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Comparison among different turkey varieties on productive, reproductive, carcass traits and chemical composition of meat reared under intensive condition

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Abstract

This study aimed to evaluate productive, reproductive, carcass characteristics, chemical composition of meat and serum lipid profile of different turkey varieties. The study was conducted at Turkey Research Shed, Poultry Research Center (PRC), Bangladesh Livestock Research Institute, Savar, Dhaka, Bangladesh from June 2022 to July 2023. In this study, 200 turkeys from White, Black, Bronze and Bourbon Red varieties of the 2nd generation were reared on a slatted floor under an intensive production system from 0 to 72 weeks of age. Turkey poults were provided with ration (Starter diet: ME 2950 kcal/kg, CP 23% for initial 8 weeks; Grower diet: ME 2950 kcal/kg, CP 16% for 8-16 weeks and Layer diet: ME 2900 kcal/kg, CP 17% for 17 weeks- end of laying period). No significant ($p>0.05$) difference was found in 0, 4, 8, 12 and 20 weeks old turkey except 16 weeks. The breast and thigh meat of the studied turkeys were subjected to quality analysis. Carcass weight, dressing percentage, breast and thigh weight of Bronze variety was significantly ($p<0.0001$) highest among four varieties. There was no significant difference ($p>0.05$) in the measured abdominal fat ($p>0.05$). Additionally, no discernible variation ($p>0.05$) in crude protein of thigh and breast meat was noticed among four varieties. The ether extract and crude fiber of breast and thigh meat of White turkey was significantly ($p<0.0001$) lower than other varieties. Ash content of breast meat of White variety was significantly ($p<0.01$) greater than other varieties. In case of egg related parameters, Bronze variety of turkey had significantly better age at first laying, egg fertility percentage and numerically better hen day egg production whereas Bourbon Red variety had significantly ($p<0.001$) better hatchability and egg weight than others. Total cholesterol, LDL, HDL were significantly ($p<0.0001$) higher in Bourbon Red turkey and lower in Bronze turkey. It can be concluded that Bronze variety of turkey might be comparatively better than other varieties.

Key words: Turkey, Carcass Characteristics, Productive, Reproductive, Proximate

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Introduction

In North America and Europe, the turkey *(Meleagris gallopavo)* is a well identified and economically important bird that is mainly farmed for meat. Nevertheless, its prevalence and market importance are not high in various developing countries such as Bangladesh. One of the major reasons for the poor acceptance of the turkey is the high level of familiarity and availability of chickens, easier to rear as well as the traditional choice for poultry farmers. Despite the challenges, turkey farming in Bangladesh has strong potential due to growing consumer demand for low-fat, high-protein meat. With proper training, disease management, and government support, turkey farming could become a profitable and sustainable alternative in the poultry sector. This has caused a little interest to rear other type of poultry despite the immense potential that turkey farming has in such areas (Jahan *et al.*, 2018).

The emerging global need for lean meat which is healthy has swept turkey production back into the spotlight especially in low resource areas where affordable farming systems are needed. Based on the small input required for housing, equipment and management, turkeys can be efficiently reared in free range or semi-intensive system. This makes them especially well-suited for small and marginal farmers, an opportunity to improve livelihood and diversify in rural poultry farming systems (Frank *et al.*, 2007; Jahan *et al.*, 2018).

Contrary to chickens used both as sources of meat and eggs, turkeys are not raised for egg production but for meat because on one hand they grow up extremely fast whereas on the other hand, they possess high meat output (Jahan *et al.*, 2018). The size and better feed conversion rate made it unique from other poultry species, and its high portions of edible parts are global indications of energy maximization. Nutritionally, turkey meat is not only low in fat, but also rich in protein compared to the geese and broilers; hence a perfect option for health-conscious consumers, particularly those who might be suffering from high cholesterol or cardiovascular diseases. It also contains relatively large quantities of vital nutrient such as B- and PP-group Vitamins, phosphorus, minerals important for physiological activities (Biesalski 2005; Baggio *et al.*, 2002).

In order to increase productivity and quality of meat, there are many turkey breeds developed. Eight varieties of the American Poultry Association (APA) have been formally recognized as standard. Bronze, Black, White Holland, Narragansett, Slate, Beltsville Small White, Bourbon Red and Royal Palm (Frank *et al.*, 2007). There has been research describing the adaptability and performance of such breeds in different rearing systems in developing countries. For example, Das *et al.*, (2022) and Miah *et al.*, (2020) mentioned promising growth and adaptation qualities possessed by Bronze and Black turkeys in the semi-intensive conditions. According to Hayet *et al.* (2021), there is genetic variability among turkey varieties in Bangladesh, while Jankowski *et al.*, (2021) elicited the effects of feeding regimes on meat quality.

Notwithstanding this mass of emerging research, there is a wide gap in studies comparing several turkey varieties in uniform intensive systems in Bangladesh. Specifically, the comparison among different varieties based on growth performance, reproductive, carcass traits,

chemical composition of meet and health markers such as serum lipid profile have not been adequately addressed.

Thus, the purpose of this study was to carry out a comparative evaluation of four turkey varieties; White, Black, Bronze, and Bourbon Red based on their productive, reproductive traits, carcass traits, serum lipid profile and chemical composition of meat under an intensive rearing system in Bangladesh. The research needs addressed and the assessment of such varieties in a local context aim to contribute to the body of knowledge that helps turkey farming develop into a profitable industry in developing countries, particularly in regions where the demand for lean meat is on the rise.

Materials and Methods

The study was conducted on local turkey varieties reared in intensive conditions at Turkey Research Shed, Poultry Research Center (PRC), Bangladesh Livestock Research Institute, Savar, Dhaka, Bangladesh.

Experimental birds

This experiment comprises a total of 200 turkeys taking from four different varieties. There were 50 birds of each variety of turkeys. Body weight of all the birds was taken from 0 day up to 20 weeks. Hen day egg production (HDEP) was calculated from the beginning of the peak period till the age of culling. Fertility and hatchability based on natural mating were evaluated and egg weight was also calculated. 1:5 male-female ratio was maintained. The duration of the

Table 1: Vaccination schedule for turkey birds reared at turkey research shed.

Age (day)	Name of the vaccine	Mode of administration	Dose/bird
1	Marek's (Live)	Subcutaneous	0.20 cc
5	IB+ ND (Live) [Nobilis Ma5+ Clone30	Eye	1 drop
7	IBD (Live) [Gumboro D78)	Water	
11	AI [H9n2] Nobilis Influenza H9N2	Subcutaneous	0.25 cc
17	IBD- Booster Dose [Gumboro D78]	Water	
21	IB+ND [Live: Nobilis Ma5+ Clone30] Booster Dose	Eye	1 drop
25	ND Killed	Intramuscular	0.50 cc
35	Fowl Pox [Nobilis AE+POX]	Wing web	Dipping the needle once
40	Fowl Cholera (Killed)	Subcutaneous	0.50 cc
45	Infectious Coryza [Nobilis CORVAC]	Intramuscular	0.50 cc
65	ND-Booster Dose [Nobilis ND Clone 30]	Water	1 vial in 25 ml water
80	Infectious Coryza [Nobilis CORVAC]	Intramuscular	0.50 cc
85	AI (Killed) [RE-6]	Wing web	1.00 cc
90	ND Killed	Intramuscular	0.50 cc
101	Infectious Coryza Booster Dose [Nobilis CORVAC]	Intramuscular	0.50 cc
106	Fowl Cholera (Killed) Booster Dose	Intramuscular	0.50 cc
110	AI (Killed) [RE-6]	Subcutaneous	1.00 cc

ND, New Castle Disease; IBD, Infectious Bursal Disease; AI, Avian Influenza and IB, Infectious Bronchitis.

experiment was 72 weeks. Forty turkeys (10 males from each variety) were slaughtered at their adult age and their carcass characteristics were evaluated. All birds were managed under the same environmental conditions. Feed and water were available ad libitum for the entire duration of the experiment. The flock was reared on the slated floor during the experiment period. The vaccination schedule was properly maintained (Table 1). Groups were as follows:

1. White turkey variety (10 males: 40 females)
2. Bronze turkey variety (10 males: 40 females)
3. Black turkey variety (10 males: 40 females)
4. Bourbon Red (B. Red) variety (10 males: 40 females)

Animal material and nutrition

Turkeys had no access to the outdoor environment. The varieties were reared in separate pans. Adequate number of feeders and waterer were provided in the pans. Turkeys were fed with starter feed (0-8 weeks), grower feed (8-17 weeks), layer feed (17 weeks up to end of the laying period) (Table 2). Additional feeding was performed with water spinach *(Ipomoea aquatica)* in the afternoon.

Slaughter and carcass Traits

A 10-hour fasting period was implemented prior to slaughter, during which the turkeys were only provided with water. Additionally, the body weight of the turkeys was measured before slaughter. In accordance with the standard methods described by Sarica et al. (2011), the carcasses were dissected into parts and the weights of all carcass parts were recorded.

Muscle to meat ratio

After the evisceration process, major edible muscle parts breast, thigh and drumstick were carefully dissected and weighed to determine total meat yield. Total skeletal muscle mass was estimated as 70% of carcass weight, following established poultry processing references (Babut, 2015) Muscle-to-meat ratio=Meat weight (breast + thigh + drumstick)/ Total muscle weight.

For the four varieties of turkey, the muscle to meat ratio for Black, Bronze, White and Bourbon Red were 65.8%,72.3%, 82.7% and 74.5% respectively.

Chemical composition

Skinless breast and thigh meat kept at -18°C was used to analyze the chemical composition. The proximate components (Moisture, Crude Protein, Crude Fiber,

Table 2: Nutrient content of ration provided to the turkey at different stages of their growth and production.

Nutritional composition	Starter ration (0-8 weeks)	Grower ration (9-16 weeks)	Layer ration (17 weeks-end of the laying period)
ME(kcal/kg)	2950	2950	2900
CP%	23	16	17
CF%	5.25	4.75	4.60
Ca%	1.00	1.50	3.50
P%	0.45	0.46	0.42

ME, Metabolizable energy; CP, Crude protein; CF, Crude Fat; Ca, Calcium and P, Phosphorus.

Ether Extract and Ash) were determined using the procedures outlined by AOAC (1990).

Egg related parameters

Fertility and hatchability

To ensure there were enough eggs for incubation, they were stored in a storage machine for up to 13 days at 18°C and 70%–80% relative humidity. Total 500 eggs (125/ variety) were incubated at peak production age. There was a 28-day incubation period overall. The eggs were placed in an incubator set at 37.5°C and 55% relative humidity for 25 days before being moved to a hatching machine set at 36.5°C and 70% relative humidity. The ratio of fertile eggs to total eggs was used to determine the fertility rate for each variety; the ratio of hatched keets to fertile eggs was used to determine the hatching rate.

Fertility=100×Number of fertile egg/Total number of eggs

Hatchability = 100 × Number of hatched chicks/ Number of fertile eggs

Hen day egg production and egg weight

The birds were housed in the same shed but in different pens separated by a wall. 16 (sixteen) hours lighting period was maintained during laying phase. For each variety, number of eggs were calculated for 18 weeks. 160 females were involved for the study. Egg weight per week was calculated using a scale sensitive to 0.01 g from 54-72 weeks.

Hen-Day Egg Production (%) = (Number of Eggs Produced ÷ Number of Hens Present) x 100.

Statistical analysis

The study examines various characteristics of different varieties of turkey. As the dependent variables constitute enough non-orthogonally, the analysis was made using completely randomized design (CRD). After completing the pre-tabulation task of the collected data, those were entered in MS office excel sheets and organized and processed for further analysis. Statistical analyses for all the parameters were done using Generalized Linear Model (GLM) procedure of Statistical Analysis System SAS 9.4 (M7) statistical software (SAS Institute Inc., 2022). Simple descriptive statistics, i.e. mean and standard error of mean (SEM) were applied to interpret the results. The results were processed by one-way ANOVA. The least squares analysis of variance (LSANOVA) and difference between least square means were calculated for all traits. Significance differences between mean values were analyzed by Duncan's New Multiple Range (DMRT) test in the same package. The following statistical model was used to describe the traits studied. The first model included the effect of turkey varieties on body weight, carcass characteristics, proximate composition, fertility, hatchability, hen day egg production percentage and egg weight of turkeys.

$$Y_{ij}=\mu+V_i+e_{ij}$$

Where, Y_{ij}= was the nth individual bird record

μ= General mean

V_i=Effect of ith variety (i=1-4)

e_{ij}=random error associated with each measurement normally distributed with mean '0' and variance $\sigma^2 e$.

Results and Discussion

Body weight

Table 3 depicts the effect of variety on body weight among four varieties of turkey. In the present study, with the exception of the 16th week, there was no significant variation ($p > 0.05$) in the body weight of the four varieties at weeks 4th ,8th, 12th and 20th which is consistent with the findings of Das *et al.* (2018). He examined the Black, Bronze and White turkey varieties and discovered no appreciable differences in body weight from the fourth to the twelfth weeks. However, he did observe variations in the sixteenth and twentieth week, where the Bronze variety's body weight was the highest. Results showed that numerically highest body weight of turkey from day old to 20 weeks of age was observed mostly in the Bronze variety (Table 3) which corresponds with the results of Miah *et al.* (2020) and Das *et al.* (2018). Das *et al.*, (2018) described that male Bronze type turkeys reached the maximum live body weight at 21 weeks of age (3720.71±64.96g/bird), followed by Black (3552.86± 112.47g/bird) and White (3282.29± 20.87g/bird) in semi-intensive conditions. The results of the current study, however, differ from those of Isguzar (2018), who found that the White turkey grew more quickly than the Bronze variety because it consistently gained more body weight than the Bronze variety from the day old until the end of the study period. Chana *et al.*, (2019) determined the impact of breed and sex on the body weight and linear body measurement of the Norfolk and Mammoth turkey breeds. Their results indicated significant difference ($p < 0.05$) in body weight across the breeds; Norfolk turkeys grew faster compared to Mammoth turkeys. Furthermore, genetic factors that have an impact on body weight and growth traits in turkeys have been studied. From a study conducted by Aslam *et al.* (2011), genetic variances and heritability estimates for body weight and other traits were estimated and it was found that body weight traits have moderate to high heritability, hence body weight could be improved through selective breeding for improved growth performance in turkeys. The insignificant body weight from 0 to 20 weeks in the current study could be due to similar feeding system, management and environmental condition.

Table 3: Body weight of different varieties of turkey reared under investigation

Week	Body weight (g)				SEM	p-value
	Black	Bronze	White	B. Red		
0	40.40	41.8	39.91	39.80	1.43	0.08
04	286.40	293.60	294.55	306.00	9.15	0.61
08	845.20	853.20	854.37	757.50	34.07	0.23
12	1678.40	1834.80	1658.37	1520.50	99.37	0.28
16	2468.40[a]	2541.20[a]	2151.37[b]	2462.75[a]	106.59	0.03
20	3231.80	3231.60	3177.91	3201.75	106.16	0.97

SEM, Standard error of means

[a-c]cMeans with different superscripts differ significantly ($p<0.05$); BW, Body weight, B, Bourbon and g, gram.

Egg related parameters

Table 4 exhibits the fertility and hatchability of turkey eggs of different varieties which ranged from 80-85% and 50-72% respectively. Significantly highest fertility of eggs was found in the Bronze variety and the highest hatchability was observed in the Bourbon Red variety. Numerically maximum hen day egg production was exhibited in the Bronze variety (Table 4) which is in line with the study of egg production performance of turkey observed by Janabi *et al.* (2019) and Das *et al.* (2022). Janabi *et al.*, (2019) observed the highest hen day egg production in the Bronze, Black and White varieties of turkey in Iraq. Adhikari *et al.*, (2024) who reported that turkeys kept in semi-intensive system attain fertility and hatchability rates of 84.77% and 79.33% respectively, which has surpassed the intensive one. According to Hasan *et al.* (2019), the total weekly hen day egg production increased from 30 to 38 weeks of age, but it fluctuated between 25 and 50 percent. From 39 to 49 weeks, the egg production declined. But the production of eggs increased from 50 weeks until the end of the laying period. In the present study, significantly the highest egg weight was found in the White variety among four varieties of turkey which is dissimilar to the findings of Janabi *et al.* (2019) who found the highest egg weight in the Black variety followed by the White variety. Anandh *et al.*, (2012) too brought out the effect of the egg weight in hatching performance underlining the higher fertility and hatchability attained in turkey eggs weighing more than 70g. Besides this, a study conducted by Jahan *et al.* (2024) revealed that incorporation of egg shell powder in turkey diets as a supplementary source of calcium improved egg production, quality of eggs and reproductive performance.

Slaughter and carcass traits

According to Table 5, the Bronze variety had significantly higher (P<0.0001) carcass weight, dressing percentage, breast and thigh meat, which contrasts with the research by Isguzaar (2018). He concluded that White turkeys had heavier carcasses and breasts than Bronze turkeys. In the current study, no notable variation (p>0.005) were seen in the value of shank length, kidney, spleen, liver, large intestine length and abdominal fat among four varieties. According to Miah *et al.* (2020), there are considerable differences in the length of the

Table 4: Reproductive and productive performance of different varieties of turkey reared under this study

Parameters	Black	Bronze	White	B. Red	SEM	p-value
Age at first laying (days)	164^{a}	162^{a}	163^{a}	168^{b}	0.913	0.008
Fertility (%)	82.67^{ab}	84.67^{a}	80.82^{b}	81.35^{b}	0.67	0.02
Hatchability (%)	62.35^{b}	53.48^{c}	51.22^{d}	70.43^{a}	0.58	0.001
HDEP (%) (54 -72 weeks)	33.93	38.32	28.27	35.00	5.10	0.59
Egg weight(g) (54-72 weeks)	67.24^{c}	69.52^{bc}	75.86^{a}	72.67^{ab}	1.25	0.0002

SEM, Standard error of means

$^{a\text{-}c}$Means with different superscripts differ significantly (p<0.05); HDEP, Hen Day Egg Production and B, Bourbon.

shanks of different turkey varieties, with the Bronze variety coming out significantly higher. However, in the current study, significant difference was found in feather plus skin weight, shank weight, head weight, neck weight, drumstick weight, wing weight, wing length, heart weight, gizzard weight, total intestine, SI weight, SI length, LI weight, caecum weight and caecum length. In most of the carcass characteristics, Bronze and White turkey had the highest value which is similar with the findings of Isguzar (2018) where Bronze turkey had the highest value in most of the carcass traits. It might be due to genotypic variation as the turkeys of Turkey had larger body weight than our local turkeys.

Table 5: Carcass characteristics of different adult turkey varieties reared at turkey research shed

Parameters	Black	Bronze	White	B. Red	SEM	p-value
Live weight(kg)	6.59	6.70	6.20	6.19	0.082	0.34
Carcass weight (kg)	3.91^{b}	4.35^{a}	3.52^{c}	3.58^{c}	0.065	<0.0001
DP(%)	59.60^{b}	64.94^{a}	56.8^{d}	57.00^{c}	0.003	<0.0001
Breast weight (g)	705.00^{d}	846.50^{a}	764.2^{c}	847.00^{b}	0.913	<0.0001
Thigh weight (g)	564.00^{c}	715.67^{a}	640.09^{b}	525.00^{c}	0.58	<0.0005
AF (g)	59.00	58.00	60.00	58.00	0.12	0.88
Feather+ skin weight (g)	1.65^{a}	1.21^{c}	1.60^{ab}	1.24^{b}	0.12	0.01
Shank weight (g)	180.00^{d}	213.00^{b}	259.00^{a}	207.00^{c}	1.12	<0.0001
Shank length(cm)	15.00	15.00	14.00	14.00	1.12	0.91
Head weight (g)	130.00^{d}	143.00^{b}	191.00^{a}	137.00^{c}	1.12	<0.0001
Neck weight (g)	280.00^{c}	350.00^{a}	329.00^{b}	278.00^{c}	0.00	<0.0001
Neck length (cm)	27.00	30.50	31.00	28.33	0.00	0.75
Drumstick weight (g)	533.00^{c}	640.50^{a}	632.00^{b}	494.33^{d}	1.09	<0.0001
Wing weight (g)	339.00^{d}	443.00^{c}	550.00^{a}	479.00^{b}	1.16	<0.0001
Wing length (cm)	24.00^{c}	28.00^{b}	38.00^{a}	36.00^{a}	1.16	0.0001
Liver weight (g)	97.00	97.00	100.00	100.00	1.16	0.09
Heart weight (g)	29.00^{b}	27.00^{b}	40.00^{a}	30.00^{b}	1.16	0.0005
Kidney weight (g)	9.00	11.00	12.00	10.00	1.16	0.36
Spleen weight (g)	2.000	4.000	3.000	4.000	0.58	0.27
Gizzard weight (g)	213.00^{b}	176.00^{c}	240.00^{a}	132.00^{d}	1.16	<0.0001
Total Intestine (g)	154.00^{b}	148.33^{c}	169.00^{a}	169.00^{a}	1.16	<0.0001
SI weight (g)	112.00^{b}	96.00^{c}	98.00^{c}	129.00^{a}	1.16	<0.0001
SI length (cm)	172.00^{a}	149.00^{c}	134.00^{d}	156.00^{b}	1.16	<0.0001
LI weight (g)	17.00^{a}	11.50^{b}	11.00^{b}	12.00^{b}	1.16	0.02
LI length (cm)	17.00	15.00	15.00	15.00	1.16	0.55
Caecum weight (g)	30.00^{b}	31.00^{b}	40.00^{a}	23.00^{c}	1.16	<0.0001
Caecum length (cm)	18.00^{b}	19.50^{b}	25.50^{a}	14.00^{c}	1.16	<0.0008

SEM, Standard error of means

$^{a-c}$Means with different superscripts differ significantly ($p<0.05$); DP, Dressing percentage; AF, Abdominal fat; SI, Small intestine; LI, Large intestine; kg; kilogram; g, gram; B, Bourbon and cm, centimeter.

Proximate analysis

Table 6 and 7 exhibit the effect of variety on the percentage of proximate component of breast and thigh meat of different varieties of turkey. There was no significant difference (P<0.05) found in protein percentage among different turkey varieties which collaborates with the findings of Amirkhanov *et al.* (2017) but is disagreeable with the results reported by Isguzar (2018) as protein percentage is higher in Bronze variety than White. In the present study, Ether extract was significantly higher in Bourbon Red turkey and low in White turkey which is agreeable with results reported by Amirkhanov et al. (2017) and Isguzar (2018). Isguzar (2018) found more fat in Bronze turkey meat than White. In the present study, the percentage of crude fiber was higher in breast and thigh meat of Black turkey. The amount of ash was higher in White turkey which is similar with the results of Amirkhanov et al. (2017). He stated that the percentage of ash is insignificantly higher in White turkey and lower in Bourbon Red turkey. The insignificant chemical composition in most of the proximate components could result from the same feed that had been provided to four varieties of turkey. Karakök et al., (2010) reported that turkey meat had a high protein content (24.38%) and low crude fat content (1.19%) which is close to the results of the current study, supporting the notion that turkey meat is a lean meat.

Table 6: Proximate analysis of breast meat of different varieties of turkey at adult age

Variety	Breast				
	Mo%	**CP%**	**EE%**	**CF%**	**Ash%**
Black	74.05	26.44	1.60^{c}	1.55^{a}	0.85^{c}
Bronze	73.85	26.28	1.80^{b}	0.45^{b}	1.10^{b}
White	73.55	26.72	1.20^{d}	0.33^{b}	1.35^{a}
B. Red	72.30	25.80	2.20^{a}	0.35^{b}	1.25^{ab}
SEM	0.58	0.58	0.058	0.058	0.058
p-value	0.22	0.73	<0.0001	<0.0001	0.001

SEM, Standard error of means

$^{a\text{-}c}$Means with different superscripts differ significantly (p<0.05); B, Bourbon; Mo, Moisture; CP, Crude Protein; EE, Ether Extract and CF, Crude Fiber.

Table 7: Proximate analysis of thigh meat of different varieties of turkey at adult age

Variety	Thigh				
	Mo%	**CP%**	**EE%**	**CF%**	**Ash%**
Black	76.90^{a}	25.45	2.00^{b}	1.65^{a}	0.93
Bronze	75.95^{ab}	26.36	1.60^{c}	0.85^{b}	1.00
White	74.15^{bc}	24.39	1.40^{d}	0.45^{c}	0.90
B. Red	73.95^{c}	25.97	2.80^{a}	0.50^{c}	1.05
SEM	0.58	0.58	0.06	0.06	0.17
p-value	0.018	0.167	<0.0001	<0.0001	0.17

SEM, Standard error of means

$^{a\text{-}c}$Means with different superscripts differ significantly (p<0.05); B, Bourbon; Mo, Moisture; CP, Crude Protein; EE, Ether Extract and CF, Crude Fiber.

Lipid profile of blood serum

The lipid profiles of turkey birds are summarized in Table 8. This study assessed total cholesterol (TL), triglycerides (TG), low-density lipoprotein (LDL) cholesterol and high-density lipoprotein (HDL) cholesterol. The mean values for total cholesterol, HDL cholesterol and LDL cholesterol were lower in the Bronze variety compared to the other turkey varieties. Conversely, the mean triglyceride levels were higher in the Black variety and lower in the White and Bourbon Red varieties. Hayet *et al.*, (2021) observed TL level was 112.53 ± 11.51 mg/dL in females of turkey which is found in the male White variety of the present study. He also found TG level was 136.68 ± 10.26 mg/dL in males of turkey which is observed in the White and Red turkey male. He found similar LDL-c and HDL-c levels in male turkey which are found in the Black and Bronze turkey variety of the present study respectively. Additionally, another research by Amirkhanov *et al.* (2017) did mention that turkey meat especially from the White variety contains less fat and this serves as another observation that was evident in the current study through lower amount of TGs in the White and Bourbon Red variety. Furthermore, Tasić *et al.* (2023) in a study, determined the fatty acid profiles and health lipid indices in raw turkey meat and found out that the turkey muscle had greater amount of saturated fatty acids (47.9%) and satisfactory atherogenicity index, indicating its use in a healthy diet.

Conclusion

It can be concluded that Bronze variety of turkey is better performer than other varieties in terms of growth, carcass characteristics, egg fertility and hen day egg production. But in the case of chemical parameters, there is no such difference although meat of the white variety has the lowest level of ether extract and crude fiber and the highest level of ash. Moreover, Bronze variety and Bourbon Red variety exhibited better performance in blood serum lipid profile.

Table 8: Lipid profile of blood serum of different adult varieties of turkey reared at turkey research shed

Variety	Lipid profile				SEM	p-value
	Black	Bronze	White	B. Red		
TL	172.00^{b}	95.50^{d}	126.07^{c}	227.00^{a}	0.67	<0.0001
HDL-c	47.00^{c}	44.33^{d}	64.00^{b}	105.00^{a}	0.67	<0.0001
LDL-c	44.00^{b}	16.00^{d}	36.00^{c}	81.00^{a}	0.58	<0.0001
TG	378.00^{a}	143.00^{b}	135.00^{c}	135.00^{c}	0.58	<0.0001

SEM, standard error of means

$^{a-c}$Means with different superscripts differ significantly ($p<0.05$); B, Bourbon; TL, Total Cholesterol; HDL, High Density Lipoprotein; LDL, Low Density Lipoprotein; TG, Triglyceride; mg, milligram and dL, deciliter.

Conflict of interest

The authors declare that there are no conflicts of interest in relation to this paper.

Reference

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