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Growth Performance and Age Regression analysis of indigenous Sudanese Large Baladi Chicken: An Experimental Study

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Abstract

Sudanese Large Baladi chicken is highly adapted to the local environment and it plays an essential role in the supply of meat and eggs for the poor households of the rural communities in Sudan. This type ofchicken is like any other chicken in the tropics, is inherently slow maturing, low growth performance and egg production. Therefore, its genetic improvement is essential to increase its productivity in order to support the smallholder poultry producers in the country. The present study was therefore carried out to examine the association between the body weight of Large Baladi chicken and their age at different stages of growth. Data on the body weights were collected from experiment conducted at the Faculty of Animal Production, University of Khartoum, Sudan. The data were analyzed applying simple linear regression model utilizing Statistical packages for social sciences (SPSS) computer software program version 20. From the results, the age of the chicken was found to be significantly ($p<0.001$) associated with their body weight. Furthermore, the agewas found to be significantly ($p<0.001$) predicted the body weight.

Keywords: Growth,Regression,Genetic improvement, Sudanese Large Baladi chicken.

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1. Introduction

Indigenous chickens contribute for meat and egg supply and represent an essential source of income for many poor households in rural communities. However, they have been reported with significantly ($p<0.05$) higher weights in all period except between 2 – 4 weeks of age **(Saxenaand Stephan, 2014).** In developed countries, characteristics of chicken production have changed drastically over the last decades, while in developing countries less effort has been paid to improve the indigenous chicken. Genetic selection makes a major contribution for improvement of performance**(Havensteinetal.,2003).**Although indigenous chickens are considered as poor producers they comprise about 80% of the national flock in Africa and Asia **(Teklewold*et al.*, 2006).**

Sudanese chickens are classified into three types, Large Baladi,Bared neck and Betwel**(Desai,1962).**For a breeder selection for body weight is necessary for genetic improvement because body weight is easy to measure as it is correlated with other several traits **(Abd El-Ghany2005, Kosba*et a*l., 2006).**
This study aims at finding relationships between body weight (dependent) and age (independent) that helps in selection for body weight at a particular time.

2. Material and Method

2.1 Experimental flock

A total of 162 pullets and 54 cockerels' Sudanese large Baladi chicken type were brought from El Gezira state (central Sudan) from El Butana area. The flockswere kept for one month adaptation period, they were subjected to the same managerial and given vitamins, minerals and antibiotic against parasites.

2.2 Housing

Poultry house used to house the flock dimensions were18 × 36 × 9 meter(width lengthand height) experiment poultry house located at the Faculty of Animal Production, University of Khartoum was used to house the flock. For breeding purpose, the house was partitioned into small pens partitions of 40 × 60 × 100cm dimensions for width, length and height.

2.3 Mating system

For mating system each 3 pullets were randomly distributed to one cockerel in a rotational mating system on daily basis within separated breeding pens as cockerel was shifted from pen to pen day after day up to three months.

2.4 Egg incubation and hatching

Eggs were collected and weighed individually using sensitive balance with capacity of 2200 g. The eggs were stored in a cold room at 15 $^{\circ}$C and 85% humidity for ten days, then fumigation was done as well as candling after 18 days and finally hatching on the day 21 of incubation.

2.5 Chicks grading and brooding

After hatching chicks were graded, identified by using leg bands and then transferred to chick brooding house made of bricks supported with netting doors and windows for ventilation, brooding house dimensions were 2 × 3 × 4 meter (width, length and height) supported with lighting system using electric bulbs. Chicks stayed in broodinghouse until twelve week of age.

2.6 Chicks feeding and watering

Standard commercial diets of 23.09% CP and 3124 Kcal energy was used as starter for chicks at age of one day old up to four weeks and 21% CP and energy 3165 Kcal was used as grower for chicks at 5 up to 12 weeks of age fed ad libitum .The birds had free access to water. Chicks were wing-banded and weighed at the first day ofhatching and thereafter their body weights were recorded individually at the end of each two weeks using sensitive balance.

2.7Statistical analyses

The data were analyzed using the statistical package for social sciences (SPSS 20). The association between body weights and age at different growthstages was investigated using simple linear regression model.

3. Results and discussion

The result of the regression analysis found that the model, association between the body weightas dependent variableandthe age as independent variablewas significant,$F(1, 5) = 996.598, p < 0.001$ (Table1) and the age significantly predicted body weight ($t = 31.569$, $p = 0.001$) (Table2). The predictive model was: The body weight =6.557 + 0.827*age, adjusted R square (determination coefficient) =

(0.978). These findings agree with what was stated by **Petrusand others (2019)** who studied relationship of age and live weight in female Boschveld chicken in Namibia and reported that the age of bird explained 98.4% of the variation in body weight of the chicken and there was strong positive correlation between age and body weight ($r = 0.99$, $p<0.001$) up to 18 week of age. Also similar study in Nigerian indigenous cock and hens showed that body weight = 2223.73 at twenty weeks of age and body weight was regressed on body measurements by forward as ageincrease **(Akpan*et al.,* 2022).**

Figure1 shows chick's body weight averages by sexes from hatching date up to 12 weeks of age. From the figure 1 it's clearthat both sexes, male and female chicks growalike from day-old age up to week 4 and thereafter, the male chicks grow heavier than the female counterpart to the end of twelve weeks of age. These findings agreed with results found in Thailand native chicken which revealed that males had significant ($p<0.05$) high weights than females from 4 – 10 weeks of age and differences increase over generations **(Chomchuen*et al.,* 2022).**

Figure 2summarizes the mean averages of overall weights of chick's weights from hatching age (one day-old) up to twelve weeks of age, which showscontinuous increase in the weights with increaseage in weeks.This findings were less than those reported by **Elsheik(2007)** who found body weight 29.24 g at hatch,147.126g at 4 weeks and 393.51 g at 8 weeks in large Baladi chicken may be due to some managerial aspects. Also **Deng (2010)** reported body weights of 24, 51, 109, 189 and 271g at hatch, 2, 4, 6and 8 weeks in Sudanese large Baladi chicken and these findings disagreed with results found in two native chicken in Indian kadaknath and Aseel chicken which indicated to be highly significant ($p = 0.001$) at 4, 8, and 12 weeks of age which recorded 51.8, 125 and 275 kg in Kadakanath while in Aseel were 65.1, 154 and 393 kg under deep management system **(Chatterjee *et al.,* 2007).** These variation in body weights could be referred to different management system.

Table (1) Means square for regressionand the corresponding significant level

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	78050.132	1	78050.132	996.598	.000[b]
	Residual	391.583	5	78.317		
	Total	78441.714	6			

Table (2)Regression slopet value and the corresponding significance level.

* Table (2Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.557	5.837		1.123	.312
	Age	.827	.026	.998	31.569	.000

*Adjusted R square = 0.978

3.3 Chicks body weight averages by sexes

Table 3 and figure 1 bellow show averages of chicks body weight by sexesfrom zero age up to twelve week of age, which showed no differences in both sexes at zero age while from the second week start to show slight differences and the differences continues to increase upward.

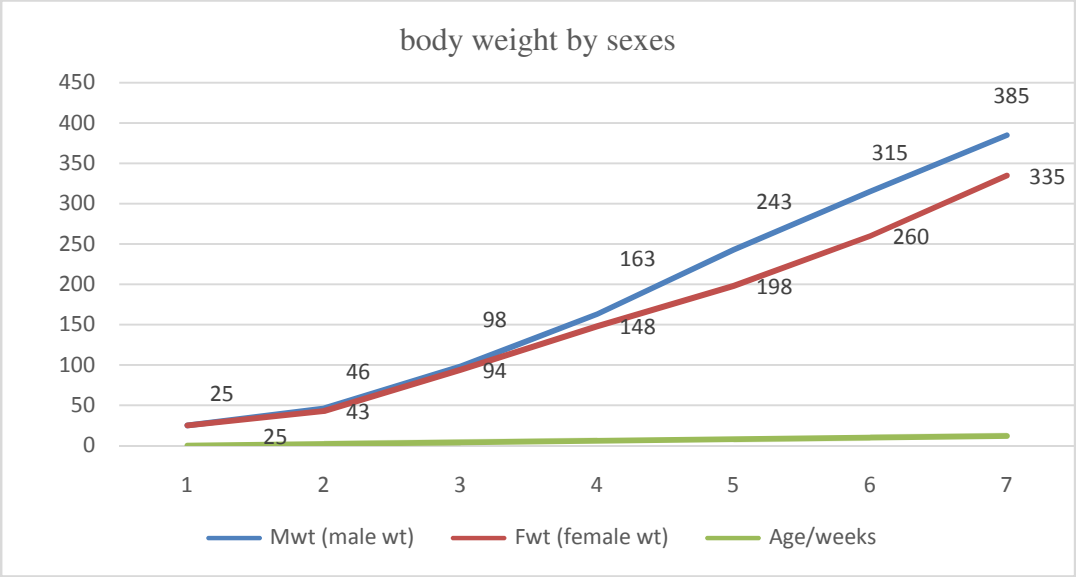
Table (3) Chicks body weight averages by sexes

Age/weeks	Fwt. (female wt.)	Mwt. (male wt.)
0	25	25
2	43	46
4	94	98
6	148	163
8	198	243
10	260	315
12	335	385

*Fwt=female weight

*Mwt=male weight

Figure (1) Chick's body weight averages by sexes



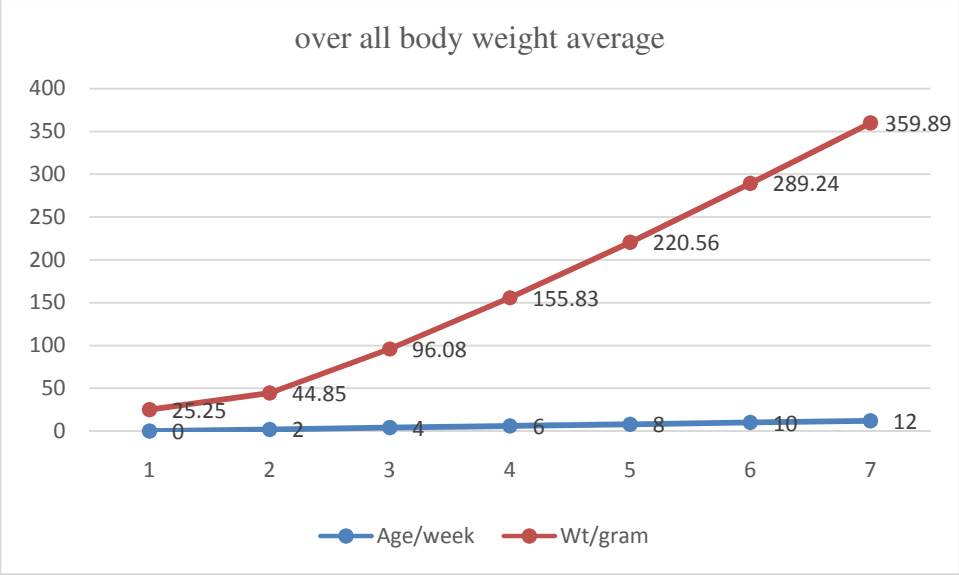
3.4 Over all body weight averages

Table 4 and figure 2 bellow show averages of overall weights of chicks from zero age to twelve week of age, which revealedcontinues increase in weight with increase of age.

Table (4) over all weight averages

Age/week	Wt./gram
0	25.25
2	44.85
4	96.08
6	155.83
8	220.56
10	289.24
12	359.89

Figure (2) Over all body weight (average)



Conclusion

The study revealed that the regression analysis of the model association between body weight and age was highly significant.($p< 0.001$). The age was found to be significant ($p< 0.001$)predicted body weight. Both sexes' chicks were found to be growing alike from day-old to four weeks of age and thereafter the male chicks grow heavier than their female counterpart up to the end of twelve weeks. It can be concluded that age is an important factor in determining the body weight of indigenous Sudanese large Baladi chicken.

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