AJMAS
https://journal.utripoli.edu.ly/index.php/Alqalam/index eISSN 2707-7179

Original article

Growth Performance, Some Carcass Traits and Biochemical Parameters of Ross 308 Broilers Under Commercial Farming Conditions in Northeastern of Libya

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ARTICLE INFO

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Received*: 01-08-2023*
Accepted*: 25-08-2023*
Published*: 27-08-2023*

Keywords*. Growth Performance, Carcass Traits, Biochemical Parameters, Ross 308 Broilers.*

ABSTRACT

Background and aims*. Assessment of the productivity of exotic strains of broilers should be periodically carried out to define their requirements and optimize productive efficiency. The growth performance, some carcass characteristics and blood parameters of Ross 308 broiler chickens under traditional rearing conditions in northeastern of Libya were investigated.* ***Methods****. The body weight (BW) and feed consumption were weekly measured, and average daily feed intake (ADFI), average daily gain (ADG), and gain: feed ratio (FCR) were calculated. At 35 days of age the final body weight, carcass characteristics and blood parameters of broilers were determined.* ***Results****. The results revealed that at 35 days of rearing, the chickens reached the mean final body weight of 1756.26 g, the eviscerated carcass weight averaged 957.1 g, and the slaughter yield was 60.8%. The ADFI, ADG, and FCR were 81.95 (g/b/day), 48.62 (g/b/day) and1.68, respectively. Mean internal organ weights were in the range reported previously for Ross 308 broilers. Of the serum biochemical parameters tested, the mean ALP and AST levels were higher than the values reported previously in literature for Ross 308 broiler chickens which could reflect pathological changes in broilers reared under traditional and commercial conditions in the study area. C****onclusion****. Ross 308 chickens examined under commercial conditions did not attain a final body weight of 2 kg and slaughter yield of 70% as productive performance targets in the broiler production system which could reflect improper practice management applied to the broiler through the entire rearing period.*

Cite this article. *Sitmo M, Meriz O, Aboushnaf F, Ismaael N, Growth Performance, Some Carcass Traits and Biochemical Parameters of Ross 308 Broilers Under Commercial Farming Conditions in Northeastern of Libya. Alq J Med App Sci. 2023;6(2):511-521. https://doi.org/10.5281/zenodo.8287562*

INTRODUCTION

The high demand for chicken meat in recent years has led to tremendous development in the poultry industry [56]. Poultry is the most numerous species of farm animals in Libya. Since 1970, commercial chicken has developed into a

significant source of protein for consumers and a significant source of income for broiler farmers [29]. The modern broiler compared to other meat-producing animals is a fast growing animal that can rapidly meet the needs of the nation's protein because it can be produced in a short production cycle [60]. Due to its market price and its contribution of roughly 44.7% to total meat production, poultry meat can be considered one of the most important sources of protein in Libya [27]. Broiler meat is healthier than red meat as it has low cholesterol and fat content and it is an excellent source of protein, minerals, and vitamins needed for a person's body to grow and develop. [22,51]. As a result of the development of the new technologies applied to chicken nutrition and genetics, the performance of the modern broiler constitutes one of the most notable improvements in productivity [16,37]. Ross 308 strain of broilers has been recognized as one of the strains that are commonly reared for commercial purposes [35]. A strain of chicken exhibits its unique efficiency and characteristics only under a certain environment, the genetic characteristics of the broiler strain as well as the non-genetic elements like feeding and management practices are equally responsible to evoke the bird's performance [50,64]. Poultry breeders suggest that the adaptability of the exotic broiler strains must be regularly monitored under local environmental conditions [30,41]. Therefore, the current study aimed to evaluate the growth performance, some carcass traits and blood parameters of the Ross 308 strain under commercial farming conditions in Libya.

METHODS

All experimental procedures were reviewed and approved by the Libyan Committee of Biosafety and Bioethics, the Libyan Authority for Scientific Research.

Birds, diets and management

The study was conducted from August to September 2021 at a commercial broiler farm in Shahhat, AL Jabal Al Akhdar district, Libya (32˚ 49`40 N, 21˚51`44 E, elevation 513 m). A total of 7000 newly hatched unsexed broiler chicks (Ross 308) were reared for 5 weeks in a well-ventilated and illuminated poultry shed measuring 37x10x3 m (LxWxH). The chicks were maintained under conventional conditions on a concrete floor covered with clean wood shavings with free access to feed and water (Figures 1, 2). Commercial broiler starter (in mash form) and grower (in pellets) rations were provided during brooding and finisher stages, respectively. Room temperatures and relative humidifies during the rearing period ranged between 28 & 35 C˚ and 46 & 69%, respectively. Samples of rations were collected and analyzed according to AOAC [7]. Some medications and dietary supplementations were provided to the chicks for their proper growth and development.

Figure 1. Chicks at 1 week of age under the commercial condition

Figure 2. Broiler chickens at 5 weeks of age

Measurements

Growth performance

During the rearing period, daily feed intake (DFI) was calculated by subtracting the leftover from the total quantity of feed provided to the chicks. The weights of birds were monitored at week intervals to calculate average chick weight (mortality corrected). The feed conversion ratio (FCR) was calculated as feed intake (g) divided by body weight gain (BWG, g).

Samples collection

On 35 days of age, thirty birds were randomly selected for sample collection, weighed, and killed by a manual neck cutter. The collection of blood samples was performed in a plain tube from each bird to extract the serum. Following chicks bleeding, the abdominal cavity was incised and the gastrointestinal tract was excised from the proventriculus to the intestine end. The proventriculus and gizzard were emptied and separately weighed. The thymus, heart, liver (without gall bladder), pancreas, spleen, and bursa of fabricius were removed and separately weighed. The weight and length of ceca and the small intestine segments, i.e., duodenum (from gizzard to pancreo-biliary ducts), jejunum (from pancreo-biliary ducts to Meckel's diverticulum), and ileum (from Meckel's diverticulum to ileo-caecal junction) were separately measured. The weights were also expressed as relative weights (in g/kg live weight). To determine Carcass yield, the eviscerated carcass (free from the head, feet, and viscera except for the lungs and kidneys) was divided by live weight.

Biochemical parameters

Samples were centrifuged at 3000 x g for 15 minutes to separate the serum, which was then stored at -20 ℃ pending analysis. The levels of total proteins, albumin, triglycerides, glucose, total cholesterol, high density lipoprotein (HDL), low-density lipoprotein (LDL), aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), were determined using a biochemical analyzer (Microlab 300, France) and its accompanying kits.

Statistical analysis

The data was analyzed using basic statistical methods like mean and percentage, etc.

RESULTS

The percentage composition of the diet provided to broilers in the starter and grower phases is shown in Table 1. Moisture content determined in rations in this study was 10 %. The crude protein contents (%) in starter and grower rations were 18.36 and 22.95, respectively. The fat content was 11.7 % in the starter ration, while it was 4.09 % in the grower ration. The percentage of crude fibers of the starter diet was 3.46 (%) and that of the grower diet was 2 (%). The total ash level (%) was 5.98 in the starter ration and 5.4 in the grower ration. Calcium and total phosphorus levels (%) of diets in the present study were (0.22, 0.059) and (0.19, 0.053) for starter and grower rations, respectively.

Table 1. Proximate composition of broiler starter and grower rations (g/100gDM)

Item	Starter ration	Grower ration
Dry matter	89.98	90.56
Moisture	10.01	9.44
Crude protein	18.36	22.95
Crude fiber	3.46	2
Crude fat	11.17	4.09
Total ash	5.98	5.4
Calcium	0.22	0.19
Total phosphorus	0.059	0.053

Growth performance

The performance indices of broiler chickens in the starter (2 weeks), grower (5 weeks) phases and the overall period are presented in Table 2. The mean body weight (BW) of broiler chicks at 14 days of age in the current study was 381.84±7.5 (g/b). The mean weight gain (WG) was 23.39 (g/b/day). The daily feed intake (DFI) and the calculated feed conversion ratio (FCR) of broiler chicks obtained by our study averaged 31.35 (g/b/day) and 1.34, respectively. The mean body weight of 5-week chicks in this study was 1756.26± 29.47 (g/b) and the mean weight gain averaged 65.45 (g/b/day). The daily feed intake and feed conversion ration values of chicks reported in this study were 112.93 (g/b/day) and 1.7, respectively. The DFI, WG, and FCR of the entire rearing period were 81.95, 48.62, and 1.68, respectively. The mortality rates recorded in the present study were 2.9, 1.1, and 4.4 (%) during the starter, grower phases, and the entire rearing period, respectively.

Table 2. Performance indices of Ross 308 broilers under commercial conditions

Variables	Starter phase 1-14 days	Grower phase 15-35 days	Total period 1-35 days
Initial weight (g/b±SEM)	54.43±0.51	381.84±7.5	54.43±0.51
Final weight (g/b±SEM)	381.84±7.5	1756.26± 29.47	1756.26± 29.47
Weight gain (g/b/day)	23.39	65.45	48.62
Daily feed intake (g/b/day)	31.35	112.93	81.95
FCR	1.34	1.7	1.68
Mortality (%)	2.9	1.1	4.4

Carcass measurements

As shown in Table 3, at the end of 35 day growing period, the mean weight of eviscerated carcass with the neck was 957.1±24.4 (g), while its relative weight (%) was 60.8. The relative weights of the digestive organs (proventriculus, duodenum, jejunum, ileum, and ceca) of broilers examined in the current study were 0.4, 1.08, 2.23, and 0.81, respectively. The mean weight (g) and the relative weight (%) of the giblets (gizzard, liver, and heart) as edible elements were 23 ±1.65, and 1.46±0.1, respectively, while the relative weight of the pancreas in this study was 0.24 (%). The mean length (cm) obtained by the present study for duodenum was 32.35±0.4, that of jejunum was 77.77±1.68, that of ileum was 78.65±1.67, and for ceca was 37.55±0.64. The relative weights (%) of the lymphoid organs (Thymus, spleen, and bursa of fabricius) examined by the current study were 0.28, 0.11, and 0.10, respectively.

Table 3. Carcass and internal organ measurements of the broiler chickens at 35 days (Mean ±SEM)

Element	Absolute organ weight (g)	Relative organ weight (%BW)
Carcass	957.1±24.4	60.8±0.27
Proventriculus	7.04±0.46	0.4 ±0.02
Gizzard	23.7±0.88	1.5±0.06
Heart	8.1±0.32	0.5±0.01
Liver	37.1±1.5	2.3±0.07
Giblets	23 ±1.65	1.46±0.1
Pancreas	3.8±0.17	0.24±0.01
Spleen	1.8±0.12	0.11±0.01
Bursa of Fabricius	1.6±0.07	0.10±0.01
Thymus	4.4±0.44	0.28±0.03
Duodenum	17±0.57	1.08 ±0.03
Jejunum	35±1.7	2.23±0.08
Ileum	28.3±1.65	1.8±0.08
Ceca	12.8±0.62	0.81±0.04
Duodenum (cm)	32.35±0.43	-
Jejunum(cm)	77.77±1.68	-
Ileum(cm)	78.65±1.67	-
Ceca(cm)	37.55±0.64	-

Biochemical parameters

Table 4 shows the biochemical indices of Ross 308 broilers at 35 days of age. The obtained mean values for total protein, albumen and globin were 3.8±0.15,1.7±0.04, and 2.05±0.14 (g/dL), respectively. The mean values of the serum total cholesterol, triglycerides, HDL, and LDL of 109.85±3.6, 48.05±2.8, 74.4±2.4, and 25.7±1.9 (mg/dL), respectively were recorded in the current study. Glucose mean value of 229.4±5.3 was obtained in this study. Analysis of serum enzyme activities revealed values (U/L) of 8.25±0.38, 318±9.9, and 2681±168 for ALT, AST, and ALP, respectively.

Table 4. The biochemical profile of Ross 308 broiler aged 35 days

Serum parameter	Mean (± SEM)
Total protein (g/dL)	3.8±0.15
Albumen (g/dL)	1.7±0.04
Globin (g/dL)	2.05±0.14
A/G	0.92±0.06
Total cholesterol (mg/dL)	109.85±3.6
Triglycerides (mg/dL)	48.05±2.8
HDL (mg/dL)	74.4±2.4
LDL (mg/dL)	25.7±1.9
Glucose (mg/dL)	229.37±5.3
ALT (U/L)	8.25±0.38
AST (U/L)	318±9.9
ALP (U/L)	2681.7±168

DISCUSSION

Evaluation of diet composition

The level of Moisture in rations provided to broilers in this study was consistent with that indicated by the Bureau of Indian Standards for nutrient requirements of Poultry [15]. However, Afolabi *et al.* reported lower values for moisture content in poultry feed (1.54%) [3]. Formulation of poultry feed with low moisture content is essential to reduce feed deterioration during storage [3]. For starter and grower rations, respectively, the crude protein content was lower than 23 (%) and higher than the 20 and 21.5 (%) levels advised by the National Research Council and the Ross Broiler Nutrition Specifications [10,49]. During the starter period, the nutritional requirements of chicks are at their peak, thus providing the right amounts of nutrients during this stage can support healthy early growth and ensure achieving body weight objectives [9]. The daily growth rates of chicks continue to rise quickly during the grower phase, so the feed must be formulated to ensure adequate nutrient intake and achieve optimal biological performance [9,49]. Fat levels in starter and finisher diets were higher and lower, respectively than those reported by previous studies [40,76]. The inclusion of lipids in broiler diets is a common practice as it represents the main source of diet energy [40,76]. However, the digestion and absorption capacity of lipids in young broilers is poor because of the immature physiological functions and the low level of natural lipase and bile acids production [5]. Therefore, the fat digestibility at such a high level used in the starter ration in the current study might have been compromised. The crude fiber content of rations in this study was in the range reported by previous studies [40,47,68]. Low levels of crude fiber in the diet of newly hatched broilers have been suggested to improve feed intake [40]. However, it was assumed that the content of fibers in the chick ration could be increased to as much as 8 to 9 percent of the ration without adverse effects on chick growth and performance [47]. Ash is the total mineral content of a diet. Jiménez-Moreno *et al.* reported higher levels of total ash, ranging between 7.6 and 9.3% in poultry feed stuffs [40]. Whereas a previous study obtained lower levels (1.65 and 2.38) in starter and finisher broiler diets, respectively [59]. Ash content in animal feed has been reported to be 5-9% and abnormally high levels could be due to contamination with soil which it is not desirable [34]. The calcium levels were lower than those recommended in the nutrition tables for optimal performance of broilers [10,49]. Optimal calcium level in broiler diets is essential for growth, bone development, and nervous and immune systems function [9]. Total Phosphorus levels were lower than those reported by Zhao and Kim (0.73 and 0.68 %) for nutrient requirements in the starter and finisher phases of broilers, respectively [77]. This macromineral is needed in proper quantity to ensure optimal skeletal system growth [77].

Growth performance

The Physiological and productive status of a given broiler strain is the product of the local conditions at which it is reared [52]. The mean body weight of chicks aged 14 days in the current study was higher than that (340.2g/b) reported by Martínez and Valdivié and lower than 399.5, 385.4, and 452.36 obtained for Ross 308 strain in other studies [14,46,70,72]. The mean weight gain of chicks obtained by our study was higher than 19.0 (g/b/day) reported by Saadatmand *et al.* [61], while Wickramasuriya *et al*. recorded a higher WG value (37.64) [61]. For the daily feed intake and feed conversion ratio, Martínez and Valdivié recorded lower FI (29g/b) and higher FCR (1.43), while Toghyani *et al*. had close values for the two performance parameters (32,1.37) at 14 days of age in this strain of broiler chickens [46,70]. Low protein content in the starter ration provided to chicks examined in this study (17.32), as shown in Table 1, may did not meet the nutritional requirements of chicks and affected growth rate and weight gain at

this stage of age. It has been suggested that for target weights achieving the weight at the age of one week should be 4.5-5 times greater than that at one day of age due to the positive link between early growth rate and the final body weight [8,43]. However, this was not the case in the present study as the chicks mean weight at one week of age was 190.61 and the initial weight was 54.43 (g/b). This poor growth performance of chicks aged one week could be attributed to improper management practices. Relative humidity (RH) during the starter phase ranged between 46-68%. It has been stated that RH lower than 50% in the first week can cause dehydration of the chicks and make them prone to respiratory problems, optimal RH levels in broiler house should be 60-70 % [8]. In addition, the environmental temperature during this phase averaged 35 Ċ which is higher than the value of 26.8-32.5 recommended to be optimal for a humidity level of 46-68% for broilers at age one to two weeks and these improper conditions may have participated to early poor growth performance [8].

The mean body weight of 5-week chicks in this study was higher than 1682.3 and 1644 (g/b) obtained for Ross 308 by Biesiada-Drzazga *et al*. and Martínez and Valdivié, respectively [14,46]. Earlier reports showed higher mean BW (2124, 2217 and 2048.8) at 35 days of age in Ross 308 strain, respectively [13,28,72]. The mean weight gain obtained by our study was lower than the value of 83.38 reported by Wickramasuriya *et al*. and the value of 72.59 obtained by Martínez and Valdivié [72,46], while it was slightly higher than 64.7 (g/b/day) for the grower period in Ross broilers reported by Upadhaya *et al*. [71]. The DFI and FCR values of broilers reported in this study were lower than 133.6 and 1.8; 185 and 2.23 obtained at 35 days of age in Ross 308 broilers in previous studies [46,72]. High protein content in the diet of broilers during the grower stage in the current study (22.95%, as shown in Table 1) has been linked to depression of broiler performance as a result of ammonia production from excess amino acids [48]. The coefficient of variation CV (%), which is the standard deviation of the population expressed as a percentage of the mean was in the current study 12.33 %. CV (%) is an index of the variability of a population, a variable flock has a high CV(%) and abnormal distribution of live weights. A CV value of 12% has been correlated with an As-Hatched (mixed sex) broiler flock in which less chicks achieve the required target live weight [8]. A similar CV value of 12.8% in Ross broilers aged 35 days was reported by Biesiada-Drzazga *et al*. [14]. A study conducted by Kokoszyński and Bernacki obtained a value of 10.2% in Ross broilers aged 42 days [42]. Rh levels during the grower phase ranged between 60-70%, however, the mean value of temperature was 30 Ċ which is higher than 19.3-22.7 recommended to be optimal for this level of humidity at 15-28 days of broiler age [8].The DFI, WG, and FCR of the entire rearing period were higher than that obtained by Upadhaya *et al*. and Martínez and Valdivié [46,71], while lower than those reported by Bedford *et al*. and Wickramasuriya *et al*. [12,72].

The variation of performance indices of Ross 308 broilers recorded in the present study compared to earlier reports could be attributed to various factors as suggested by many broiler researchers: the feeding process is a very important factor on which the economics of production depend as the nutrition directly influences the feed conversion ratio [27,46]. For profitable production, it is essential to provide the bird with diets that satisfy its nutritional requirements at each stage of its development [33]. The diets offered to broilers in the commercial farm under study were formulated as per recommendations of the National Research Council [49]. However, as shown in Table 1 most of the diet ingredients in both starter and grower rations were deviated from the proper recommended levels for optimal growth and productive performance. Furthermore, the application of the proper management practices for the rearing of broilers must be taken into account. "Interactions between nutrition quality, genetics, and optimal facilities are essential for the animal to express its maximum genetic potential and achieve high yields during the production stage" [39]. The broiler chicks of the flock examined in the present study were of both sexes. Gender has been reported to influence broiler performance, as males require higher amounts of dietary amino acids than females to attain maximum growth performance [53]. Sex-separate broiler productions are used in developed countries to improve the productive efficiency of broilers reared by using this production type [46].

Carcass measurements

The mean weight of eviscerated carcass with the neck at the end of the rearing period, as shown in Table 3, was lower than the values of 1529 and 1216.3 (g), respectively in Ross 308 broilers aged 5 weeks reported by Biesiada-Drzazga *et al*. and Biegniewska *et al*. [13,14]. The relative weight (%) of carcass obtained in this study was lower than 68, 72, and 70 (%), respectively recorded by Biegniewska *et al*., Biesiada-Drzazga *et al*. and Martínez and Valdivié [13,14,46]. However, this value was slightly higher than 59.8 for Ross broilers at 42 days of age obtained by Saadatmand *et al*. [61]. Dressing percentage represents an important criterion for evaluation of the slaughter value of broiler carcasses which normally accounts for 70-71(%) of the live body weight [13].

Different parts of the gut perform different digestive roles in feed digestion and making the various nutrients of the diet available to the broiler [67]. Better digestion of feed by a healthy gut promotes weight gain and growth performance in broiler chicken [72]. The type and composition of diet have been found to influence digestive organs

and hence broiler growth performance [11]. Ross 308 chick as a fast-growing broiler poses a digestive system that develops and matures faster than that of slow growing ones [38]. The relative weights of the digestive parts (proventriculus, duodenum, jejunum, ileum, and ceca) of broilers examined in the current study were comparable to those in Ross broilers aged 42 days found by Toghyani *et al*. and Saadatmand *et al*. [61,70].

The mean weight (g) and the relative weight (%) of the giblets (gizzard, liver, and heart) as edible elements were lower than those recorded by Biesiada-Drzazga *et al*. [14], while they were comparable to the values reported in Ross broilers aged 35 and 42 days by Kokoszyński and Bernacki, Saadatmand *et al*., Wickramasuriya *et al*. and Martínez and Valdivié [42,46,61,72]. Various dietary components in quality and quantity have been found to influence feed intake and body weight gain which in turn affect proportional weights of internal organs of broiler chicken [11,75]. Previous studies have demonstrated that the non-starch polysaccharide level of the diet (fibrous ingredient) has been implicated in changes related to morphometric aspects of the gastrointestinal tract in broiler chickens [32,25]. The mean lengths (cm) obtained by the present study for the small intestine segments and ceca were comparable to those reported by Saadatmand *et al*.[61]. Similarly, the length of these intestinal segments is influenced by diet [40,61].

The relative weight of the pancreas in this study was lower than 0.25 and 0.28 (%), respectively reported by Toghyani *et al*. and Saadatmand *et al*. [61,70], while it was similar to the values obtained by Shakouri and Malekzadeh and Wickramasuriya *et al*. [66,72]. The relative weights (%) of the lymphoid organs (Thymus, spleen, bursa) examined by the current study were higher for thymus and bursa than the values (0.23, .06) obtained in a previous study in Ross broilers aged 42 days [4]. Shakouri and Malekzadeh; and Wickramasuriya *et al*. reported higher (0.22) and comparable (0.09) percentage weights for the bursa and spleen, respectively, while Upadhaya *et al*. recorded higher percentage weights for these two organs than the values obtained by our study [72]. Dietary supplementation of various fat sources has been well documented to positively affect the weight of bursa and thymus and might have influenced the immunological responses of broilers in these studies [4,20].

Serum biochemical parameters

Blood biochemical profile provides important information about animal's health and immune status [16]. Table 5 shows the biochemical parameters of Ross 308 broilers at 35 days of age, the obtained mean values for total protein, albumen and globin were higher than the values reported by Upadhaya *et al*., Al-Rekabi *et al*. and Bontempo *et al*. [6,17,71]. They were lower than those obtained by Abdi-hache *et al*. [2]. Toghyani *et al*. reported similar values in Ross 308 broilers [70]. The mean value of total protein obtained in this study was within the range of a previous study which is 2.5 to 4.5 (g/dL) [69]. Piotrowska *et al*. obtained similar serum albumin level in broiler chickens (1.7g/dL) on day 42 of age [57]. High serum globulin reported in the current study may be an indication of a better immune response to many environmental stimuli and stressors [63]. The measurement of blood protein levels in avian patients is of a special significance for the assessment of health and nutritional condition because blood proteins play a crucial role in the maintenance of body homeostasis [57]. High total protein concentrations in serum have been linked to the growth process and feeding with protein-rich diets [24]. Different fractions of serum proteins play different physiological key roles in growing broiler chickens. Increased concentrations of globulins during the fattening period have been attributed to their roles in the transport of lipid molecules to supply great energy requirements and in the maturation of the immune system [24], while higher albumin fractions have been linked to their role in iron transport and hemoglobin synthesis associated with the extremely rapid growth in the fattening period [27,74]. The A/G ratio value in the current study was in the range reported by previous studies in broiler chickens [1,74].

For serum lipid profile, some studies recorded higher values of cholesterol, triglycerides [2,19,21,72], while a study conducted by Al-Rekabi *et al* obtained higher cholesterol and lower triglycerides values than those reported by our study [6]. Similar levels of these serum metabolites were reported by Ozdogan and Aksit, Bontempo *et al*. and Upadhaya *et al*. [17,55,71]. For HDL and LDL levels, the mean values obtained by the present study were higher for HDL and lower for LDL than those reported by Toghyani *et al*., Chand *et al*., and Bontempo *et al*. [17,19,70]. It has been documented that the inclusion of animal fat in broiler diets causes elevated levels of blood lipid metabolites such as cholesterol, LDL, and triglycerides [76]. Triglycerides are transported from its synthesis site in the liver to peripheral tissues through LDL and from tissues to the liver through HDL. HDL has also an important role in decreasing the negative effects of high blood cholesterol [31,55]. The mean glucose value obtained in this study was lower than that reported by Chand *et al*. [19]. However, it is within the normal range of 200 to 500 (mg/dl) reported for broiler chickens [18].

Assessment of blood enzymes status is essential for diagnosis of avian diseases [63]. ALT level was lower than that reported by Abdi-Hachesoo *et al*. and Chand *et al*. [2,19], it was also lower than the range level of 19 to 50 (IU/ L.) recorded for bird species in general by Lumeij [50]. Lower AST levels were reported in previous studies [2,19]. ALT and AST are essential indicators of liver health as they are located in liver cells and their high serum levels indicate

acute liver failure due to their release into the blood in case of liver damage [54]. “ALP is an enzyme responsible for dephosphorylation of a substrate therefore it is produced in all types of tissues in the body but its elevated levels can be mostly seen in liver damages" [63]. Senanayake *et al*. recorded a mean ALP level close to the value found in the current study in broilers kept at high ambient temperatures. This study was conducted in summer at an ambient temperature reached 35Ċ which could be the reason for the elevated levels of some serum metabolites recorded in this strain of broilers which belongs to fast-growing strains that are more susceptible to heat stress compared to those having slow growth rate [67]. High environmental temperature affects many serum metabolites in broiler chickens. An increase in serum levels of ALT, AST, ALP, Glucose, HDL, LDL and cholesterol in broilers under heat stress has been documented [30,36]. Hyperactivity of the adrenal gland and the overproduction of glucocorticoid and corticosterone hormones at high ambient temperature could cause an increase in serum glucose, triglycerides and cholesterol levels in broiler chickens [30]. Increased activities of serum AST and ALP at high ambient temperature have been shown in broiler chicks and the reason has been linked to high production of reactive oxygen species due to decreased activity of antioxidative enzymes [19,44,64]. Elevated activity of serum ALT and AST has also been reported in broilers fed diets that have high levels of unsaturated fats and this effect could be associated with lipid peroxidation and its negative effect on the liver [23,26]. However, the ALT level obtained in the current study was lower than that shown by previous study as discussed above. Furthermore, Modern broiler chickens have been developed with high feed intake to gain more weight which has been associated with animal metabolic abnormalities [41].

CONCLUSION

It can be concluded that the poor productive performance of broilers examined in this study could be in part attributed to feeding process, in which the diet as shown was deviated in most nutrients from the proper levels recommended for broilers, or to improper management practices applied under commercial conditions. Further investigations are needed to assess the nutritional and management program used in broiler production, which could help to establish a guideline for proper management regimes and adjusted nutritional recommendations that would provoke this broiler strain to express its productive potential and to improve growth performance and economic profitability.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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أداء النمو ,بعض خواص الذبيحة والمعاييرالكميائية للدجاج اللاحم روس 308 تحت ظروف التربية التجارية في شمال شرق ليبيا

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الملخص

الخلفية والأهداف:.تقييم إنتاجية أنواع سلالات الدجاج اللاحم الخارجية يجب أن يجرى بشكل دوري لتحديد متطلباتها ولتحسين فعاليتها الإنتاجية. أداء النمو، بعض صفات الذبيحة ومعايير الدم لطيور الدجاج اللاحم روس 308 تحت شروط التربية التقليدية في شمال شرق ليبيا تم فحصها. **طرق الدراسة**: وزن الجسم ومعدل استهلاك الغذاء للطيور تم قياسهما إسبوعيا، متوسط أكل الطير اليومي (ADFI) ومتوسط الوزن المكتسب اليومي (ADG) ومعامل تحويل الغذاء (FCR) (نسبة الوزن المكتسب :الغذاء) تم قياسها. عند عمر 35 يوم حدد وزن الجسم النهائي للطير وبعض خواص الذبيحة ومعايير مصل الدم. **نتائج الدراسة**: أظهرت النتائج أنه عند عمر 35 يوم من فترة التربية وصلت الطيور لمتوسط وزن جسم نهائي عادل 1756.26 جم ومتوسط وزن الذبيحة منزوعة الأحشاء بلغ 957.1 جم وعائد الذبح بلغ 60.8 %. ADG, ADFI و FCR كانت 81.95 (جم/طير/يوم)، 48.62 (جم/طير/يوم) و 1.68 على التوالي. متوسط وزن الأعضاء الداخلية للطيور تحت شروط التربية الليبية كانت ضمن المعدل المسجل لهذا النوع من سلالة الدجاج اللاحم في دراسات سابقة. من المعايير البيوكيميائية للدم التي تم فحصها، متوسط مستوى إنزيمي ALP و AST كانا أعلى من قيمتيهما المسجلة في دراسات سابقة والذي قد يعكس تغيرات مرضية في هذه الطيور المرباة تحت الشروط التقليدية التجارية في منطقة الدراسة. **الخاتمة**: طيور دجاج اللاحم روس 308 المفحوصة تحت الشروط التجارية الليبية لم تحقق متوسط وزن جسم نهائي 2 كجم وعائد ذبح 70% كهدفين للأداء الإنتاجي الذي يمكن أن يكون ناتجا عن ممارسات تربية غير مناسبة مطبقة في رعاية الطيور خلال دورة الإنتاج الكاملة.

الكلمات المفتاحية: أداء النمو، خواص الذبيحة، المعايير البيوكيميائية، طيوراللاحم روس 308.