COMPARISON STUDY OF CARCASS TRAITS IN ROOSTERS RESULTED FROM DIFFERENT LOCAL LINES AND THEIR CROSSES WITH ISA BROWN

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Abstract—The present study was conducted at Gardarash station, College of Agriculture, University of Salahaddien in collaboration with Hawler Research Station, Directorate of Agricultural Research–Erbil, Ministry of Agriculture during June and July, 2014. A total of 125 roosters aged 6 to 7 months were belong to three local lines and their crosses with 2 (ISA brown). Birds were starved overnight, thereafter weighed and slaughtered. Carcass yield was considered the hot eviscerated carcass weight, without feet, head and abdominal fat, in relation to the live body weight. Dressing percentage was calculated as a percentage of carcass weight in relation to live weight. The cuts including thigh, breast, back, wings and neck were considered as the percentage of their weight in relation to their carcass weight, while the giblets including liver, heart and gizzard were calculated as a percentage of their weight in relation to their live body weight. About 80-90 g, were taken from each of thigh and breast of three roosters from each genetic group, aged six months in order to estimate proximate analysis. General Linear Model within the statistical program SAS was used to study the effect of genetic groups on traits mentioned above.

The results showed that there were significant differences between the genetic groups of roosters in their live body weight, carcass weight and dressing percentage, and their overall mean were 2445.60 (g), 1965.62 (g) and 80.32 % respectively. Also significant differences were recorded among genetic groups of roosters in the percentages of their carcass parts which include thigh, breast, back, wing and neck percentages and their averages were 16.16%, 20.12%, 22.45%, 5.34% and 5.28% respectively. It was found that there were significant differences among genetic groups in liver and heart percentages only. The differences due to genetic groups in the percentages of chemical composition traits in thigh of roosters which include protein, fat, moisture and ash % were significant and their overall mean were 79.99, 9.31, 74.79 and 3.87 % respectively. Protein and moisture percentages in breast affected significantly by genetic groups of roosters, while the differences in fat and ash percentages were not significant, and the averages were 81.89, 2.89, 73.70 and 4.10 % for protein, fat, moisture and ash respectively.

Conclusion: According the above results, the roosters must be selected according to their body weight to be parents for the next generation in order to have chicks with high meat quality. It will be very important to conduct other studies using different ages and sexes.

Keywords— Poultry Genetic Groups, Carcass Traits, Chemical Composition.

I. INTRODUCTION

Abdullah et al. (2010) stated that poultry now occupies the second place in the world meat production, just after pork, and the success of poultry production has been strongly related to the improvements in growth performance and carcass yield and composition. Because breast is the most valuable portion of the chicken carcass in the market, even small differences in breast yield among strain crosses could have a significant economic impact.

Souza et al. (1994) showed that some breeds have presented a continuous genetic progress in traits of economic interest. For this reason, the broiler industry is constantly interested in evaluating the performance of the commercially available strain crosses, considering weight and yield of the breast meat as the most important variables (Scheuermann et al., 2003). Several factors including strain have been shown to affect carcass yield, carcass composition and quality of meat (Young et al., 2000; and Musa et al., 2006).

In Kurdistan Region-Iraq, there are many local genetic lines had selected according to their plumage colour (Hermiz et al., 2012). Since, no researches found on evaluating carcass traits, their cuts as well chemical composition traits of local roosters, this study conducted to evaluate the mentioned traits of roosters belongs to local genetic groups and their crosses with ISA brown. This evaluation could be considered as the best option to determine the quality and quantity of meat and make it easy to predict the outcome of breeding programs.

II. MATERIALS AND METHODS

The present study was conducted at Gardarash station, College of Agriculture, University of Salahaddien in collaboration with Hawler Research Station, Directorate of Agricultural Research–Erbil Ministry of Agriculture during June and July, 2014. A total of 125 roosters aged 6 to 7 months were belongs to lines 1 (Local black with brown neck), 3 (Local white), 5 (Local black) and their main and reciprocal crosses with 2 (ISA brown).

Birds were starved overnight and thereafter weighed. Roosters were slaughtered using a knife at the experimental poultry laboratory of the College of Agriculture, University of Salahaddien, Erbil, KRG and were allowed to bleed for 3 minutes. To calculate the carcass yield, it was considered the hot eviscerated carcass weight, without feet, head and abdominal fat, in relation to the live body weight. The dressing percentage was calculated as a percentage of carcass weight in relation to live body weight. The cuts including thigh, breast, back, wings and neck were considered as the percentage of their weight in relation to their carcass weight, while the giblets including liver, heart and gizzard were calculated as a percentage of their weight in relation to their live body weight. About 80-90 g, were taken from each of thigh and breast of three roosters from each genetic group aged six months in order to measure the chemical composition. The percentages of protein, fat, moisture and ash were calculated depending on the dry matter basis and estimated according to AOAC (2000). General Linear Model within the statistical program SAS (2005) was used to study the effect of genetic groups on traits mentioned above. Duncan Multiple Range Test (Duncan, 1955) was conducted to diagnosing the significance differences between the means of the groups.

III. RESULTS AND DISCUSSION

The results in Table (1) showed that there were significant differences between the genetic groups of roosters in their live body weight, carcass weight and dressing percentage, and their overall mean were 2445.60 (g), 1965.62 (g) and 80.32 % respectively. The heavier (2681.56 g) and lightest (1988.57 g) live weights were recorded for local black with brown neck (L1) and the cross Isa Brown (L2) X Local white (L3). Higher carcass weight (2155.71 g) and dressing percentage (82.87 %) were found in the cross L1 X L2, while the lowest 1554.29 g and 78.14% were recorded in the cross L2 X L3 for the above traits on the same order (Table 1). Previously, Abeni and Bergoglio (2001), Kosarachukwu et al. (2010) and Malik et al. (2013) showed that strain differences significantly (P≤0.05) affected all carcass traits including body weight and hot carcass. On the other hand, Moreira et al. (2003) verified no difference in carcass yield between different breeds.

Table 2 summarize the results of the significant differences among genetic groups of roosters in the percentages of their carcass main parts which include thigh, breast, back, wing and neck percentages and their averages were 16.16%, 20.12%, 22.45%, 5.34% and 5.28% respectively. The highest percentages of thigh (16.96%), breast (20.87%), back (23.64%), wing (5.55%) and neck (6.10%) were recorded for L5, L3XL2, L2, L5 and L1XL2, while the lowest percentages 15.73%, 19.41%, 21.25%, 5.02% and 4.11% of the same traits on the same order were found in L1XL2, L2XL1, L5XL2, L1XL2 and L5 respectively. It was noticed that the genetic groups with higher percentages of back and wing have lower percentage of neck and vice versa. Several authors also found significant differences among different breeds, strain crosses in their breast weight (Scheuermann et al., 2003 and Abdullah et al., 2010) and in all carcass traits (Malik et al., 2013). Genetic variations in breast muscle yield of broiler chickens may be attributed to differences in number and size of muscle cells (myofibers) (Scheuermann et al., 2003). While, Moreira et al. (2003) and Kosarachukwu et al. (2010) showed no significant differences in carcass cuts between breeds or strains.

Table 1. Means ± S.E. for the factors affecting Live Weight, Carcass Weight and Dressing Percentage in different genetic groups of roosters:

Effects	No.	Live Weight (g)	Carcass Weight (g)	Dressing Percentage (%)
Overall mean	125	2445.60 ±27.18	1965.62 ±23.24	80.32 ±0.23
Genetic Group (♂×♀)				
Local Black with Brown Neck (L1)	16	2681.56 ±55.47 a	2140.31 ±41.55 a	79.92 ±0.90 bcd
L2 x L1	10	2501.50 ±99.61 ab	2006.00 ±84.56 ab	80.20 ±0.51 bcd
L1 x L2	14	2603.21 ±58.90 ab	2155.71 ±47.67 a	82.87 ±0.82 a
Isa Brown (L2)	12	2373.33 ±61.91 b	1867.08 ±55.38 bc	78.58 ±0.41 cd
Local White (L3)	12	2146.67 ±89.28 c	1698.75 ±73.49 cd	79.08 ±0.43 cd
L2 x L3	7	1988.57 ±63.04 c	1554.29 ±52.13 d	78.14 ±0.36 d
L3 x L2	7	2432.86 ±95.50 b	1976.43 ±98.39 ab	81.23 ±0.27 ab
Local Black (L5)	13	2426.54 ±67.49 b	1923.31 ±52.90 b	79.27 ±0.32 bcd
L2 x L5	19	2503.16 ±55.49 ab	2012.11 ±49.41 ab	80.32 ±0.39 bc
L5 x L2	15	2469.33 ±70.24 ab	2032.00 ±57.37 ab	82.35 ±0.69 a

Means not having a common letter within each column differ significantly (P<0.05).

Comparison Study of Carcass Traits in Roosters Resulted From Different Local Lines and Their Crosses With Isa Brown

Table 2. Means ± S.E. for the factors affecting the percentages of carcass main parts in different genetic groups of roosters:

Effects	No.	Back (%)	Breast (%)	Thigh (%)	Wing (%)	Neck (%)
Overall mean	125	22.45±0.14	20.12±0.11	16.16±0.08	5.34±0.03	5.28±0.08
Genetic Group						
Local Black with Brown Neck (L1)	16	23.42±0.29 ab	19.78±0.34 ab	16.53±0.18 abc	5.47±0.04 a	5.32±0.22 bc
L2 x L1	10	21.92±0.45 cd	19.41±0.39 b	16.66±0.23 ab	5.43±0.12 a	6.05±0.24 a
L1 x L2	14	21.25±0.44 d	20.29±0.26 ab	15.89±0.25 bc	5.02±0.09 b	6.10±0.10 a
Isa Brown (L2)	12	22.40±0.27 a-d	20.17±0.28 ab	16.96±0.19 a	5.28±0.09 ab	5.32±0.16 bc
Local White (L3)	12	22.87±0.32 abc	19.75±0.39 ab	16.02±0.20 bc	5.52±0.11 a	5.31±0.22 bc
L2 x L3	7	22.75±0.71 abc	20.71±0.69 a	16.15±0.61 bc	5.54±0.25 a	4.16±0.30 d
L3 x L2	7	21.98±0.37 cd	20.87±0.26 a	15.84±0.28 c	5.24±0.13 ab	5.96±0.25 ab
Local Black (L5)	13	23.64±0.50 a	20.50±0.38 ab	15.82±0.22 c	5.55±0.10 a	4.11±0.31 d
L2 x L5	19	22.14±0.32 bcd	19.84±0.26 ab	16.04±0.16 bc	5.22±0.07 ab	5.23±0.18 c
L5 x L2	15	22.06±0.33 cd	20.44±0.29 ab	15.73±0.18 c	5.25±0.05 ab	5.16±0.16 c

Means not having a common letter within each column differ significantly (P<0.05).

It was found that there were significant differences among genetic groups in liver and heart percentages while the differences were not significant in gizzard percentage and their averages were 1.50, 0.57 and 1.52 % respectively (Table 3). The higher (1.83%) and lower (1.26%) percentages of liver were recorded for the cross (L2 X L3) and Isa Brown (L2) respectively, whereas the higher and lower percentages of heart recorded for the cross (L1 X L2) and local black (L5) and were 0.64 and 0.48 % respectively. Malik et al. (2013) studied the effect of strains (Ross, Cob and Hubbard) on non carcass traits and reported that heart weight was not affected by strains. Gizzard was not different in Ross and in cob while Hubbard strain estimates were significantly (P≤0.05) different from both strains. On the other hand, liver weight in Ross significantly (P≤0.05) different from estimates obtained by Cobb and Hubbard. Previously, Kosarachukwu et al. (2010) claimed that the differences between the strains (Ross, Abor Acres and Anak) were not significant in non carcass traits including liver, heart, and Gizzard percentages at 12 weeks.

The differences due to genetic groups in the percentages of chemical composition traits in thigh of roosters which include protein, fat, moisture and ash % were significant and their overall mean were 79.99, 9.31, 74.79 and 3.87 % respectively (Table 4). The averages of the same traits in breast were 81.89, 2.89, 73.70 and 4.10 % respectively, and it was found that only protein and moisture percentages in breast affected significantly by genetic groups of roosters

(Table 5). As regards the anatomic region, origin, genotype, structure and function of muscle tissue of broilers, most authors emphasize differences in the chemical composition including protein and fat percentages of breast and thigh (Farran et al., 2000 and Meluzzi et al., 2009). Rizzi and Chiericato (2010) confirmed the strong effect of genotype on meat protein content, as well as the importance of selection for substantial improvement of the trait. Also Diaz et al. (2010) stated that the fat and protein content of muscles is a complex trait simultaneously affected by a large number of genetic and non-genetic factors. On the other hand, Abeni and Bergoglio (2001) found that there was no significant difference (p>0.05) for breast meat composition (moisture, protein and fat) from three broilers strains, except in ash content. Also Abdullah et al. (2010) reported that moisture, crude protein, ether extract and ash % for breast muscle were not affected (p<0.05) by strain.

CONCLUSION

The results demonstrated that the genetic groups affect most of the studied traits including carcass traits, main and second parts as in the chemical composition traits in thigh and breast. So it can be concluded that roosters must be selected according to their body weight to be parents for the next generation in order to have chicks with high meat quality. These results and because of the importance of meat quality, it will be very important to conduct other studies using different ages and sexes.

Table 3. Means ± S.E. for the factors affecting the percentages of carcass secondary parts in different genetic groups of roosters:

Effects	No.	Liver (%)	Heart (%)	Gizzard (%)
Overall mean	125	1.50 ± 0.02	0.57 ± 0.01	1.52 ± 0.02
Genetic Group (♂×♀)				
Local Black with Brown Neck (L1)	16	1.44 ± 0.05 bcd	0.55 ± 0.01 bcd	1.45 ± 0.05 a
L2 x L1	10	1.54 ± 0.06 b	0.56 ± 0.02 abcd	1.43 ± 0.08 a
L1 x L2	14	1.52 ± 0.03 b	0.64 ± 0.03 a	1.57 ± 0.05 a
Isa Brown (L2)	12	1.26 ± 0.03 d	0.61 ± 0.02 abc	1.56 ± 0.06 a
Local White (L3)	12	1.53 ± 0.07 b	0.53 ± 0.03 cd	1.65 ± 0.08 a
L2 x L3	7	1.83 ± 0.10 a	0.61 ± 0.03 abc	1.45 ± 0.12 a
L3 x L2	7	1.49 ± 0.07 bc	0.59 ± 0.02 abc	1.51 ± 0.06 a
Local Black (L5)	13	1.31 ± 0.05 cd	0.48 ± 0.02 d	1.41 ± 0.06 a
L2 x L5	19	1.47 ± 0.05 bc	0.57 ± 0.02 abc	1.55 ± 0.05 a
L5 x L2	15	1.77 ± 0.06 a	0.62 ± 0.02 ab	1.58 ± 0.06 a

Means not having a common letter within each column differ significantly (P<0.05).

Table 4. Means ± S.E. for the factors affecting chemical composition traits (%) in Thigh of different genetic groups of roosters:

Effects	No.	Protein %	Fat (%)	Moisture (%)	Ash (%)
Overall mean	30	79.99 ± 1.33	9.31 ± 0.47	74.79 ± 0.25	3.87 ± 0.05
Genetic Group (♂×♀)					
Local Black with Brown Neck (L1)	3	70.88±3.64 c	12.11 ± 1.07 a	74.08 ± 0.77 ab	3.82 ± 0.13 ab
L2 x L1	3	82.50±2.60 abc	7.99 ± 1.41 ab	76.36 ± 0.25 a	3.94 ± 0.08 ab
L1 x L2	3	87.08±6.55 a	8.51 ± 1.70 ab	76.24 ± 0.13 a	3.96 ± 0.18 ab
Isa Brown (L2)	3	79.63±4.01 abc	6.65 ± 2.46 b	74.31 ± 0.52 ab	4.08 ± 0.13 a
Local White (L3)	3	73.79±4.55 bc	10.39 ± 1.10 ab	73.14 ± 1.36 b	3.50 ± 0.27 b
L2 x L3	3	84.79±2.65 ab	8.63 ± 1.70 ab	75.33 ± 0.67 ab	4.06 ± 0.11 a
L3 x L2	3	85.42±3.41 ab	9.19 ± 1.42 ab	75.27 ± 0.67 ab	4.01 ± 0.12 ab
Local Black (L5)	3	75.21±0.83 abc	10.74 ± 1.09 ab	73.83 ± 0.68 b	3.82 ± 0.12 ab
L2 x L5	3	78.96±2.70 abc	9.71 ± 0.99 ab	74.77 ± 0.16 ab	3.71 ± 0.13 ab
L5 x L2	3	81.67±1.45 abc	9.23 ± 1.41 ab	74.56 ± 0.64 ab	3.83 ± 0.15 ab

Means not having a common letter within each column differ significantly (P<0.05).

Table 5. Means ± S.E. for the factors affecting chemical composition traits (%) in Breast of different genetic groups of roosters:

Effects	No.	Protein %	Fat (%)	Moisture (%)	Ash (%)
Overall mean	30	81.89±1.08	2.89 ± 0.15	73.70 ± 0.16	4.10 ± 0.14
Genetic Group (♂×♀)					
Local Black with Brown Neck (L1)	3	87.21±1.05 a	3.01 ± 0.56 a	72.87 ± 0.56 c	4.18 ± 0.76 a
L2 x L1	3	75.17±3.03 b	3.02 ± 0.38 a	73.90 ± 0.02 abc	3.38 ± 0.68 a
L1 x L2	3	77.88±2.31 ab	2.99 ± 0.62 a	75.13 ± 0.29 a	4.23 ± 0.15 a
Isa Brown (L2)	3	84.63±1.09 ab	2.84 ± 0.51 a	73.10 ± 0.55 c	4.52 ± 0.15 a
Local White (L3)	3	77.58±2.59 ab	2.23 ± 0.33 a	73.06 ± 0.22 c	4.17 ± 0.03 a
L2 x L3	3	85.46±2.27 a	2.46 ± 0.32 a	73.65 ± 0.19 bc	3.71 ± 0.74 a
L3 x L2	3	84.29±1.27 ab	3.12 ± 0.62 a	73.35 ± 0.36 bc	4.18 ± 0.36 a
Local Black (L5)	3	79.63±7.54 ab	3.28 ± 0.77 a	73.31 ± 0.54 bc	4.66 ± 0.45a
L2 x L5	3	85.75±2.20 a	3.50 ± 0.60 a	74.51 ± 0.39 ab	4.38 ± 0.32 a
L5 x L2	3	81.38±0.87 ab	2.46 ± 0.37 a	74.13 ±0.35 abc	3.59 ± 0.24 a

Means not having a common letter within each column differ significantly (P<0.05).

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