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Effects of Production System and Gender on Liveweight and Body Measurements in Pekin Ducks*

Mehmet SARI[1]✉, Muammer TİLKİ[1], Kadir ÖNK[2], Serpil IŞIK[1]

1. Kafkas University, Faculty of Veterinary Medicine, Department of Animal Science, Kars.
2. Kafkas University, Kars Vocational College, Department of Crop and Animal Production, Kars.

Abstract: The purposes of this study were to determine the effects of different production systems and gender on the liveweight and body measurements in Pekin ducks. The effect of production system on the liveweight was significant at the 2, 4, 6 and 8 weeks of age (P<0.05-P<0.001). The effect of production system on the body measurements were found to be significant (P<0.05-P<0.001), except for; a) the metatarsus and femur lengths at 2 weeks of age, b) the beak length at 4 weeks of age, c) the neck and trunk lengths, the beak and chest widths, the head and metatarsus diameters at 6 weeks of age, and d) the trunk and tibia lengths and the chest width at 8 weeks of age. The effect of gender on the liveweight was significant at the 6 and 8 weeks of ages (P<0.05-P<0.001). The effect of gender on the body measurements were not significant at 2 weeks of age and except for; a) the beak, metatarsus and femur lengths at 4 weeks of age, b) the trunk, wing and femur lengths, the chest girth and depth, the beak width at 6 weeks of age, and c) the wing, tibia and femur lengths, the chest depth and tibia diameter at 8 weeks of age (P<0.05-P<0.001). There was no interaction (P>0.05) between the production system and gender. The liveweight and body measurements were higher in deep litter bedding on the floor than those measured in the cage systems. The liveweight and body measurements were higher in males than those of females. Liveweight and body measurements increased with the age.

Key words: Body measurements, Duck, Gender, Liveweight, Production system.

Pekin Ördeklerinde Canlı Ağırlık ve Vücut Ölçülerine Üretim Sistemi ve Cinsiyetin Etkisi

Özet: Bu çalışma, Pekin ördeklerinde canlı ağırlık ve vücut ölçüleri üzerine üretim sistemi ve cinsiyetin etkisini belirlemek amacıyla yapıldı. Üretim sisteminin 2, 4, 6 ve 8. hafta canlı ağırlıkları üzerine etkisi önemli idi (P<0.05-P<0.001). Üretim sisteminin; a) 2 haftalık yaştaki metatarsus ve femur uzunluğu, b) 4 haftalık yaştaki gaga uzunluğu, c) 6 haftalık yaştaki boyun ve gövde uzunluğu, gaga ve göğüs genişliği, baş ve metatarsus çapı, ve d) 8 haftalık yaştaki gövde ve tibia uzunluğu ile göğüs genişliği hariç, etkisi önemli idi (P<0.05-P<0.001). Cinsiyetin; a) 2 haftalık yaştaki vücut ölçüleri, b) 4 haftalık yaştaki gaga, metatarsus ve femur uzunluğu, c) 6 haftalık yaştaki gövde, kanat ve femur uzunluğu, göğüs çevresi ve genişliği ile gaga genişliği, ve d) 8 haftalık yaştaki kanat, tibia ve femur uzunluğu, göğüs derinliği ve tibia çapı hariç, önemli etkisi tespit edildi (P<0.05-P<0.001). Derin altlıklı sistemde yetiştirilen ördeklerin, canlı ağırlık ve vücut ölçülerinin kafeste yetiştirilenlerden daha yüksek olduğu belirlendi. Erkek ördeklerin canlı ağırlık ve vücut ölçülerinin dişi ördeklerden daha yüksek olduğu bulundu. Canlı ağırlık ve vücut ölçüleri yaş ile birlikte arttı.

Anahtar kelimeler: Canlı ağırlık, Cinsiyet, Ördek, Üretim sistemi, Vücut ölçüleri.

✉ Mehmet SARI
Kafkas University, Veterinary Medicine Faculty, Department of Animal Science, Kars.
e-mail: msari_40@hotmail.com
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INTRODUCTION

Growth is a complicated progress in animals that is controlled by genetic and environmental factors. These factors are expressed with the species, breeds and genders. Body growth in livestock may be evaluated by using body components such as liveweight and body measurements (Saatci and Tilki, 2007). Growth is characterised by the increase in body weight. Development is characterised by alterations in the structure and shape of the body, its tissues and organs and their functions. In avian species, the effect of gender on growth becomes more pronounced with the advancing age (Akcapinar and Ozbeyaz, 1999). The waterfowl species vary in growth rates and generally males grow faster than females (Pingel, 1990).

Ducks are raised primarily for meat, egg and feathers. In general, they grow under an intensive system without swimming pool (Selcuk and Akyurt, 1986). But, there are three different production systems for duck. These are; open range, intensive and semi-intensive systems. The intensive system could either be the deep litter-bedded floor or the cage system. In the former system, similar to that of chicken, ducks are kept in an enclosed room on the litter with proper ventilation and aeration (Chandy, 2012). On the other hand, although we have sufficient data on duck breeding potential in Turkey, it is only known that there are very few small-scale duck farms with raising purposes (Testik, 1995). Ducks are easy to raise, resistant and less susceptible to many of the common poultry diseases, such as; leucosis, Marek's disease, infectious bronchitis and other respiratory disorders (Ensminger, 1992; Oluyemi and Ologbobo, 1997).

The present study was therefore aimed to determine different production systems and gender on the liveweight and body measurements in Pekin ducks.

MATERIALS and METHODS

The study was carried out at the Animal Breerding and Experimental Research Farm of Kafkas University, Kars-TR. Animal materials constituted from male (n=48) and female (n=48) Pekin ducks. Ducklings were wing-tagged after hatching and their genders were determined after day one. One-day-old ducklings were placed into brooder batteries with 24 h of light supply. All ducklings were kept under the same condition. One-day-old ducklings were transferred into shelter run, by both genders together. A total of 48 ducklings (24 male and 24 female) of similar weights were chosen and reared on deep bedded-floor pens. About 8-10 cm of wood shaving was used as bedding. The stocking density in the deep litter-bedded system was 4 ducklings per m^2. In total, 48 ducklings (24 male and 24 female) of similar weights were chosen and reared on cage system. Six standard cages (of 1 m x 2 m x 85 cm) were used with a stocking rate of 8 ducks per cage (Ensminger, 1992). After the second week, the duration of daily photoperiod consisted of 16 h light and 8 h darkness. The ambient temperature was 32-34 °C in the first week, thereafter it was decreased every week by about 3-5 °C a week to reach a minimum of 19-20 °C by about 4 weeks, when the ducklings were fully-grown. All ducklings were fed by a starter diet with 22 % crude protein and 3,000 kcal/kg metabolisable energy until ducklings were in 5 weeks old. Thereafter, until the age of 8 weeks, at which the experiment was ceaesed, they received a grower diet with 18 % crude protein and 3,100 kcal/kg (Table 1) metabolisable energy recommended by National Research Council for ducks (NRC, 1994). Food and water were offered *ad libitum*.

Ducklings were weighed fortnightly, from 2 weeks of age until the 8 weeks. Body measurements were taken just after each weighing. Herein, the beak length was defined as the length of upper beak rim, and the head length as the distance between the end of the beak and the end of the condoyle

occipital. In addition, the beak and head diameters and the beak width were measured using calipers. The neck length was measured between the first and the last cervical vertebrae and the trunk length between the first dorsal vertebra and the pygostyle. The tibia, metatarsus and femur lengths and the tibia and metatarsus diameters were measured on the left leg. The chest depth was measured between the first back vertebra and the sternum. The chest width was measured as the distance between the right and left glenoid cavities. The chest depth and width were quantified by using a digital display caliper with an accuracy of 0.01 mm. The chest girth was measured by body circumference at the tip of the pectus (hind breast). The wing length was established as the linear measurement from the caput humeri to the end of the third carpal digit (Szabone Willin, 1997). Data were analysed using least squares mixed model procedures of SPSS 11.5 software package. The traits measured on ducks were analysed by the fixed effects of production system (deep litter-bedded floor and cage systems) and gender of duck (male and female). The model used to analyse the growth characteristics and body measurements were:

$Y_{ijk} = \mu + a_i + b_j + (a + b)_{ij} + e_{ijk}$ where;

For growth characteristics and body measurements, Y: the characteristics, μ: the overall mean, a_i: the effect of production system (deep litter-bedded floor system and cage system), b_j: the effect of gender (male and female), $(a + b_{)ij}$: the interactive effect of production system and gender, e_{ijk}: the random residual.

RESULTS

The effects of production system and gender on the liveweight and body measurements at 2 weeks of age are presented in Table 2. The effects of production system on the liveweight and body measurements were found to be significant (P<0.05-P<0.001), except for the femur and metatarsus lengths at 2 weeks of age. The effects of genders on the liveweight and body measurements were found to be insignificant at 2 weeks of age. Generally, male gender and deep litter-floored ducks had higher liveweight and body measurements than those of female and cage systems. The liveweight and body measurements increased with advancing the age.

The means and standard errors of the effect of production system and gender on the liveweight and body measurements at 4 weeks of age are presented in Table 3. The effects of production system on the liveweight and body measurements were found to be significant (P<0.001), except for the beak length at 4 weeks of age. The effects of gender on the liveweight and body measurements were found to be insignificant (P>0.05), except the beak, metatarsus and femur lengths. Male gender and deep litter-floored ducks at 4 weeks of age had higher liveweight and body measurements than those of female and cage systems.

The effects of production system and gender on the liveweight and body measurements at 6 weeks of age are presented in Table 4. The effects of production system on the liveweight and body measurements were found to be significant (P<0.05-P<0.001), except for the neck and trunk lengths, the beak and chest widths, the head and metatarsus diameters at 6 weeks of age. The effects of genders on the liveweight and body measurements were found to be significant (P<0.05-P<0.01), except for the trunk, wing and femur lengths, the beak width, the chest girth and the chest depth.

The means and standard errors of the effect of production system and gender on the liveweight and body measurements at 8 weeks of age are presented in Table 5. The effects of production system on the liveweight and body measurements were found to be significant (P<0.05-P<0.001), except for the trunk and tibia lengths and the chest width at 8 weeks of age. The effects of genders on the liveweight and body measurements were found to be significant (P<0.05-P<0.01), except for the wing, tibia and femur lengths, the chest depth and the tibia diameter.

Table 1. The ingredient and chemical analyses of the concentrate fed during the starter and grower periods.
Tablo 1. Başlangıç ve büyüme döneminde verilen konsantre yemin kimyasal analizi ve içeriği.

Ingredient	**Starter (%)**	**Grower (%)**
Corn	54.00	65.00
Soybean	40.15	29.15
Vegetable oil	3.00	3.00
Lime stone	1.00	1.00
Dicalciumphosphate	1.00	1.00
Dl-Methionine	0.10	0.10
Salt	0.25	0.25
Vit.-Min. Premix[1]	0.50	0.50
Chemical analysis		
Dry matter	92.50	93.10
Crude protein	22.00	18.00
Metabolisable energy[2] (kcal/kg)	3015	3125
Etherextract (in DM)	3.75	3.35
Crudefibre (in DM)	3.70	4.40
Ash (in DM)	7.70	6.10

[1]Provided per kg concentrate: Vitamin A, 21,000 IU; Vitamin D_3, 4,200 IU; Vitamin E, 52.5 mg; Vitamin K_3, 4.38 mg; Vitamin B_1, 5.25 mg; Vitamin B_2, 12.25 mg; Vitamin B_6, 7 mg; Vitamin B_{12}, 0.03 mg; Folicacid, 1.75 mg; D-Biotin, 0.08 mg; Vitamin C, 87.5 mg; Niacin,70 mg; Cal-D-Pantothenat, 14 mg; Cholinechloride, 218.75 mg; Fe, 140 mg; Zn, 105 mg; Cu, 14 mg; Co, 0.35 mg; I, 1.75 mg; Se, 0.26 mg; Mn, 140 mg.
[2]Provided by calculation (NRC, 1994).

Table 2. The effects of production system and gender on the liveweights and body measurements at 2 weeks of age (Mean±SE).
Tablo 2. İki haftalık yaştaki canlı ağırlık ve vücut ölçüleri üzerine üretim sistemi ve cinsiyetin etkisi (Ortalama±Standart hata).

Traits	Production System			Gender			Interactive Effects				
							Cage		Deep Litter Floor		
	Cage System	Deep Litter Floor	P	Male	Female	P	Male	Female	Male	Female	P
Body weight (g)	321.53±11.77	382.71±7.14	***	362.83±10.21	341.42±10.96	NS	336.90±17.14	306.16±15.87	388.75±8.62	376.67±11.45	NS
Beak length (cm)	3.30±0.03	3.72±0.04	***	3.52±0.05	3.50±0.05	NS	3.30±0.03	3.30±0.04	3.74±0.06	3.70±0.07	NS
Head length (cm)	4.41±0.07	4.90±0.06	***	4.69±0.08	4.62±0.06	NS	4.44±0.12	4.38±0.09	4.95±0.09	4.85±0.06	NS
Neck length (cm)	7.13±0.14	10.23±0.15	***	8.83±0.27	8.52±0.27	NS	7.36±0.21	6.89±0.18	10.30±0.26	10.15±0.16	NS
Trunk length (cm)	13.87±0.19	17.49±0.18	***	15.72±0.32	15.65±0.33	NS	13.88±0.28	13.86±0.27	17.55±0.20	17.44±0.30	NS
Wing length (cm)	6.81±0.11	7.58±0.12	***	7.32±0.13	7.07±0.12	NS	6.94±0.17	6.69±0.15	7.71±0.17	7.45±0.17	NS
Chest girth (cm)	12.91±0.16	13.70±0.17	***	13.35±0.18	13.26±0.16	NS	12.93±0.23	12.9±0.22	13.78±0.27	13.62±0.22	NS
Metatarsus length (cm)	3.82±0.05	3.87±0.05	NS	3.87±0.05	3.82±0.05	NS	3.82±0.06	3.81±0.08	3.92±0.07	3.82±0.07	NS
Tibia length (cm)	5.19±0.07	6.81±0.14	***	6.14±0.15	5.86±0.16	NS	5.27±0.11	5.10±0.09	7.00±0.15	6.61±0.23	NS
Femur length (cm)	4.23±0.09	4.22±0.05	NS	4.24±0.07	4.20±0.08	NS	4.24±0.12	4.21±0.14	4.24±0.09	4.19±0.06	NS
Beak width (mm)	15.46±0.17	16.41±0.16	***	16.06±0.18	15.81±0.17	NS	15.66±0.23	15.26±0.25	16.46±0.27	16.36±0.16	NS
Beak diameter (mm)	14.50±0.17	15.18±0.15	**	14.92±0.17	14.77±0.16	NS	14.56±0.26	14.45±0.22	15.28±0.20	15.08±0.22	NS
Head diameter (mm)	26.05±0.25	28.50±0.27	***	27.44±0.33	27.12±0.29	NS	26.08±0.32	26.02±0.39	28.79±0.44	28.21±0.31	NS
Chest depth (mm)	43.15±0.69	50.49±0.50	***	47.31±0.72	46.32±0.88	NS	44.44±1.02	41.86±0.87	50.18±0.61	50.79±0.81	NS
Chest width (mm)	43.65±1.01	48.75±0.51	***	46.76±0.95	45.64±0.79	NS	44.47±1.73	42.82±1.05	49.06±0.53	48.45±0.88	NS
Metatarsus diameter (mm)	7.52±0.15	9.66±0.11	***	8.59±0.19	8.60±0.22	NS	7.64±0.22	7.40±0.20	9.53±0.15	9.79±0.16	NS
Tibia diameter (mm)	5.38±0.16	6.47±0.10	***	6.04±0.17	5.80±0.14	NS	5.59±0.26	5.17±0.19	6.50±0.17	6.44±0.11	NS

NS (Not Significant): P>0.05, **: P<0.01, ***: P<0.001

Table 3. The effects of production system and gender on the liveweights and body measurements at 4 weeks of age (Mean±SE).
Tablo 3. Dört haftalık yaştaki canlı ağırlık ve vücut ölçüleri üzerine üretim sistemi ve cinsiyetin etkisi (Ortalama±Standart hata).

Traits	Production System			Gender			Interactive Effects				
							Cage		Deep Litter Floor		
	Cage System	Deep Litter Floor	P	Male	Female	P	Male	Female	Male	Female	P
Body weight (g)	973.78±33.94	1131.00±21.91	***	1085.00±28.10	1019.00±32.54	NS	1024.00±46.30	923.25±48.41	1146.00±27.58	1115.00±34.37	NS
Beak length (cm)	4.56±0.05	4.64±0.05	NS	4.69±0.05	4.51±0.05	**	4.63±0.06	4.49±0.08	4.75±0.07	4.52±0.05	NS
Head length (cm)	5.28±0.12	7.20±0.08	***	6.36±0.18	6.13±0.17	NS	5.38±0.19	5.19±0.16	7.34±0.10	7.07±0.11	NS
Neck length (cm)	13.89±0.17	15.85±0.12	***	14.96±0.19	14.78±0.22	NS	14.05±0.20	13.72±0.28	15.87±0.18	15.83±0.16	NS
Trunk length (cm)	20.99±0.34	25.03±0.26	***	23.39±0.43	22.63±0.40	NS	21.33±0.49	20.66±0.46	25.45±0.37	24.60±0.34	NS
Wing length (cm)	12.51±0.30	17.76±0.33	***	15.45±0.49	14.83±0.50	NS	12.84±0.41	12.18±0.44	18.05±0.46	17.47±0.48	NS
Chest girth (cm)	18.67±0.32	23.00±0.23	***	21.13±0.38	20.54±0.46	NS	19.23±0.38	18.12±0.49	23.04±0.35	22.96±0.31	NS
Metatarsus length (cm)	4.67±0.07	5.25±0.04	***	5.08±0.06	4.84±0.08	**	4.80±0.09	4.53±0.10	5.35±0.05	5.15±0.07	NS
Tibia length (cm)	8.19±0.11	9.37±0.14	***	8.92±0.16	8.64±0.14	NS	8.31±0.14	8.07±0.18	9.53±0.23	9.21±0.16	NS
Femur length (cm)	5.70±0.09	6.58±0.09	***	6.36±0.11	5.92±0.10	***	5.89±0.12	5.51±0.14	6.83±0.14	6.33±0.09	NS
Beak width (mm)	21.15±0.24	24.72±0.25	***	23.20±0.31	22.66±0.39	NS	21.53±0.32	20.76±0.34	24.88±0.21	24.56±0.45	NS
Beak diameter (mm)	18.07±0.23	21.58±0.27	***	20.01±0.36	19.64±0.35	NS	18.17±0.26	17.97±0.39	21.85±0.41	21.31±0.34	NS
Head diameter (mm)	35.72±0.39	38.34±0.29	***	37.32±0.34	36.74±0.44	NS	35.92±0.47	35.52±0.65	38.72±0.29	37.97±0.49	NS
Chest depth (mm)	53.88±1.11	66.87±0.61	***	60.91±1.25	59.83±1.36	NS	54.96±1.57	52.79±1.59	66.86±0.92	66.87±0.84	NS
Chest width (mm)	57.36±1.51	69.92±0.58	***	64.47±1.42	62.81±1.49	NS	58.52±2.17	56.20±1.05	70.43±0.70	69.42±0.94	NS
Metatarsus diameter (mm)	11.11±0.18	13.04±0.14	***	12.19±0.21	11.96±0.22	NS	11.32±0.26	10.91±0.26	13.07±0.20	13.00±0.21	NS
Tibia diameter (mm)	8.69±0.25	10.20±0.10	***	9.64±0.21	9.25±0.22	NS	8.93±0.34	8.46±0.36	10.35±0.12	10.05±0.16	NS

NS (Not Significant): P>0.05, **: P<0.01, ***: P<0.001

Table 4. The effects of production system and gender on the liveweights and body measurements at 6 weeks of age (Mean±SE).
Tablo 4. Altı haftalık yaştaki canlı ağırlık ve vücut ölçüleri üzerine üretim sistemi ve cinsiyetin etkisi (Ortalama±Standart hata).

Traits	Production System			Gender			Interactive Effects				
							Cage		Deep Litter Floor		
	Cage System	Deep Litter Floor	P	Male	Female	P	Male	Female	Male	Female	P
Body weight (g)	1750.00±46.85	1859.00±30.13	*	1866.00±36.28	1743.00±41.88	*	1823.00±61.26	1677.00±68.97	1909.00±38.24	1809.00±45.09	NS
Beak length (cm)	5.61±0.04	6.17±0.02	***	5.95±0.05	5.83±0.06	*	5.70±0.07	5.52±0.05	6.20±0.02	6.15±0.04	NS
Head length (cm)	7.38±0.06	8.87±0.09	***	8.24±0.13	8.00±0.13	*	7.45±0.08	7.31±0.07	9.03±0.09	8.70±0.16	NS
Neck length (cm)	20.61±0.23	20.97±0.17	NS	21.17±0.16	20.41±0.22	**	21.18±0.25	20.05±0.36	21.17±0.20	20.77±0.26	NS
Trunk length (cm)	28.48±0.28	28.34±0.29	NS	28.77±0.18	28.04±0.35	NS	28.69±0.31	28.26±0.46	28.85±0.21	27.82±0.53	NS
Wing length (cm)	26.11±0.61	29.83±0.27	***	28.29±0.52	27.65±0.56	NS	26.57±0.85	25.65±0.88	30.02±0.39	29.65±0.38	NS
Chest girth (cm)	25.10±0.37	28.00±0.48	***	27.07±0.43	26.03±0.51	NS	25.80±0.54	24.40±0.47	28.34±0.57	27.68±0.78	NS
Metatarsus length (cm)	5.34±0.03	6.05±0.06	***	5.79±0.07	5.59±0.06	**	5.40±0.05	5.28±0.04	6.19±0.07	5.91±0.08	NS
Tibia length (cm)	11.01±0.12	11.48±0.07	***	11.38±0.09	11.11±0.11	*	11.17±0.14	10.85±0.19	11.60±0.10	11.37±0.11	NS
Femur length (cm)	7.03±0.06	7.82±0.09	***	7.51±0.10	7.35±0.09	NS	7.09±0.10	6.98±0.08	7.93±0.12	7.72±0.14	NS
Beak width (mm)	24.80±0.23	24.89±0.16	NS	25.07±0.23	24.62±0.16	NS	25.06±0.38	24.54±0.25	25.08±0.26	24.71±0.19	NS
Beak diameter (mm)	20.60±0.21	27.06±0.27	***	24.17±0.53	23.50±0.52	*	20.76±0.25	20.44±0.33	27.58±0.31	26.55±0.43	NS
Head diameter (mm)	42.74±0.30	43.33±0.49	NS	43.85±0.46	42.21±0.30	**	43.44±0.36	42.03±0.43	44.26±0.86	42.40±0.43	NS
Chest depth (mm)	63.03±0.72	78.67±0.98	***	71.54±1.53	70.17±1.32	NS	63.20±1.04	62.87±1.03	79.88±1.55	77.47±1.19	NS
Chest width (mm)	88.91±1.21	89.73±1.57	NS	91.65±1.01	86.99±1.64	*	90.44±1.45	87.38±1.91	92.85±1.40	86.60±2.70	NS
Metatarsus diameter (mm)	13.30±0.16	13.51±0.24	NS	13.69±0.25	13.12±0.14	*	13.53±0.28	13.07±0.17	13.86±0.42	13.16±0.22	NS
Tibia diameter (mm)	9.58±0.14	10.76±0.12	***	10.38±0.16	9.96±0.15	*	9.73±0.20	9.42±0.19	11.02±0.16	10.51±0.17	NS

NS (Not Significant): P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001

Table 5. The effects of production system and gender on the liveweights and body measurements at 8 weeks of age (Mean±SE).
Tablo 5. Sekiz haftalık yaştaki canlı ağırlık ve vücut ölçüleri üzerine üretim sistemi ve cinsiyetin etkisi (Ortalama±Standart hata).

Traits	Production System			Sex			Interactive Effects				
							Cage		Deep Litter Floor		
	Cage System	Deep Litter Floor	P	Male	Female	P	Male	Female	Male	Female	P
Body weight (g)	2401.00±48.73	2530.00±36.29	*	2568.00±36.45	2364.00±45.78	***	2489.00±55.81	2313.00±76.89	2647.00±42.14	2414.00±49.31	NS
Beak length (cm)	6.30±0.05	6.88±0.06	***	6.72±0.07	6.47±0.06	***	6.40±0.07	6.20±0.05	7.03±0.07	6.74±0.07	NS
Head length (cm)	7.93±0.09	9.08±0.07	***	8.70±0.12	8.31±0.14	***	8.08±0.13	7.78±0.12	9.33±0.07	8.84±0.09	NS
Neck length (cm)	22.35±0.23	23.72±0.23	***	23.41±0.25	22.66±0.23	**	22.72±0.37	21.97±0.26	24.09±0.29	23.34±0.34	NS
Trunk length (cm)	31.76±0.28	31.53±0.54	NS	32.59±0.47	30.70±0.34	**	32.42±0.36	31.10±0.40	32.76±0.87	30.30±0.55	NS
Wing length (cm)	32.18±0.24	33.17±0.27	**	32.94±0.27	32.41±0.25	NS	32.37±0.36	32.00±0.32	33.51±0.38	32.82±0.37	NS
Chest girth (cm)	30.99±0.32	33.21±0.47	***	32.73±0.48	31.47±0.36	*	31.62±0.32	30.37±0.53	33.85±0.85	32.56±0.36	NS
Metatarsus length (cm)	5.48±0.03	6.42±0.05	***	6.02±0.08	5.89±0.08	*	5.51±0.04	5.45±0.05	6.52±0.06	6.33±0.06	NS
Tibia length (cm)	11.67±0.06	11.83±0.08	NS	11.81±0.06	11.69±0.08	NS	11.75±0.06	11.59±0.09	11.87±0.11	11.80±0.13	NS
Femur length (cm)	7.29±0.04	8.59±0.05	***	8.00±0.11	7.88±0.10	NS	7.31±0.05	7.27±0.06	8.69±0.06	8.49±0.08	NS
Beak width (mm)	26.27±0.18	27.18±0.17	***	27.17±0.20	26.28±0.15	***	26.63±0.27	25.91±0.21	27.72±0.25	26.64±0.18	NS
Beak diameter (mm)	22.44±0.30	30.32±0.24	***	26.88±0.59	25.87±0.66	**	23.28±0.47	21.60±0.29	30.48±0.31	30.15±0.38	NS
Head diameter (mm)	44.67±0.29	46.31±0.30	***	46.18±0.33	44.80±0.27	***	44.98±0.41	44.35±0.41	47.39±0.40	45.24±0.34	NS
Chest depth (mm)	87.84±1.74	93.88±0.95	**	91.28±1.84	90.43±0.96	NS	87.94±3.32	87.73±1.15	94.62±1.34	93.13±1.36	NS
Chest width (mm)	101.38±0.92	101.41±0.70	NS	103.34±0.78	99.45±0.76	***	103.51±1.29	99.24±1.19	103.17±0.91	99.65±0.95	NS
Metatarsus diameter (mm)	13.56±0.12	13.90±0.12	*	14.01±0.10	13.45±0.13	***	13.87±0.15	13.25±0.16	14.15±0.13	13.65±0.18	NS
Tibia diameter (mm)	11.13±0.11	11.63±0.21	*	11.58±0.14	11.19±0.16	NS	11.38±0.18	10.87±0.10	11.77±0.29	11.50±0.30	NS

NS (Not Significant): P>0.05, *: P<0.05, **: P<0.01, ***: P<0.001

DISCUSSION

Defined measurements of body parts and the relationship between these traits and the liveweight were demonstrated in Pekin ducks. Liveweight showed an increasing trend with the advancing age. Male ducks exhibited markedly higher live weights than those in female ducks at the 6 and 8 weeks of age ($P<0.01$). The rapid growth of liveweights was observed from the week 2 to 8, and the 8 weeks weights were 2568 and 2364 g in males and females, respectively. The liveweights of female and male ducks determined at 4 weeks herein were lower than the values reported by Isguzar et al. (2002), and were similar to the value reported by Larzul et al. (2004). The liveweights of female and male ducks determined at the 8 weeks studied were higher than those reported by Isguzar et al. (2002) and Omojola (2007) at the 8 weeks of age. The liveweights of ducks reared in deep litter-bedded floor system at the 2 and 8 weeks of age were markedly higher than those in the cage system. The liveweights of ducks reared in deep litter floor and the cage systems at the 6 weeks herein were lower than the values reported by Erisir et al. (2009) and Onbasilar et al. (2011). The liveweights of ducks reared in deep litter floor and the cage systems at the 2, 4 and 6 weeks of age were higher than those reported by Arslan et al. (2003) in native Turkish ducks raised in fattening platform, but these values were lower than those reported by Lacin and Aras (2008) as for; i) duck-fish integration group (IG), ii) non-integrated group (NIG) as duck group raised only in without fish ponds and iii) poultry house condition group (PHCG) raised in duck house condition without fish and pond.

Body measurements showed an increasing trend with the advancing age. Generally, deep litter-floored ducks had higher body measurements than that of cage systems. The head length, beak length, neck length, tibia length, metatarsus length and beak diameter at the 2, 4 and 6 weeks of age studied was lower than those reported by Onbasilar et al. (2011), but the head diameter herein was higher than those reported by the same workers at 2, 4 and 6 weeks of age. The metatarsus and femur lengths for males at the 8 weeks of age were lower than those reported by Raji et al. (2009) for Muscovy ducks, but the metatarsus, femur, beak and wing lengths at the 8 weeks of age for females herein were higher than those reported by the same workers for Muscovy ducks. Males grew faster than females in the 8 weeks based on the trunk length and this measurement also showed growth with the age. The results of trunk length at the 6 weeks of age studied were higher than those reported by Kokoszynski and Bernacki (2011) at the 7 weeks of age in Pekin ducks.

The chest depth, girth and width are the most critical characteristics based on the reflection of growth (Saatci and Tilki, 2007). Production and gender factors generated a marked variation in the chest depth, girth and width in ducks. Herein, the enlargements in chest depth, girth and width were extremely intensive until the 8 weeks of age. The chest depth and width at the 2, 4 and 6 weeks of age were lower than those reported by Onbasilar et al. (2011). The chest girth and chest width at the 8 weeks of age for males were lower than those reported by Raji et al. (2009) for Muscovy ducks.

The present data demonstrated that the production system and gender influenced most of the traits studied in Pekin ducks. Generally, the values from deep litter-floored ducks were higher than those from the cage system and also the values for male ducks were higher than those for female ducks. Some body measurements could be obtained easily. The study may also allow for making comparison of the results from Pekin ducks with those of other duck breeds.

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