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Diet Selection by Japanese Quails (Coturnix Coturnix Japonica) Offered Grounded Wheat and Concentrate Feed as a Choice

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Abstract: The effect of choice feeding on feed intake, diet selection, growth performance and some carcass characteristics in Japanese quails was investigated in the current study. Choice-fed quail chicks were offered a choice of a concentrate feed (CON, 300 g CP and 13.1 MJ ME kg^{-1}) and grounded wheat (GW, 115 g CP and 12.8 MJ ME kg^{-1}), while control quail chicks (single- fed) were fed on a commercial feed (230 g CP and 13.4 MJ ME kg^{-1}). Choice feeding did not affect feed intake, daily gain, feed conversation ratio, final live weight and carcass weight ($P>0.05$). These were determined in control and choice-fed quails as 24.9 vs 24.4 g , 7.58 vs 7.32 g, 3.29 vs 3.33, 282.8 vs 274.4 g, 203.7 vs 202.3 g, respectively. Choice-fed quails made a diet containing 255 g CP and 13.1 MJ, which had higher protein content, but lower metabolic energy content than control diet 230 g CP and 13.39 MJ per kg ($P<0.01$), by selecting 74 % concentrate feed and 24 % grounded wheat when they were offered concentrate feed and grounded wheat simultaneously. Also, it was determined that the nutrient requirement of Japanese quails were higher than what given in NRC (1994) for protein (240 g CP kg^{-1}) and energy requirement (12.1 MJ ME kg^{-1}). To conclude, choice feeding did not affect the performance parameters of Japanese quails, but gave them the opportunity to balance their nutrient intakes.

Key words: Japanese quails, diet selection, wheat

Introduction

The nutrient requirements of Japanese quails are well illustrated in NRC (1994). According to NRC (1994), Japanese quails need 240 g crude protein (CP) and 2900 kcal (12.1 MJ) ME per kg diet. Even though the amount of feed eaten by quails is low, feed conversion ratio (g feed: g gain) has been not reached a level broiler chicks did. Feed conversion ratio for broilers for meat production is about 1.8, but this is about 2.5-3 for quails. Of course, their genetic make-up and super-active behaviour make their maintenance requirements be higher in comparison to broiler chickens for per unit body weight. Commercially or conventionally, quails are fed singly ad lib with adequate diet in cages or small poultry rooms. Usually, when quail starter diet was not obtained, broiler chick's starter mash diet has been used in quail farming in practice, even though this diet has 230 g CP and 13.4 MJ ME content per kg diet. These nutrient contents are high for energy, but low for protein in comparison to NRC (1994) standards for Japanese quails. Therefore, there is a need to clarify the nutrient requirements of Japanese quails in order to nourish them correctly for the aspect of animal welfare. However, there has been a limited feeding applications (choice feeding, split feeding, etc.) in quail feeding when looked on literature.

Rather, choice feeding will give an opportunity to domestic fowls to select what they require in terms of energy and protein (Huges, 1984; Cumming, 1994), leading less consumption of commercial feed and the evaluation of surplus of cereals (Forbes, 1995). There are sufficient evidences regarding choice feeding of broiler chickens when offered concentrate feed and cereals (Forbes and Covasa, 1995). For instance, Kaufman *et al.* (1978) found out in their study that broiler chicks in choice feeding (a choice between soybean meal (460 g CP kg^{-1}) and grounded maize (90 g CP kg^{-1}) gained the same rate as control chicks. Recently, °ahin *et al.* (2001) observed that choice-fed broiler chickens selected a diet having from 8% (8-13 d) to 55% (35-42 d) whole wheat. However, there has been a lack of information quails' responses to choice feeding. Thus, the following experiment was carried out to determine the diet selection and growth responses of Japanese quail chicks to choice feeding.

Materials and Methods

This study was conducted at the Research Unit of Samandağ Vocational High School of Mustafa Kemal University, Antakya-Turkey. After hatching, two hundred Japanase quail chicks were fed on control feed (Table 1). The chicks were raised in mesh-floored metal large cages with 24 h continuous lighting and 33 to 27 C° of ambient temperature until the experimental procedure (for two weeks).

At the beginning of study, 160 quail chicks 14 d-old were divided into 2 groups with 4 replications. They were mixed sex and had 70.62 ± 0.62 g body weight in average. Each sub-group (replication) contained 20 birds in the experimental unit on ground. First group was control consuming mash control feed (230 g crude protein and 13.4 MJ ME kg^{-1}), while the second group (WS) was offered either concentrate feed (300 g CP and 13.1 MJ ME kg^{-1}) or grounded wheat (120 g CP and 12.8 MJ ME kg^{-1}) (Table 1). Feed intake was recorded daily throughout this study. Water was available all day through experimental period. Feed conversion ratio (g feed: g gain) was

Table 1: The composition of experimental feeds

	Single feeding (control)	Choice feeding (treatment)	
Ingredients (g kg^{-1} feed)	Control feed	Concentrate feed (CON)	Ground wheat (GW)
Wheat	-	-	1000
Maize	420	370	
Soya bean meal	260	420	
Maiz gluten meal	50	60	
Fish meal	50	70	
Corn oil	48	60	-
Limeston	13	12	
DCP	5	2	
Salt	1	1	
Premix (vitamin & minerals)	5	5	
Total	1000	1000	1000
	Content (g per kg feed)		
Dry matter	888	889	880
ME (MJ/kg) (calculated)	13.4	13.1	12.8
Crude Protein	230	300	115
Ash	80	68	50

Table 2: The effect of choice feeding on feed intake, diet selection growth and some carcass characteristics of Japanese quails

Parameters, g bird-1	Control	Choice feeding	SEM
	Feed intake and diet selection		
Daily total feed intake (TFI)	24.92	24.38	0.77
-Concentrate intake (CONI)	-	18.35	0.94
-Wheat intake (WI)	-	6.03	0.61
Wheat selection (WI/TFI)	-	0.26	0.02
Concentrate selection (CONI/TFI)	-	0.74	0.02
Protein intake (CPI)	5.74	6.20	0.19
Protein selection (g CP per kg diet)	230.00b	254.60a	2.88
Energy intake (MJI)	0.33	0.32	0.01
ME selected (MJ ME per kg diet)	13.39a	13.11b	0.02
P. E ratio (CPI/MJI)	17.40b	19.40a	0.25
	Growth and some carcass characteristics		
Final live weight	282.11	274.38	2.89
Daily gain	7.58	7.32	0.15
FCR (g feed : g gain)	3.29	3.33	0.04
Carcass weight	203.68	202.29	2.20
Heart weight	1.16	1.25	0.02
Liver weight	3.00	3.41	0.14
Gizzard weight	2.23b	2.67a	0.07

a,b show the significant difference between means ($P<0.01$)

calculated for per group in experimental group during the experimental period. A random selection of 6 birds (3 males + 3 females) aged 42-d from each replicate was killed for the measurement of some carcass measurements (carcass, liver, heart and gizzard weights).

The main effect of feeding styles (control, choice) was compared. Data concerning growth, carcass characteristics, feed intake and diet selection were analysed using the "One-Way" ANOVA procedure of SPSS (SPSS, 1999).

Results and Discussion

Primarily, it needs to be emphasised that the experimental animals were mixed-sex and they were not fed

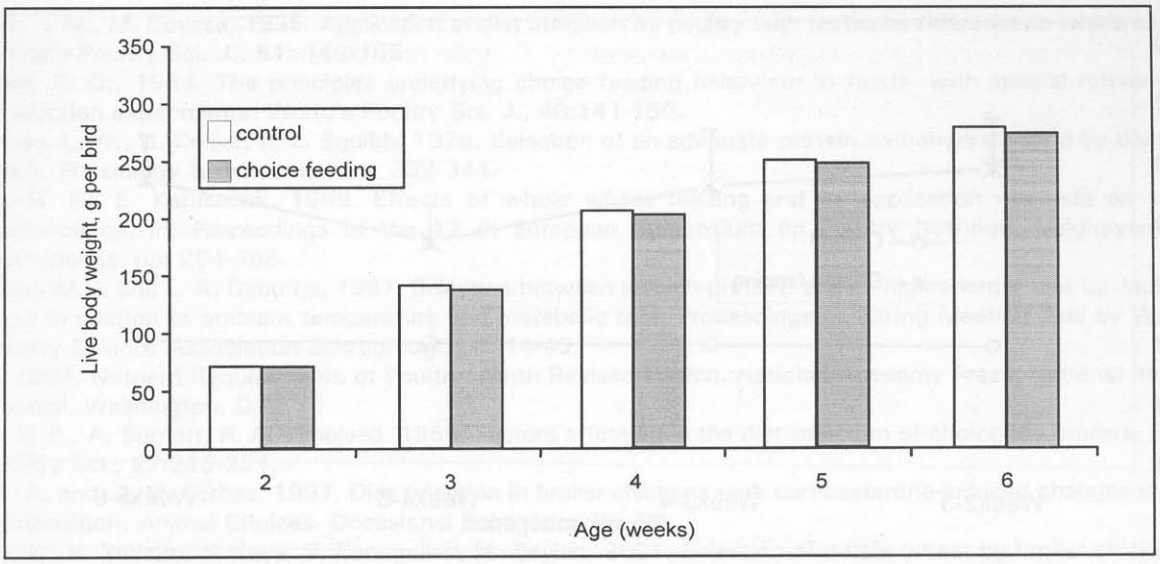

Fig. 1: The effect of choice feeding on the changes in live weight of Japanese quails

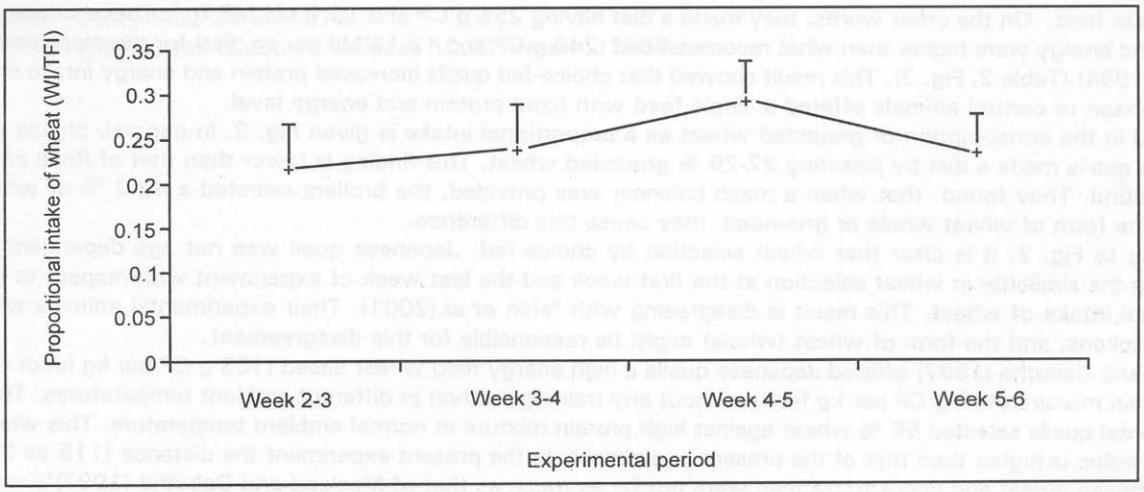

Fig. 2: The proportional intake of wheat against concentrate feed wheat intake (WI)/total feed intake (TFI) in choice fed quails

individually. In practice, both male and female quail chicks one-d-old have been obtained together. For this reason, the present experiments were designed to approach choice feeding conventionally. Thus, the effect of sex on choice feeding was eliminated. However, if male and female quail chicks were separated and fed individually, it could have been seen the difference in feed intake, diet selection, growth and carcass characteristics between them, as it was previously observed by Sahin and Forbes (1997) in broiler chickens. Also, quails were not subjected to training period to familiarise the experimental feeds as Shaiatmadari and Forbes (1993) did, ie, Japanese quail chicks were not trained to familiarise themselves to organoleptic properties of experimental feeds since they were kept in-group. When poultry are trained group feeding (Forbes and Covasa, 1995), the ability of diet choice from offered feeds could be accelerated or tuned.

Table 2 shows the effect of choice feeding on feed intake, diet selection, growth performance and some carcass characteristics in Japanese quails. Choice feeding did not change feed intake, daily gain, feed conversion (FCR) ratio and carcass parameters ($P>0.05$), except gizzard weight ($P<0.01$). As shown in Fig. 1, choice feeding did not change the body weights of Japanese quails during the experimental period. In other words, choice feeding did not differentiate the growth performance. The carcass measurements (carcass, heart, liver) were not affected by choice feeding as found by Kutlu and Karakozak (1999) with respect to carcass weight in broiler chicken.

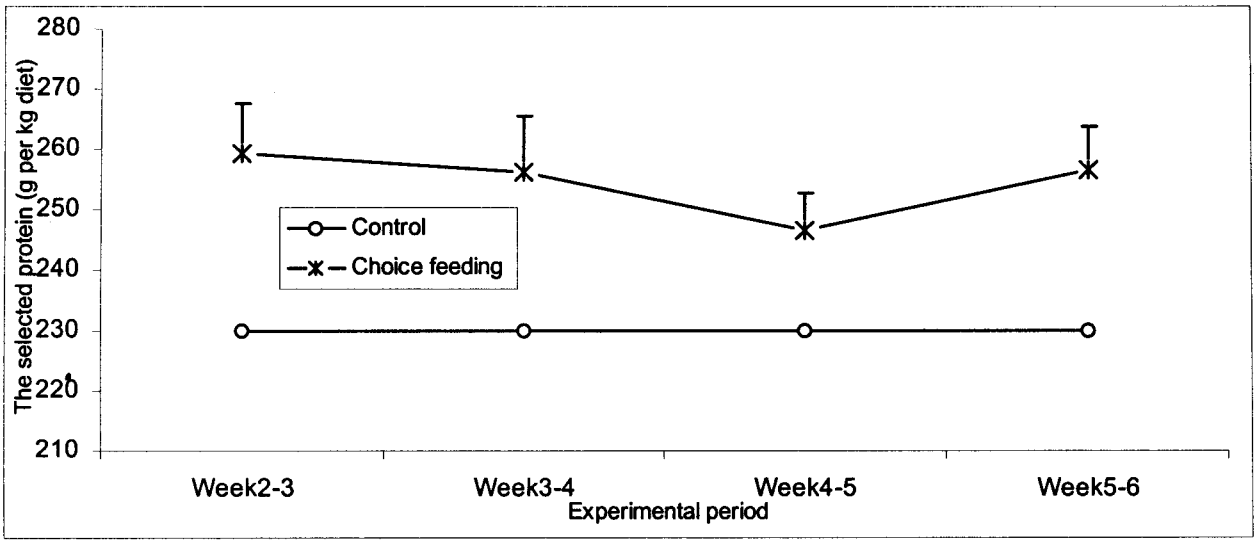

Fig. 3: The protein selection by quails fed control and choice feeding

For entire study (16-42 d old), choice-fed Japanese quails made a diet by selecting 24 % wheat and 76 % concentrate feed. On the other words, they made a diet having 255 g CP and 13.1 MJ ME kg^{-1}. These values for protein and energy were higher than what recommended (240 g CP and 12.13 MJ per kg diet) for the same period by NRC (1994) (Table 2, Fig. 3). This result showed that choice-fed quails increased protein and energy intake with in comparison to control animals offered a single feed with fixed protein and energy level.

The trend in the consumption of grounded wheat as a proportional intake is given Fig. 2. In general, choice fed Japanese quails made a diet by selecting 22-29 % grounded wheat. This finding is lower than that of Rose *et al.* (1986) found. They found that when a mash balancer was provided, the broilers selected a 42.2 % of whole wheat. The form of wheat whole or grounded may cause this difference.

According to Fig. 2, it is clear that wheat selection by choice-fed Japanese quail was not age dependent as evidenced the similarity in wheat selection at the first week and the last week of experiment with respect to the proportinal intake of wheat. This result is disagreeing with Şahin *et al.*(2001). Their experimental animals were broiler chickens, and the form of wheat (whole) might be responsible for this disagreement.

Macleod and Dabutha (1997) offered Japanese quails a high energy feed wheat based (103 g CP per kg feed) and high protein mixture (448 g CP per kg feed) without any training method in different ambient temperatures. Their experimental quails selected 55 % wheat against high protein mixture at normal ambient temperature. This wheat selection value is higher than that of the present experiment. In the present experiment the distance (115 vs 300 g CP) between wheat and concentrate feed were not far as much as that of Macleod and Dabutha (1997)'s work (105 vs 448 g CP) with respect to protein content of feeds. That was why Japanese quails in the present experiment predominantly chose concentrate feed, about 76 % of diet, which was closer to their optimum protein requirement compared to grounded wheat. This diet selection paradigm is well illustrated in the work of Shariatmadari and Forbes (1993) in broiler chicks. According to their results, growing broiler chicks can match their protein intake closely to their requirements when given a pair of feeds that allows this; if both feeds are on the same side of the optimum, then, the one closest to that required is predominantly chosen. In the current experiment, the nutrient content of concentrate feed was the closest to the optimum requirement of Japanese quail chicks.

In conclusion, the present results suggest that diet formulation with dietary preferences of Japanese quails would be having a nutritionally important. Japanese quails in this study chose a diet with optimal body gain and modify their feed choice according to the changes in the body components to be ready for breeding season. Also, implementing the usage of grounded wheat with choice feeding in current experiment have a potential for commercial benefit, as shown reduction in feed cost by birds' self-replacement of wheat in their diet.

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