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Effect of probiotic on the laying performance of Japanese quails (*Coturnix japonica*)

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Abstract

This study was conducted to investigate the effect of different levels of Protexin on feed efficiency and egg laying traits of Japanese quails. Forty eight Japanese quails (*Coturnix japonica*), having average age six weeks were equally allocated to four treatments each containing three replicates. In each replicate were included three female and one male bird. Birds received diets which were supplemented with 0, 0.250, 0.500, and 1.000 gm Protexin per kg diet as control, treatments 2, 3 and 4 respectively. Feed intake was measured daily and feed conversion ratio was calculated. After 63 days of experimental period, egg weight, albumen weight, yolk weight, and shell weight were measured. Feed intake decreased significantly in group 3, while FCR decreased significantly in all treatments. Egg weight, shell weight, albumin weight increased significantly in group 3. However, yolk weight decreased significantly in group 4. In conclusion, Protexin at the level of 0.500 gm/kg of feed improved the egg traits in Japanese quail.

Keywords: *Coturnix japonica*; egg; probiotic protexin; quail

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Introduction

In a natural environment, the establishment of a microbial population in the digestive tract of all warm blooded animals, soon after birth, is inevitable. The microbial types which first establish, in most cases, are the forerunners of the final organisms which will colonize and persist in the digestive tract throughout the adult life of the animal. There are generally two different types of bacterial populations which can become established in the digestive tract. The first is that which exists in close association with the gut epithelium and the second is that which occurs free in the gut lumen. The ideal situation throughout the life of any animal would be to maintain specific numbers of beneficial bacteria in the digestive tract. This would ensure that at all times; the animal would have the proper microbial balance (Vali, 2009).

The use of probiotics in poultry was pioneered by Tortuero (1973), who reported an increase in growth rate in chicks given a *Lactobacillus acidophilus* culture in drinking water for 11 days from hatching. Similar results on the beneficial effects of *Lactobacillus* cultures on the growth of chickens were also reported by several researchers (Kalbane et al., 1992; Jin et al., 1998). 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* 1.89×10^{10} cfu/kg (colony forming unit per kilo gram), *Lactobacillus delbrueckii* subsp. *Bulgaricus* 3.09×10^{10} cfu/kg, *Lactobacillus acidophilus* 3.09×10^{10} cfu/kg, *Lactobacillus rhamnosus* 3.09×10^{10} cfu/kg, *Bifidobacterium bifidum* 3.00×10^{10} cfu/kg, *Streptococcus salivarius* subsp. *Thermophilus* 6.15×10^{10} cfu/kg, *Enterococcus faecium* 8.85×10^{10} cfu/kg, *Aspergillus oryza* 7.98×10^{9} cfu/kg, *Candida pintolopesii* 7.98×10^{9} cfu/kg). All the micro-organisms in the protexin are

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naturally occurring and have been isolated from a wide range of feed, plant, animal, bird and human sources (Ayasan et al., 2006).

However, there is incomplete knowledge on the effect of probiotic supplementation to the compound feed on the growth, performance, egg quality and gut characteristics of poultry, especially in Japanese quail. Because of the importance of poultry as an economic and nutritious form of animal protein and the fast growing characteristics of this animal, research workers have devoted studies to the use of probiotics in poultry. This study was conducted to investigate the effect of different levels of Protexin on the growth performance and egg laying traits, of Japanese quails.

Table 1: Composition of the basal diet fed

feed ingredient	(%)
Corn	49.44
Soybean meal	18.29
Wheat	20
Fatty acid	2.34
Oyster shell	7.41
Bone meal	1.71
Common salt	0.28
Vitamin-Mineral premix[1]	0.5
DL-Methionine	0.12
Calculated values	
ME. Kcal/Kg	2900
Cp. %	16.5
Calcium. %	3.4
Available phosphorus. %	0.32
Sodium. %	0.15
Lysin. %	0.69
Methionine. %	0.34
Methionine- Cysteine. %	0.55
Tryptophan. %	0.18

[1]Each kg of vitamin premix contains 9000000 IU Vitamin A; 2000000 IU Vitamin D3; 1800 mg Vitamin B1; 6600 mg Vitamin B2; 10000 mg Vitamin B3; 3000 mg Vitamin B6; 15 mg Vitamin B12; 18000 mg Vitamin E; 2000 mg Vitamin K3; 1000 mg Vitamin B9; 30000 mg Vitamin B5; 100 mg Vitamin H2; 21 mg Folic acid; 65 mg Niacin; 14 mg Biotin; 500000 mg Choline Chloride; 100000 mg Manganese; 85000 mg Zinc; 50000 mg Iron; 10000 mg Copper; 1000 mg iodine; 200 mg selenium.

Materials and Methods

Forty eight Japanese quails (*Coturnix japonica*), 6 weeks of age were equally allocated to four treatments containing three pens in each. In Each replicate were included three female and one male bird. The ingredients and composition of basal diet in this study are shown in Table 1. Diets were formulated to meet the nutrient requirements for poultry (NRC, 1994). Birds received diets which were supplemented with 0, 0.250, 0.500, and 1.000gm Protexin per kg diet. The experiment lasted for nine weeks. Feed intake was recorded by replicate every week. Feed efficiency was calculated by dividing the feed consumption by the egg mass produced during the time that feed consumption was measured. During 63 days of experimental period, egg weight, albumen weight, yolk weight, and shell weight was measured. Shells were washed under water, dried, and weighted. All analyses were carried out with one way analysis of variance SPSS (SPSS software, 1999). Means were compared by using Duncan's test.

Results and Discussion

The effects of the treatments on feed intake, feed conversation ratio and egg weight are presented in Table 2. Treatment 3 had significantly low feed intake ($P<0.05$). Results showed that feed conversation ratio decreased significantly ($P<0.05$) in all treated groups. The previous studies showed that diet supplementation with probiotic could improve feed intake and FCR (Balevi et al., 2001). However, some studies observed that feed consumption and FCR were not affected by the dietary probiotics (Homma and Shinohara, 2004; Ayasan et al., 2006; Guclu, 2011). In the study of Chen et al. (2005) inulin and an o*ligofructose-type* commercial prebiotic had no effect on feed consumption but improved feed efficiency in laying hens.

Egg weight, shell weight, albumen weight and yolk weight of Japanese quail are summarized in Table 3. Egg weight increased significantly ($P<0.05$) in birds of group 3. These results are in agreement with the findings of Abdel-Azeem et al. (2005) and Imran et al. (2013) who indicated that egg production, egg weight and egg mass were improved in laying hens fed probiotic supplemented diets. The positive effects of probiotic supplementation could be due to decrease in the reproduction of harmful bacteria resulting from improvement in gut environment and enhanced nutrient utilization (Imran et al., 2013). Proposed mechanisms for the beneficial effect of direct-fed microbial (for example *Lactobacillus*-based) are to increase nutrient utilization through improved intestinal health resulting in greater intestinal enzyme activities and nutrient availability (Nahashon et al., 1992).

Egg, shell and albumin weight increased significantly ($P<0.05$) in group 3. Yolk weight of group 4 decreased significantly ($P<0.05$) compared to the control and other groups. These results are in conformity with results of Ayasan et al. (2006), who indicated that protexin supplementation to the quails diet affected egg shell weight ($P<0.05$). A similar effect was found when laying hens were fed a diet supplemented with probiotic (Pedroso et al., 2001). Other studies indicated that probiotic supplementation to the diets significantly affected egg specific gravity, albumen index, yolk index and Haugh unit (Guclu, 2011). Although, statistically not significant, increased

specific gravity and shell thickness might suggest that probiotics may improve the egg shell quality due to the increased calcium absorption from the intestine (Mohan et al., 1995). Different results among these studies may be due to the several factors such as differences in the chemical composition of the ingredients of the diet, levels (percentage) and main contents of the probiotics used in the diet, adaptation, and the selectivity of the microflora and stress factors (Guclu, 2011).

In conclusion, Protexin at the level of 0.500 gm/kg of feed improved the egg traits in Japanese quail.

Table 2: Effect of probiotic on performance of Japanese quail (*Coturnix japonica*)

Probiotic levels Treatments (g/ton)	Feed intake (g/bird/d)	Feed conversion ratio (FCR) (g/g)
Group 1	27.15[a]	2.17[a]
Group 2	26.12[ab]	1.92[b]
Group 3	26.25[b]	1.92[b]
Group 4	26.61[a]	1.98[b]
SEM	0.23	0.03

[abc]Means within column with different superscripts differ significantly (P<0.05); Group1: Control; Group 2: 0.25gm/kg Protexin; Group 3: 0.5 gm/kg Protexin; Group 4: 1 gm/kg Protexin

Table 3: Effect of probiotic on egg quality parameter of Japanese quail (*Coturnix japonica*)

Probiotic levels Treatments (g/ton)	Egg weight (g)	Shell weight (g)	Albumen weight (g)	Yolk weight (g)
Group 1	12.78[c]	1.92[ab]	6.96[b]	4.79[a]
Group 2	13.68[ab]	1.91[ab]	6.9[b]	4.8[a]
Group 3	13.9[a]	1.97[a]	7.23[a]	4.83[a]
Group 4	13.17[ab]	1.82[b]	6.96[b]	4.44[b]
SEM	0.16	0.11	0.05	0.21

[abc]Means in a column with different superscripts differ significantly (P<0.05); Group1: Control; Group 2: 0.25gm/kg Protexin; Group 3: 0.5 gm/kg Protexin; Group 4: 1 gm/kg Protexin

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