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A Comparative Study of Some Biochemical Blood Characteristics of Six Lines of Iraqi Local Female Chickens

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ABSTRACT
The development in the poultry industry led to a change in many physiological functions in poultry, and this requires studying and understanding the physiological processes, as they contribute to raising production efficiency. Therefore, the study aimed to compare some of the biochemical characteristics and kidney functions in the serum of Six lines of Iraqi local chickens. We used chicken 55 weeks old (four chickens from each line), which are black and white striped chickens, white naked chickens, red naked chickens, white chickens, red brown chickens, and black chickens. The results indicated a significant increase in the studied traits in the brown naked chicken line compared to the rest of the lines, which indicates the presence of damage to some tissues and cells of the body due to some diseases that affect this line.

Keywords: Chickens, Blood Serum Lipids, Kidney function, Lipoproteins.

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INTRODUCTION

The local chicken (Gallus gallus) is one of the first domesticated birds since thousands of years ago, as it has been incorporated into some peoples' cultures [1] , and in order to preserve its biological and genetic diversity itself, it has contributed to building the genome of local chickens[2]. The development in the poultry industry has led to a change in many physiological functions in poultry, and this requires us to study and understand the physiological processes, as they contribute to raising the production efficiency, so it is necessary to lay scientific foundations for the poultry industry and to address the obstacles it faces [3]. Therefore, the purpose of modern poultry breeding is to prepare high-production lines and to be able to determine the production value of the layers of laying hens, through their ability to prepare production requirements, by controlling the productivity of poultry by several genetic indicators related to reproductive potential and egg production [4]. Also, local indigenous breed lines are preserved as a reserve in many countries as they are used as basic genetic material in genetic improvement programs, and as a result of the genetic diversity in poultry, lines with high productivity and sustainability can be produced, as well as benefit from them and increase their resistance to adverse environmental conditions unfavorable for breeding [5]. And due to the increased interest in breeding and improvement programs for laying lines, many important genes related to poultry production have been identified[6,7]. In some developed countries, commercial breeds are the ones that dominate the production of meat and eggs, while the local chicken is marginalized. In developing countries, it is still interested in local chickens, which represent 70-80% of the country's national economy[8,9]. Thus, domestic chickens are considered a valuable genetic resource due to their ability to adapt to most of the inappropriate environmental conditions, as it shows an improvement in its weight upon sexual maturity as well as an improvement in egg productivity [10]. Accordingly, the aim of the study is to compare some biochemical characteristics between female breeds of Iraqi domestic chickens.

MATERIALS AND METHODS

Sample collection

Six lines were used in the study from Iraqi local female chickens at the age of 55 weeks, and four hens were taken from each line, which are the White and Black chicken line (AB), White naked-neckline (WN), and Brown naked-neckline (BRN), White chicken line (W), brown chicken line (BR), and black chicken line (BL).

Blood was drawn from the jugular vein in the ward, the blood samples were placed in tubes containing EDTA (Diamine Tetra Acetic Acid) to prepare the blood serum for biochemical tests.

Biochemical tests

1- Blood lipid measurement

1- **Measurement of serum cholesterol concentration**:
The concentration of cholesterol in plasma was estimated, according to the attached method, with several special measurements, and as indicated by [11,12]. Total Cholesterol (mg / 100ml) = Sample / Standard X200

2- **Measure the serum concentration of triglyceride**:
The concentration of triglycerides in serum was estimated, according to the method of enzymatic analysis and according to the method of [13]. Concentration of triglycerides (mg / ml100) = Sample / Standard solution X200

3- **Measurement of the concentration of High-Density Lipoprotein** (HDL) (100 mg / ml plasma) was estimated according to the method of [14] .

4**- The concentration of Low-Density Lipoprotein (LDL**) was estimated using the equation referred to [14], according to the following equation:
LDL = Cholesterol - (HDL + VLDL)

2- Measurement of kidney function

1- Measurement of serum Creatinine concentration

The serum Creatinine concentration was determined according to the supplied method, with the measuring kit, provided by Biolabo [15].
Creatinine C. (mg / dl) = (A2 - A1) Sample / (A2 - A1) Standard * C. Standard

2- Measurement of serum urea concentration (UREA)

The concentration of urea in serum was estimated, according to [16] , using a measuring kit manufactured by (Spinreact, S.A., Espain), measuring the absorbance at wavelength 580 nm.

3- Glucose measurement

The level of Glucose measurement in the blood serum was estimated according to [17],and following equation:
Sample (T) Glucose = Sample (T) /Sample X100(standard solution) mg/100ml

4- Statistical analysis

The statistical analysis was conducted with Costas software (Monterey, CA, USA). The experimental data were presented as mean±SE. We detected differences between the two groups by one-way analysis of variance (ANOVA) and the t-test. A P value ⩽0.05 and ⩽0.01 were considered significant**.**

RESULTS AND DISCUSSION

Table (1) shows the concentrations of glucose, cholesterol, triglycerides, high-density lipoproteins and low-density lipoproteins for six lines of domestic female chickens (± standard error).

The results of the statistical analysis recorded a significant increase in the blood glucose of the brown naked neckline (BRN) with a concentration rate (191.666 mg/100ml) compared to the white naked line (WN), which recorded a concentration rate of (187.666 mg/100ml), at a significant level (P⩽ 0.01), while no Significant differences between striped (AB), white (W), brown (BR) and black (BL) chicken line.

The results of the statistical analysis recorded a significant superiority in the cholesterol concentration in the blood serum of the brown bare neckline of chickens (BRN) and the average concentration (234 mg / 100ml) compared to the striped chicken line (AB) with a concentration rate of (90.333 mg /100ml) at a significant level (P⩽ 0.05), while there were no significant differences between white bare-necked (WN), white (W), brown (BR) and black (BL) hens.

As for triglyceride concentrations, no significant differences were recorded between the six chicken lines under study, and the highest value was for the brown bare neckline (BRN)), white bare neckline (WN) and brown (BR) at rates of (978, 965 and 964), respectively and the lowest value was for black chicken line (BL) with a score of (611) at a significant level ((P≤0.01).)

The results of high-density lipoproteins HDL recorded significant superiority in the brown bare neckline (BRN) with a concentration rate (105.333 mg / ml100) compared to the black chicken line (BL) with a concentration rate (26.666 mg/100ml) at a significant level (P≤ 0.05), while it was not recorded. No significant differences between striped chicken lines (AB), white bare neck (WN), white (W) and brown (BR).

As for low-density lipoprotein (LDL), the results of the statistical analysis recorded a significant superiority of the bare neckline (BRN) and the brown (BR) with a concentration rate of (104.93 and 99.866) mg/100ml respectively, compared to the black chicken line (BL) with a concentration rate of (49,533 mg/100ml). While no significant differences between striped chicken line (AB), naked white (WN) and white (w) at a significant level (P≤ 0.05).

Table 1. shows a comparison of Biochemical characteristics of blood for six lines of local female chickens (± Standard Error).

Treatments	Biochemical characteristics of blood			Lipoproteins	
	Glucose (mg/100ml)	Cholesterol (mg/100ml)	Triglyceride (TG) (mg/100ml)	HDL (mg/100ml)	LDL (mg/100ml)
AB	186.666 0.27 ± ab	90.333 5.624 ± b	671 76.76 ± a	45.666 3.311 ± ab	78.333 8.96 ± ab
WN	187.666 0.27 ± b	196.333 15.49 ± ab	965.666 2.373 ± a	72 5.437 ± ab	83 5.49 ± ab
BRN	191.666 0.27 ± a	234 42.24 ± a	978 4.989 ± a	105.333 34.03 ± a	104.93 12.18 ± a
W	189 0.47 ± ab	130.333 21.5 ± ab	707.333 221 ± a	52.333 8.722 ± ab	88.733 12.7 ± ab
BR	188.666 0.54 ± ab	140.666 11.7 ± ab	964.333 10.88 ± a	53.333 0.544 ± ab	99.866 3.256 ± a
BL	190.666 0.98 ± ab	147.666 50.26 ± ab	611 159.1 ± a	26.666 7.061 ± b	49.533 11.26 ± b
	**	*	**	*	*

Small letters within one column indicate significant differences between fonts within one column. * Indicates significant differences at the level (P⩽ 0.05). ** Indicates significant differences at the level (P⩽0.01). AB: White and Black chicken line, WN: naked-neck white chicken line, BRN: brown naked-neck chicken line, W: white chicken line, BR: Brown chicken line, BL: black chicken line. The results obtained showed that the level of glucose was within the normal range, which is between 200 - 450 mg / 100ml blood plasma, and glucose is affected by the nutritional and health status of the bird [18]. While the results obtained showed that high cholesterol was almost

within normal limits except for the bare brown line of the neck, it achieved the highest morale, it may be due to some diseases that afflicted this line and that the normal range for blood plasma cholesterol is 80 - 130 mg / 100ml.

A previous study indicated that a high level of cholesterol and triglycerides is associated with hunger, excess fat in the diet, liver disease, and hepatic lipidsis. As well as an increase in the level of cholesterol in birds suffering from xanthomatosis, a condition in which cholesterol is deposited in the skin [19]. And another study (Mahata *et al*., 2008)[20]showed that triglycerides are associated with cholesterol within the lipoprotein molecules, and that the decrease in lipoprotein synthesis in the liver leads to a decrease in the concentration of triglycerides and vice versa. Also, study (Sharaf and Claw, 2006) [21]showed that there is an inverse relationship between levels of lipoproteins (HDL, LDL), which is a natural result of the opposite of their function. Because a high level of HDL is beneficial and not harmful to health, it works to convert cholesterol into bile acids and collect them and concentrate them in the juice Bile, high levels of it protect against blood clots. While Low levels of it (less than 40 mg/dl) increase the risk of heart disease. So, HDL carries cholesterol out of the arteries and returns it to the liver and delays the process of building it up on the walls of blood vessels [22]. Also, the results of high cholesterol levels were in agreement with the results of high levels of LDL, because high levels of this lipoprotein are harmful to health because they contain a high percentage of cholesterol and because they are transported in the bloodstream from the manufacturing site in the liver to the cells of the body, and cholesterol is the main part of low-density lipoproteins, which represents 65% of total cholesterol in the blood and any reason that leads to high LDL will lead to an increase in blood cholesterol and vice versa [23].

The results of Table (2) also show a comparison of the rates of kidney function concentrations (creatinine and uric acid) for six lines of local female chickens. The results recorded a significant superiority in the concentration of creatinine in the striped chicken (AB), white naked (WN), brown bare neck (BRN) and brown (R) lines, with (0.383, 0.396, 0.386 and 0.38 mg / dl) lines, respectively. In black (BL), whose average concentration was (0.236 mg / dl), while the average concentration of the white line (W) was (0.333 mg / dl) at (P≤ 0.05.)

The results of the statistical analysis also recorded a significant superiority in the concentration of uric acid in the brown naked chicken line (BRN), reaching (28 mg /100ml), compared to the striped (AB), naked white (WN), brown (R) and black (BL) lines. With concentration rates of (4.666, 12, 13, and 10.666 mg / 100ml) respectively, while the white line (W) recorded a concentration rate of (15 mg / 100ml) at a significant level (P≤ 0.01). The study of (Al-Daraji *et al*., 2008) [19] proved that high serum creatinine is caused by renal insufficiency (deficiency), but it is less reliable in assessing kidney function and that the normal level of creatinine is (0.5 - 1.5 mg / 100ml), meaning that the results were within the normal limit. Our results agreed with (Darraji *et al*, 2008) that the values of uric acid range from 2-15 mg / 100ml, and the height more than 20 mg /100ml increase in blood as a result of hunger and gout (visceral and joint) as well as severe tissue destruction renal disease impairment (failure) of kidney function . According to the results of this study, the brown, bare neck streak of chickens is significantly higher in creatinine and uric acid, which indicates the presence of damage to some tissues and cells of the body.

Table 2. shows the concentration rates of kidney function (creatinine and uric acid) for six lines of local female chickens (± Standard Error).

Treatments	Kidney function	
	Creatinine (mg/dl)	Urea (Uric acid)
AB	0.383 0.024 ± a	4.666 0.98 ± b
WN	0.396 0.019 ± a	12 4.19 ± b
BRN	0.386 0.041 ± a	28 3.27 ± a
W	0.333 0.05 ± ab	15 2.94 ± ab
BR	0.38 0.005 ± a	13 0.94 ± b
BL	0.236 0.026 ± b	10.666 1.96 ± b
	*	**

Small letters within one column indicate significant differences between fonts within one column. * Indicates significant differences at the level (P≤ 0.05). ** Indicates

significant differences at the level (P⩽0.01). AB: White and Black chicken line, WN: naked-neck white chicken line, BRN: brown naked-neck chicken line, W: white chicken line, BR: Brown chicken line, BL: black chicken line.

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