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Effect of probiotic fermented supplementation on egg quality in *Cotornix Japonica*

تأثير أضافة المعزز الحيوي المخمر في نوعية البيض لدى طائر السمان *(Cotornix Japonica)*

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Summary:

This study was conducted at Poultry Farm of Animal Resources Dept. College of Agriculture ,University of Baghdad to investigate the effects of probiotic fermented supplementation on egg quality in Cotornix Japonica (No. 160 female, 24 wk old, period 1/1/2014 to 31/3/2014). The effect of four treatments (0, 25, 50 and75 % probioptic fermented) , were evenly distributed to 4 groups with two replicates containing (20 birds in each replicate). Increase of egg yolk weight was not significant (P>0.05) in first , second and third week, had significant effect on egg yolk weight from fourth week to eight week (P<0.05). Although addition of probiotic had significant effect (P<0.05) on egg yolk high in 1 , 2 , 4 , 5 , 7 and 8 week, had no significant effect (P>0.05) in 3 , 4 and 6 week, although addition of probiotic had significant effect (P<0.05) on egg albumin weight, the increase of egg albumin weight with increase of probiotic, these were expected which have already been reported. Although addition of probiotic had significant effect (P<0.05) on egg albumin high, the increase of egg albumin high with increase of probiotic. Statistically not significant effect (P>0.05) addition of probiotic on shell weight. Although addition of probiotic had significant effect (P<0.05) on Haugh unit, the increase of Haugh unit with increase of probiotic. Supplementation of probiotic fermented to the diet of quail breeders improved egg quality (yolk , albumin and haugh unit).

Key words: Cotornix Japonica , Probiotic fermented , Egg quality.

الخلاصة :

اجريت هذه الدراسة في حقل الطيور الداجنة التابع لقسم لثروة الحيوانية-كلية الزراعة/جامعة بغداد بهف دراسة تأثير اضافة المعزز الحيوي المخمر على نوعية البيض لطائر السمان (العدد 160 انثى بعمر 24 اسبوع، للمدة من 2014/1/1 الى 2014/3/31). شمل البحث تأثر اربعة معاملات (0، 25، 50 و 75% معزز حيوي مخمر)، وزعت الطيور على المجاميع الاربعة بواقع مكررين لكل معاملة على (20 طير لكل مكرر). لم تكن الزيادة في وزن الصفار معنويا (P>0.05) في الاسبوع الاول والثاني والثالث لكن تأثرت صفة وزن الصفار معنويا من الاسبوع الرابع الى الثامن (P<0.05). كما ان لإضافة المعزز الحيوي المخمر تأثير معنويا (P<0.05) في ارتفاع الصفار للأسابيع 1و 2 و 3 و 4 و 5 و 7 و 8 اسبوع لكن غير معنوية للأسابيع 3 و4 و 6. كان تأثير اضافة المعزز الحيوي المخمر معنويا (P<0.05) في وزن بياض البيض، إذ ازداد وزن البياض مع زيادة نسبة المعزز الحيوي وهذا مطابق للدراسات السابقة. كان هنالك تأثيرا معنويا (P<0.05) لاضافة المعزز الحيوي المخمر (P<0.05) في ارتفاع البياض، إذ ازداد ارتفاع البياض مع زيادة النسبة المئوية للمعزز. اظهرت نتائج التحليل الاحصائي (P>0.05) عدم معنوية تأثير المعزز الحيوي المخمر في وزن القشرة. تبين أن لاضافة المعزز الحيوي المخمر تأثيرا معنويا (P<0.05) في وحدة هو، إذ ازدادت وحدة هو بزيادة المعزز الحيوي. أن اضافة المعزز الحيوي المخمر الى عليقة انواع السمان من شأنه تحسين الصفات النوعية للبيض (الصفار والبياض ووحدة هو).

الكلمات المفتاحية: طائر السمان-المعزز الحيوي المخمر-نوعية البيض

Introduction:

This organisms may be mono or mixed cultures of live, protective microorganisms beneficially affect the host animal by competing with other microorganisms for adhesive site. They stimulate appetite, improve host's intestinal microbial balance and intestinal environment for processes of the digestion and absorption of nutrients. They also inhibit certain pathogens that produce toxic compounds (12, 15 & 18). Prebiotics, non-digestible feed ingredients, have selective effects on the intestinal microflora. It has been claimed that the benefits of MOS based on its specific properties such as modification of the intestinal flora, reduction in turnover rate of the intestinal mucosa and modulation of the immune system (7, 8 & 17). Probiotics (meaning ''for life'') are defined as microbial cell preparations that have a beneficial effect on the health and wellbeing of the host (6). Direct fed microbials benefit the host animal by stimulating appetite (14), improve intestinal microbial balance (6),synthesize vitamins (3), stimulate the immune system (20). Regarding the controversial results about using biological additives, the strain, concentration and form of them (viability, dryness or their products) shoud be considered. Feeding viable *Lactobacillus* at 1100 mg kg-1, increased daily feed consumption, egg size, nitrogen and calcium retentions and decreased intestinal length from 7 to 59 weeks of age (14). Haddadin *et al*. (10) reported that egg production, egg size and egg quality were improved by the addition of a liquid culture of *Lactobacillus acidophilus* to the basal diet. Goodling *et al*. (9) observed no improvement in hen day egg production, feed efficiency, livability and egg size when laying pullets were fed a drived non-viable *Lactobacillus* product. The addition of *Lactobacillus acidophilus* plus light d . Feed consumption were recorded at the end of *Lactobacillus casei* mixed culture to maize-barley (50/50) diet improved hen day egg production, feed conversion ratio, egg weight and albumen quality (19). It is also reported that some body and product factors are influenced by biological additives, for instance probiotic supplementation can depress cholesterol concentrations in blood and egg yolk (1 & 10). The purpose of this study was to investigate the effects of probiotic fermented inclusion supplements on *Japonica quail* performance (egg quality).

Materials & Methods :

This study was conducted at Poultry Farm of Animal Resources Dept. College of Agriculture ,University of Baghdad. During the 8 weeks of the experiment (24-32 weeks old, No. 160 female , 24 wk old, period 1/1/2014 to 31/3/2014)). The aims of this investigate to effect of four treatments (0, 25, 50 and 75% probioptic fermented) in egg quality, were evenly distributed to 4 groups with two replicates containing (20 birds in each replicate) hens had free access to feed and water. The basal diets are shown in Table 1. The photoperiod was 14 h -light d . Feed consumption were recorded at the end of each four weeks of the experimental period. Egg weight, yolk and albumin weight , yolk and albumin high , shell weight and Hough unit score were measured for 5 eggs from each replicate eight weeks period and egg.

Statistical Analysis

The Statistical Analysis System- SAS (16) was used to effect of different factors in study parameters according to complete randomized design -CRD. Duncan (5) multiple range test was used to significant compare between means in this study according to mathematical model.
was assumed in the analysis of all traits. $Y = \mu + Ti + eij$. where Y = observed value for a particular character, $\mu = ij$ overall mean, Ti= effect of the i treatment and eij = random error associated with the ij^{th} recording .

Table 1: Composition of experimental basal diets

Ingredients	(%)
Yellow corn	62.5
Soybean meal	21
Fish meal	3
Soybean oil	0.5
Oyster shell	8.6
Phosphate	0.8
Vitamin premix1	0.25
Mineral premix2	0.25
Salt	0.3
DL-methionine	0.1
Vitamin D_3	0.03
Sand	2.67
Calculated analysis	
Metabolizable energy (kcal/kg)	2717.3
Crude protein (%)	16
Crude fiber (%)	3.06
Methionine (%)	0.4
Methionine+Cysteine (%)	0.65
L-Lysine (%)	0.84
Calcium (%)	3.48
Available phosphate (%)	0.35

1Vitamin premix provided per kilogram of diet: vitamin A, 10000 IU; vitamin D3, 2500 IU; vitamin E, 10 IU; vitamin B1, 2.2 mg; vitamin B2, 4 mg; pantothenic acid, 8 mg; vitamin B6, 2 mg; niacin, 30 mg; vitamin B12, .015 mg; folic acid, 0.5 mg; biotin, 0.15 mg; cholin chloride,200 mg. 2Mineral premix provided per kilogram of diet: manganese, 80 mg; copper, 10 mg; iodine, 0.8 mg; cobalt, 0.25 mg; selenium, 0.3 mg; zinc, 80 mg; iron, 80 mg.

Results and Discussion:

The increase of egg yolk weight was not significant ($P>0.05$) in first , second and third week, had significant effect on egg yolk weight from fourth week to eight week ($P<0.05$), the maximum value of this traits at use 50 & 75 % from probiotic fermented (table 2).

Although addition of probiotic had significant effect ($P<0.05$) on egg yolk high in 1 , 2 , 4 , 5 , 7 and 8 week, had no significant effect ($P>0.05$) in 3 , 4 and 6 week (table 3).

Shaw in table (4) although addition of probiotic had significant effect ($P<0.05$) on egg albumin weight, the increase of egg albumin weight with increase of probiotic, these were expected which have already been reported (2 & 10).

Although addition of probiotic had significant effect ($P<0.05$) on egg albumin high, the increase of egg albumin high with increase of probiotic (table 5), these were expected which have already been reported (2 & 10).

Statistically not significant effect ($P>0.05$) addition of probiotic on shell weight (table 6), these were expected which have already been reported (2 , 10 & 13).

Although addition of probiotic had significant effect ($P<0.05$) on Haugh unit, the increase of Haugh unit with increase of probiotic (table 7), these were expected which have already been reported (2).

improvement in albumen quality in the microbial additive groups. Damron *et al*. (4) and Jensen *et al*. (11) found significant improvements in interior egg quality as measured by Hough units in hens fed distillers feeds and corn fermentation soluble. Subsequent studies Tortuero & Fernandez (20) described that the variations in plasma mineral concentration were not sufficient to implicate

supporting the hypothesis that trace elements improve albumen quality with microbial supplementation.

Supplementation of probiotic to the diet of hen's breeders improved egg quality (yolk , albumin and haugh unit), correlated of this traits with positively affected hatchability in *Japonica quail*.

Table 2. Effect of treatments study in egg yolk weight (gm)

Week	Mean ± SE				Level of sig.
	Control	25%	50 %	75 %	
First	3.18 ± 0.09	3.56 ± 0.06	3.63 ± 0.08	3.68 ± 0.08	NS
Second	3.52 ± 0.11	3.65 ± 0.10	3.48 ± 0.05	3.68 ± 0.05	NS
Third	3.63 ± 0.08	3.49 ± 0.09	3.95 ± 0.10	3.85 ± 0.07	NS
Fourth	3.61 ± 0.08 b	3.71 ± 0.10 b	4.32 ± 0.10 a	4.01 ± 0.06 a	*
Fifth	3.51 ± 0.08 b	3.97 ± 0.12 b	3.73 ± 0.08 ab	3.82 ± 0.10 a	*
Sixth	3.96 ± 0.07 b	4.11 ± 0.09 ab	4.15 ± 0.09 a	4.22 ± 0.08 a	*
Seventh	3.89 ± 0.08 b	4.00 ± 0.11 b	4.03 ± 0.08 b	4.18 ± 0.09 a	*
Eighth	3.91 ± 0.08 c	4.08 ± 0.08 bc	4.14 ± 0.11 ab	4.22 ± 0.08 a	*
Means with the different latters in row are significant difference. * (P<0.05), NS: Non-significant.					

Table 3. Effect of treatments study in yolk high of egg (mm)

Week	Mean ± SE				Level of sig.
	Control	25%	50 %	75 %	
First	8.06 ± 0.43 b	9.91 ± 0.60 a	10.45 ± 0.61 a	10.20 ± 0.54 a	*
Second	8.82 ± 0.55 b	9.14 ± 0.52 ab	9.25 ± 0.52 a	10.34 ± 0.58 a	*
Third	8.34 ± 0.41	8.59 ± 0.62	8.71 ± 0.72	9.47 ± 0.64	NS
Fourth	8.24 ± 0.60	8.40 ± 0.55	8.61 ± 0.52	8.88 ± 0.62	NS
Fifth	8.83 ± 0.61 b	9.04 ± 0.49 ab	9.36 ± 0.54 a	9.58 ± 0.61 a	*
Sixth	8.79 ± 0.53	8.80 ± 0.52	8.93 ± 0.46	9.06 ± 0.52	NS
Seventh	7.57 ± 0.41 b	8.62 ± 0.70 ab	9.14 ± 0.46 a	9.58 ± 0.62 a	**
Eighth	8.62 ± 0.35 b	8.76 ± 0.52 b	9.62 ± 0.59 a	9.59 ± 0.48 a	*
Means with the different latters in row are significant difference. * (P<0.05), ** (P<0.01), NS: Non-significant.					

Table 3. Effect of treatments study in albumin weight of egg (gm)

Week	Mean ± SE				Level of sig.
	Control	25%	50 %	75 %	
First	6.17 ± 0.75 b	6.68 ± 0.60 ab	6.91 ± 0.49 a	7.51 ± 0.61 a	*
Second	6.13 ± 0.81 b	6.63 ± 0.46 ab	6.85 ± 0.62 ab	7.25 ± 0.71 a	*
Third	5.66 ± 0.47 b	6.35 ± 0.75 a	6.62 ± 0.53 a	6.54 ± 0.58 a	*
Fourth	5.57 ± 0.42 b	6.44 ± 0.83 a	6.28 ± 0.70 a	6.16 ± 0.68 a	*
Fifth	5.47 ± 0.55 b	6.29 ± 0.35 a	6.23 ± 0.52 a	6.62 ± 0.64 a	*
Sixth	5.75 ± 0.63 b	6.41 ± 0.52 a	6.47 ± 0.39 a	6.38 ± 0.44 a	*
Seventh	5.59 ± 0.49 b	6.87 ± 0.81 a	6.97 ± 0.62 a	6.98 ± 0.39 a	*
Eighth	5.83 ± 0.42 b	6.45 ± 0.52 a	7.02 ± 0.58 a	6.64 ± 0.67 a	*
Means with the different latters in row are significant difference. * (P<0.05).					

Table 4. Effect of treatments study in albumin high of egg (mm)

Week	Mean ± SE				Level of sig.
	Control	25%	50 %	75 %	
First	3.64 ± 0.09 c	4.46 ± 0.07 b	4.97 ± 0.06 ab	5.40 ± 0.06 a	*
Second	3.21 ± 0.07	4.13 ± 0.04 ab	4.14 ± 0.11 ab	4.84 ± 0.09 a	*
Third	3.59 ± 0.05 b	3.59 ± 0.08 b	4.11 ± 0.08 a	3.97 ± 0.10 a	*
Fourth	3.92 ± 0.08 b	3.98 ± 0.11 b	4.35 ± 0.06 a	4.62 ± 0.08 a	*
Fifth	3.69 ± 0.04 b	3.83 ± 0.08 b	4.34 ± 0.06 a	4.28 ± 0.08 a	*
Sixth	3.88 ± 0.10 b	3.79 ± 0.08 b	4.17 ± 0.08 a	4.22 ± 0.06 a	*
Seventh	3.91 ± 0.07 b	3.88 ± 0.09 b	4.20 ± 0.08 a	4.22 ± 0.10 a	*
Eighth	3.96 ± 0.10 b	3.86 ± 0.06 b	4.19 ± 0.08 a	4.26 ± 0.08 a	*
Means with the different latters in row are significant difference. * (P<0.05).					

Table 5. Effect of treatments study in Haugh unit

Week	Mean ± SE				Level of sig.
	Control	25%	50 %	75 %	
First	73.27 ± 2.38 b	74.69 ± 2.04 b	78.37 ± 1.92 ab	82.95 ± 2.56 a	**
Second	73.79 ± 1.88 c	76.48 ± 2.35 b	80.21 ± 2.16 ab	82.67 ± 2.42 a	**
Third	75.13 ± 2.05 b	76.09 ± 2.83 b	82.45 ± 3.02 a	84.62 ± 2.36 a	**
Fourth	76.75 ± 1.71 b	76.47 ± 2.05 b	82.66 ± 2.19 a	85.33 ± 2.51 a	**
Fifth	76.93 ± 2.24 c	78.40 ± 2.59 bc	82.10 ± 2.63 ab	85.96 ± 2.31 a	**
Sixth	80.51 ± 2.16 b	81.44 ± 1.97 ab	82.69 ± 2.06 ab	86.25 ± 2.77 a	*
Seventh	79.41 ± 1.94 b	81.68 ± 2.63 b	84.82 ± 2.36 ab	86.97 ± 3.01 a	*
Eighth	80.92 ± 2.27 b	83.56 ± 2.19 b	84.12 ± 2.77 ab	87.61 ± 1.89	**
Means with the different latters in row are significant difference. * (P<0.05) , ** (P<0.01).					

Table 6. Effect of treatments study in shall weight of egg (mm)

Week	Mean ± SE (gm)				Level of sig.
	Control	25%	50 %	75 %	
First	1.69 ± 0.03	1.58 ± 0.07	1.65 ± 0.04	1.64 ± 0.06	NS
Second	1.69 ± 0.04	1.69 ± 0.11	1.73 ± 0.08	1.84 ± 0.06	NS
Third	1.65 ± 0.10	1.67 ± 0.03 a	1.72 ± 0.06	1.67 ± 0.03	NS
Fourth	1.78 ± 0.06	1.80 ± 0.04	1.77 ± 0.10	1.81 ± 0.05	NS
Fifth	1.79 ± 0.06	1.77 ± 0.04	1.81 ± 0.07	1.75 ± 0.08	NS
Sixth	1.81 ± 0.06	1.81 ± 0.02	1.76 ± 0.06	1.76 ± 0.06	NS
Seventh	1.83 ± 0.04	1.79 ± 0.06	1.80 ± 0.05	1.78 ± 0.04	NS
Eighth	1.83 ± 0.06	1.81 ± 0.04	1.79 ± 0.06	1.79 ± 0.03	NS
NS: Non-significant.					

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