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Research Article

EFFECT OF DIETARY SUPPLEMENTATION OF PROTEASE ON EARLY REPRODUCTIVE PERFORMANCE IN JAPANESE QUAILS (*COTURNIX COTURNIX JAPONICA*)

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ABSTRACT

An experiment was conducted to study the effect of two levels of Protease enzyme (100g and 200g /MT) on protein utilization and early reproductive performances of Japanese Quail *(Coturnix Coturnix Japonica)* chicks until 9 weeks of age. Two hundred and twenty five, day-old Japanese Quail chicks were divided into three identical groups having five replicates of 15 birds in each replicate and allotted randomly into three dietary treatments viz., T1, T2 and T3. The treatments consisted of a standard Quail chick ration as control (T1) and standard Quail chick ration with protease enzyme @100g/MT (T2) and 200g/MT of feed (T3). Chicks in each replicate were housed randomly in individual but identical pens and reared under cage system of management. Standard managemental procedures were adopted throughout the experimental period of nine weeks. Feed and water were provided *ad libitum*. Birds were fed with Quail chick ration up to six weeks of age and then switched over to Quail layer feed. Day on first egg, average age at sexual maturity (age at 5% production) and percent Hen day egg production (HEDP) were recorded. Bird in T3 group laid first egg on 40th day followed by T2 on 41st day and control on 43rd day and also the results showed that average age at sexual maturity (age at 5 % egg production) was significantly lowest ($P<0.05$) in T3 (40.80±0.37 days) followed by T2 (42.40±0.51 days) and control T1 (43.80±1.11 days) indicating that microbial protease improve early sexual maturity, through improved protein and amino acid utilization. There is an increasing trend in Hen Day Egg Production (HEDP) in protease supplemented groups viz. T2 (34.83 %) and T3 (32.14 %) up to 9 weeks of age, indicating that microbial protease improve early egg production, through improved protein and amino acid utilization.

INTRODUCTION

Japanese quail is one of the poultry types with very short generation interval. Quail farming serves as a form of alternate poultry production in many nations and is gaining attention from the farmers, entrepreneurs, and researchers. It is used for food, game, pet and also for research purposes (Muthukumar and Dev Roy, 2005). It has good nutritive value, amazing taste, gamy flavor, tender meat that are delicious with low caloric value and high dry matter. It is rich in protein, vitamins, essential amino acids, saturated fatty acids, unsaturated fatty acids and phospholipids (Muthukumar and Dev Roy, 2005).

Enzymes may be a practical mean to improve performance and permit utilization of higher levels of agro-industry by-product in monogastric animal nutrition. Multienzymes containing -glucanase, -amylase, cellulase, pectinase, xylanase, hemicellulase without or with protease and phytase could improve feed utilization and overcome the anti-nutritional factors of feedstuffs, and improve gut health and immune response (Jeroch *et al.*,1995; Saleh *et al.*, 2003; Yonemochi *et al.*, 2003; Meng *et al.*,2005; Choct, 2006 and Yoruk *et al.*, 2006)

The goal of the present study was to evaluate the effects of protease supplementation to diets of Japanese Quail *(Coturnix coturnix Japonica)* and its effects on early reproductive performance of laying Japanese Quail hens.

MATERIALS AND METHODS

An experiment was conducted for a period of nine weeks to study two levels of Protease enzyme (100g and 200g / MT) on protein utilization and early reproductive performances of Japanese Quail *(Coturnix Coturnix Japonica).*

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Experimental Materials

Experimental Birds

Two hundred and twenty five, day-old Japanese Quail chicks received from Poultry Research Station (PRS), Madavaram, TANUVAS, Chennai formed the experimental subjects.

Experimental Rations

Three experimental rations were formulated, viz.,

1. T1 (Control) - Standard quail rations as per Dafwang (2006) specifications.
2. T2 - Standard quail rations (T1) with protease enzyme at the rate of 100g/MT of feed
3. T3 - Standard quail rations (T1) with protease enzyme at the rate of 200g/MT of feed

Feed ingredients used in the formulation of the experimental rations were yellow maize, rice polish, soybean meal and De-Oiled Rice bran.

Birds were fed with Quail chick ration up to six weeks of age and then switched over to Quail layer feed. The laying birds were fed formulated diet containing 18% crude protein and 2700 Kcal/Kg metabolizable energy as recommended by Dafwang (2006).

Enzyme

The enzyme used in this trial was 'RONOZYME® ProAct' a product manufactured and marketed by DSM Nutritional Products India Pvt. Ltd. Plot No. E-57, & E-58, Additional Midc, Anand Nagar, Ambernath - 421501, Maharashtra, India. It is a Protease enzyme that breaks down protein molecules into the amino acids and peptides needed by animals and poultry. Adding protease can increase protein digestibility, Improve protein utilization by the animal, Allow lower quality protein sources to be included in diets and Protect the environment by reducing the nitrogen excretion from poultry. Specifically developed for inclusion in poultry diets, RONOZYME® ProAct significantly increases the digestibility of protein. It complements naturally occurring proteases in feed, and considerably increases amino acid and peptide supply so as to enhance animal performance. It improves the digestibility of a wide range of protein sources and cereals, allowing savings in diet costs.

The enzyme was added in two different levels viz., 100 g/MT (T2) and 200g/MT (T3)

Experimental Methods

Housing of Birds

The experimental pens, feeders, waterers and other equipment were properly cleaned and disinfected one week before the chicks were housed. The chicks were wing banded, weighed individually and vaccinated against Ranikhet disease, before housing.

Experimental Design

The chicks were randomly divided into 15 groups of 15 chicks each. The groups were allotted randomly to three dietary treatments viz., T1, T2, and T3 with five replicates in each treatment. The details of treatments are presented in Table 1.

Table 1 Distribution of the different dietary treatments

Treatment	Replicate	No. of birds	Treatment diet
T1	R1	15	Control Diet
	R2	15	
	R3	15	
	R4	15	
	R5	15	
T2	R1	15	Protease – 100g/Tonne
	R2	15	
	R3	15	
	R4	15	
	R5	15	
T3	R1	15	Protease – 200g/Tonne
	R2	15	
	R3	15	
	R4	15	
	R5	15	
Total		225	

Management

The birds were provided with feed and water *ad libitum* throughout the experimental period and were maintained individual but identical boxes under cage system of management. Standard managemental procedures were adapted identically to all treatments during the entire experimental period of nine weeks.

Birds were fed with quail chick ration up to six weeks of age and then switched over to quail layer feed. Day on first egg, average age at sexual maturity (age at 5% production) and percent Hen Day Egg Production (HEDP) were recorded.

Statistical Analysis

Data collected on various parameters were statistically analyzed by Completely Randomised Design (CRD) method as described by Snedecor and Cochran (1985). Means were compared by Least Significant Difference (LSD) test using MSTATC.

RESULTS AND DISCUSSIONS

The results on Day on first egg, average age at sexual maturity (age at 5% production) and percent Hen day egg production (HEDP) were presented in Table 2.

Table 2 Effect of Protease enzyme supplementation on reproductive performance of Japanese quail hens

Treatments	Day at First Egg	Average age at sexual maturity (age at 5% production) in days	*HDEP % (at 9 weeks)
T1	42	43.80±1.11^{a}	29.67
T2	41	42.40±0.51^{ab}	34.83
T3	40	40.80±0.37^{b}	32.14
Overall mean		42.33±0.51	
F value		2.42*	

* Significant ($p<0.05$)

HDEP- Hen day egg production, T1 - Standard quail rations as control.

T2 & T3 - Standard quail rations with protease enzyme at the rate of 100g/MT and 200 g/MT of feed, respectively.

Bird in T3 group laid first egg on 40th day followed by T2 on 41st day and control on 43rd day. Age at first egg obtained in the range of 50.94-61.22 days reported by El-Full *et al.*, (2001). Sezer *et al.*, (2006) documented that, Japanese quails lay her first egg at an early age of 45.82±0.22 days. Early sexual

maturity shows the effectiveness of protease enzyme supplementation.

Age at first egg obtained in this study on 40 - 43 days in various treatments indicates early sexual maturity of birds compare with the range of 45.3-58.9 days reported by Mark (1993) and 50.94-61.22 days reported by El-Deen *et al.*, (2008) and El-Full (2001) respectively. Sezer *et al.*, (2006) documented that, Japanese quails lay her first egg at an early age of 45.82±0.22 days. However, Thomas and Ahuja (1988) and Daikwo (2011) reported that the age at sexual maturity was 48.9-49.6 and 47.01±0.22 days, respectively in Japanese quail. Age at first egg can be very variable because it is affected by selection/genetics, feeding and management practices.

The results indicted in Table 2 showed that average age at sexual maturity (age at 5 % egg production) was significantly lowest ($P<0.05$) in T3 (40.80±0.37 days) followed by T2 (42.40±0.51 days) and control T1 (43.80±1.11 days) indicating that microbial protease improve early sexual maturity, through improved protein and amino acid utilization. The results of this study are consistent with those cited by Bedford (2000). The author points out that the use of exogenous enzymes had positive results in terms of improvements in the utilization of nutrients, reduction of moisture in the excreta and partial or total elimination of the anti-nutritional factors found in the dietary feeds commonly used in poultry farming.

There is an increasing trend in Hen Day Egg Production (HEDP) in protease supplemented groups viz. T2 (34.83 %) and T3 (32.14 %) at 9 weeks of age than control T1 (29.67%), indicating that microbial protease improve early egg production, through improved protein and amino acid utilization.

The data relating to eggs laying suggests that the protease used in the experiments contributed to improve the intake of the calories and amino acids contained in the diets, due to the fact that eggs production can be altered mainly by changing the energy and protein levels. Such effect was observed in an experiment conducted by Araújo & Peixoto (2005) with semi-weighted layers, where they found an increased eggs production. According to the results, a decrease in nutritional levels is possible in case of enzyme supplementation at the levels used in the present study, without compromising eggs production.

CONCLUSION

The findings on early reproductive performance of Japanese quails in this study suggest that the microbial protease is favorable for early reproductive performance of Japanese Quails *(Coturnix Coturnix Japonica)* through improved protein and amino acid utilization and decrease in nutritional levels of protein and amino acids are possible in case of enzyme supplementation at the levels used in the present study, without compromising eggs production.

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