

Effect of Strain and Sex on Carcass Characteristics of Three Commercial Broilers Reared in Deep Litter System in the Derived Savannah Area of Nigeria

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Abstract: The effect of strain and sex on the carcass characteristic of three commercial broiler strains reared in deep litter was investigated. A total of 90 birds from Anak, WadiRoss and Ross strains (30 individual birds per strain and 15 individual per sex) were randomly taken as a representative sample and were slaughtered and carcass dissected manually. The parameters for all breeds and sexes studied included the weights of live body, carcass, shank, breast, drumstick and gizzard. Regarding to all parameters collected, strain and sex were found to be significantly ($P < 0.05$) different for all carcass characteristics. Anak and WadiRoss male strains had significantly ($P < 0.05$) higher values of live body weight, shank, drumstick and gizzard than their female groups. This was in contrary measured in Ross male strain that showed lower values of live body weight, carcass, breast drumstick and gizzard than their female groups. The interaction between strain and sex had no significant effect. Regardless the sex, the high significant measurements of live body weight and breast muscles was recorded for Anak, WadiRoss and Ross strains. Regardless the strain, the males have the highest live body weight for Anak and WadiRoss. The only one high female body weight is recorded for Ross strain compared with their male groups.

Key words: Strains • sex • carcass • derived savannah

INTRODUCTION

In Nigeria today, the persistence short supply of protein for populace is the main problem which was compounded by the accelerated increase in human population and thus created pressure on every form of food supply. The expansion of Nigeria commercial poultry production has great potentials in improving animal protein status of the Nigerian populace [1]. Broiler meat production is raised primarily for human consumption within shortest period of time profitability. Until recently most birds were sold whole, but there has been a dramatic increase in the production of birds being grown for portioning and further processing [2].

The greatest scientific and technological development of poultry industry in the last years demanded the evaluation of different commercial broiler strains, as well as different handling technique, in order to improve production efficiency and help in decision-making. In a world scale, there is a great tendency for increasing chicken meat consumption [3]. Studies report

that sexes influence the growth rates; females show higher breast proportion than males, but lower leg and thigh proportion [4]. [5] reported that the higher body, carcass and breast weights in broilers Ross strain. The higher abdominal fat deposition limited the age in female which can be commercialized [6]. Sex differences are known to influence carcass and abdominal fat deposition [7-9]. The success of poultry meat production has been strongly related to improvements in growth and carcass yield, mainly by increasing breast proportion and reducing abdominal fat [10]. Carcass composition can be modified by age, sex, handling and manipulation and it is known that fat deposit increase with age. This is simply related to maturity and happens in the majority of the bird strains [6]. The rapid growth of modern broiler is now accompanied by increased carcass and abdominal fat that are of concern to the consumer and the processor [11]. The marketing of poultry has been greatly diversified with a significant increase in cut-up (parts) and processed products [12]. Demand for high quality cut-up (parts) and further processed convenience foods have driven the

poultry industry to change its marketing practices [13]. Today, with the vast majority of poultry being marketed in this manner, yield of high value items such as breasts and broiler filets have become critical to processors [14].

The continuing effort made by breeders to produce broiler chickens with improved production traits necessitates continuing evaluation of the various broiler strains. Based on these strains and sex characteristics, this study was performed aiming to determine the effect of strains and sex on carcass composition in three commercial broiler strains reared in deep litter system.

MATERIALS AND METHODS

Site of study: The study was conducted at the Teaching and Research Farm of Ladoko Akintola University of Technology, Ogbomoso. It is located on longitude 4°15' East of Greenwich Meridian and Latitude 8° 7' North of the equator. It is about 145km Northeast of Ibadan, the capital of Oyo State. The altitude is between 300 and 600 meters above sea level and the mean annual temperature of 27°C with mean rainfall of 1247mm [15].

Experimental birds: A total bird of 300 day-old chick of three commercial broiler strains were used and purchased at Obasanjo's Farm in Abeokuta with all necessary vaccination administered. Each strain was identified by tagging differently and also given a separate pen in an environmentally controlled brooder house with a floor covered with wood shavings which was kept dry throughout the experimental period by replacing the spoiled litter when required.

Feed: Birds were fed *ad libitum* on a broiler starter diet (containing 24%CP and 2900kcal/Kg/ME) from hatching to 5th week of age followed by a finisher diet (21%CP and 2800kcal/Kg/ME) to 12th week of age. Water and feed were available *ad libitum* to the birds.

Data collection: At the end of experiment (12 weeks) a male and a female of each replicate (15 birds/strain) were selected randomly from each of the three strains, birds were starved of feed over night and individually weighed to obtain starved live body weight. The birds were stunned and bled by severing the blood vessels and nerve trunks at the roof of the mouth with a sticking knife. Thereafter, the birds were scalded, depumed and eviscerated through a slit made between the end of the keel bone and rectum. The dressed weight of the carcass was recorded. The carcass was separated into breast,

thighs, drumstick, back, wing, thigh, neck, head and giblets (liver, heart, gizzard, spleen and proventriculus).

The weights of these parts were expressed as grams of starved live weight, the entire length of the intestine and colon-rectum of each carcass were measured in cm.

Statistical analysis: The data collected were subjected to two-way analysis of variance using the general linear model of [16].

$$Y_{ijk} = \mu + S_i + A_j + (SA)_{ij} + E_{ijk}$$

Where

Y_{ijk} = The individual measurement on each bird

μ = The overall mean

S_i = Effect of the i^{th} strain

A_j = Effect of the j^{th} sex

$(SA)_{ij}$ = Interaction effect of strain and sex

E_{ijk} = The random error

RESULTS AND DISCUSSION

The effect of strain and sex on carcass characteristics is shown in Table 1. Sex and strain interaction was observed for 12 weeks live body weight with significant ($P < 0.05$) effect on the carcass. The Ross strain had a lower growth rate of 12 week of age, regardless of sex when compared with the Anak and WadiRoss strains.

Similar results are obtained by [8, 17] who reported significant difference in live body weight at 8 week among five sexed broiler strains of combined sex raised for 49day post hatch respectively. While contradicts [18] who reported that no significant difference in live body weight of both sexes of broiler raised. Also, [19] reported a significant difference on live body weight for male but not for female broiler chickens.

Male birds from Ross strain had higher carcass weight at 12 week of age than WadiRoss and Anak respective males. These results contradicts the findings by [20] who reported a change in live body weight occurred among female but not for male birds. Female birds for WadiRoss and Ross but not Anak, had higher carcass weight at 12 weeks of age than their respective males, this was in agreement with estimates reported by [4] who noticed a significant difference ($P < 0.05$) in carcass weight between sex and strains of broiler.

The female broilers in WadiRoss and Ross strain had higher breast weight, than the male broilers. This result was in agreement with [8] who found significant differences between sexes but females had greater breast

Table 1: The effect of strain and sex on carcass characteristic of three commercial broiler reared in deep litter

Strain	Sex	Live	Carcass					
		weight (g)	weight (g)	Shank (g)	Breast (g)	Back (g)	Drumstick (g)	Gizzard (g)
Anak	Male	1908.27±17.28 ^a	1198.00±8.43 ^a	110.53±1.61 ^a	290.07±0.07 ^a	300.00±0.00 ^a	255.27±0.88 ^a	52.94±0.05 ^a
	Female	1508.27±15.64 ^b	892.47±11.97 ^b	52.53±1.55 ^b	212.80±2.93 ^b	174.60±9.77 ^b	193.40±1.01 ^b	41.11±0.28 ^b
Wadi Ross	Male	1523.00±4.19 ^a	805.60±12.15 ^b	90.33±6.72 ^a	184.27±5.87 ^b	194.73±6.50	177.67±4.32 ^a	46.31±0.05 ^a
	Female	1450.00±0.00 ^b	921.47±3.70 ^a	75.80±3.52 ^b	190.00±0.00 ^a	194.80±0.97	173.53±3.26 ^b	37.05±0.32 ^b
Ross	Male	1333.93±3.20 ^b	692.20±26.88 ^b	72.47±3.45 ^a	128.53±4.49 ^b	177.13±3.79 ^a	99.13±8.07 ^b	35.70±1.28 ^b
	Female	1400.07±0.07 ^a	728.60±4.57 ^a	69.80±8.44 ^b	185.60±8.27 ^a	107.67±8.18 ^b	130.73±4.33 ^a	84.57±0.27 ^a

^{ab}Means with different superscripts on the same column are significantly different (P<0.05)

Table 2: Pearson correlation coefficient of carcass characteristics in Anak strain

Item	Liveweight (g)	Carcass weight (g)	Shank (g)	Breast (g)
Carcass weight (g)	0.95**			
Shank weight (g)	0.93**	0.92**		
Breast muscle weight (g)	0.97**	0.94**	0.94**	

**Coefficient is significant at the 0.001 level

Table 3: Pearson correlation coefficient of carcass characteristics in Wadi Ross Strain

Item	Liveweight (g)	Carcass weight (g)	Shank (g)	Breast (g)
Carcass weight (g)	-0.78**			
Shank weight (g)	0.46**	-0.21		
Breast muscle Weight (g)	-0.06	0.43*	0.09	

**Coefficient is significant at the 0.001 level, *Coefficient is significant at the 0.05 level

Table 4: Pearson correlation coefficient of carcass characteristics in Ross strain

Item	Liveweight (g)	Carcass weight (g)	Shank (g)	Breast (g)
Carcass weight (g)	0.25			
Shank weight (g)	-0.01	0.09		
Breast muscle weight (g)	0.28	0.34	0.35	

weight and back but smaller leg; and similar to report of [4]. Between the strains, The Anak strain showed the highest breast weight compared with WadiRoss and Ross but disagreed with the findings of [5] who evaluated higher body, carcass and breast weight in broilers for Ross strain. Similarly, [21] reported higher breast yield that favoured Ross strains.

Male broilers in Anak and WadiRoss strain but not Ross had higher drumstick weight than female's broilers which is in line with the findings of [18] who reported higher values of drumstick weight in favoured male broilers. The shank weight value was favoured in male

broilers than the female birds. This result was compatible with those of [22], who observed lower values of shank weight for female birds. The male broilers had the higher gizzard weight throughout the strains than the female strains; this is in support with the reports of [23] who reported that differences in gizzard weight were higher in male strain of broiler than female strain.

The high positive and significant (P<0.001) correlation in Anak breed between the live weight and the weights of carcass, shank and breast are shown in Table 2. This was in line with the findings of [24, 25] who reported positively correlated with live weight, carcass weight, breast weight and abdominal fat weight. Also the correlation between shank weight and carcass weight and breast muscle weight were also positively significantly correlated (P<0.001). The result shows a direct relationship between shank weight and carcass weight, breast muscle weight and carcass weight and breast muscle weight. This value was compatible with those reported by [24].

Table 3 shows Pearson correlation coefficient of carcass composition in WadiRoss strain. The correlation between live weight and carcass weight (-0.78) was high, negative and significantly correlated (P<0.001). This shows the same trend with the findings of [26, 27] who reported unfavourably positive for live weight and carcass weight. Although, positive low and significant correlated (P<0.001) against shank weight with live weight was also observed. The carcass weight against breast weight was positive, medium and significantly correlated (P<0.005) this finding is in agreement with those of [28].

Table 4 shows Pearson correlation coefficient of carcass composition in Ross strain. There were no significant correlation obtained from Ross strain on the evaluated parameters, thus this result completely contradicted to the results of [24] who reported significantly positive and negative correlated for Anka and Rugao broilers strains. The interaction between strain and sex had no significant effect.

CONCLUSIONS AND RECOMMENDATION

Strain and sex had significant effect on the carcass characteristics. Anak strain has the highest carcass weight followed by WadiRoss and Ross strain having respectively. The Pearson correlation coefficient in Anak had the highest value, which positive, significant and close to unity. Therefore Anak would recommend for the farmer especially in this derived savannah area.

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