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Effect of season on serum enzymes activity of Collared dove (*Streptopelia decaocto*) and Laughing dove (*Streptopelia senegalensis*)

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Abstract

The objective of this study was to determine the activities of some serum enzymes of Collared dove (*Streptopelia decaocto*) and Laughing dove (*Streptopelia senegalensis*) as a species classification. Twenty (10 males and 10 females) individuals of Collared dove and eighteen (10 males and 8 females) of Laughing dove were collected from different regions of Baghdad city during two seasons, winter and summer. Serum enzymes in three replicates for each species in both sexes were determined. Results revealed significant species differences in serum enzymes ($P<0.05$). Collared dove dominated Laughing dove in the average values of serum GOT, GPT and AP in winter season. Also, significant species differences were found in serum enzymes activity ($P<0.05$) during summer season. Collared dove predominated Laughing dove in the average values of studied enzymes with high values compared with winter. Significant sex differences were found in serum enzymes activity ($P<0.05$). Males of the two species predominated females in the values of studied enzymes during the two seasons.

Key words: Collared Dove, Laughing Dove, Serum, GOT, GPT, AP, Classification

Introduction

Collared dove (*Streptopelia decaocto*) and Laughing dove (*Streptopelia senegalensis*) are actually birds of Iraq, they have well adapted in Baghdad areas, nesting on the top of buildings, window sills and any other place they can build a stable nest (Allouse, 1962; Moudhafer et al., 2009). The Collared dove, also known as Eurasian Collared dove is one of the great colonizers of the avian world. Its original range was warmer temperate regions from South Eastern Europe to Japan. Laughing doves also called palm dove are found throughout Africa, Middle East, some parts of Asia and Australia. The Laughing dove earned its name because of the distinctive coo that sounds just like a human laughing (Anonymous, 2004).

Clinical hematology and blood chemistry are useful diagnostic tools (Campbell, 1988). In recent years, normal hematologic values for both pet and wild birds and hematological changes in response to disease have been reported (O'Halloranj et al., 1988). Tissue enzyme profiles of some avian species have also been established (Lumeij, 1988). Serum enzyme activities of glutamic-oxaloacetic acid transaminase (GOT), glutamic-pyruvic acid transaminase (GPT) and alkaline phosphatase (AP) do not change substantially, but it depends on animal species, age, sex, performance, reproduction stage and nutrition (Bouda et al., 1977; Bouda et al., 1980).

The objective of this study was to determine the activities of some serum enzymes including GOT, GPT and AP of Collared dove and Laughing dove as a species classification.

Materials and Methods

Twenty three (13 males and 10 females) individuals of Collared dove (*Streptopelia decaocto*) and fifteen (8 males and 7 females) of Laughing dove (*Streptopelia senegalensis*) were collected from different regions of Baghdad city during two seasons, winter and summer. Samples of 1.0 ml of whole blood were taken from the wing vein on the inside of the elbow joint from individual birds. 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 10ml test tubes to clot. The blood was centrifuged for 5 minutes. The serum was removed by a transfer pipette to clean test tubes and were frozen.

The activities of GOT, GPT and AP in serum were determined photometrically using commercial Bio-test kit (RANDOX).

Statistical analysis was carried out using computerized statistical analysis program (SAS, 2001).

Results

Significant species differences were found in serum enzymes (P<0.05). Collared dove dominated Laughing dove in the average values of serum GOT, GPT and AP during winter season (Table 1). Also, significant sex differences were found in serum enzymes activity (P<0.05). Males of the two species predominated females in the concentrations of serum GOT, GPT and AP.

Table (2) showed significant species differences in serum enzymes activity (P<0.05) during summer season. Collared dove dominated Laughing dove in the average values of studied enzymes. Also, significant sex differences were found in serum enzymes activity (P<0.05). Males of the two species predominant females in the values of serum GOT, GPT and AP.

Discussion

Serum transaminase enzymes of glutamic-oxaloacetic acid transaminase (commonly abbreviated GOT), which also called Aspartate aminotransferase (commonly abbreviated AST) and glutamic-pyruvic acid transaminase (commonly abbreviated GPT) are type of enzymes that help produce chemical reactions in the body. It is found mainly in the blood but also in certain body tissues, especially the heart and the liver. Transaminase enzymes helps to form an acid known as oxaloacetic acid or pyruvic acid and an amino acid known as glutamic acid. Amino acids are groups of chemical substances that form proteins. Proteins are extremely complex, naturally occurring substances made of amino acids that are essential to the body's structure and function. Alkaline phosphatase (AP) is present in nearly all tissues and organs, in particular liver and in bones, where it is associated with osteoblastic processes. In avian and poultry, males have consistently higher values for AP compared to females (Mauro et al., 1990; Niu et al., 2009).

All heat-stressed animals displayed systemic inflammation and activated biochemical markers evidenced by cellular ischemia and injury/dysfunction included increased plasma levels of blood glutamic oxaloacetic transaminase, glutamic pyruvic transaminase and alkaline phosphatase; increased striatal levels of glutamate, glycerol and lactate/pyruvate ratio; and decreased striatal levels of partial pressure of oxygen and local cerebral blood flow, which were all observed during heat stroke (Chen et al., 2006).

High environmental temperature, 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 (Bogina 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-

Table 1: Serum enzymes of Collared dove and Laughing dove during winter

Species	GOT (U/l)	GPT (U/l)	AP (U/l)
Collared dove (males)	30.3^{a}	6.6^{a}	33.5^{b}
Collared dove (females)	28.8^{b}	5.9^{b}	36.2^{a}
Average	29.6^{A}	6.3^{A}	34.6^{A}
Laughing dove (males)	29.8^{a}	6.3^{a}	32.4^{b}
Laughing dove (females)	28.1^{b}	5.5^{b}	33.8^{a}
Average	29.0^{B}	5.9^{B}	33.1^{B}

^{a,b}different superscripts in a column differ significantly (P<0.05)
^{A,B} different superscripts in a column differ significantly (P<0.05)

Table 2: Blood serum enzymes of Collared dove and Laughing dove during summer

Species	GOT (U/l)	GPT (U/l)	AP (U/l)
Collared dove (males)	34.7^{a}	8.0^{a}	39.7^{a}
Collared dove (females)	32.3^{b}	7.6^{b}	36.8^{b}
Average	33.5^{A}	7.8^{A}	38.3^{A}
Laughing dove (males)	34.4^{a}	7.5^{a}	39.2^{a}
Laughing dove (females)	31.2^{b}	7.1^{b}	35.9^{b}
Average	32.8^{B}	7.3^{B}	37.6^{B}

^{a,b}different superscripts in a column differ significantly (P<0.05)
^{A,B}different superscripts in a column differ significantly (P<0.05)

diphosphoglycerate or inositol-5-phosphate, which affect oxygen and carbon dioxide affinity to haemoglobin (Lehninger, 1978; Whittow, 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, show that 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 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, include 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; Chen et al., 2006).

Serum enzymes including GOT, GPT and AP are simple tests providing important information that may help the avian taxonomists in dove species classification.

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