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EVALUATION OF THREE COMMERCIAL BROILER TURKEY STRAINS FOR CARCASS CHARACTERISTICS AND MEAT QUALITY

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ABSTRACT

This study evaluated the effects of genotype and sex on carcass characteristics, offal weights and meat quality of three commercial broiler turkey strains: British United Turkey (BUT), Hybrid Converter (HC) and Nicholas Premium (NP). The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Sixty-seven day-old poults comprising 22 BUT, 22 HC and 23 NP, were sourced from a reliable hatchery. Each poult was wing tagged and reared under an intensive deep litter system in a 3 × 2 factorial experiment arrangement in a Randomized Complete Block Design. At 14 weeks, 10 turkeys per strain were sacrificed and carcass parameters (live weight, bled, defeathered, eviscerated, carcass, breast, back, drumstick, thigh, shank, head, wing and neck weight) and weights of some offals (gizzard, heart and liver) were evaluated. Breast meat from each strain was evaluated by 10 panelists for colour, flavour, tenderness, juiciness, texture and overall acceptability using 9-point Hedonic scale. Cooking and refrigeration losses were also assessed. Data were analyzed using the General Linear Model procedure of SAS (2009). Genotype and sex significantly influenced ($p < 0.05$) carcass characteristics. Hybrid Converter had the highest value of back weight (602.00±27.98g) while males exhibited higher values than females. Meat quality revealed that genotype significantly ($p < 0.05$) affected juiciness, texture, and overall acceptability. NP strain exhibited superior juiciness (7.00±0.36), while HC recorded the highest texture (6.50±0.50) and overall acceptability (7.33±0.21). Furthermore, sex significantly influenced all meat quality parameters. Males exhibited superior sensory attributes and females recorded higher cooking loss (47.56±2.10) and texture values (5.38±0.78). The study concluded that HC turkeys are the most suitable breed for commercial meat production because of their high carcass yield. NP exhibited superior meat juiciness, making them a preferred option where meat quality is prioritized. Male turkeys should be preferred for carcass and sensory attribute.

Keywords: Carcass characteristics, meat quality, genotype, sex, Hybrid Converter, Nicholas Premium, British United Turkey

INTRODUCTION

Turkey remains an important poultry species for meat production, with demand influenced by the broader growth in global poultry meat consumption and increasing consumer demand for animal source protein (OECD/FAO, 2026). Turkey is one of the fast growing poultry species, with modern commercial strains capable of attaining higher body weights as a result of selective breeding for growth rate, feed efficiency, and meat yield (Clark *et al*., 2019).

Turkey is characterized by a relatively high carcass yield, with dressing percentage reported to reach approximately 87% in some commercial turkey strains (Turkey Management Guide, 2012; Gibril *et al*., 2013). Carcass characteristics are economically important in commercial broiler turkeys because valuable carcass portions such as the breast, thigh, drumstick and wings contribute directly to processing yield and product value. Carcass performance is influenced by several factors, including genotype, sex and slaughter weight, which can affect carcass and offal characteristics.

Meat quality extends beyond carcass yield, it includes sensory characteristics that influence consumer acceptance and processing performance. Important meat quality attributes include colour, tenderness, juiciness, flavour and texture, while technological properties such as water-holding capacity and cooking loss provide important information on moisture retention, processing yield and eating quality (Hiscock *et al*., 2022).

Despite the major shift in commercial turkey production, information comparing carcass yield and meat quality of major commercial strains under Nigerian production conditions remains

limited. Therefore, this study evaluated the effects of genotype and sex on carcass characteristics, offal yield and meat quality of British United Turkey, Hybrid Converter and Nicholas Premium turkeys.

Materials and Methods

Experimental site

The experiment was carried out at the Poultry Unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Ogbomoso is situated in the derived savannah zone of Nigeria on longitude 4°15′ East and latitude 8°15′ North east of the Greenwich Meridian. The town lies at an altitude of approximately 300–600 m above sea level. The mean annual rainfall and temperature are approximately 1,247 mm and 27°C, respectively (Google Earth 2026)

Experimental birds and management

The total of sixty-seven day old Poults (male and female combined) comprising 22 Poults each of Hybrid converter, British united turkey and 23 Poults of Nicholas premium were sourced from a reliable hatchery. Poults were individually wing tagged for identification purposes and reared under intensive deep litter management for 14 weeks. Routine biosecurity, vaccination schedules (Newcastle Disease, LaSota, Fowl Pox, Gumboro), and health management practices were strictly observed. Clean water was given *ad libitum*.

Birds were fed *ad libitum* with Turkey starter feed containing 28% Crude Protein and 2800 Kcal/kg Metabolizable Energy from day old till 4 weeks of age, turkey grower feed containing 24% Crude protein and 2900 Kcal/kg Metabolizable Energy were given to the Poults between four weeks till 8weeks and turkey finisher feed containing 18% Crude Protein and 3000 Kcal/kg Metabolizable Energy from eight weeks till 14 weeks.

Experimental design and data collection

The experiment followed a 3x2 Factorial arrangement in a Randomized Complete Block Design (RCBD), testing three genotypes (HC, NP, BUT) and two sexes (Male, Female).

Carcass and Offal Evaluation

At 14 weeks, ten turkeys per strain were randomly selected, fasted overnight and slaughtered. Carcass evaluation was done as described by Amao *et al*. (2023). The following parameters were determined;

Live Weight

The live weight of staved birds was measured using a sensitive scale in grams.

Bled Weight

Bled weight was determined in grams using a sensitive scale after slaughtering process has occurred and blood is fully drained.

De-feathered Weight

The weights of the birds were determined in grams using a sensitive scale after removing the feathers.

Eviscerated Weight

Weighing the carcass after removal of the viscera and other non-carcass organs using a calibrated weighing balance.

Thigh Weight

It was obtained by cutting the hip joint and weighed with a sensitive scale in grams.

Chest Girth

This was obtained by cutting the cartilaginous junctures of the ribs from the backbone towards coracoids and weighed with a sensitive scale in gram.

Offal cut

The offals (heart, gizzard and liver) were weighed using a sensitive scale in gram.

Meat Quality

At 14weeks, 50g of breast meat from ten samples of each strain were analyzed for the following;

Cooking Weight Loss

This was measured by taking 50g of meat sample cut, wrapped in a foil paper and boiled for 30 minutes.

$$\text{Cooking loss (\%)} = \frac{\text{weight ofsample before cooking} - \text{weight of sample after cooking}}{\text{weight of sample before cooking}} \times 100$$

Refrigerated Weight Loss:

This was determined by weighing 20g of meat sample and refrigerated for 24hours.

Refrigeration loss =

Sensory evaluation

Meat samples of selected turkeys in each strain were collected and hygienically wrapped in nylon, labeled accordingly and boiled in water for 20 minutes. Sensory evaluation involves serving a 10-man panelist a bite size of 5g of the cooked meat samples. Each panelist had a taste of each sample and grade for colour, tenderness, juiciness flavour and overall acceptability of the cooked meat sample.

Statistical Analysis

Data obtained were subjected to General Linear Model procedure of SAS (2009). Significant means were separated with the same software.

Model: $Y_{ijk} = \mu + \alpha_i + \beta_j + e_{ijk}$

Where;

Y_{ijk} = individual observation

μ = Overall mean

α_i = fixed effect of i^{th} genotype (i = 1, 2,3)

β_j = fixed effect of j^{th} sex (j = 1,2)
e_{ijk} = Random experimental error which is evenly distributed.

Results and Discussion

Genotype and Sex Effect on Carcass Parameters

Table 1 and 2 showed the mean values of carcass parameters as affected by genotype and sex of different strains of turkey. Table 3 and 4 showed the significant interaction effects ($p < 0.05$) of Genotype and sex

Turkey genotype had significant effect ($p<0.05$) only on back weight where Hybrid Converter recorded the highest back weight (602.00 ± 27.98 g). Sex significantly affected most carcass components, with males generally recording higher values. These results suggest that carcass yield is more closely related to sex than genotype, similar observations were reported by Ojedapo *et al*. (2015) in broiler chickens. They found that male birds had superior carcass yield compared to females. The greater carcass component weights recorded in males are consistent with sexual dimorphism in turkeys, in which males generally attain greater body size and muscle deposition.

Table 5 showed weights of offals from different turkey strains as affected by genotype and sex. There was no significant effect ($p<0.05$) of turkey genotype on any of the offals weight while sex had effect on all parameters.

Whole gizzard weight, empty gizzard weight, heart weight, and liver weight measurements were significantly affected ($p<0.05$) by the interactions of genotype and sex (Table 5).

Nicholas premium males recorded the highest empty gizzard weight (125.33±5.46) and heart weight (24. 67±1. 33). However, Hybrid converter males had the highest whole gizzard weight while British united turkey recorded the highest liver weight (80.67±15.37). The higher whole and empty gizzard weights, heart weight, and liver weight observed in male turkeys may be associated with their greater growth rate and feed consumption, which increase the functional demands and growth of metabolically active organs. According to Gous *et al*. (2019), males recorded higher offal weights, which may be associated with their greater overall body size and live body weight, as offal components generally increase with body size in turkey

Table 1 Carcass Weight of Different Turkey Strains as Affected by Genotype and Sex

Variables	OBS	LVW (g)	BLDW (g)	DFW (g)	EVW (g)	CAW (g)	BRW (g)	BKW (g)
Genotype								
BUT	10	3981.67±358.57	3770.33±341.75	3390.00±361.28	2839.67±282.02	2636.00±271.69	821.33±154.36	523.67±40.29^{a}
HC	10	4493.00±211.95	4257.67±207.55	4037.00±194.85	3246.33±165.56	3052.00±154.35	992.33±67.90	602.00±27.98^{a}
NP	10	4130.00±333.84	3945.33±313.78	3489.33±139.67	2839.33±286.53	2681.33±224.28	909.33±75.50	474.00±19.89^{b}
Sex								
Female	15	4063.78±246.55^{a}	3867.78±230.19^{a}	3645.33±218.01^{a}	2898.22±191.36^{a}	2734.89±184.22^{a}	871.56±63.38^{a}	537.11±38.85^{a}
Male	15	4339.33±254.62^{a}	4114.44±246.99^{a}	3898.22±230.53^{a}	3052.00±197.41^{a}	2844.67±188.77^{a}	943.78±78.09^{a}	529.33±18.66^{a}

^{a,b} Means occupying same column within each genotype and sex having different superscripts are significantly ($p < 0.05$). BUT = British United Turkey; HC = Hybrid Converter; NP = Nicholas Premium; OBS = Number of observations; LVW = Live weight; BLDW = Bled weight; DFW = Defeathered weight; EVW = Eviscerated weight; CAW = Carcass weight; BRW = Breast weight; BKW = Back weight

Table 2 Carcass Weights of Different Turkey Strains as Affected by Genotype and Sex

Variables	OBS	DSW (g)	THW (g)	SHW (g)	HDW (g)	WGW (g)	NKW (g)
Genotype							
BUT	10	442.00±43.14	431.33±39.26	155.67±16.77	88.33±9.84	444.00±39.95	197.33±16.83
HC	10	476.00±29.95	471.67±23.96	182.67±16.00	97.33±4.55	504.00±24.94	211.00±15.87
NP	10	451.67±44.56	422.67±31.29	162.00±18.26	89.67±6.96	458.33±39.59	210.67±28.65
Sex							
Female	15	436.00±29.17^{b}	438.44±28.48^{a}	166.89±14.04^{a}	91.56±6.69^{a}	454.67±27.62^{b}	191.11±12.57^{b}
	15	477.11±32.73^{a}	445.33±24.28^{a}	166.67±14.10^{b}	92.00±5.32^{a}	482.89±30.46^{a}	221.56±18.96^{a}

^{a,b} Means occupying same column within each genotype and sex having different superscripts are significantly ($p < 0.05$). BUT = British United Turkey; HC = Hybrid Converter; NP = Nicholas Premium; DSW = Drumstick weight; THW = Thigh weight; SHW = Shank weight; HDW = Head weight; WGW = Wing weight; NKW = Neck weight

Table 3: Mean values of Carcass Weight as Affected by the Interaction of Genotype and Sex of turkey

GENOTYPE	SEX	OBS	LVW (g)	BLDW (g)	DFW (g)	EVW (g)	CAW (g)	BRW (g)	BKW (g)
BUT	F	5	3935.33±708.50^{a}	3739.33±666.76^{a}	3516.67±618.08^{a}	2850.00±512.76^{a}	2660.00±486.82^{a}	801.33±164.59^{a}	535.33±84.71^{a}
HC	F	5	4587.33±53.32^{a}	4350.00±52.20^{a}	4125.33±42.53^{a}	3312.00±94.00^{a}	3126.00±84.07^{a}	998.00±87.18^{a}	638.67±25.10^{a}
NP	F	5	3668.67±35.78^{a}	3514.00±38.17^{a}	3294.00±38.43^{a}	2532.67±118.65^{a}	2418.67±184.05^{a}	815.33±43.88^{a}	437.33±12.87^{a}
BUT	M	5	4028.00±372.48^{a}	3801.33±372.07^{a}	3161.33±488.89^{a}	2829.33±366.93^{a}	2612.00±362.63^{a}	841.33±179.11^{a}	512.00±28.31^{a}
HC	M	5	4398.67±461.38^{a}	4165.33±451.82^{a}	3948.67±424.53^{a}	3180.67±351.99^{a}	2978.00±326.46^{a}	986.67±124.08^{a}	565.33±44.03^{a}
NP	M	5	4591.33±585.77^{a}	4376.67±552.06^{a}	3684.67±240.64^{a}	3146.00±414.27^{a}	2944.00±385.54^{a}	1003.33±133.18^{a}	510.67±21.61^{a}

^{a,b,c} Means occupying same column within each genotype and sex having different superscripts are significantly different ($p<0.05$), BUT= British United turkey, HC= Hybrid Converter, NP= Nicholas Premium, OBS= numbers of observations, F= female, M= male, LVW= live weight, BLDW= bled weight, DFW= defeathered weight, EVW= eviscerated weight, CAW= carcass weight, BRW= breast weight, BKW= back weight.

Table 4: Mean values of Carcass Weight as Affected by the Interaction of Genotype and Sex of turkey

GENOTYPE	SEX	OBS	DSW (g)	THW (g)	SHW (g)	HDW (g)	WGW (g)	NKW (g)
BUT	F	5	432.00±89.69^{a}	442.00±80.16^{a}	158.67±35.14^{a}	98.67±17.90^{a}	454.67±77.20^{a}	188.00±25.49^{a}
HC	F	5	480.67±15.37^{a}	492.00±8.08^{a}	194.00±21.20^{a}	96.67±5.81^{a}	507.33±18.81^{a}	210.00±85.77^{a}
NP	F	5	395.33±9.95^{a}	381.33±12.98^{a}	148.00±10.07^{a}	79.33±8.35^{a}	402.00±8.33^{a}	175.33±10.98^{a}
BUT	M	5	452.00±34.08^{a}	420.67±34.14^{a}	152.67±12.72^{a}	78.00±7.57^{a}	433.33±43.65^{a}	206.67±26.08^{a}
HC	M	5	471.33±65.00^{a}	451.33±48.91^{a}	171.33±26.49^{a}	98.00±8.33^{a}	500.67±52.39^{a}	212.00±21.01^{a}

^{a,b,c} Means occupying same column within each genotype and sex having different superscripts are significantly different ($p<0.05$), BUT= British United Turkey, HC= Hybrid Converter, NP= Nicholas Premium, OBS= numbers of observations, F= female, M= male, DSW= drum stick weight, THW= thigh weight, SHW= shank weight, HDW= head weight, WGW= wing weight and NKW= neck weight.

Table 5. Weight of Some Offals of Different Turkey Strains as Affected by Genotype and Sex

Variables	OBS	WGW (g)	EGW (g)	HW (g)	LW (g)
Genotype:					
BUT	10	143.67±11.35	108.67±9.53	16.17±1.68	76.00±8.57
HC	10	162.67±11.68	118.00±8.42	16.00±0.52	66.00±2.78
NP	10	166.00±5.37	123.33±4.67	19.00±2.67	66.00±7.06
Sex:					
Female	15	149.78±7.75^{b}	110.44±5.91^{b}	15.89±1.21^{b}	65.78±4.64^{b}
Male	15	165.11±8.49^{a}	122.89±6.40^{a}	18.22±1.71^{a}	72.89±5.95^{a}

^{a,b}Means occupying same column within each genotype and sex having different superscripts are significantly different ($p<0.05$), BUT= British United Turkey, HC= Hybrid Converter, NP= Nicholas Premium, OBS= numbers of observations, WGW= whole gizzard weight, EGW= empty gizzard weight, HW= heart weight, LW= liver weight..

Table 6. Mean values of Some Offals' weight of Different Turkey Strains as Affected by Interaction of Genotype and Sex.

GENOTYPE	SEX	OBS	WGW (g)	EGW (g)	HW (g)	LW (g)
BUT	F	5	133.33±18.78^{c}	96.00±12.86^{c}	17.67±3.18^{b}	71.33±10.42^{a}
HC	F	5	150.67±3.53^{b}	114.00±3.05^{b}	16.67±0.67^{b}	67.33±3.71^{b}
NP	F	5	165.33±9.95^{b}	121.33±8.67^{a}	13.33±1.33^{c}	58.67±9.68^{b}
BUT	M	5	154.00±13.61^{b}	121.33±18.15^{a}	14.67±1.33^{b}	80.67±15.37^{a}
HC	M	5	174.67±22.93^{a}	122.00±18.15^{a}	15.33±0.67^{b}	64.67±4.81^{b}
NP	M	5	166.67±6.67^{b}	125.33±5.46^{a}	24.67±1.33^{a}	73.33±10.09^{a}

^{a,b,c} Means occupying same column within each genotype and sex having different superscripts are significantly different ($p<0.05$), BUT= British United Turkey, HC= Hybrid Converter, NP= Nicholas Premium, OBS= numbers of observations, F= female, M= male, WGW= whole gizzard weight, EGW= empty gizzard weight, HW= heart weight, LW= liver weight.

Table 7 and 8evealed that genotype had significant effect ($p<0.05$) on juiciness, texture and overall acceptability while meat quality parameters were significantly affected by ($p<0.05$) by sex. Nicholas Premium had the highest value of juiciness (7.00±0.21). Meat quality parameters were significantly ($p < 0.05$) affected by genotype and sex interactions. Nicholas premium females had the highest value for juiciness (7.33±0.67) while Hybrid converter females recorded the highest texture (7.00±1.00). Hybrid converter males had the highest value in colour, flavor, tenderness and overall acceptability. The above results indicate that the genotype associated with desirable carcass performance does not necessarily exhibit the same pattern for every sensory attribute, because genetic differences can influence individual meat-quality characteristics differently (Hiscock *et al*., 2022)). Meat juiciness is an important sensory attribute that contributes greatly to consumer preference and palatability (Joo *et al*., 2013). Nicholas Premium and Hybrid Converter strains showed better sensory qualities, indicating their suitability for consumer preference. This agrees with the findings of Baes *et al*. (2022), who reported that genetic factors influence meat quality traits in poultry.

Table 7. Genotype and Sex Effect on Meat Quality

Variables	OBS	Colour	Flavour	Tenderness	Juiciness	Texture	Overall acceptability	Cooking loss (g)	Refrigeration loss (g)
Genotype									
BUT	10	5.50±0.62	5.50±1.36	4.67±0.85	3.67±0.62^{c}	3.83±0.40^{c}	5.50±0.85^{b}	47.33±2.40	1.67±0.33
HC	10	6.50±0.22	5.67±0.92	5.17±0.95	6.33±0.33^{a}	6.50±0.50^{ab}	7.33±0.21^{a}	46.67±2.76	1.33±0.21
NP	10	5.67±0.80	4.83±0.83	5.83±0.60	7.00±0.36^{a}	3.67±0.97^{c}	7.00±0.26^{a}	46.00±1.79	1.83±0.17
Sex:									
Female	15	5.25±0.53^{b}	4.75±0.70^{b}	4.88±0.78^{b}	5.38±0.84^{a}	5.38±0.78^{a}	6.00±0.71^{b}	47.56±2.10^{a}	1.33±0.17^{a}
Male	15	6.40±0.40^{a}	5.80±0.89^{a}	5.50±0.54^{a}	5.90±0.41^{a}	4.90±0.55^{b}	7.10±0.18^{a}	45.78±1.54^{b}	1.89±0.20^{a}

^{a,b} Means occupying same column within each genotype and sex having different superscripts are significantly different ($p<0.05$), BUT= British United Turkey, HC= Hybrid Converter, NP= Nicholas Premium, OBS= numbers of observations.

Table 8: Mean values of Meat Quality Weight of different Turkey strain as Affected by the Interaction of Genotype and Sex

GENOTYPE	SEX	OBS	COLOUR	FLAVOUR	TENDERNESS	JUICINESS	TEXTURE	OVERALL ACCEPTABILITY	COOKING LOSS (g)	REFRIGERATION LOSS (g)
BUT	F	5	4.67±0.67^{c}	5.33±1.86^{a}	4.67±1.67^{a}	2.67±0.33^{c}	3.33±0.67^{c}	4.33±1.45^{c}	50.00±3.05^{a}	1.33±0.33^{a}
HC	F	5	6.00±0.00^{a}	3.50±0.50^{c}	3.50±1.50^{a}	6.50±0.50^{a}	7.00±1.00^{a}	7.00±0.00^{a}	45.33±5.70^{a}	1.00±0.00^{a}
NP	F	5	5.33±1.33^{b}	5.00±0.58^{b}	6.00±1.00^{a}	7.33±0.67^{a}	6.33±1.20^{b}	7.00±0.58^{a}	47.33±2.40^{a}	1.67±0.33^{a}
BUT	M	5	6.33±0.88^{a}	5.67±2.40^{a}	4.67±0.88^{a}	4.67±0.88^{b}	4.33±0.33^{c}	6.67±0.33^{a}	44.67±3.53^{a}	2.00±0.58^{a}
HC	M	5	6.75±0.25^{a}	6.75±0.95^{a}	6.00±1.08^{a}	6.25±0.48^{a}	6.25±0.63^{b}	7.50±0.29^{a}	48.00±2.00^{a}	1.67±0.33^{a}

^{a,b,c} Means occupying same column within each genotype and sex having different superscripts are significantly different ($p<0.05$), BUT= British United Turkey, HC= Hybrid Converter, NP= Nicholas Premium, OBS= numbers of observations, F= female, M= male.

Conclusion

Genotype had significant effect only on back weight, while sex exerted a stronger influence on carcass yield. The sensory evaluation of meat quality showed that genotype and sex affected important attributes. Nicholas Premium recorded the highest juiciness, whereas Hybrid Converter recorded high texture and overall acceptability scores. These findings indicate that both genotype and sex should be considered when evaluating commercial turkey strains for carcass characteristics and meat quality.

Recommendations

Hybrid Converter should be considered in commercial meat production systems where superior body weight and desirable carcass characteristics are important. Nicholas Premium turkeys should be considered for meat quality improvement due to their superior juiciness. Sex should be considered in commercial production because males demonstrated greater carcass characteristics. Further research should use larger sample sizes.

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