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Seasonal variation in blood enzymes of sandgrouse

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Abstract

The aim of this study was to estimate the effect of season on enzymes activity in blood of native sandgrous (*Pterocles alchata alchata*, Linnaeus, 176). Samples of blood from these birds were collected from Abu-Graib west of Baghdad during 2015 to identified the activity of *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: Sandgrous, *Pterocles alchata alchata*, Blood enzymes, Sex, Season.

Introduction

Sandgrouse birds are sixteen species, which belongs to the family of Pteroclididae. They are traditionally placed in two genera. The two central Asian species are classified as *Syrrhaptes* and the other fourteen species, from Africa and Asia, are placed in the genus *Pterocles*. Sandgrouse are ground dwelling birds restricted to treeless, open country, such as plains, savannahs and semi-deserts. They are distributed across northern, southern and eastern Africa, Madagascar, the Middle East and India through to central Asia (Al-Obaidi *et al.*, 2012). The genus *Pterocles* is common in Iraq, and four species are native: *Pterocles alchata alchata*, Linnaeus, 1766 and *Pterocles lichtensteinii arabicus*, Temminck, 1825; *Pterocle sorientali sorientalis*, Linnaeus, 1758 and *Pterocles senegallus*, Linnaeus, 1771 (Allouse, 1962; Moudhafer*et al.*, 2006; Al-Obaidi *et al.*, 2012).

In Iraq, high environmental temperature durind Summer, 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). Al-Obaidi and Al-Shadeedi (2011) study in Baghdad revealed significant species differences in blood serum enzymes activity ($P<0.05$) during Summer season, Collared dove predominant Laughing dove in the average values of GOT, GPT and AP enzymes with high values compared with Winter.

The aim of this study was to estimate the effect of season on enzymes activity in blood of native sandgrous (*Pterocles alchata alchata*, Linnaeus, 176), so this results will provide a new data for Ornithologists in Iraq.

Materials and Methods

Birds: A total of 15 (9 males and 6 females) individuals of native sandgrous (*Pterocles alchata alchata*, Linnaeus, 176) were collected from Abu-Graib west of Baghdad city during two seasons, Winter and Summer.

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).

Results and Discussion

Table (1, 2 and 3) showed that significant sex and season differences (P<0.05) were found in the average value of blood serum GOT, GPT and AP enzymes activity. The average values of serum GOT were 34.6, 35.5 and 35.7 (U/L) for male respectively during Summer season and the average values of serum GOT activity were low as 31.7, 32.0 and 32.0 (U/L) for male respectively during Winter season (Table 1). The GPT and AP enzymes for also varied significant (P<0.05) due to season, the average values were 8.1, 8.2 and 8.1 (U/L) and 31.3, 31.6 and 31.6 (U/L) respectively.

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

	Season		
Sex	Summer	Winter	Average
Male	35.8 a	33.5 b	34.7 B
Female	37.2 a	34.8 b	36.0 A
Average	36.5 a	34.2 b	35.4 AB

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 native sandgrous.

	Season		
Sex	Summer	Winter	Average
Male	8.5 a	8.0 b	8.3 B
Female	8.8 a	8.3 b	8.6 A
Average	8.7 a	8.2 b	8.5 AB

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

Table (2): Blood serum AP (U/L)of native sandgrous.

	Season		
Sex	Summer	Winter	Average
Male	34.6 a	30.4 a	32.5 B
Female	37.7 a	31.2 a	34.5 A
Average	36.2 a	30.8 a	33.5 AB

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

Al-Obaidi and Al-Shadeedi (2014) study in Baghdad revealed significant season differences in blood serum enzymes activity (P<0.05), birds predominant in the average values of GOT, GPT and AP enzymes with high values during Summer compared with Winter. This results agree with Kordonowy *et al.* (2010), Romero and Remage-Healey (2000).

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 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. 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).

Conclusion

The data of this study revealed that significant effect due to season and sex were found in blood serum enzymes.

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