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RESEARCH ARTICLE

Determination of Body Weight and Some Carcass Traits in Japanese Quails *(Coturnix coturnix japonica)* of Different Lines [1]

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Summary

The purpose of this study was to determination of body weight and some carcass traits in Japanese quails *(Coturnix coturnix japonica)* of different lines. The material used in this experiment was selected from three lines: high body weight line (HL), low body weight line (LL) of 5-week body weight and a random bred control line (C). There were significant differences among the lines in respect to body weight and carcass weight. Highest and lowest body weight and carcass weight were measured in HL and LL lines, respectively. While there were no significant differences among the lines in terms of relative proportion of breast, the sex affected significantly (P<0.01). No significant differences were found in terms of left wing, right wing, neck and back percent of body weight for lines and sexes. Also, there were found significant correlations among the carcass traits.

Keywords: *Japanese quails, Sex, Line, Body weight, Carcass traits*

Farklı Hatlardaki Japon Bıldırcınlarında *(Coturnix coturnix japonica)* Canlı Ağırlık ve Bazı Karkas Özelliklerinin Belirlenmesi

Özet

Bu araştırmada, farklı hatlardaki Japon bıldırcınlarında *(coturnix coturnix japonica)* canlı ağırlık ve bazı karkas özelliklerinin belirlenmesi amaçlanmıştır. Materyal olarak beşinci hafta canlı ağırlığa göre yüksek canlı ağırlık (HL) ve düşük canlı ağırlık (LL) yönünde seleksiyon uygulanan hatlar ile kontrol hattı (C) kullanılmıştır. Canlı ağırlık ve karkas ağırlığı bakımından hatlar arasında önemli farklılıklar saptanmıştır. En yüksek ve en düşük canlı ağırlık ve karkas ağırlığı sırasıyla HL ve LL hatlarında saptanmıştır. Oransal göğüs ağırlığı bakımından hatlar arasında önemli bir farklılık bulunmamasına karşın, cinsiyetler arası fark önemli çıkmıştır. Sol kanat, sağ kanat, boyun ve sırt ağırlıkları bakımından hatlar ve cinsiyetler arasında farklılık saptanmamıştır. Karkas özellikleri arasında da önemli korelâsyonlar bulunmuştur.

Anahtar sözcükler: *Japon bıldırcını, Cinsiyet, Hat, Canlı ağırlık, Karkas özellikleri*

INTRODUCTION

The Japanese quail is the smallest avian species farmed for egg and meat production [1,2] and it has also assumed world-wide importance as a laboratory animal. The advantages of Japanese quail, which have been widely used for biological and genetic studies [3,4] because it has a small body size, it is easily handled, and large number of birds can be kept in a limited space, depending on the day length, some females start laying at 35 days of age (average 40 days) and are in full production by 50 days of age and having a short generation interval such

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as its ability to produce 3 to 4 generations per year, make it an interesting laboratory animal. Because of this, they are an economic animal model for research. Coturnix eggs are characterized by a variety of color patterns, ranging from dark brown, blue, and white to buff, each heavily mottled with black, brown, and blue. Average weight of a coturnix egg is approximately 10 grams (about 8% of the hen's body weight) [5]. Some of the estimated genetic parameters for various traits of domestics Japanese quail were reported by several researchers [6-9]. Kawahara and Saito [6] reported the genetic parameters of different organs and body weights in the Japanese quails. Toelle et al.[7] estimated genetic and phenotypic relationships between body weight, carcass and some of the organ parameters. Minvielle et al.[9] reported the carcass characteristics of a heavy Japanese quail line under introgression with the roux gene. Many factors affect carcass characteristics, including age, sex, line, brooding temperature [10].

The experiment was conducted to evaluate the relationships between the line and carcass characteristics in both sexes in Japanese quails of different lines.

MATERIAL and METHODS

The material used in this research was selected for 11 generations from high (HL) or low (LL) body weight *Japanese quail* lines according to 5-week body weights and their random bred control line (C) which were bred in the Akdeniz University, Faculty of Agriculture in Turkey. The lines were established by applying individual selection with 10% and 40% selection intensity for males and females, respectively. Mating was random to minimize inbreeding.

The obtained eggs from 11 generations selected lines were individually weighed and incubated. Heatched quail chicks were wing-banded and individually weighed. Chicks were housed in temperature controlled battery brooders at a density of 150 cm²/quail. Temperature was 34°C in the first week of age and was reduced by 2°C/week until the birds were 4 weeks old, and then supplemental heating was disconnected. Length of 2.5 cm feeder was applied per each quail and two automatic drinkers were placed into each compartment. Quails were fed with a diet containing 11.9 MJ/kg metabolizable energy and 240 g crude protein/kg as ad libitium, while unlimited water was supplied until the end of the experiment. The lighting regime was 23 L:1 D. At 42 days of age and, total 20 quails (10 male and 10 female) were selected at random per each line, and starved for 12 h, but with water available. All quails were weighed individually with a digital balance with accuracy 0.01 g before slaughter. Quails were slaughtered at 6 weeks of age.

Quails were killed by cutting the jugular vein. Following a 4 min bleeding time, each quail was dipped in a water bath at 55°C for 2 min, and defeathered mechanically. Carcasses were eviscerated manually. Wings were removed by cutting through the shoulder joint at the proximal end of the humerus. The whole breast portion was obtained by cutting through the ribs, thereby separating the breast portion from the back. In order to reduce variation in the cutting procedure, all dissections were carried out by one operator [11].

Data were subjected to analysis of variance using the General Linear Model Procedure of SPSS [12] and significant differences among the means were tested by Duncan's Multiple Range Test. The Pearson's correlations were calculated among the traits. Following model was used for determination of the effect of line and sex on body weight, carcass weight and carcass parts of quails.

$$Y_{ijk} = \mu + L_i + S_j + e_{ijk}$$

Y_{ijk}: represents the body weight, carcass weight or % of carcass parts

L_i: effect of the i^{th} line
S_j: effect of the j^{th} sex
e_{ijk}: error term, ~N (0, σ^2_e)

RESULTS

The effects of line and sex on body weight, carcass weight, carcass yield, carcass parts ratios, and Pearson's correlation coefficients were presented in *Table 1, 2* and *3*.

DISCUSSION

In this study, the line had significant effect on body weight for both sexes (P<0.01), and females showed a higher body weight than the males, which was agreed with previous studies [2,6,7,9,13,14]. Also, the line and sex had significant effect on the carcass weight *(Table 1)*, and females had higher carcass weight than males. No significant line effect for carcass yield was found for both sexes. The sex had significant effect on the carcass yield (P<0.01), and the males had higher carcass yield (71.2%), than the females (63.1%), which supported the earlier studies results [9,13]. Also, Şahin et al.[15] reported that the carcass yield values were found as 75.47% for females and 73.47% for males.

The effects of line and sex on relative proportion of body parts were presented in *Table 2*. While there were no significant differences among the lines for both sexes in respect to the breast percent of body weight, the sex

Table 1. *The effects of line and sex on body weight, carcass weight and carcass yields of quails (±SD)*
Tablo 1. *Bıldırcınlarda hat ve cinsiyetin canlı ağırlık, karkas ağırlığı ve karkas randımanına etkileri (±SS)*

Traits	Sex	Lines			Average
		LL	HL	C	
Body weight (g)	F	139.17±12.29	255.65±35.12	199.37±25.08	198.06±54.45 ^{Y}
	M	110.00±16.18	211.99±20.51	167.86±20.31	163.28±46.30 ^{X}
	Average	124.59±20.48 ^{A}	233.28±35.85 ^{C}	183.62±27.47 ^{B}	180.67±53.09
Carcass weight (%)	F	87.02±6.06	166.08±22.48	122.31±13.39	125.14±36.13 ^{y}
	M	79.94±13.19	149.59±15.74	118.49±15.74	116.01±32.36 ^{x}
	Average	83.48±10.63 ^{A}	157.84±20.69 ^{C}	120.40±14.36 ^{B}	120.57±34.32
Carcass yield (%)	F	62.7±3.08	65.0±3.06	61.5±3.25	63.1±3.36 ^{X}
	M	72.5±2.69	70.5±1.26	70.5±1.87	71.2±2.18 ^{Y}
	Average	67.6±5.77	67.8±3.62	66.0±5.28	67.1±4.96

X,Y: *Means in a column with no common superscript differ significantly (P<0.01),* ***x,y:*** *Means in a column with no common superscript differ significantly (P<0.05),* ***A,B,C:*** *Means in a row with no common superscript differ significantly (P<0.01),* ***HL:*** *High Line,* ***LL:*** *Low Line,* ***C:*** *Control*

Table 2. *The effects of line and sex on ratios of different carcass parts of quails, % of body weight (±SD)*
Tablo 2. *Bıldırcınlarda hat ve cinsiyetin karkas parçalarına (canlı ağırlığın yüzdesi) etkileri (±SS)*

Parts (%)	Sex	Lines			Average
		LL	HL	C	
Breast (with bones)	F	37.4±1.6	38.1±1.3	37.9±1.8	37.8±1.5 ^{Y}
	M	36.4±1.8	36.1±2.4	37.2±2.0	36.5±2.1 ^{X}
	Average	36.9±1.7	37.1±2.1	37.5±1.9	37.2±1.9
Thigh (with bones)	F	21.9±0.7	22.3±0.7	22.7±0.7	22.3±0.7 ^{X}
	M	22.2±0.7	22.6±0.5	22.9±0.9	22.9±0.9 ^{Y}
	Average	22.1±0.7 ^{A}	22.9±0.9 ^{B}	22.8±0.8 ^{B}	22.6±0.9
Right Wing (with bones)	F	4.6±0.3	4.6±0.4	4.6±0.2	4.6±0.3
	M	4.6±0.4	4.6±0.5	4.7±0.4	4.6±0.4
	Average	4.6±0.3	4.6±0.5	4.6±0.3	4.6±0.4
Left Wing (with bones)	F	4.8±0.7	4.4±0.3	4.5±0.2	4.6±0.5
	M	4.6±0.3	4.3±0.4	4.4±0.4	4.4±0.4
	Average	4.7±0.5	4.4±0.4	4.5±0.4	4.5±0.4
Neck (with bones)	F	8.0±0.3	7.5±0.9	7.9±0.8	7.8±0.7
	M	7.6±0.8	7.8±1.2	7.7±0.5	7.7±0.8
	Average	7.8±0.6	7.6±1.0	7.8±0.7	7.8±0.8
Back (with bones)	F	23.2±1.4	23.1±1.3	22.1±1.2	22.8±1.4
	M	23.3±2.3	23.5±0.8	22.7±1.0	23.2±1.5
	Average	23.2±1.8	23.3±1.1	22.4±1.1	23.0±1.4

X,Y: *Means in a column with no common superscript differ significantly (P<0.01),* ***A,B,C:*** *Means in a row with no common superscript differ significantly (P<0.01),* ***a,b,c:*** *Means in a row with no common superscript differ significantly (P<0.05),* ***HL:*** *High Line,* ***LL:*** *Low Line,* ***C:*** *Control*

Table 3. *Pearson's correlations among the some carcass part traits in Japanese quails, % of body weight*
Tablo 3. *Japon bıldırcınlarında karkas parçaları (canlı ağırlığın yüzdesi) arasındaki Pearson korelasyon katsayıları*

Traits	Carcass weight	Breast	Thigh	Right wing	Left wing	Neck	Back
Body weight	0.968 **	0.305 *	0.159	-0.160	-0.315 *	-0.210	-0.111
Carcass weight		0.240	0.219	-0.188	-0.367 *	-0.220	-0.058
Breast			-0.383 *	-0.396 **	-0.277 *	-0.382 *	-0.625 **
Thigh				0.170	-0.070	-0.003	0.049
Right Wing					0.566 **	0.144	0.014
Left Wing						0.182	-0.077
Neck							-0.053

***** *P<0.05,* ****** *P<0.01*

affected significantly (P<0.01). Similarly, Vali et al.[16] reported that the females (41.55%) had significant higher breast percent of body weight than the males (38.98%). But, Yalçın et al.[11] reported that the difference between the females (30.6%) and males (32.1%) for breast percent of body weight was no significant. Also, Genchev et al.[17] and Akşit et al.[18] reported that the difference between the sexes in respect to breast percent of body weight was no significant.

The effects of the line and sex on thigh percent of body weight were found significant (P<0.01). The males showed higher thigh percent of body weight than the females. But, Vali et al.[16] reported that there was no significant difference between the sexes in terms of thigh percent of body weight. In contrast, Genchev et al.[17] reported significant difference between the sexes in respect to relative proportion of thigh weight (P<0.01).

In this study, line and sex had no significant effect on the left wing, right wing, neck and back percent of body weight. These results were consistent with another report [11].

Although positive correlations were determined between the body weight and carcass weight, breast percent, there were found negative correlations between the body weight and left wing percent. Again, there was found negative correlation between the breast percent and all other carcass percent traits of body weight (P<0.01, 0.05). No significant differences were found between thigh percent and other carcass traits except for breast percent of body weight. Vali et al.[16] reported negative phenotypic correlation between the breast percent and carcass yield (-0.082). Also, they reported negative correlations between the thigh percent and body weight (-0.279), carcass yield (-0.351) and breast percent (-0.157). As a result, while the line and sex had significant effect on the thigh weight, body weight and carcass weight, there were found significant differences between the sexes in respect to carcass yield, breast percent and thigh percent of body weight. No significantly negative or positive relationship was found between body weight and thigh percent of body weight. Especially, selection according to low body weight of 5-week had led to decrease in respect to body weight, carcass weight and thigh percent of body weight.

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