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Effect of Feed Restriction on Growth Performance of Japanese Quail (*Coturnix coturnix japonica*)

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Abstract: This study was conducted to investigate effect of feed restriction (80 and 70% of *ad libitum* consumption) on growth performance of Japanese quail. To achieve this goal, 1 day old 363 Japanese quail were divided into 3 groups, randomly; The 1st, 2nd and 3rd groups were control, 20% feed restricted and 30% feed restricted, respectively. All chicks were weighed by 0.01 g sensitivity; leg banded by tape and reared on 5 cm deep wood shavings. They were provided *ad libitum* access to a commercial starter breeder diet containing 28% CP with 2800 kcal ME kg^{-1} for 14 days and provided commercial finisher breeder diet containing 24% CP with 3000 kcal ME kg^{-1} for 28 days. Feed restriction was started at the end of 14 days after hatching and lasted 2 weeks. During the trail control group had *ad libitum* access to the feed but 2nd and 3rd group had 80 and 70% of control group. Birds were weighed individually every week and supplied water for *ad libitum* consumption until end of the trail. Analysis of variance was carried out on the data using the General Linear Model procedure of base SAS software. T-test was used to compare differences among the treatments. At the end of 14 days after hatching, average body weights of group 1, 2 and 3 were 60.50±1.17, 62.12±1.18 and 61.93±1.20 g ($p>0.05$) for males and 62.80±1.10, 61.32±1.07 and 63.2±1.18 g ($p>0.05$) for females, respectively. Feed restriction had negative effect on quail growing at the end of 4th week after hatching, which was last week of feed restriction practice. At this week, average body weights for group 1, 2 and 3 were 134.36±2.18, 125.34±2.19 and 124.85±2.18 g ($p<0.01$) for males and 135.00±2.25, 124.17±2.29 and 130.76±2.49 g ($p<0.01$) for females, respectively. At the end of trial, average body weights of group 1, 2 and 3 were 164.18±2.89, 166.74±2.91 and 162.17±2.97 g for males and 184.92±2.92, 182.47±2.85 and 186.39±3.12 g for females ($p>0.05$), respectively. As it was seen, body weights of feed restricted quail were significantly lower than control group during trail. Two weeks after feed restriction ended, however, body weights were no longer different. As a result, the effects of feed restriction during growing period for quail in this study were similar to those observed in chickens. These data indicate that by 30% feed restriction can be practiced for 2 weeks during growing period of quail.

Key words: Quail, feed restriction, growth performance, *ad libitum*, Japanese

INTRODUCTION

First time, feed restriction studies have done on Turkey toms then on chicken widely, however, it has not been practiced on quail breeding sufficiently. It is well known that about 70% of the expense of broiler and layer is feed cost (Cakir *et al*., 1981). Reducing the feeding cost is the most important factor on profitability. Feed restriction studies especially, on chickens were summarized by Lee *et al*. (1971) and Hester and Stevens (1990). The researchers focused on the effects of feed restriction on growth performance and reproduction traits of chicken. However, results of the studies were contradictory. The researchers expressed that the reason for these varieties were probably daily restriction (Lee, 1987), skip-a-day feeding (Wilson *et al*., 1983), uncontrolled environment factors (Lillie and Denton, 1966) and differences among the genotypes (Robbins *et al*., 1986; Katanbaf *et al*., 1989).

The data in respect of feed restriction on growth performance of some laboratory models were similar but sparse for Japanese quail (Gebhardh-Henrich and Marks, 1995). Zelenka *et al*. (1984) studied the effects of different level of dietary protein (26, 24, 20, 16 and 14%) and feed restriction (80 and 60% of *ad libitum*) on BW and body composition of Japanese quail at sexual maturity. They

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reported that the effects of feed restriction on BW at the onset of lay were not significant; however, it was delay age at 1st egg.

The propose of this study is to figure out the effects of feed restriction (70 and 80% of *ad libitum*) for 2 weeks (at the age of 2 weeks) on growth performance of Japanese quail.

MATERIALS AND METHODS

This study was pursued on floor-pens (2 m^2 area-each) of chicken house in University of Yuzuncu Yil, in Turkey. As animal materials, totally 363 day-old Japanese quail chicks were used. All day-old chicks were randomly assigned to 3 groups and weighted by 0.01 g sensitive then leg banded by tape. After a week, leg band changed to metal wing band. Each treatment group was separated into 3 equal experimental unit (replicates), which were distributed at random to minimize pen effects.

The chicks were reared on 5 cm deep wood shavings. In this experiment, the 1st group (n = 124) was control fed by *ad libitum*, the 2nd group (n = 126) 20% feed restricted of the control and the 3rd group (n = 113) was 30% feed restricted of the control. They were provided *ad libitum* access to a commercial starter breeder diet containing 28% CP with 2800 kcal ME kg^{-1} for 14 days and provided commercial finisher breeder diet containing 24% CP with 3000 kcal ME kg^{-1} for 28 days. Even treatment groups (2nd and 3rd) had finished the feed, they have not been given feed till control group finished. Feed restriction has gone through 14-28th day of age (2 weeks). So, quantitative feed restriction was practiced by this way. During the trail, control group had *ad libitum* access to the feed but 2nd and 3rd group had 80 and 70% of control only. There was no water restriction from beginning to the end of trail. Chicks were weighed by weekly from hatching to the end of experiment.

Analysis of Variance was carried out on the data using the General Linear Model procedure of base SAS (1988) software. T-test was used to compare differences among the treatments. The following mathematical model was:

$$Y_{ijk} = \mu + a_i + b_j + e_{ijk}$$

where:

Y = Yield feature
μ = General mean
a = Effect of feed restriction
b = Effect of sex
e = Residual random term with variance σ^2

RESULTS AND DISCUSSION

The mean group differences of body weights, in the beginning of the trail were not significant (Table 1). At the beginning of feed restriction treatment, body weights of group 1, 2 and 3 were observed as for male 60.50±1.17, 62.12±1.18 and 61.93±1.20 g, for female 62.8±1.1, 61.32±1.07 and 63.2±1.18 g and for mix (male + female) 61.67±0.80, 61.67±0.80 and 62.57±0.84, respectively. As it could be seen on the Table 1, the body weight differences among the groups were not significant at the beginning of the treatment in terms of male, female and mix.

After a week (3rd week of age) from the beginning of the treatment, the body weight of the control group was

Table 1: Least square means, standard error and significant level of body weights (g) of quail at different age

		Group 1 (Control)		Group 2 (20% feed restriction)		Group 3 (30% feed restriction)	
Groups	Significant level	N	X±Sx	N	X±Sx	N	X±Sx
Day-old body weight (g)	ns	60	M:8.65±0.09	59	E:8.51±0.09	57	E:8.60±0.09
	ns	64	F:8.59±0.09	67	D:8.63±0.09	56	D:8.63±0.09
	ns	124	X:8.62±0.06	126	K:8.57±0.06	113	K:8.62±0.06
1 week of age body weight (g)	ns	60	M:28.81±0.18	59	E:28.28±0.18	56	E:28.23±0.18
	ns	64	F:28.35±0.16	67	D:28.29±0.16	57	D:28.27±0.17
	ns	124	X:28.25±0.12	126	K:28.28±0.12	113	K:28.25±0.13
2 weeks of body weight (g)	ns	60	M:60.50±1.17	59	E:62.12±1.18	57	E:61.93±1.20
	ns	63	F:62.80±1.10	67	D:61.32±1.07	56	D:63.21±1.18
	ns	123	X:61.67±0.80	126	K:61.67±0.80	113	K:62.57±0.84
3 weeks of body weight (g)	ns	60	M:96.95±1.74	59	E:95.94±1.74	57	E:95.36±1.17
	ns	63	F:97.34±1.87	67	D:95.19±1.82	56	D:96.80±1.20
	ns	123	X:97.15±1.28	126	K:95.53±1.26	113	K:96.07±1.33
4 weeks of body weight (g)	**	58	M:134.36±2.18b	59	E:125.34±2.19a	57	E:124.85±2.18a
	**	64	F:135.00±2.25a	67	D:124.17±2.29b	55	D:130.76±2.49a
	**	122	X:134.65±1.59b	126	K:124.66±1.59a	112	K:127.75±1.66a
5 weeks of body weight (g)	ns	58	M:159.76±2.80	59	E:156.11±2.78	57	E:155.36±2.85
	*	64	F:167.84±2.79b	65	D:157.68±2.77a	55	D:165.50±2.98a
	*	122	X:163.84±1.98a	124	K:156.78±1.97b	112	K:160.42±2.07ab
6 weeks of body weight (g)	ns	58	M:164.18±2.89	59	E:166.74±2.91	57	E:162.17±2.97
	ns	64	F:184.92±2.92	65	D:182.47±2.85	55	D:186.39±3.12
	ns	122	X:174.56±2.09	124	K:174.47±2.04	112	K:174.26±2.15

[1]a,b,c: Means within a line no common letter differ, M = Male, F = Female, X = Male+Female (Mix), * = $p<0.05$; ** = $p<0.01$; ns = not significant

heavier than the treatment groups, however, the differences were not significant. Significant effects ($p<0.01$) were observed at the end of 4th week of age. At the end of feed restriction treatment, body weights of group 1, 2 and 3 were observed as for male 134.36±2.18, 125.34±2.19 and 124.85±2.18 g, for female 135.00±2.25, 124.17±2.29 and 130.76±2.49 g and for mix (male + female) 134.65±1.59, 124.66±1.59 and 127.75±1.66 g, respectively.

One week after termination of restricted feeding (5th week of age), the body weights of the treatment groups tend to cover negative effects of the feed restriction (Table 1). Even average least square means of body weight of the control group's male were heavier than treatment groups but not significant in this week. Nevertheless, significant differences ($p<0.05$) of body weight among the groups in female and mix were still present.

At the end of the treatment, average body weight of the groups 1-3 were observed as for male 164.18±2.89, 166.74±2.91 and 162.17±2 g, for female 184.92±2.92, 182.47±2.85 and 186.39±3.12 g and for mix (male + female) 174.56±2.09, 174.47±2.04 and 174.26±2.15 g, respectively. The differences were not significant ($p>0.05$). That means, differences among the groups in 4th and 5th week of age were disappeared. Treatment groups were as heavier as control group at the end of the trail in terms of the mix.

Gebhard-Henrich and Marks (1995) were used randombred quail line and a quail line that had been selected for high 4 weeks body weight for 83 generation. In that experiment; randombred and selected line were fed 70% of control group for 44 and 28 days from the beginning of the trail, respectively. They resulted that during feed restriction (1-44 days), the quail had significantly lower body weight in both sexes. One week after termination of restricted feeding, body weight of restricted males were no longer significantly lower than body weight of control males. However, 3 weeks after assuming *ad libitum* feeding, restricted males significantly smaller than control *ad libitum* males. Female body weight of restricted quail remained significantly lower than *ad libitum* contemporaries for only one week after termination of feed restriction.

In 2nd experiment, during feed restriction (1-28 days), both male and female restricted quail had significantly lower body weight for only one week after feed restriction. Results of the researchers agree to our experiment. On the other hand, similar results were reported for chicken as well (Plavnik and Hurwitz, 1988; Altan *et al*., 1992, 1998).

Feed consume was similar before and after feed restriction period. However, it was significantly different ($p<0.01$) during the treatment period. Average feed consume during the treatment period for group 1-3 was 23.78±1.35, 19.02±1.15 and 16.65±0.92 kg, respectively. By practicing 20 and 30% feed restriction experiment for 2 weeks between 2-4 weeks of age for group 2 and 3, average 4.76 and 7.13 kg feed saved in comparing to the control group. Overall feed conversion rates for group 1-3 were 5.83, 5.27 and 4.87, respectively.

Mortality rates of the groups were small and similar through the trail. Mortality rates of the groups 1-3 were 1.61, 1.58 and 0.88%.

CONCLUSION

As a result, compensatory growth in quail in this study after release from fed restriction was remarkable. The effects of feed restriction during growing period for quail in this study were similar to those observed in chickens. These data indicate that by 30% feed restriction can be practiced for 2 weeks during growing period of quail. However, more experiments are necessary to figure out the best feed restriction period in quail.

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