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Effect of summer and winter seasons on blood enzymes of outdoor rearing two quail strains

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Abstract

This study aimed to identify the effect of season on enzymes activity in blood of Two Japanese quail (*Coturnix coturnix japonica*) strains (white and Brown). Samples of blood from these quails were collected from some outdoor reared at farms in Baghdad city during 2017. 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: Quail strains, Outdoor, Blood enzymes, Season, Sex.

Introduction

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; Al-Obaidi and Al-Shadeedi, 2018).

In Iraq, many quail flocks were outdoor rearing in silk cages, it grow in low level of nutrition and may suffering of high environmental condition or heat stress during summer season and may suffering from low temperature during winter season (Al-Obaidi, 2017). Al-Obaidi and Al-Shadeedi (2014) noticed that significant species differences in blood serum enzymes activity during summer season compared with winter. To our knowledge only very few studies about outdoor reared quail 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 in Iraq, so this study aimed to identify the effect of season on enzymes activity in blood of two Japanese quail (*Coturnix coturnix japonica*) strains.

Materials and Methods

Birds: Some native Japanese quail (*Coturnix coturnix japonica*) birds were outdoor reared in silk cages at farms in Baghdad city, Iraq.

Quail strains: Two Japanese quail (*Coturnix coturnix japonica*) strains (white and Brown) were used in this study, these quail strains were outdoor reared at farms in Baghdad city during two seasons, winter and summer 2017.

Quails Management: quails aged 7 to 30 weeks were used in this study. Quail were fed in the morning approximately 10g/bird/day concentrated ration as mentioned in Table (1) with grass and some rejected vegetable materials during the day.

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 analyzed 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).

Table (1): Chemical composition of the diet used for feeding quails.

Ingredient	(%)
Corn (*Zea maize*)	60.54
Soybean meal	25.95
Vegetable oil	3.00
Calcium carbonate	8.33
Calcium phosphate	1.28
Salt	0.30
Mineral premix[1]	0.25
Vitamin premix[2]	0.35
Total	100.0
Calculated analysis	
Metabolic Energy (Kcal)	2857
Crude Protein (%)	17.00
Lysine (%)	0.77
Methionine (%)	0.30
Methionine + cysteine (%)	0.59
Ca (%)	3.50
P Available (%)	0.35

[1]Vitamin premix supplied diet the following: vitamin A: 12,000 IU; vitamin D3: 2500 IU; vitamin E: 30 IU; vitamin K3: 2 mg; thiamine: 2.25 mg; riboflavin: 7.5 mg; pyridoxine: 3.5 mg; cobalamine: 0.02 mg; niacin: 45 mg; D-pantothenic acid: 12.5 mg; biotin: 0.125 mg; folic acid: 1.5 mg. [2]Mineral premix supplied diet the following: zinc: 50; copper: 12; iodine: 0.3; cobalt: 0.2; iron: 100; selenium: 0.1.

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 of the tow strain of Japanese quail (Tables 2, 3 and 4).

The average values of serum GOT of White strain were 85.1 and 86.3 (U/L) for male and female respectively during summer season and the average values were low as 82.0 and 83.9 (U/L) for male and female respectively during winter season, Brown strain were 83.5 and 88.7 (U/L) for male and female respectively during summer season and the average values of serum GOT activity were low as 81.4 and 84.3(U/L) for male and female respectively during winter season (Table 2).

Table (3) shows that the average values of serum GPT of White strain were 9.1 and 9.4 (U/L) for male and female respectively during summer season and the average values of serum GPT activity were low as 8.9 and 9.2 (U/L) for male and female respectively during winter season, Brown strain were 9.1 and 9.5 (U/L) for male and female respectively during summer season and the average values of serum GPT activity were low as 9.0 and 9.2 (U/L) for male and female respectively during winter season.

The average values of serum AP of White strain were 36.1 and 38.0 (U/L) for male and female respectively during summer season and the average values were low as 32.1 and 34.5 (U/L) for male and female respectively during winter season, 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 36.5 and 38.4 (U/L) for male and female respectively during winter season (Table 4).

No significant differences were found in the average value of blood serum GOT. GPT and AP due to chicken strains (Tables 2, 3 and 4).

Table (2): Blood serum GOT (U/L) of two Japanese quail strains.

		Season		
Japanese quail strains	Sex	Summer	Winter	Average
White	Male	85.1 b	82.0 b	82.9 B
	Female	86.3 a	83.9 a	83.9 A
	Average	85.2	83.0	83.4
Brown	Male	83.5 b	81.4 b	83.0 B
	Female	88.7 a	84.3 a	83.8 A
	Average	85.6	81.9	83.4

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

Table (3): Blood serum GPT (U/L) of two Japanese quail strains..

		Season		
Japanese quail strains	Sex	Summer	Winter	Average
White	Male	9.1 b	8.9 b	9.0 B
	Female	9.4 a	9.2 a	9.3 A
	Average	9.2	9. 0	9.1
Brown	Male	9.1 b	9.0 b	9.1 B
	Female	9.5 a	9.2 a	9.4 A
	Average	9.4	9.1	9.3

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

Table (4): Blood serum AP (U/L) of two Japanese quail strains..

		Season		
Japanese quail strains	Sex	Summer	Winter	Average
White	Male	36.1 b	32.1 b	34.1 B
	Female	38.0 a	34.5 a	36.3 A
	Average	37.1	33.3	35.2
Brown	Male	36.5 b	32.6 b	34.6 B
	Female	38.4 a	35.0 a	36.5 A
	Average	37.5	33.8	35.7

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

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, 1986).

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, also agreed with Romero and Remage-Healey (2000) and Kordonowy *et al.* (2017).

The effect of long-term high environmental temperature on enzyme activities in the blood occurred during summer season in our study. 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 changed 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.,* 1996; Kordonowy *et al.*, 2017).

References

Al-Obaidi, F.A. 2017. Effect of summer and winter seasons on outdoor rearing of blood enzymes of some native chicken strains. J. Genet. Environ. Resour. Conserv., 5(1):55-58.

Al-Obaidi, F.A. and Al-Shadeedi, Sh.M.J. 2014. Seasonal variation in egg phenotype and chemical composition of collard dove

(*Streptopelia decaocto*) in Baghdad. J. Genet. Environ. Resour. Conserv., 2014, 2(1): 69-73.

Al-Obaidi, F.A. and Al-Shadeedi, Sh.M.J. 2018. Effect of summer and winter seasons on egg abnormalities of outdoor rearing some native chicken strains. J. Bio. Environ. Sci., 12: 220-225.

Bare, M. and Ziegler-Ulsh, C. 2012. Establishing a small-scale, sustainable, pastured poultry operation. Rodale Institute, https://rodaleinstitute.org/establishing-a-small-scale-sustainable-pastured-poultry-operation/

Bogin, E., Y. Avidar, V. Pech-Waffenschmidt, Y. Doron, B. A. Israei, and E. P. Kevkhayev, 1996. The relationship between heat stress, survivability and blood composition of the domestic hen. European J. Clin. Chem. Clin. Biochem., 34: 963-469.

Kordonowy, L.; Lombardo, K.D.; Green, H.L.; Dawson, M.D. Bolton, E.A.; LaCourse, S.; MacManes, M.D. 2017. Physiological and biochemical changes associated with acute experimental dehydration in the desert adapted mouse, *Peromyscus Eremicus*. Physiol. Rep., 5(6): 22.

Lehninger, A.L. 1978. Biochemistry 2nd ed., the Johns Hopkins and Function. School Medicine, World Publication, INC, New York, USA.

Romero, L.M. and Remage-Healey, L. 2000. Daily and seasonal variation in response to stress in captive starlings (*Sturnus vulgaris*): corticosterone. Gen. Comp. Endocrinol., 119(1): 52-59.

SAS Institute, 2001. SAS/STAT User's Guide for Personal Computer. Release 6.12 SAS Institute, INC., Cary, N.C., USA.

Schermer, S. 1967. The blood morphology of laboratory animals. 3rd ed., F.A. Davis Co., Philadelphia.

Steel, R.G. and J.H. Torrie, 1980. Principle and Procedures of Statistics. 2nded., McGrow-Hill Book Co., Inc, New York, USA.

Sturkie, D.H.D. 1986. Avian Physiology. 4th ed. Springer Verlag, New York.

Whittow, G.C. 1986. Regulation of body temperature. In P.D. Sturkie ed., Avian Physiology, 4th ed., 221-252pp) New York: Springer Verlag.

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