Comparative study of intestinal segments development and some blood constituents in meat- and egg-type chicks

R. A. Abo-Salem [*], H. M. S. Shoukry, M. A. Al-Gamal, and A. A. El-Shafei

Department of Animal Production, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt.

* Corresponding author E-mail: roshdyabosalem86@azhar.edue.eg (R. Abo-Salem)

ABSTRACT:

The digestive system of birds has unique aspects in that they ingest their feed. The genetic development of highly productive breeds chosen for either egg or meat production is essential to the commercial chicken industry. The study was done to investigate the anatomical differences in the gastrointestinal tract and some blood constitutes of broiler and layer breeds. A total number of 600 female chicks (300 chicks from Ross 308 as meat-type and 300 chicks from Lohmann Selected Leghorn (L.S.L.) as egg-type) were used in the study. The birds were randomly distributed among three replicates for each chick type and each replicate contained 100 birds. The experiment started from the first week to the fifth week of age. A comparative study of intestinal segments development was done between both types of chicks according to their chronological age regardless of their weight differences including BWT, BWG and FI, weights, lengths and density of duodenum, jejunum, ileum, cecum, and rectum. Also, plasma albumin, triglycerides, cholesterol, and HDL were measured. Results indicated that BWT, BWG, FI, weights, lengths and density of the duodenum, jejunum, ileum, cecum, and rectum in the Ross 308 meat-type chicks were significantly($P \leq 0.05$) higher than L.S.L. egg-type chicks through weeks of study. Triglycerides, cholesterol and HDL were significantly higher in the Ross 308 meat-type compared with the L.S.L. egg-type chicks. Bases upon these results, it can be concluded that all variables were superior in the Ross 308 meat-type chicks compared to the L.S.L. egg-type chicks.

Keywords: Segments; Lengths; Weights; Meat; Egg.

INTRODUCTION

The poultry industry is currently the most highly efficient livestock production sector and the domestic chickens (*Gallus gallus domesticus*) are the most widespread farm animal and a remarkable model organism. The gastrointestinal tract (GIT) is the machinery that swallows, ingests and processes food to provide energy and other nutrients for living and production. This crucial role of GIT attracts research efforts to investigate it. Long-term domestication of chicken resulted in the formation of several breeds that differ significantly in body weight and variety of other traits. Bennett *et al.,* (2018) reported that breeding efforts between the late middle ages and the present day caused a doubling in the body size of chickens. The biological qualities that the birds have acquired are reflected in the significant variations in overall appearance that arise from the synthesis of breeds through crossbreeding and selection (Larkina *et al.,* 2021).

A change in the productivity of the meat-type chicken industry was achieved via intentional genetic selection through classic quantitative methods (Zuidhof *et al.,* 2014). The US consumer price index for the products of chicken climbed between 1960 and 2004 at half the pace of all other items due to advancements in growth and efficiency. This has been a significant element in the rise in the consumption of chicken meat (Hunton, 2006).

The growth rate of broiler and layer chicks is different and is presumed to stem from distinctive developments of the digestive and absorptive system (Uni *et al*, 1996). Domestication is a directive adaptation, and the course of domestication can be influenced by man through artificial selection (Price and King, 1968). Additionally, Domestication changed the bird's behavior, physiology and production and eliminated anatomical deformations (Al-Nasser *et al.,* 2007).

The objective of this research work is to study differences in gastrointestinal tract structure between meat- and egg-type chickens and look at some different plasma constituents between both types of chickens.

MATERIALS AND METHODS

The study was conducted at the Poultry Research Station, Animal Production Department, Faculty of Agriculture, Al-Azhar University, Nasr City, Cairo, Egypt.

Composition of nutrient of experimental diets:

The birds were fed commercial diets for both types of chicks according to their guidelines. The diets were purchased from Feed mix, Egypt Feed Industry Company at El-Obour City, Cairo. The chicks were given basal diets based on yellow corn and soybean meal. Diets of the meat- and egg-type chicks were provided in 2 phases, starter from hatch to 21days of age and grower from day 22 of age to the end of the experiment for both strains (Ross [308] and L.S.L.) according to their guidelines and (NRC 1994). The analyses of the experimental starter and grower commercial diets used in the experiments are shown in Table (1).

Experimental Design:

A total number of 600 female chicks (300 chicks from Ross [308] as meat-type and 300 chicks from Lohmann Selected Leghorn (L.S.L.) as egg-type) were used in the study. The birds were randomly distributed among three replicates for each chick type and each replicate contained 100 birds.

Measurements and data collection

Body weight (BWT):

The live body weight of both types of chicks was individually recorded weekly to the nearest (0.1g) from the 1st to the 5th week of age.

Body weight gain (BWG):

Body weight gain was calculated on weekly basis. The average body weight gain of a replicate was calculated by subtracting the average initial live body weight at the beginning of a week from the average live body weight at the end of the same week. Then the body weight gain of the bird was obtained by dividing the weekly body weight gain of the replicate by the bird numbers of the same replicate.

Feed intake (FI):

The amount of feed consumed was measured on weekly basis for each replicate by subtracting the total amounts of feed offered to the birds at the beginning of the week from the remaining amounts of feed at the end of the same week. Then the amounts of feed consumed per bird were calculated by dividing the total amount of feed consumed by the number of birds in the same replicate.

Physiological measurements

Blood plasma constituent:

Blood was sampled from 4 birds per replicate weekly from 1st to 5th week of age from both chick types (12 samples for each). The birds were handled with care and approximately 5.0 ml of blood samples were collected from the jugular vein using sterile syringes in a test tube containing an anticoagulant agent (1mg EDTA-2Na /1ml blood). The blood samples were centrifuged at 3000 rpm for 15 minutes to separate plasma. Then the plasma samples were collected and kept frozen at (-20 ∘C) until analysis to determine the plasma biochemical constituents including albumin, triglycerides, total cholesterol, and high-density lipoprotein (HDL) all blood constituents were determined by spectrophotometric methods using commercial kits (Spectrum Company, Cairo, Egypt).

Segment weights:

All organ weights were weighed to the nearest 0.1 g 4 birds per replicate. Birds were randomly sampled weekly from 1st to 5th weeks of age for slaughtering. The birds were individually weighed just before being slaughtered. After complete bleeding, and defeathering, the organs of the digestive system were excised, then weighed including the duodenum, jejunum, ileum, cecum, and rectum according to the method of Mabelebele *et al.,* (2017) and Ege *et al.,* (2019).

Segment lengths:

All organ lengths were measured to the nearest 0.1 cm. After weighing the digestive system parts, the lengths of the same parts were taken and recorded using the same landmarks as formerly stated.

Segment density:

The density of duodenum, jejunum, ileum, cecum, and rectum segments was calculated as [weight of segment (g)/length of the same segment (cm)] on weekly basis. The intestine weight per unit of length (g/cm) was defined as the "intestinal density".

The statistical analysis:

A complete randomized block design with replicate was used to test the effects of breed within a week. Least squares means were used to compare means according to (Winer, 1971). The statistical analysis was carried out by applying the software package of SAS (2015) using GLM procedure.

Complete Randomized block design with replicates model:

$$\gamma_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ijk}$$

γ_{ijk} = Individual observation, μ = Population mean, α_i = Effect of block, β_j = Effect of breed. $(\alpha\beta)_{ij}$ interaction between block and breed, ε_{ijk} = Experimental error, k=number of replicates.

RESULTS AND DISCUSSIONS

Grow-out analysis of meat- and egg-type chicken:

Table (2) shows that the main effects of breed on body weight (BWT) (g /bird /wk) and body weight gain (BWG) (g /bird /wk) in Ross[308] meat-type and L.S.L. egg-type chickens were significant (P≤0.05) at 1, 2, 3, 4, and 5 weeks of age. The body weight (g /bird /wk) in the Ross [308] meat-type chickens was significantly (P≤0.05) higher than the L.S.L. breed at 1, 2, 3, 4, and 5 weeks of age.

These findings may be due to the impact of strain on body weight and muscularity may be predetermined during embryonic development when the quantity of myofibers is set (Henry and Burke, 1998). Due to genetic selection, commercial broilers are marketed at earlier ages and are considerably heavier (Gyles, 1989). Depending on their genetic backgrounds, the chosen strains also differ from one another (Abdullah *et al.,* 2010) and this has been observed in this study. It follows that nutritional and management practices adapted to the genetic background of the chicken may be important for both broiler breeding and egg production, as the early post-hatch period as a percentage of the life of the modern broiler chicken increases with each generation (Nir *et al.,* 1993). In addition, Gonzales *et al.,* (1998) found that body weight gain was affected by strain, with Ross broilers achieving higher weight gain in comparison with other strains. Body weight growth variations across the strains may have been caused by genetic diversity.

Table (2) shows that the main effects of breed on feed intake (FI) (g/bird /wk) in the Ross[308] meat-type and L.S.L. egg-type chickens were significant (P≤0.05) at 1, 2, 3, 4, and 5 weeks of age. The feed intake (g /bird /wk) in the Ross[308] meat-type chickens was significantly (P≤0.05) higher than the L.S.L. egg-type chickens at 1, 2, 3, 4, and 5 weeks of age (Table, 2). Smith *et al.,* (1998) found that strain and gender had affected feed intake and FCR. Ross ×Ross [208] male birds had higher feed

intake than Peterson × Arbor Acres males at 53 days of age.

Blood Chemical analyses of meat- and egg-type chickens:

The main effect of the breed on albumin was not significant (P≤0.05) at 1, 2, 3, 4, and 5 weeks of age but in general L.S.L. Chickens were insignificantly higher in albumin concentration compared to the Ross[308] chickens (Table, 3). These results are in the normal physiological range.

The main effects of the breed on plasma triglycerides, cholesterol, and high-density lipoproteins were significantly (P≤0.05) higher in Ross [308] than those of L.S.L. chicks at 2, 3, 4, and 5 weeks of age (Table, 3). The hormonal control is probably influenced by genetic selection since it may regulate the rate of hepatic lipogenesis. The liver is also the primary location for the production of cholesterol and phospholipids, which, together with proteins, are the primary building blocks of the surface monolayers of the lipoproteins (Hermier, 1997). Piotrowska *et al.,* (2011) reported that lipid metabolites are strongly associated with energy metabolism and reflect its fluctuation occurring during the growth period.

In harmony with these interpretations of increased plasma lipids profile in broiler chicks, Abdi-Hachesoo *et al.,* (2011) found that the cholesterol content in the Ross chickens (181.50 ± 33.22 mg/dl) was higher than that in the indigenous chickens (152.60 ± 28.11mg/dl). The lower content of cholesterol in indigenous poultry may be due to high body activity and high energy demands (Almeida *et al.,* 2006). In addition, the higher plasma lipids profile of broiler chicks may be due to the higher mobilization of lipids to build up more abdominal fat compared to L.S.L chicks (Griffin *et al.,* 1987)

Weight of Segments:

Table (4) shows that the effects of breed on the weights (g) of the duodenum, jejunum, ileum, cecum, and rectum in the Ross[308] meat-type were significantly (P≤0.05) higher than L.S.L. egg-type chicks. This trend was noticed in all weeks of the experimental period starting from 1 through 5 weeks of age.

These results may be due to, in broiler chickens, the digestive system matures earlier and more quickly compared to other slow-growing indigenous chickens and regulates itself according to the chicken's physiological requirements (Mabelebele *et al.,* 2014).

Moreover, Yamauchi and Isshiki (1991) reported that rapid growth-bred broiler chickens develop their small intestines more quickly. In comparison to indigenous chickens, broiler chicks gain body weight faster due to their increased small intestine weight (Jamroz, 2005) and this agreed with our findings and also agrees with Al-marzooqi *et al.,* (2019) who observed that the weight of the internal organs was significantly (P<0.001) higher for the broiler versus the indigenous Omani chickens.

Length of segments:

Table (5) shows that the effects of breed on the lengths (cm) of the duodenum, jejunum, ileum, cecum, and rectum in the Ross[308] meat-type were significantly (P≤0.05) higher than L.S.L. egg-type chicks. This trend was noticed in all weeks of the experimental period starting from 1 to 5 weeks of age.

These results agreed with those of Mabelebele *et al.,* (2017) who found that the absolute and relative organs length of gastrointestinal tract (GIT) for broiler and Venda chickens were significantly longer (P<0.05) in the Ross [308] broiler than that of Venda chickens. Also, these results are in correspond with those achieved by Karthika *et al.,* (2019) who found that the average length (cm) of the duodenum was 33.45 ± 3.32 and 23.30 ± 1.00, jejunum was 71.5 ± 6.82 and 38.4 ± 3.20, ileum was 70.6 ± 53.61, and 41.93 ± 3.57, and colorectum was 7.95 ± 0.80 and 4.1 ± 0.65 in broiler and layer-type chicks, respectively. These observations agreed with the present study. Increasing the intestinal segments length will affect the surface area available for absorption (Ravindran *et al.,* 2006).

The density of segments:

Table (6) shows that the effects of breed on the density (g/cm) of the duodenum, jejunum, ileum, cecum, and rectum in the Ross[308] meat-type were significantly (P≤0.05) higher than L.S.L. egg-type chicks. This trend was noticed in all weeks of the experimental period starting from 1 to 5 weeks of age.

These results indicate that the weight of 1 cm from all intestinal segments was significantly higher in broilers compared to those of L.SL. chicks; in other words the segments of the broiler intestine are packed with more cells and other structures responsible for digestion compared to L.S.L. chicks.

These results agreed with Alshamy *et al.,* (2018) who found that from day 1 to day 35, the length and density of the whole intestine increased at rates of 4.57 cm/d and 2.47 g/d in Ross [308] chicks and 2.98 cm/d and 1.08 g/d in Lohmann Dual (LD) chicks, respectively. They asserted that the intestinal density was influenced by both BW and the chickens' genetic heritage.

In conclusion, the results explained that the body weight, body weight gain, and feed intake in the Ross [308] meat-type chickens were higher than in the L.S.L. egg-type chickens at 1, 2, 3, 4, and 5 weeks of age. In addition, intestinal segment weight, length and density of broiler chicks are significantly higher than egg-type chicks through the first five weeks of age. This enhances the digestion of food in broilers to support high metabolism and grow-our performance. In addition, the plasma lipids profile in the broiler proved to be significantly higher than that of egg-type chicks at the 5th week of age. This may indicate that higher lipids mobilization supports the build-up of abdominal fat.

REFERENCES

Abdi-Hachesoo, B., Talebi, A., Asri-Rezaei, S. 2011: Comparative Study on Blood Profiles of Indigenous and Ross-308 Broiler Breeders. Global Veterinaria 7 (3): 238-241.

Abdullah, A.Y., Al-Beitawi, N.A., Rjoup, M.M.S., Qudsieh-Rasha, I., Abu Ishmais, M.A. 2010: Growth Performance, Carcass and Meat Quality Characteristics of Different Commercial Crosses of Broiler Strains of Chicken. J. Poult. Sci. 47: 13-21.

Alshamy, Z., Richardson, K.C., Hünigen, H., Hafez, H.M., Plendl, J., Al Masri, S. 2018: Comparison of the gastrointestinal tract of a dual-purpose to a broiler chicken line: A qualitative and quantitative macroscopic and microscopic study. PloS one, 13(10)1-22.

Al-Nasser, A., Al-Khalaifa, H., Al-Saffar, A., Khalil, F., Albahouh, M., Ragheb, G., Al-Haddad, A., Mashaly, M. 2007: Overview of chicken taxonomy and domestication. World's Poultry Science Journal 63(2): 285–300.

Al-Marzooqi, W., Al-Maskari, Z.A.S., Johnson, E.H., Al-Kharousi, K., Mahgoub, O., Al-Saqri, N.M., El Tahir, Y. 2019: Comparative evaluation of growth performance, meat quality and intestinal development of indigenous and commercial chicken strains. Int. J. Poult. Sci., 18: 174-180.

Almeida, J.G., Vieira, S.L., Gallo, B.B., Conde, O.R.A., Olmos, A.R. 2006: Period of incubation and post hatching holding time influence on broiler performance. Brazilian Journal of Poultry Science, 8 (3):153-158.

Bennett, C.E., Thomas, R., Williams, M., Zalasiewicz, J., Edgeworth, M., Miller, H.M., Marume, U. 2018:The broiler chicken as a signal of a human reconfigured biosphere. Royal Society open science, 5(12), 180325.

Ege, G., Bozkurt, M., Koçer, B., Tüzün, A.E., Uygun, M., Alkan, G. 2019: Influence of feed particle size and feed form on productive performance, egg quality, gastrointestinal tract traits, digestive enzymes, intestinal morphology, and nutrient digestibility of laying hens reared in enriched cages. Poultry science, 98(9), 3787-3801.

Gonzales, E., Johan, B., Takita, T.S., Sartori, J.R., Decuypere, E. 1998: Metabolic disturbances in male broilers of different strains.1. Performance, mortality, and right ventricular hypertrophy. Poult. Sci., 77:1646-1653.

Gyles, R. 1989: Poultry, people, and progress. Poultry Science, 68:1-8.

Griffin, H.D., Butterwith, S.C., Goddard, C. 1987: Contribution of lipoprotein lipase to differences in fatness between broiler and layer-strain chickens. British Poultry Science, 28: 197-206.

Henry, M.H., Burke, W.H. 1998: Sexual dimorphism in broiler chick embryos and embryonic muscles development in late incubation. Poult. Sci., 77:728-736.

Hermier, D. 1997: Lipoprotein Metabolism and Fattening in Poultry. J. Nutr. 127: 805 -808.

Hunton, P. 2006: 100 years of poultry genetics. World's Poultry Science Journal, 62(3), 417-428.

Jamroz, D. 2005: Comparative characteristic of gastrointestinal tract development and digestibility of nutrients in young chickens, ducks and geese. Proceedings of the 15th European Symposium on Poultry Nutrition, September 25-29, 2005, Balatonfured, Hungary, pp: 74-85.

Karthika, K., Sunilkumar, N.S., Dixy, B.A., Sebastian, H. 2019: Comparative studies on the morphometry and percent organ weights of digestive tract in commercial broiler and layer chicken. The Pharma Innovation Journal, 8(4): 994-997.

Larkina, T.A., Barkova, O.Y., Peglivanyan, G.K., Mitrofanova, O.V., Dementieva, N.V., Stanishevskaya, O.I., Romanov, M.N. 2021: Evolutionary subdivision of domestic chickens: Implications for local breeds as assessed by phenotype and genotype in comparison to commercial and fancy breeds. Agriculture, 11(10), 914.

Mabelebele, M., Alabi, O.J., Ng`ambi, J.W., Norris, D., Ginindza, M.M. 2014: Comparison of gastrointestinal tracts and pH values of digestive organs of Ross 308 broiler and indigenous Venda chickens fed the same diet. Asian Journal of Animal and Veterinary Advances, 9:71-76.

Mabelebele, M., Norris, D., Brown, D., Ginindza, M.M., Ngambi, J.W. 2017: Breed and sex differences in the gross anatomy, digesta pH and histomorphology of the gastrointestinal tract of gallus gallus domesticus. Brazilian Journal of Poultry Science, 19, 339-346.

N.R.C., Nutrient requirements of poultry (1994). 9th ed., National Academy of Science, National Research Council. Washington, D. C. U.S. A.

Nir, I., Nitsan, Z., Mahagna, M. 1993: Comparative growth and development of the digestive organs and of some enzymes in broiler and egg type chicks after hatching. British Poultry Science, 34(3), 523-532.

Piotrowska, A., Burlikowska, K., Szymeczko, R. 2011: Changes in Blood Chemistry in Broiler Chickens during the Fattening Period. Folia biologica (Kraków), 59: 183-187.

Price, E.O, King, J.A. 1968: Domestication and Adaptation, chapter 3 in: Adaptation of Domestic Animals edited by E. S. E. Hafez. Published by Lea & Febiger, Philadelphia, USA.

Ravindran, V., Wu, Y.B., Thomas, D.G., Morel, P.C.H. 2006: Influence of whole wheat feeding on the development of digestive organs and performance of broiler chickens. Aust. J. Agric. Res., 57, 21–26.

SAS Institute 2015: SAS/Stat User's guide release 6.03 ed. SAS Institute Inc., Cary NC. USA.

Smith, E.R., Pesti, G.M., Bakalli, R.I., Ware, G.O., Menten, J.F. 1998: Further studies on the influence of genotype and dietary protein on the performance of broilers. Poultry Science, 77:1678-1687.

Uni, Z., Noy, Y., Sklan, D. 1996: Development of the small intestine in heavy and light strain chicks before and after hatching. British Poultry Science, 37(1), 63-71.

Winer, B. 1971: Statistical Principles in Experimental Design McGraw-Hill Book Company, 518 .

Yamauchi, K., Isshiki, Y. 1991: Scanning electron microscopic observations on the intestinal villi in growing white leghorn and broiler chickens from 1 to 30 days of age. Br. Poult. Sci., 32, 67–78.

Zuidhof, M.J., Schneider, B.L., Carney, V.L., Korver, D.R., Robinson, F.E. 2014: Growth, efficiency, and yield of commercial broilers from 1957, 1978, and 2005.Poultry science, 93(12), 2970-2982.

Table 1: Analyses of experimental commercial diets of Ross 308 and L.S.L. chicks based on a dry basis according to Company Label:

Items	Egg-type starter diet	Meat-type starter diet	Egg-type grower diet	Meat-type grower diet
Crude protein (%)	20	23	18	21
Metabolizable energy (kcal/kg)	2900	3000	2890	3100
Crude fiber (%)	3.82	3.8	3.61	3.5
Crude fat (%)	3.87	5.6	3.18	5.8

Table 2: Body weight (BWT), body weight gain (BWG), and feed intake (FI) of meat- and egg-type chickens during weeks of the experiment:

Measurements		Weeks				
		1	2	3	4	5
Variables	Breeds					
BWT (g)	ROSS 308	209.08[1][a] ±1.168	450.45[a] ±5.033	858.35[a] ±5.373	1437.3[a] ±8.997	1824.5[a] ±6.252
	L.S.L	79.910[b] ±1.168	130.21[b] ±5.033	192.08[b] ±5.373	267.15[b] ±8.997	322.49[b] ±6.252
BWG (g/bird/week)	ROSS 308	165.08[a] ±1.168	241.36[a] ±2.141	407.90[a] ±4.058	578.97[a] ±5.547	387.18[a] ±5.994
	L.S.L	43.910[b] ±1.168	50.300[b] ±2.141	61.873[b] ±4.058	75.073[b] ±5.547	55.336[b] ±5.994
FI (g/bird/week)	ROSS 308	185.45[a] ±3.270	435.00[a] ±2.141	740.02[a] ±10.70	1034.3[a] ±5.201	1304.6[a] ±2.856
	L.S.L	76.492[b] ±3.270	127.02[b] ±2.141	178.33[b] ±10.70	210.00[b] ±5.201	257.33[b] ±2.856
Variables	Source of Variance					
BWT	Breed	0.0002	0.0005	0.0001	0.0001	0.0001
BWG	Breed	0.0002	0.0008	0.0003	0.0002	0.0007
FI	Breed	0.0018	0.0001	0.0007	0.0001	0.0001

[1]Least square means ± pooled standard error.

[a,b] Means having different letter exponents between breeds within a week are significantly different (P≤0.05).

Table 3: Plasma albumin, triglycerides, cholesterol, and high-density lipoproteins (HDL) of meat- and egg-type chickens during the period of the experiment:

Measurements		Blood plasma concentrations				
		Weeks				
		1	2	3	4	5
Variables	Breeds					
Albumin (g/dl)	ROSS [308]	1.314 ±0.06	1.278 ±0.06	1.423 ±0.04	1.490 ±0.05	1.648 ±0.09
	L.S.L.	1.455 ±0.06	1.311 ±0.06	1.454 ±0.04	1.539 ±0.05	1.656 ±0.09
Triglycerides (mg/dl)	ROSS [308]	158.45 ±9.72	172.14[1a] ±11.84	174.41[a] ±9.55	185.38[a] ±9.53	197.04[a] ±8.09
	L.S.L.	130.21 ±9.72	121.06[b] ±11.84	83.29[b] ±9.55	99.56[b] ±9.53	74.41[b] ±8.09
Cholesterol (mg/dl)	ROSS [308]	159.32 ±7.60	162.15[a] ±8.05	166.03[a] ±8.48	169.49[a] ±9.88	183.26[a] ±11.78
	L.S.L.	144.70 ±7.60	137.43[b] ±8.045	133.76[b] ±8.48	70.87[b] ±9.88	97.03[b] ±11.78
High-density lipoproteins (mg/dl)	ROSS [308]	86.497[a] ±4.45	91.010[a] ±4.81	95.760[a] ±4.02	97.565[a] ±6.36	106.428[a] ±5.13
	L.S.L.	68.733[b] ±4.45	65.978[b] ±4.81	55.623[b] ±4.02	57.950[b] ±6.36	52.440[b] ±5.13
Variables	Source of Variance	$P \leq$ values				
Albumin (g/dl)	Breed	0.1702	0.6900	0.6051	0.0602	0.9584
Triglycerides (mg/dl)	Breed	0.0548	0.0069	0.0001	0.0001	0.0001
Cholesterol (mg/dl)	Breed	0.1906	0.0435	0.0150	0.0001	0.0001
HDL (mg/dl)	Breed	0.0112	0.0017	0.0001	0.0003	0.0001

[1]Least square means ± pooled standard error.

[a,b] Means having different letter exponents between breeds within a week are significantly different (P≤0.05).

Table 4: Weight of duodenum, jejunum, ileum, cecum, and rectum of meat- and egg-type chickens during 5 weeks of the experiment:

Measurements		Weeks				
		1	2	3	4	5
Segments	Breeds					
Duodenum (g)	ROSS 308	4.8041[1][a] ±0.411	6.0841[a] ±0.200	7.8325[a] ±0.241	8.8300[a] ±0.313	14.250[a] ±0.805
	L.S.L.	1.4700[b] ±0.411	2.0166[b] ±0.200	2.3366[b] ±0.241	3.0650[b] ±0.313	3.6708[b] ±0.805
Jejunum (g)	ROSS 308	6.6833[a] ±0.517	14.232[a] ±0.602	14.432[a] ±0.696	15.478[a] ±0.538	26.242[a] ±0.792
	L.S.L.	2.6641[b] ±0.517	3.8033[b] ±0.602	4.0425[b] ±0.696	5.5416[b] ±0.538	6.0266[b] ±0.792
Ileum (g)	ROSS 308	5.7466[a] ±0.383	10.276[a] ±0.629	12.110[a] ±0.636	12.091[a] ±0.383	23.195[a] ±0.762
	L.S.L.	2.0041[b] ±0.383	2.8825[b] ±0.629	2.9741[b] ±0.636	3.8300[b] ±0.383	4.9266[b] ±0.762
Cecum (g)	ROSS 308	1.8333[a] ±0.123	4.3058[a] ±0.387	4.7800[a] ±0.209	7.7258[a] ±0.352	12.211[a] ±0.697
	L.S.L.	1.0375[b] ±0.123	1.3575[b] ±0.387	1.5491[b] ±0.209	2.2258[b] ±0.352	2.7625[b] ±0.697
Rectum (g)	ROSS 308	1.3641[a] ±0.085	1.5700[a] ±0.098	2.2058[a] ±0.113	2.2958[a] ±0.119	3.4625[a] ±0.159
	L.S.L.	0.4341[b] ±0.085	0.4741[b] ±0.098	0.5716[b] ±0.113	0.6900[b] ±0.119	1.0258[b] ±0.159
Segments	Source of Variance	P ≤ values				
duodenum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001
Jejunum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001
Ileum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001
Cecum	Breed	0.0002	0.0001	0.0001	0.0001	0.0001
Rectum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001

[1]Least square means ± pooled standard error.

[a,b] Means having different letter exponents between breeds within a week are significantly different (P≤0.05).

Table 5: Length of duodenum, jejunum, ileum, cecum, and rectum of meat- and egg-type chickens during 5 weeks of the experiment:

Measurements		Weeks				
		1	2	3	4	5
Segments	Breeds					
Duodenum (cm)	ROSS 308	17.750[1a] ±0.631	22.250[a] ±0.458	22.166[a] ±0.682	24.333[a] ±0.802	27.500[a] ±0.596
	L.S.L.	13.500[b] ±0.631	13.083[b] ±0.458	14.000[b] ±0.682	16.166[b] ±0.802	16.916[b] ±0.596
Jejunum (cm)	ROSS 308	42.416[a] ±0.940	57.333[a] ±1.844	69.833[a] ±1.483	73.583[a] ±1.475	80.666[a] ±1.181
	L.S.L.	28.666[b] ±0.940	33.875[b] ±1.844	38.500[b] ±1.483	42.083[b] ±1.475	41.916[b] ±1.181
Ileum (cm)	ROSS 308	38.302[a] ±1.198	48.375[a] ±2.009	62.708[a] ±1.844	63.750[a] ±1.282	77.166[a] ±1.573
	L.S.L.	24.750[b] ±1.198	27.791[b] ±2.009	31.375[b] ±1.844	37.000[b] ±1.282	38.833[b] ±1.573
Cecum (cm)	ROSS 308	8.8383[a] ±0.502	20.458[a] ±0.696	28.166[a] ±1.183	30.000[a] ±0.994	35.833[a] ±0.819
	L.S.L.	6.3750[b] ±0.502	12.833[b] ±0.696	15.500[b] ±1.183	17.833[b] ±0.994	21.333[b] ±0.819
Rectum (cm)	ROSS 308	4.8083[a] ±0.253	6.9583[a] ±0.209	8.0833[a] ±0.373	7.5416[a] ±0.336	9.3333[a] ±0.384
	L.S.L.	3.7916[b] ±0.253	3.9166[b] ±0.209	4.5000[b] ±0.373	5.8333[b] ±0.336	6.7083[b] ±0.384
Segments	Source of Variance	P ≤ values				
Duodenum	Breed	0.0002	0.0001	0.0001	0.0001	0.0001
Jejunum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001
Ileum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001
Cecum	Breed	0.0027	0.0001	0.0001	0.0001	0.0001
Rectum	Breed	0.0110	0.0001	0.0001	0.0001	0.0001

[1]Least square means ± pooled standard error.
[a,b] Means having different letter exponents between breeds within a week are significantly different (P≤0.05).

Table (6): Density of duodenum, jejunum, ileum, cecum, and rectum of meat- and egg- type chickens during weeks of the experiment:

Measurements		Weeks				
		1	2	3	4	5
Segments	Breeds					
Duodenum (g/cm)	ROSS 308	0.2716[1][a] ±0.020	0.2733[a] ±0.008	0.3553[a] ±0.011	0.3671[a] ±0.013	0.5177[a] ±0.028
	L.S.L	0.1097[b] ±0.020	0.1541[b] ±0.008	0.1667[b] ±0.011	0.1910[b] ±0.013	0.2195[b] ±0.028
Jejunum (g/cm)	ROSS 308	0.1554[a] ±0.010	0.2506[a] ±0.009	0.2069[a] ±0.009	0.2131[a] ±0.009	0.3257[a] ±0.011
	L.S.L	0.0932[b] ±0.010	0.1113[b] ±0.009	0.1055[b] ±0.009	0.1316[b] ±0.009	0.1434[b] ±0.011
Ileum (g/cm)	ROSS 308	0.1472[a] ±0.008	0.2163[a] ±0.012	0.1944[a] ±0.011	0.1905[a] ±0.007	0.3033[a] ±0.012
	L.S.L	0.0813[b] ±0.008	0.1037[b] ±0.012	0.0974[b] ±0.011	0.1035[b] ±0.007	0.1277[b] ±0.012
Cecum (g/cm)	ROSS 308	0.2167[a] ±0.016	0.2269[a] ±0.023	0.1710[a] ±0.007	0.2620[a] ±0.015	0.3398[a] ±0.018
	L.S.L	0.1634[b] ±0.016	0.1149[b] ±0.023	0.1007[b] ±0.007	0.1260[b] ±0.015	0.1313[b] ±0.018
Rectum (g/cm)	ROSS 308	0.3073[a] ±0.020	0.2248[a] ±0.012	0.2732[a] ±0.012	0.3071[a] ±0.012	0.3819[a] ±0.024
	L.S.L	0.1143[b] ±0.020	0.1212[b] ±0.012	0.1292[b] ±0.012	0.1197[b] ±0.012	0.1542[b] ±0.024
Segments	Source of Variance	P ≤ values				
Duodenum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001
Jejunum	Breed	0.0007	0.0001	0.0001	0.0001	0.0001
Ileum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001
Cecum	Breed	0.0342	0.0035	0.0001	0.0001	0.0001
Rectum	Breed	0.0001	0.0001	0.0001	0.0001	0.0001

[1]Least square means ± pooled standard error.

[a,b] Means having different letter exponents between breeds within a week are significantly different (P≤0.05).

دراسة مقارنة لتطور أعضاء الجهاز الهضمي وبعض مكونات الدم في كتاكيت اللحم والبيض

رشدى أحمد أبوسالم *، هشام محمد صالح شكري، محمد عبد المنعم الجمل، عبدالرفيع أحمد الشافعي

قسم الانتاج الحيواني، كلية الزراعة، جامعة الأزهر، القاهرة، مصر

*البريد الإلكتروني للباحث الرئيسي: roshdyabosalem86 @azhar.edue.eg

الملخص العربي:

يتميز الجهاز الهضمي للطيور بجوانب فريدة من حيث تناولها لطعامها. يعتبر التطور الوراثي للسلالات عالية الإنتاج المنتخبة إما لوضع البيض أو لإنتاج اللحم أمرًا ضروريًا لصناعة الدواجن التجارية. أجريت الدراسة لمعرفة الفروق التشريحية في الجهاز الهضمي وبعض مكونات الدم في كتاكيت اللحم وكتاكيت البيض. تم استخدام عدد 600 كتكوت من نوعين من الكتاكيت (300 كتكوت روص 308 من نوع اللحم و 300 كتكوت من نوع ال اس ال كنوع إنتاج بيض). وزعت الطيور عشوائياً على ثلاث مكررات لكل نوع من الكتاكيت ، واحتوت كل مكررة على 100 طائر. بدأت التجربة من الأسبوع الأول إلى الأسبوع الخامس حيث أجريت دراسة مقارنة لتطور أعضاء الجهاز الهضمي بين إناث كلا النوعين من الكتاكيت حسب العمر لكل منها بغض النظر عن اختلاف الوزن بينها حيث تم قياس وزن الجسم والزيادة فى وزن الجسم واستهلاك العلف وأطوال وكثافة الاثنى عشر، الصائم ، اللفائفى ، الأعور والمستقيم. من ناحية أخرى ، تم قياس الألبومين ، الكوليسترول ، الدهون الثلاثية ، وليبيدات البروتينات عالية الكثافة .أشارت النتائج إلى زيادة معنوية فى وزن الجسم والزيادة فى وزن الجسم واستهلاك العلف وأوزان واطوال وكثافة الاثنى عشر ،الصائم ، اللفائفى ، المستقيم والأعور فى كتاكيت اللحم روص 308 أعلى مقارنة عن كتاكيت إنتاج البيض ال اس ال خلال أسابيع الدراسة . كما أظهرت النتائج زيادة معنوية فى تركيز الدهون الثلاثية ،الكوليسترول وليبيدات البروتينات عالية الكثافة فى كتاكيت اللحم روص 308 أعلى مقارنة عن كتاكيت إنتاج البيض ال اس ال خلال أسابيع الدراسة. تلخص الدراسة الى أن جميع المتغيرات كانت متفوقة فى كتاكيت اللحم روص 308 عن كتاكيت إنتاج البيض ال اس ال .

الكلمات الإسترشادية: الأمعاء، الأطوال، الأوزان، اللحم، البيض.