic is preparation birds living microbial culture whether it was bacteria or molds. This micro living is settles in the epithelial cells within the gut and then covers the receptors on the walls of these cells. Locking these receptors will prevent pathogenic bacteria (Salmonella Coli) from reaching and agglutinating the epithelial cells and then out with residual outside of the body *[9],* probiotics used as dietary supplements in special diet by (Food Drug Administration) and it was proved that using it among the healthy and mainly materials which spread widely because of its efficiency in improving the animal health condition *[10; 11].*

Probiotics using in poultry industry for over than half century, to prevent bacterium infection and improvement poultry performance but having these little quantities of probiotics in birds body led to the growth of resistant bacterium strains for these probiotics in final poultry meat production *[12]*. Scientists identified the prebiotic as any dietary stuff indigestible and have useful effects on the host by stimulating the growth of specific kinds of useful bacteria or increasing its effectiveness *[13]*. Prebiotic is identified as long chain complex sugars like Fructo Oligo Saccharide (FOS) and Manno Oligo Saccharide (MOS). These sugars were found in the outside walls of some kinds of bacteria, yeast and molds beside they can be found in medical weed like union, garlic, chicory, anise and others *[14]*. The modern studies showed that these sugars have the ability to stop the receptors that exists on the morbidity bacteria surface so it prevents it from agglutination with cells receptors that inlayer the gut and then it prevents from the disease whiplash that caused by these kinds of bacteria. These sugars cannot degrade or digested inside the poultry gut because there is no eupeptic enzyme for it *[15; 16]*. For a while the scientists made a scientific researches to produce and develop probiotics reinforcements techniques and prebiotics to maximize poultry performance through increase the availability of the nutrients by increasing the efficiency of digested enzymes in gut *[17; 18; 19]*, and increase poultry proofed and improve the economic performance for poultry projects *[19; 20; 21; 22]*. The aim of this study was investigate the effect of probiotic and prebiotic supplementation with or without animal protein concentrate on performance of female quails.

Material and method

The experiment was conducted in the Poultry Farm of Animal Production Department\College of Agriculture\University of Kirkuk, from the period of 12/1/2017 to 13/3/2017. One hundred sixty quail females at 70 days old randomly distributed to eight treatments. Each treatment included 5 replicates (cages). The dimension of these cages was (40 × 30 × 20) cm length, width and height. The number of birds for each replicates was four birds. The lighting period was provided for 17 hours, water and feed were supplied *ad libitum* throughout the experiment. The treatments were illustrated in Table (1). The treatments were T1 basal ration contain 5% animal protein concentrated without supplementation of probiotic or prebiotic; T2: basal ration without animal protein concentrated, probiotic and prebiotic; T3: T1 + 0.10% probiotic; T4: T1 + 0.10% prebiotic (Yeast); T5: T1 + 0.10% probiotic + 0.10% prebiotic; T6: T2 + 0.10% probiotic; T7: T2 + 0.10% prebiotic; T8: T2 + 0.10% probiotic + 0.10% prebiotic. Hen-day egg production (%) was recorded daily, whereas egg weight, feed intake, feed conversion ratio and egg mass were determined each 3 weeks interval for 3 periods. Egg mass was calculated by multiplying egg weight by hen-day egg production percentage, feed conversion ratio (FCR) was calculated as gram feed consumption per day bird divided by gram egg mass per day per bird. In the end of each period, 10 eggs from each treatment were randomly taken in order to determine egg weight, egg component (percentage of egg yolk weight %, egg albumen %, egg shell % and egg shell thickness mm). All data were statistically analyzed by the Completely Randomized Design (CRD) by the (SAS, 2001) system and the differences between the means of groups were separated by Duncan Multiple Range Test (Duncan, 1955) statements of statistical significance are based on (P≤ 0.05).

Ingredient (%)	*T1*	*T2*	*T3*	*T4*	*T5*	*T6*	*T7*	*T8*
Wheat	*55.90*	*54.46*	*55.90*	*55.90*	*55.90*	*54.46*	*54.46*	*54.46*
Barley	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*
Animal Protein concentrate 40% CP [a]	*5.00*	-	*5.00*	*5.00*	*5.00*	-	-	-
Soybean meal, 46% CP	*23.14*	*28.14*	*23.14*	*23.14*	*23.14*	*28.14*	*28.14*	*28.14*
Vegetable oil	*4.31*	*4.52*	*4.31*	*4.31*	*4.31*	*4.52*	*4.52*	*4.52*

Dicalcium phosphate	*0.9*	*1.94*	*0.9*	*0.9*	*0.9*	*1.94*	*1.94*	*1.94*
Limestone	*5.4*	*5.34*	*5.4*	*5.4*	*5.4*	*5.34*	*5.34*	*5.34*
Salt (NaCl)	*0.20*	*0.20*	*0.20*	*0.20*	*0.20*	*0.20*	*0.20*	*0.20*
Mineral and Vitamin premix	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*
L-Lysine	-	*0.12*	-	-	-	*0.12*	*0.12*	*0.12*
DL-Methionine	*0.05*	*0.18*	*0.05*	*0.05*	*0.05*	*0.18*	*0.18*	*0.18*
BLR) -PRO (Probiotic) [b]	-	-	*0.10*	-	*0.10*	*0.10*	-	*0.10*
Prebiotic (Yeast)	-	-	-	*0.10*	*0.10*	-	*0.10*	*0.10*
Total	*99.70*	*99.75*	*100*	*100*	*100*	*100*	*100*	*100*

Table -1: Composition of experimental diets of laying quails

Calculated Analysis [c]

ME (kcal / kg)	2916	2900	2916	2916	2916	2900	2900	2900
Crude Protein %	20	20.01	20	20	20	20.01	20.01	20.01
Calcium (%)	2.5	2.5	2.5	2.5	2.5	2.5	2. 5	2. 5
Available phosphorus (%)	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Lysine (%)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Methionine (%)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45

a- used animal protein concentrate, Wafi (Originating Hollander) and contained 40% crude protein, 2100 (Kcal/ Kg), 5% crude fat, 3.85% Lysine, 3.70% Methionine, 4.12% Methionine + cysteine, 5% Calcium and 4.68% phosphor.
b- Originating: Bacillus cereus var. toyoi: 1.0×10 CFU/g, Beta-glucanase: 14 U/g and Cellulase: 35 U/g.
c- Calculated analysis depending according to (NRC, 1994).

Results and Discussion

Egg production%, egg weight and egg mass average were presented in Table (2). The results showed that there were are no significant effect of treatments on the egg production traits. This finding was agreement with *[8; 19; 23; 24; 25; 26]*. The supplementation of 0.10% probiotic or prebiotic to the ration contained with or without 5% animal protein concentration cause no difference in the availability of the nutrients for the birds of the treatments. The average feed intake, feed conversion ratio, energy consumption and energy conversion ratio were illustrated in Table (3).

Table - 2: Effect of probiotic and prebiotic supplementation with or without animal protein concentrate on egg production, egg weight and egg mass (Mean ± SE) of female quails

treatment	*Egg Producti (HDP%)*	*Egg Weig (g)*	*Egg Mass (g)*
T1	*0.70±91.50 a*	*0.32 ±12.66 a*	*0.31±11.58 a*
T2	*3.73±87.00 a*	*0.08 ±12.28 a*	*0.13 ±11.13 a*
T3	*3.71±85.33 a*	*0.34 ±12.94 a*	*0.26 ±11.69 a*
T4	*4.53±84.16 a*	*0.25±12.48 a*	*0.44±11.39 a*
T5	*1.18 ±91.33 a*	*0.20±12.72 a*	*0.32 ±11.62 a*
T6	*3.63 ±86.58 a*	*0.33 ±12.60 a*	*0.46±11.34 a*

T7	3.75 ± 84.33 a	0.09 ± 12.28 a	0.32± 11.02 a
T8	2.15 ± 86.75 a	0.15 ± 12.33 a	0.32 ± 11.00 a

There were no significant differences in feed intake, feed conversion ratio and energy conversion ratio among the treatments, these results were agreement with *[19; 27]* on the other hand, did not agreement with *[26]*. Probiotics contained in laying hen diets contribute to improving egg quality, increasing laying rates and reducing feed costs *[28; 29; 30; 31; 32; 33; 34]*, while *[35; 36; 37; 38; 39]* revealed that probiotics had no influence on all or some performance traits. *[40]* obtained that feeding quail breeder diets contained probiotics or prebiotics (0.5 or 1 kg/ton of feed) was significantly (P≤0.05) increase egg production, feed consumption, feed efficiency and egg weight.

Table - 3: Effect of probiotic and prebiotic supplementation with or without animal protein concentrate of female quails feed intake, feed conversion ratio, energy consumption and energy conversion ratio (Mean ± SE).

treatment	*Feed intake (g/bird/day)*	*Feed conversion (g/g WG)*	*Energy consump (kcal/bird/day)*	*Energy conversion ratio (kcal/g WG)*
T1	0.74±20.34 a*	0.03 ± 1.76 a	2.18 ± 59.33 ab	0.10 ± 5.12 a
T2	0.91 ± 21.09 a	0.07 ± 1.89 a	2.66 ± 61.16 ab	0.22 ± 5.50 a
T3	0.61 ± 20.00 a	0.05 ± 1.71 a	1.78 ± 58.00 ab	0.10 ± 4.96 a
T4	0.65 ± 19.88 a	0.02 ± 1.74 a	1.92± 57.65 ab	0.09± 5.06 a
T5	0.77± 21.68 a	0.10 ± 1.87 a	2.25 ± 63.22 a	0.29 ± 5.44 a
T6	0.92 ± 20.14 a	0.02 ± 1.78 a	2.67± 58.41 ab	0.07 ± 5.15 a
T7	0.86 ± 19.06 a	0.05 ± 1.73 a	2.52 ±55.27 b	0.25 ± 5.02 a
T8	0.80 ± 19.47 a	0.06 ±1.76 a	2.33 ± 56.46 ab	0.23 ± 5.13 a

*a-b the different letters within the same column refers to significantly differences (p≤0.05).

Effect of using animal protein concentrate, probiotic and prebiotic on external egg quality and internal egg quality are shown in Table (4 and 5), respectively. There were significant (P≤0.05) differences between some experiment treatments. Yolk index for the T1 and T2 were significantly (P≤0.05) higher than T3, T4, T5, T6, T7 and T8. While, for the albumin index of the T4 was significantly (P≤0.05) better than T6. The difference did not significant among treatments for the yolk weight percentage, while the albumin weight percentage of the dietary treatment 2, 5, 6 and 7 were significantly (P≤0.05) better than T1. The differences were not significant for albumin weight (g) and Haugh unit among the experiment treatments. Yolk weight (g) of the T1 was significantly (P≤0.05) better than T2 and T7. The average of shape index of the T1 was significantly (P≤0.05) better than T2; while, the average of shell thickness (mm) of T8 was significantly (P≤0.05) lower than T6. Surface area of the egg (cm^2) of T2, T7 and T8 were significantly lower than T3. Egg specific gravity of T1 was significantly (P≤0.05) better than T6. The average of shell weight (g) of T1 were significantly (P≤0.05) better than T6 and T7, while the percentage of shall weight for T1 were significantly (P≤0.05) better than T6. Feeding quail breeder with probiotics (0.5 or 1 kg/ton feed) cause no significant differences for the egg specific gravity, albumin index, yolk index and Haugh unit. In other studies for different physical egg traits which influenced by adding probiotics to layer diet as better albumin quality *[34; 33; 41]* while influence was not observed in other experiments *[42; 29; 31]*.

Table - 4: Effect of probiotic and prebiotic supplementation with or without animal protein concentrate of female quails upon external parameters (Mean ± SE)

Treatment	External Parameters					
	Shape index	Shell thickness (mm)	Surface area (cm^2)	Egg specific gravity	Shell weight (g)	Shell weight (%)
T1	5.75±87.14 a*	0.06±0.21 ab	0.68±37.92 ab	0.03 ±1.11 a	0.07 ±1.82 a	0.51 ±14.40 a
T2	0.63±76.66 b	0.04 ±0.22 ab	0.13±36.77 b	0.01±1.10 ab	0.03 ±1.66 ab	0.20±13.55 ab
T3	0.53±78.31 ab	0.04±0.21 ab	0.75 ±38.77 a	0.03 ±1.10 ab	0.08 ±1.77 ab	0.58±13.69 ab
T4	1.14±77.92 ab	0.07±0.22 ab	0.62±37.38 ab	0.01 ±1.10 ab	0.03 ±1.72 ab	0.32 ±13.85 ab
T5	0.43 ±78.75 ab	0.06±0.22 ab	0.51 ±38.08 ab	0.03 ±1.10 ab	0.06±1.68 ab	0.65 ±13.33 ab
T6	0.58 ±77.67 ab	0.06 ±0.23 a	0.73 ±37.71 ab	0.02 ±1.10 b	0.05 ±1.58 b	0.47±12.63 b
T7	6.20 ±83.32 ab	0.05±0.22 ab	0.39 ±36.78 b	0.02 ±1.10 ab	0.06±1.61 b	0.47 ±13.14 ab
T8	1.03±78.07 ab	0.06±0.21 b	0.41 ±36.92 b	0.02±1.10 ab	0.05 ±1.68 ab	0.36 ±13.70 ab

*a-b the different letters within the same column refers to significantly differences (p≤0.05).

Table - 5: Effect of probiotic and prebiotic supplementation with or without animal protein concentrate of female quails upon internal parameters (Mean ± SE).

Treatn	Internal Parameters						
	Yolk index	Albumen index	Yolk Weight %	albumin weigh%	albumin weight g	Haugh Unit	Yolk Weigh
T1	0.00±0.55 a*	0.06±0.11 abc	0.28 ±33.85 a	0.52±51.73 b	0.11 ±6.54 a	1.17 ±89.32 a	0.09 ±4.28 a
T2	0.01 ±0.54 a	0.03 ±0.10 bc	0.47 ±32.56 a	0.51 ±53.88 a	0.07 ±6.62 a	0.66±87.71 a	0.06 ±3.99 b
T3	0.00 ±0.48 b	0.04 ±0.11 ab	0.44 ±32.70 a	0.86 ±53.60 ab	0.19 ±6.94 a	0.85±89.59 a	0.08±4.23 ab
T4	0.01 ±0.49 b	0.04 ±0.12 a	0.48 ±32.96 a	0.58 ±53.18 ab	0.13 ±6.64 a	0.69 ±89.64 a	0.10 ±4.12 ab
T5	0.00 ±0.49 b	0.03±0.10 bc	0.57 ±32.86 a	0.87 ±53.80 a	0.18 ±6.85 a	0.68 ±87.63 a	0.09±4.17 ab
T6	0.00 ±0.46 b	0.03 ±0.10 c	0.33 ±33.40 a	0.57 ±53.95 a	0.15±6.80 a	0.73 ±88.00 a	0.10±4.20 ab
T7	0.00±0.49 b	0.05±0.10 abc	0.61±32.39 a	0.59±54.45 a	0.10 ±6.69 a	0.96 ±88.13 a	0.07 ±3.98 b
T8	0.00±0.47 b	0.03 ±0.11 abc	0.41 ±33.66 a	0.49 ±52.63 ab	0.10 ±6.49 a	0.86±89.03 a	0.05±4.15 ab

* a-c in each column means with different letter significantly differ (P≤0.05).

References

[1] Agawane, S. B. and Lonkar, P. S. "*Effect of probiotic containing Saccharomyces boulardii on experimental ochratoxicosis in broilers: hematobio chemical studies*", J. Vet. Sci., Vol.(5), No. 4, pp: 359–367. (2004).

[2] Manju, G. U; Reddy, B. S. V., Gideon Gloridoss, T. M. ; Prabhu, K. S. ; Giridhar; and Suma, N. "*Effect of supplementation of lysine producing microb vis-a-vis source and level of dietary protein on performance and egg quality characteristics of post-peak layers",* Veterinary World, EISSN: pp: 2231-0916. 235-247.(2015).

[3] Güler, T. Ertaş ,O.N., Çiftçi ,M. and Dalkılıç, B. "*The effect of coriander seed (Coriandrum sativum L.) as diet ingredient on the performance of Japanese quail",* South African Journal of Animal Science, Vol.(35), No.4, pp: 260 -266. (2005).

[4] Siddons, R.C. and Coates, M.E. "*The influence of intestinal microflora on disaccharides activities in the chick*", British J. Nutrition, Vol.(27), pp: 101-112. (1972).

[5] Banday, M. T. and Risam, K. S. "*Growth performance and carcass characteristics of broiler chicken fed with probiotics",* Poul. Abst., Vol.(28), pp: 388. (2002).

[6] EL. Banna, H. A; Zorba,H.Y ; Attia, T.A; and Abd Elatif ,A. "*Effect of probiotic, prebiotic and symbiotic on broiler performance",* Word applied sciences journal, Vol.(11), No.4, pp: 388-393. (2010).

[7] Mansoub, N.H. "*Effect of probiotic Bacteria Utilization on Serum Cholesterol and Triglycrides Contents and performance of Broiler Chickens",* Global Veterinaria, Vol.(5), No.3, pp: 184-186. (2011).

[8] Hashemipour, H.; Khaksar, V. and Kermanshahi, H. "*Application of probiotic on egg production and egg quality of chukar partridge",* African Journal of Biotechnology, Vol.(10), No.82, pp: 19244-19248. (2011).

[9] Liong, M.T. "*Probiotics, Biology, Genetics and Health Aspects*". Springer- Verlag, Berlin Heidelberg. (2011).

[10] Bartlett, J. "*New antimicrobial agents for patients with Clostridium difficile infection",* Curr. Infect Dis Rep., Vol.(11), No.1, pp: 8-21. (2009).

[11] Weicheslbaum, E. "*Potential benefits of probiotcs – main findings of an in -depth review",* Br. J. Community Nurs., Vol.(15), No.3, pp: 4-110. (2010).

[12] Toghyani, M.; Toghyani, M. and Tabeidian, S.A. "*Effect of probiotic and prebiotic as antibiotic growth promoter substitutions on productive and carcass traits of broiler chicks",* International Conference on Food Engineering and Biotechnology. IPCBEE Vol.(9), pp: 82-86. (2011).

[13] Dimovelis, P., Christaki, E., Tservani-Goussi, A. and Spais, A.B. "*Preformanc of layer hens fed a diet with mannan-oligosaccharides from Sacharomyces cerevisiae (Bio-mas) ",* 21th worlds poultry conf. Istanbul. Turkey. (2004).

[14] Guergoletto, K.B. ; Magnani, M.; Martin, J.S.; Andrade, C. G. and Garcia, S.S. "*Survival of Lactobacillus casei (LC-1) adhered to probiotic vegetal fibers",* Innovative Food Science and Emerging Technologies, Vol.(11), pp: 415-421. (2010).

[15] Gibson, G.R. and Roberfroid, M.B. "*Dietary modulation of the human colonic microbiota: introducing the concept of prebiotics",* J. Nutr., Vol.(125), pp: 1401-1412. (1995).

[16] Hajela, N. "*Probiotic Health",* Jan , Issue 1. (2011).

[17] Toms, C. and Powrie, F. "*Control of intestinal inflammation by regulatory T cells",* Microbes Infect., Vol.(3), pp: 929-935. (2001).

[18] Pelicia, K.; Mendes, A. A.; Saldanha, E. S.P. B.; Pizzolante; C.C., Takahashi S.E.; Garcia, R. G.; Moreira, J.; Paz, I.C.L.A.; Quinteiro, R.R. and Komiyama, C.M. "*Probiotic and Prebiotic Utilization in Diets for Free- Range Broiler Chickens",* Brazilian Journal of Puoltry Science, Vol.(6) No.2, pp: 99-104. (2004).

[19] Mahdavi, A.H.; Rahmani, H .R. and Pourreza, J. "*Effect of probiotic supplements on egg quality and laying hen's performance",* International Journal of poultry Science, Vol.(4), pp: 488-492. (2005).

[20] Gilliland, S.E. and Kim, S.H. "*Effect of viable starter culture bacteria in yogurt on lactose utilization in humans",* J. Dairy. Sci., Vol.(97), pp: 1-6. (1984).

[21] Saarela, M.; Mogensen, G.; Fonden, R.; Matto, J. and Mattila-Sandholm, T. "*Probiotic bacteria: safety,functional and technological properties",* J. Biotechnol., Vol.(84), pp: 197-215. (2000).

[22] Kabir, S.M.L. ; Rahman, M.M.; Rahman, M.B. and Ahmad, S.U. "*The dynamics of probiotics on growth performance and immune response in broilers",* Int'I. J. Poult. Sci., Vol.(3) pp: 361-364. (2004).

[23] Goodling, A. C.; Cerniglia, G. J. and Herbert, J. A. "*Production performance of whit leghorn layers fed lactobacillus fermentation products",* Poultry Sci., Vol.(66), pp: 480-486. (1987).

[24] AL-Dhanqi, Z. T. M. *"Locally produced probiotic and its effect on production performance of broiler, layer and broiler breeders",* Degree of doctor. The college of agriculture at the University of Baghdad. (2003).

[25] Zangana, B. S. R. "*Locally Produced probiotic, prebiotic, symbiotic and their effect on egg production, Egg quality and semen characteristics of white leghorn",* Degree of doctor. College of agriculture of the university of Bagdad. (2007).

[26] Sultan, K.H. and Abdul-Rahman, S.Y. "*Effect of Probiotic on Some Physiological Parameters in Broiler Breeders",* International Journal of Poultry Science, Vol.(10), No.8, pp: 626-628. (2011).

[27] Zeweil, H. S.; Eid, Y. Z.; Zahran, S.; Dosoky, W., Salma, H. A.; and Amal, G. "*Effect of different levels of Aspergillus awamori as probiotic on the production and egg quality of laying Japanese quail under summer conditions",* Egypt. Poult. Sci., Vol.(36), No. I, pp: 53-65.(2016).

[28] Panda , A. K. ; Reddy, M. R.; Rama, R. S. V. and Praharaj, N. K. "*Production performance , seruml yolk cholesterol and competence of white leghorn layers as influenced by dietary supplementation with probiotic",* Trop. Anim. Health Prod., Vol.(35), pp:85-94. (2003).

[29] Xu, C. L. ; Ji , C.; Ma, Q.; Hao, K.; Jin, Z. Y. and LI, Y. "*Effect of a dried bacillus subtilis culture on egg quality",* Poultry sci., Vol.(85), pp: 364 – 368 . 2006 .

[30] Panda , A., K.; Rama , R. S. S. ; Raju, M. V. L. N. and Sharma , S. S. "*Effect of probiotic (Lactobacillus sporogenes) feeding on egg production and quality , yolk cholesterol and humoral immune response of white leghorn layer breeders",* J. sci. Food. Agric., Vol.(88), pp.:43-47. (2008).

[31] Youssef, A.W., Hassan, H.M., Ali, H.M. and Mojamed, M. A. "*Effect of probiotics , prebiotics and organic acids on layer performance and egg quality",* Asian J. poultry sci., Vol.(7), pp.: 65 – 74. (2013).

[32] Jayaraman , S., Thangavel, G., Kurian, H., Mani, R.; Mukkalil, R. and Chirakkal, H. "*Bacillus subtilis PB6 improves intestinal health of broiler chickens challenged with clostridium perfringens Induced necrotic enteritis",* Poultry sci., Vol.(92), pp.:370-374. (2013).

[33] Chung , S. H., Lee, J. and Kong, C., "*Effect of multi strain probiotics on egg production and quality in laying hens fed diet containing food waste product",* Int. J. Poultry sci., Vol.(14), pp.: 19 – 22 . (2015).

[34] Sobczak, A. and Koziowski, K., "*The effect of probiotic preparation containing Bacillus subtilis AT CCPTA-6737 on egg production and physiological parameters of laying hens",* Ann. Anim Sci., Vol.(15), No. 3, pp.: 711 – 723. (2015) .

[35] Gallazzi , D., Giardini , A., Mangiagalli, M. G. Marelli , S., Ferrazzi V., Orsi , C. and Cavalchini, L. G. "*Effect of lactobacillus acidophilus D2/CSL on laying hen performance",* Ital. J. Anim. Sci., Vol.(7), pp.: 27-37. (2008).

[36] Quarantelli, A., Righi, F. A., Gazzi, A., Invernizzi, G., Ferroni, M., Chevaux, E. "*Effect of the administration of pediococcus acidilactici to laying hens on productive performance",* Vet. Res, Commum., Vol.(32), pp.: 359-361. (2008).

[37] Balevi, T., Ucan, U.S., Coscun, B., Kurtoglu, V. S. and Cetingul, S. "*Effect of dietary probiotic on performance and humoral immune respone in layer hen",* Arch. Zootech., Vol.(12), pp.: 14 – 23. (2009).

[38] Ramasamy , K., Abdulla, N., Jalaludin, S., Wong, M. and Ho, Y.W. "*Effect of lactobacillus cultures on performance of laying hens and total cholesterol, lipid and fatty acids composition of egg yolk",* J. Sci. Food. Agri., Vol.(89), pp. 482-486.(2009).

[39] Mikulski, D. ; Jankowski, J., Mikulska, M. and Demey, V. "*Effect of dietary probiotic (Iediocoocus acidilactici) supplementation on performance , nutria ent digestability , egg traits , egg yolk cholesterol and fatty acid profile in laying hens",* Poultry Sci., Vol.(91), pp.: 2691-2700. (2012).

[40] Guclu, M.B.K. "*Effect of probiotic and prebiotic (mannoligo saccharide) supplementation on performance , egg quality and hatchability in quail breeders",* Ankara Univ. Vet Fak. Derg., Vol.(58), pp.: 27-32. (2011).

[41] Zhang J.L., Xie, Q. M. , Ji, J. ,Yang, W.H., Wu, Y. B. Li , C., Ma, J. Y. and Bi, Y. Z. "*Different combinations of probiotics improve the production performance , egg quality and immune response of layer hens",* Poultry Sci, Vol.(91), pp.:2755-2760. (2012).

[42] Mahdavi, A.H., Rahmani, H.R. and Pourreza, J. "*Effect of probiotic supplements on egg quality and laying hens performance",* Int. J. Poultry Sci., Vol.(4), pp.: 488-492. (2005).

[43] SAS. Statistical analysis system. (2001). Users guide for personal computer. Release 6-18 SAS Instituted Inc. Cary, NC, USA.

[44] Duncan ,D.B.(1955).*Multiple range* and F., test Biometric 11:42.