



Effect of summer and winter seasons on outdoor rearing of blood enzymes of some native chicken strains

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Abstract

This study aimed to identify the effect of season on enzymes activity in blood of some native chickens (Local strains: brown, barred and white). Samples of blood from these chickens were collected from some outdoor reared at farms in Baghdad city during 2016. Blood serum enzymes activity were determined which included glutamic oxaloacetic transaminase (GOT), glutamic pyruvic transaminase (GPT) and alkaline phosphatase (AP) during summer and winter seasons. Results obtained revealed that significant differences ($P < 0.05$) due to sex were found in blood serum enzymes, also significant differences ($P < 0.05$) were found due to season.

Keywords: Native chicken, Strains, Blood enzymes, Season, Sex.

Introduction

Native chickens have always preferred by Iraqi consumers over that of commercial broilers due to its unique meat taste, flavor and texture and lower fat content. Being free ranged, native chicken is generally perceived as free from antibiotics and other synthetic chemical residues. The global trend of shifting consumer preferences toward organic and naturally produced products in recent years justifies the premium price offered for native chicken over that of its commercial hybrid counterpart. Native chickens are a very important national resources and a bank of unique genotypes which acclimatized in Iraq ecosystem and have a very good resistance for endemic diseases also, can grow in low level of nutrition (Al-Hadeethi, 2002).

Outdoor rearing or sustainable poultry farming, integrates birds with the farm and land in a way that, with proper management, promotes the health and well-being of the birds, the land, the farm, and the farmer. Outdoor rearing or pastured chickens offer many benefits to the sustainable farm, supplying eggs and/or meat, enhancing soil fertility, and controlling weeds and insects (Bare and Ziegler-Ulsh, 2012).

In Baghdad, Al-Obaidi and Al-Shadeedi (2014) noticed significant species differences in blood

serum enzymes activity ($P < 0.05$) during summer season compared with winter. To our knowledge only very few studies about outdoor reared native chickens in Iraq, to estimated large-scale seasonal variation among some populations on blood enzymes activity of native chickens, so this results will provide a new data for ornithologists and avian physiologist in Iraq.

This study aimed to identify the effect of season on enzymes activity in blood of some native chickens (Local strains).

Materials and Methods

Chickens: some native chickens (Local strains: brown, barred and white). These chickens were outdoor reared at farms in Abu-Graib west of Baghdad city during two seasons, winter and summer 2016.

Blood collection: Samples of 2.0 ml of whole blood were taken from the wing vein on the inside of the elbow joint from individuals. The dove was held with its back downward and the wing laterally spread. Removal of a few feathers made the vein visible (Schermer 1967). Whole blood was drawn from each dove species by a B-D insulin syringe needle and put in a 10 ml test tube until to clotting. The blood was centrifuged for 5 min. The serum was removed by a transfer pipette to clean test tube and frozen.

Blood enzymes activity: The activities of GOT, GPT and AP in blood serum were determined photometrical using commercial Bio-test kit (RANDOX).

Statistical analysis: Data were analysed by using the General Linear Model Procedure of SAS (2001). Means were compared by the Duncan's Multiple Range test at 5% probability (Steel and Torrie, 1980).

Results and Discussion

Significant sex and season differences (P<0.05) were found in the average value of blood serum GOT, GPT and AP enzymes activity (Tables 1, 2 and 3).

The average values of serum GOT of Brown strain were 34.2 and 35.4 (U/L) for male and female respectively during summer season and the average values of serum GOT activity were low as 31.5 and 32.3 (U/L) for male and female respectively during winter season, Barred strain were 34.5 and 35.3 (U/L) for male and female respectively during summer season and the average values were low as 31.4 and 32.2 (U/L) for male and female respectively during winter season, White strain were 34.8 and 35.7 (U/L) for male and female respectively during summer season and the average values were low as 31.7 and 32.5 (U/L) for male and female respectively during winter season (Table 1).

Table (2) shows that the average values of serum GPT of Brown strain were 9.2 and 9.6 (U/L) for male and female respectively during summer season and the average values of

serum GPT activity were low as 8.6 and 8.8 (U/L) for male and female respectively during winter season, Barred strain were 9.2 and 9.5 (U/L) for male and female respectively during summer season and the average values were low as 8.7 and 8.7 (U/L) for male and female respectively during winter season, White strain were 9.1 and 9.6 (U/L) for male and female respectively during summer season and the average values of serum GPT activity were low as 8.7 and 8.8 (U/L) for male and female respectively during winter season.

The average values of serum AP of Brown strain were 34.2 and 34.9 (U/L) for male and female respectively during summer season and the average values of serum AP activity were low as 30.0 and 31.2 (U/L) for male and female respectively during winter season, Barred strain were 34.3 and 34.9 (U/L) for male and female respectively during summer season and the average values were low as 30.2 and 30.9 (U/L) for male and female respectively during winter season, White strain were 34.0 and 34.8 (U/L) for male and female respectively during summer season and the average values were low as 30.1 and 30.9 (U/L) for male and female respectively during winter season. No significant differences were found in the average value of blood serum GOT due to chicken strains (Table 3).

No significant differences were found in the average value of blood serum GOT, GPT and AP due to chicken strains (Tables 1, 2 and 3).

Table (1): Blood serum GOT (U/L) of some native chickens.

Native chicken strains	Sex	Season		Average
		Summer	Winter	
Brown	Male	34.2 b	31.5 b	32.9 B
	Female	35.4 a	32.3 a	33.9 A
	Average	34.8	31.9	33.4
Barred	Male	34.5 b	31.4 b	33.0 B
	Female	35.3 a	32.2 a	33.8 A
	Average	34.9	31.8	33.4
White	Male	34.8 b	31.7 b	33.3 B
	Female	35.7 a	32.5 a	34.1 A
	Average	35.3	32.1	33.7

Different letters among columns revealed significant differences (P<0.05) : * large letters between sex, ** small letters between season.

Table (2): Blood serum GPT (U/L) of some native birds.

Native chicken strains	Sex	Season		Average
		Summer	Winter	
Brown	Male	9.2 b	8.6 a	9.0 A
	Female	9.6 a	8.8 a	9.2 A
	Average	9.4	8.7	9.1
Barred	Male	9.2 b	8.7 a	9.0 A
	Female	9.5 a	8.7 a	9.1 A
	Average	9.4	8.7	9.1
White	Male	9.1 b	8.7 a	8.9 A
	Female	9.6 a	8.8 a	9.2 A
	Average	9.4	8.7	9.1

Different letters among columns revealed significant differences ($P < 0.05$): * large letters between sex, ** small letters between season.

Table (3): Blood serum AP (U/L) of some native birds.

Native chicken strains	Sex	Season		Average
		Summer	Winter	
Brown	Male	34.2 b	30.0 b	32.1 B
	Female	34.9 a	31.2 a	33.1 A
	Average	34.6	30.5	32.6
Barred	Male	34.3 b	30.2 b	32.3 B
	Female	34.9 a	30.9 a	31.9 A
	Average	34.6	30.5	31.6
White	Male	34.0 b	30.1 b	32.1 B
	Female	34.8 a	30.9 a	32.9 A
	Average	34.4	30.5	32.5

Different letters among columns revealed significant differences ($P < 0.05$): * large letters between sex, ** small letters between season.

The present study agreed with Al-Obaidi and Al-Shadeedi (2014) study which revealed significant ($P < 0.05$) species differences in blood serum enzymes activity of dove during summer season, collared dove predominant laughing dove in the average values of GOT, GPT and AP enzymes with high values compared with winter, also agreed with Romero and Remage-Healey (2000) and Kordonowy *et al.* (2017).

High environmental temperature during summer season, causing hyperthermia, leads to a sequence of physiological and metabolic changes resulting from the need to cool the body temperature or a sequence of metabolic events originated from the hyperthermia. In the

birds, as well as other animals, one way of cooling the body is accomplished by panting and evaporative cooling, with eventual loss of carbon dioxide and development of respiratory alkalosis (Bogin *et al.*, 1996). One way for adapting to the new blood gas levels is by regulating the levels of phosphorylated intermediates such as 2-3-diphosphoglycerate or inositol-5-phosphate, which affect oxygen and carbon dioxide affinity to haemoglobin (Lehninger, 1978; Whittow, G.C. 1986).

In the present study, the effect of long-term high environmental temperature on enzyme activities in the blood occurred during summer season. As seen from the results, there were

significant changes in the activity levels of the studied enzymes. Evaluation of the effects caused by long-term hyperthermia on the various body organs by the degree and number of enzymatic changes, showed the heart muscle and kidney to be most affected. In the case of the heart, it is possible that the hyperthermia led to a functional stress and to an increased metabolic overload. This increased demand for energy production and utilization, with creatine kinase being at the crossroad, led to cellular adaptation with the eventual increase in enzyme concentration and activity. This pattern was not uniform for all blood serum enzymes, as seen from the enzyme alkaline phosphatase, which did not change due to a stressed metabolic pathway. The increased activities in renal enzymes, following a long-term hyperthermia, included alkaline phosphatase, probably because of having an important role in the kidney function (Lehninger, 1978; Sturkie, 1986). This change could be associated with the increased load of metabolic activities required to adjust blood pH, compensating and neutralizing the developing respiratory alkalosis caused by panting and hyperventilation in the process of cooling the body (Bogina *et al.*, 1997; Kordonowy *et al.*, 2017).

To our knowledge only very few studies about outdoor reared native chickens in Iraq, to estimate blood enzymes activity of native chicken strains, so this results will provide a new data for ornithologists and physiologist in Iraq.

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