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The Effects of Dietary Inclusion of Probiotic Protexin on Egg Yield Parameters of Japanese Quails (*Coturnix coturnix Japonica*)

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Abstract: The present study was conducted to investigate the effects of grower diets, dietary three different levels of probiotic (protexin) in grower diet on egg production parameters and egg shell quality of Japanese quail (*Coturnix coturnix Japonica*). In this study, 225 female Japanese quails were used. The experimental quails were divided into three dietary groups of similar mean weight comprising 75 birds each, consisted of 3 subgroup containing 25 birds each. Treatment groups were assigned control Group A (unsupplemented diet), Group B (0.5 kg per tonne "Protexin" supplemented diet) and Group C (1.0 kg per tonne "Protexin" supplemented diet) for 5 weeks. After 5 weeks, probiotic treatment was ceased and then all groups were allowed to nourish standard layer diet. Results showed that age and body live weight of quails at the first laying was found significant ($P<0.05$) but the first 10 eggs weight and shape index of the first 10 eggs were not found significant ($P>0.05$) different between groups. During the egg production period, probiotic supplementation to the diet did not affect feed intake, feed conversion efficiency, average egg weight, egg shell thickness and egg shape index ($P>0.05$), but affected egg production and egg shell weight ($P<0.05$).

Key words: Probiotic (protexin), egg yield parameters, egg shell quality, Japanese quail

Introduction

Probiotics are live microbial feed supplements, which improve the intestinal microbalance (Pal, 1999; Salminen *et al*., 1999). One of the probiotics used in poultry feed is Protexin. Protexin is a multi-strain probiotic containing live microbes to establish, enhance or re-establish essential microflora in the gut. Protexin is a highly concentrated pre-mix containing seven strains of bacteria and two yeasts (*Lactobacillus plantarum* 1.89 x 10^{10} cfu/kg,Lactobacillus delbrueckii subsp. Bulgaricus 3.09 x 10^{10} cfu/kg, Lactobacillus acidophilus 3.09 x 10^{10} cfu/kg, Lactobacillus rhamnosus 3.09 x 10^{10} cfu/kg, Bifidobacterium bifidum 3.00 x 10^{10} cfu/kg, Streptococcus salivarius subsp. Thermophilus 6.15 x 10^{10} cfu/kg, Enterococcus faecium 8.85 x 10^{10} cfu/kg, Aspergillus oryza 7.98 x 10^{9} cfu/kg, Candida pintolopesii 7.98 x 10^{9} cfu/kg). All the micro-organisms in the protexin are naturally occurring and have been isolated from a wide range of feed, plant, animal, bird and human sources. Protexin is reported to be safe, non-toxic and residual free. There are no risks of overdosing and protexin is compatible with all feeds, feed ingredients like vitamins and minerals and some antibiotics (International Animal Health, 1999). Protexin can be used in a wide range of circumstances, either to improve the general health of animals, address specific problems or to maximize animal's performance. Under general conditions Protexin has been promoted to: improve health naturally, stimulate appetite, aid in establishment of gut flora in immature animals like day old chicks, calves, lambs, kids, kittens, re-establish gut microflora after antibiotic treatment, optimize digestion of feed and reduce stress (Rajmane, 1998; Cyberhorse, 1999; Panda *et al*., 2000). Many studies have been conducted to test the efficacy of protexin on animal growth and performance. A number of studies have shown that probiotics have no positive effects on broilers and layers (Goodling *et al*., 1987; Maiolino *et al.*, 1992). Several studies have been conducted to asses whether dietary supplemental protexin can improve performance of broilers and piglets.

A study on broiler, Parreira (1998) has also showed that dietary supplementation of protexin increased growth performance and decreased mortality in broilers. Rajmane and Sonawane (1998) showed a significant improvement in body weight, improved feed conversion efficiency and reduction in mortality with the use of protexin as a growth promoter in broilers. Balevi *et al.,* (2000) indicated that supplementation of diets with protexin at 500 gr/tonne quality was shown to cause some improvement in feed intake and feed conversion as well as broken egg ratio. These decreases were statistically different while effects on egg production, egg weight and specific gravity were not. Zanzad *et al*. (2000) included that improved feed conversion efficiency was observed in all probiotic supplemented groups consumed nearly similar quantity of feed.

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Ayasan and Okan (2001) investigated the effect of four different levels of protexin on fattening performance and carcass characteristics of Japanese quails. The results of the experiment showed that growth performance parameters and carcass characteristics of Japanese quails was not affected by protexin supplementation.

As seen in the previous studies, there has not been information in the literature on the effect of dietary protexin supplementation on egg production and egg shell quality of Japanese quail. Therefore, the present study was conducted to investigate the effects of protexin on egg production and egg shell quality of Japanese quails.

Materials and Methods

The experimental quails were divided into three dietary groups of similar mean weight comprising 75 birds each, consisted of 3 subgroup containing 25 birds each. Treatment groups were assigned control Group A (unsupplemented diet), Group B (0.5 kg per tonne “Protexin” supplemented diet and Group C (1.0 kg per tonne “Protexin” supplemented diet) for 5 weeks. After 5 weeks, probiotic treatment was ceased and then all groups were allowed to nourish standard layer diet (170 g/kg CP and 2605 kcal ME per kg diet, Table 1).

The time at which 50% of egg production by birds was accepted as the age at sexual maturity. Body live weight of quails at the first laying was determined in this division. Laying performance was determined daily by measuring feed intake, feed conversion rate, egg production (number and weight). Length, width, shape index (width/length), shell weight, shell thickness of each egg obtained on the sixth days of every week were recorded. After measuring width and length, the egg was broken was then separated and then weighed. Shell samples from top, middle and bottom sites of the egg were measured for thickness using a micrometer and the mean was calculated prior to statistical analysis.

The experimental data were analyzed using ANOVA procedures.

Results and Discussion

The results obtained in the experiment summarized in Table 2 and 3. The results showed that probiotic supplementation to the diet affected mean live weight at sexual maturity significantly (P<0.05) but the first 10 eggs weight and shape index were not found significant (P>0.05) different between groups (Table 2). Age at sexual maturity in groups were 47-57, 51-53 and 51-57 days for quails, respectively. Mean live weights at sexual maturity were found 271.30, 291.48 and 300.00 g in groups. Randal (1998) reported that Japanese quail mature in about six weeks and are usually in full egg production by 50 days of age. Lewis *et al*. (1998) also reported that egg weight at all stages of the laying year is significantly correlated with age and body weight at first egg. A study on quails, Akinci (2001) found that the hen-housed egg production and egg mass in age at the first egg groups were 55, 50, 46, 38 and 630.94, 581.29, 550.64, and 452.80 gr respectively and the differences among the age at first egg groups were not significant for shape index.

The results showed that protexin supplementation to the diet affected egg production and egg shell weight (P<0.05) significantly but had no significant (P>0.05) effects on feed intake, feed conversion efficiency, average egg weight, egg shell thickness and egg shape index (Table 3). However, protexin supplementation especially at 0.5 kg/tonne protexin levels exhibited the highest egg production (73.53 %) than another groups. Quail given diet containing 0 kg/tonne protexin (control group), attained greater cumulative feed intake than the another groups numerically but not significant (P>0.05). Rajmane and Sonawane (1998), who has worked on the broiler, found that feed consumption was approximately same for the both groups (P>0.05). Balevi *et al*. (2001) compared the effects of dietary protexin supplementation at 0, 250, 500 or 750 ppm on layer performance for 90 days. They found that there was no significant difference between the controls and the groups receiving 250 and 750 ppm protexin in feed consumption.

No positive effect of protexin on feed conversion efficiency was determined. The average feed conversion efficiency were 5.99 for control group (Group A), 5.38 for protexin supplement group (Group B). This feed conversion efficiency on Group B than the group A was mainly due to better utilization of feed as a result of protexin supplementation. These results are consisted with previous experiment of Parreira (1998), who observed to improve feed conversion efficiency with the supplementation of probiotic to the diet. Average egg weights of the groups remained similar. However, protexin supplementation at 1.0 kg/tonne exhibited about 1.5 % higher egg weight when compared with control group. In agreement with Balevi *et al*. (2000); Balevi *et al*. (2001); Yoruk *et al*. (2004), the addition of probiotics to diets did not affect on egg weight. This result is contrary to that reported with layers, in which egg weights were higher on probiotic supplemented than the control group (Nahashon *et al*., 1996).

Protexin supplementation to the diet affected egg production significantly (P<0.05). Onol *et al*. (2003) showed that dietary protexin supplementation has no beneficial effects on the egg production of laying quails. Yoruk *et al.* (2004), egg production for hens supplemented with probiotic was not different but was greater than for control hens.

Dietary protexin supplementation affected egg shell weight (P<0.05). The highest mean values for egg shell weight were achieved by the group of birds fed on the 1.0 kg/tonne protexin supplemented diet (Group C). A similar effect was found when laying hens were fed a

Table 1: Ingredients and Chemical Composition of the Experimental Diet

Ingredients	g/kg	Nutrient Contents	
Corn	300.00	Dry Matter, %	88.22
Barley	198.82	ME (Kcal/kg)	2605.11
Wheat Bran	109.54	Crude Protein, %	17.00
Sunflower Meal	80.73	Ether Extract, %	4.70
Limestone	71.52	Crude Fiber, %	6.00
Poultry Offal Meal	60.00	Crude Ash, %	13.00
Full-Fat	43.88	Lysine, %	0.76
Meat and Bone Meal	41.29	Threonine, %	0.61
Wheat Middlings	43.43	Methionine + Cystine, %	0.66
Soybean	30.08	Isoleucine, %	0.62
Corn Gluten Meal	10.00	Leucine, %	1.35
Soda	2.51	Valine, %	0.80
Vitamin premix*	2.00	Phenylalanine, %	0.79
Bentonite	2.00	Ca, %	3.50
Toksisep	2.00	Available P, %	0.48
Mineral Premix**	1.50	Sodium, %	0.15
Alimet	0.70	Potasium, %	0.69

*Each kg of vitamin premix contains 6000000 IU Vitamin A; 800000 IU Vitamin D_3; 14000 mg Vitamin E; 1600 mg Vitamin K_3; 1250 mg Vitamin B_1; 2800 mg Vitamin B_2; 8000 mg Niacin; 4000 mg Ca-D-Pantothenate; 2000 mg Vitamin B_6; 6 mg Vitamin B_{12}; 400 mg Folic Acid; 18 mg D-Biotin; 20000 mg Vitamin C; 50000 mg Choline Chloride. **Each kg of mineral premix contains 80000 mg Mangan; 60000 mg Iron; 60000 mg Zinc; 5000 mg Copper; 200 mg Cobalt; 1000 mg Iod; 150 mg Selenium.

Table 2: Age and Live Weight at First Egg, and Mean Weight and Shape Index for First 10 Eggs in Quail fed 0, 0.5 or 1.0 kg/tonne Protexin Probiotic from 0 to 5 weeks of Age

Groups	A	B	C
Day at the first egg production	40-48	40-46	42-46
Age at sexual maturity (days)	47-57	51-53	51-57
Live Weight at sexual maturity (g)	271.30±5.76[b]*	291.48±7.04[a]	300.00±5.67[a]
First 10 eggs weight (g)	11.75±0.54	10.64±0.44	11.49±0.43
First 10 eggs shape index (%)	78.85±0.93	78.21±0.97	79.55±0.56*

[a,b]means in the same rows for the same parameter are significantly different (P<0.05).

Table 3: The Effects of Different Protexin Levels on Feed Consumption, Feed Conversion Ratio, Egg Production Parameters and Egg Shell Quality

	Groups		
Parameters	A	B	C
Feed Intake (g per bird)	2613.93±75.47	2582.20±49.55	2496.02±43.00
Feed Conversion Ratio	5.99±0.52	5.38±0.34	6.45±0.43
Egg Weight (g per egg)	12.52±0.19	12.61±0.17	12.71±0.20
Egg Production (%)	62.19±4.34[a]*	63.53±3.48[a]	51.49±3.89[b]
Egg Weight (Sampled), g	12.32±0.23	12.50±0.18	12.78±0.22
Egg Shell Weight (g/egg)	1.30±0.03[b]	1.33±0.03[b]	1.42±0.02[a]
Egg Shell Thickness (µ)	234.41±3.43	237.54±2.85	231.21±2.72
Egg Shape Index ((width/length)*100)	79.32±0.49	77.92±0.46	79.08±0.51 *

[a,b]parameters in the same row are significantly different between each other (P<0.05).

diet supplemented with probiotic (Pedroso *et al*., 2001). Egg shell weight increased as a result of protexin supplementation by laying quails (Onol *et al*., 2003).

The data of Table 3 demonstrate that egg shell thickness and shape index were found to be similar among the groups. The group receiving no supplemental probiotic attained the highest egg shape index, while the group receiving 0.5 kg/tonne probiotic highest egg shell thickness numerically but not significant (P>0.05). Egg shell thickness in groups were found 234.41, 237.54 and 231.21µ. Novartis (1998) observed that egg shell thickness increased as a result of probiotic supplementation. Pedroso *et al.* (2001), found that the addition of probiotic in laying hens diets did not improve the egg shell thickness. This is support with results obtained later by Yoruk *et al.* (2004).

The results obtained in this experiment showed that protexin supplementation to the diet results that especially 0.5 kg/tonne, could improve laying performance. During the egg production period, probiotic supplementation to the diet did not affect feed intake, feed conversion efficiency, average egg weight, egg shell thickness and egg shape index (P>0.05), but affected egg production and egg shell weight (P<0.05).

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