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Comparative Study of Some Hematological, Biochemical and Thyroid Biomarkers on Males and Females *(Gallinula Chloropus)* Water Birds[1]

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ABSTRACT

The current study was objective in clarifying some of the physiological and hormonal characteristics on male and female of migratory water birds *Gallinula Chloropus*, that bought from Basrah market during the winter season. This study conducted on 30 healthy birds was divided into fifteen males and fifteen females and suggest that the male *Gallinula Chloropus* has higher levels of red blood cells count(RBC), hemoglobin(Hb) and Packed cell volume (PCV) than the females, while the total protein, albumin, globulin, calcium, phosphorus, and triiodothyronine (T3) concentrations recorded high significantly in the female than the males. In addition, there is no difference in the levels of Thyroid stimulation hormone (TSH) and blood glucose.

Keywords: *Migrate birds (Gallinula Chloropus), hematological, biochemical and thyroid biomarkers.*

INTRODUCTION:

Moorhen bird is one of many poultry species considered to be a one food source for the Iraqi people (Al-Ibrahimi *et al.*, 2017). Moorhen belongs to the phylum: Chordata: Ornith order: Gruiformes and family Rallidae Genus: Gallinula, widely distributed in central and southern Iraq, able to withstand rain, humidity, temperature, and wind, these birds feed on frogs, insects, fish, grass, and plants, and their sexual roles are partially reversed, with females more aggressive than males.

Moorhen *Gallinula Chloropus* is a socially monogamous and sometimes polygamous rally bird with partial sex role reversal with females more aggressive than the males in winter flocks and more active in courtship and mating, therefore in the line with sociobiological theory (Trivers, 1972). The study of hematological and biochemical parameters play very important role to assess the physiological state of wild birds and to conduct eco physiological or conservation studies, as well as to understand basic physiological parameters and how these parameters vary with age, sex, and life history events. Hematological and biochemical parameters are good indicators of metabolic status and are influenced by various seasonal processes related to molting, breeding, and migration, as well as circadian variability induced by circadian rhythms (Jenni-Eiermann *et al*., 2002). As birds migrate, they are exposed to a variety of stress conditions such as high metabolic demands, physical activity, poor food quality, and quantity of environmental contaminants, all of which may cause changes in hematological parameters (Vleck & Vleck, 2002), which may lead to migration related-disease (Studds & Marra, 2005). Although studies have been conducted on the various factors that affect the health of these birds, they have not been able to determine the serum biochemical, electrolytes and hematological parameters of

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these birds during their migration season, therefore this study objective to analyze the some hematological, electrolytes, biochemical and hormonal parameters of the *Gallinula chloropus* gender to provide reference values during migration and normal physiologic conditions.

MATERIALS AND METHODS

Animals

This study was conducted in Veterinary College of Basrah University, during the winter season (from December 2019 to February 2020) as it has been bought total (30) specimens of adult female and male moorhen birds from Basrah market. After ensuring that the birds are free from hematology and gastrointestinal parasites, its divided in to two groups males group and females group that fifteen bird for each group.

Blood Samples

Morning (9-11 am) about 5ml of blood samples were collected from the jugular vein of each *Gallinula chloropus* gender before the time of slaughter by using a heparinized syringe. Two milliliter of this blood was collected for hematological study and others parts put in other test tubes for separated plasma, these samples were centrifuged at a speed of 3,000 rpm for 10 minutes , isolate plasma and stored at -20 ^{0}C until the specimen was analyzed later in the day.

Hematological analysis:

Erythrocyte count (RBC), Hemoglobin concentration (Hb) and Packed cell volume (PCV) were obtained by hematology –auto analyzer .

Electrolyte and biochemical analysis :

Estimation serum blood glucose Used kit (liquid glucose GOD-PAP) from (Randox) company .

Calcium and phosphorus , total protein, albumin and globulin were measured in private laboratories Bayan group for advance laboratories diagnosis at Basrah Governorate.

Hormone analysis:

Used T3 and TSH enzyme immunoassay test kit catalogs number: 125- 300 Total triiodothyronine product code: 325-300 Thyrotropin: All from monobind inc. Lake forest, CA92630, USA

Statistical analysis

Data analysis was conducted to determine the standard deviation and mean values of the bird's parameters according to (Abo-Allam, 2003) by used SPSS Programe version 2018.

RESULTS AND DISCUSSION

The various forms of biochemical and hematological parameters have been widely used to monitor the health of various animals, such as birds Sánchez-Guzmán *et al.*, 2004).However, their usefulness can be limited due to certain factors include the lack of reference values for the environment's condition and physiological states of the birds (Nyholm, 1998) . Migration is a critical event in the life cycle of a bird species; it can promote various physiological and behavioral changes (Schwilch *et al*., 2002). Biochemical changes in the plasma of birds are frequently used to monitor their health and nutritional status (Artacho *et al*., (2007) .
Jenni & Jenni-Eiermann, (1998) revealed that a rapid and reproducible method can be used to analyze the physiological state of free-living birds.

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Referring to the data present in table (1) serum total protein concentrations in female moorhen birds showed significant increased than the males, this result conducted with the findings by (Orji *et al*., 1986b; Verma *et al*., 1975), in female chickens and guinea fowls respectively. While, Dawson & Bortolotti, (1997) referred that the feeding habits of migratory birds are having high food absorption rate and liver's ability to produce proteins, some of these proteins are then catabolized during flight to obtain their endogenous form (Klaassen *et al*., 2000). In the case of dehydration, protein could be mobilized to provide water, this could be done as a result of decreased body mass during migration (Klaassen, 1996) or as an adaptive response to the physiological effects of endurance flight (Jenni & Jenni-Eiermann, 1998).

The elevated level of plasma albumin in the female moorhen birds than the males may be due to the plasma metabolites in birds are regulated by their metabolism and dietary intake and serve as an indicator of their nutritional status (Artacho *et al*., 2007; Rodríguez *et al.*, 2005). The high concentrations of blood globulin in adult females were linked to their reproductive health, they also reportedly developed maternal antibodies that help create the egg yolk (Monika Okuliarova *et al*., 2014).

The results of the study show the levels of phosphorus and calcium in the female moorhen birds were higher than those in the males, this is because the physiological processes that are needed to development and maintenance of this animal's reproductive system which require higher levels of these nutrients (Okeudo *et al*., 2003). The main reason to the differences in the sexual characteristics between males and females can be explained by the sex hormone is that the hormone determines the somatic characteristics of the male (Short , 1980).In other words, the male's sex hormone determines the characteristics of the female. The female in the bird is the heterogametic sex, which means that most dimorphisms are the result of the ovarian estrogen and the minority from the androgen secretion (Lawrence & Fowler 1997).

The main source of glucose in the metabolism is from the diet or from glycogen stores. Its concentration within a narrow range is regulated by hormonal control. Because glucose is the primary source of energy for the nervous system, it is kept within a tight range (Rodríguez *et al*., 2005). In our study show that no difference in the mean values of glucose in both sexes, this study is like found by (Simaraks *et al*., 2004) in Chickens, but disagreement with that found (Homswat *et al*., 1999) who documented increased in glucose serum level in male pheasant compared to female.

The RBC values are measure the size, concentration, and hemoglobin content (Glomski &Pica, 2011).Referring to the data present in the table (1) that the RBC, Hb and PCV values of males recorded high significant than the females, this variance agreement with(Orji *et al*., 1986a) Whom were noted the sex and species effects on the hematological parameters. The difference in the concentration of hemoglobin is related to the changes in the blood volume per unit of body weight (Nirmalan & Robinson, 1971) noted that the birds with bigger bodies have higher PCV and Hb content.

Plasma level assay of T3 show low levels in moorhen males than the females, while TSH level did not recorded any significant in both sex. Previously studies on others species of the birds (Welcker *et al*. 2013; Zheng *et al.*, 2013) investigated that the (T3) hormone is a vital component of thermogenesis and substrate metabolism and the concentration of this hormone in the blood is positively correlated with the basic metabolic rate (BMR) of various bird species It has also been observed that individuals with higher plasma T3 levels tend to start breeding earlier (Chastel *et al.*, 2003).

Zhao *et al*., (2017) found that the timing of the development of pre-reproductive changes within the endocrine system and metabolism of energy in both resident and migrant species can be similar. However, the former can accumulate more energy reserves faster than the latter. Although migration did not directly affect the timing of metabolic and reproductive changes, it can give migrant species more time to gain body mass. In others study (Smith, 1982) was mentioned to the cold temperatures and changes in day length appeared to have little effect on thyroid activity.

Table1.Some hematological, biochemical and hormonal value on males and females of the migratory Gallinula chloropus (Mean ± Stander Deviation)

Parameters	Male ±SD	Female ±SD
Total protein (g\l)	33±0.01	38±0.06
Albumin (g\l)	20 ±0.00	23±0.02

Globulin (g\ l)	13±0.04	15±0.01 a
Phosphorus gm\dl	1.66±0.06	2.06±0.08 a
Calcium gm\dl	5.63±0.145	7.01±0.16 a
Glucose (mg/ml)	366.01±10.04	366.02±10.04
RBC s (10^6 /µl)	4.35 ±0.10 a	3.07±0.10
Hb %	16.14±0.56 a	14.86±0.58
PCV%	46±0.11 a	41±0.01
T3 (ng/ml)	0.772±0.058	2.62±0.12 a
TSH (µlU/ml)	0.002±0.0022	0.001±0.0042

The small letters mean significant changes . Mean stander deviation

CONCLUSIONS

To our knowledge, this is the first study that perform comparative blood analysis on blood samples collected from male and female of *Gallinula chloropus* birds during their wintering season in Basrah city, Iraq. The results of the study contribute to the understanding of the physiological adaptations that allow these birds to survive and reproduce successfully. The lack of hematological, biochemical and hormonal studies on these birds during migration have also contributed to the development of the current reference physiological values for these birds.

Migration conditions and the period of adaptation of water birds to the new environment can affect by the vital values .Therefore, we recommend extensive and comprehensive studies of waterfowl and other birds that inhabit southern Iraq in winter.

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دراسة مقارنة لبعض المتغيرات الدموية والفسيولوجية والهرمونية على ذكور وإناث الطيور المهاجرة (*Gallinula chloropus*)

الخلاصة

بشرى فليح حسن1 جنان هلال2 حارث نجم عبد الله3

هدفت الدراسة الحالية إلى توضيح بعض الخصائص الفسيولوجية والهرمونية على ذكور وإناث طيور *Gallinula Chloropus* التي تم شراؤها من سوق البصرة خلال فصل الشتاء. أجريت هذه الدراسة على ثلاثون طائرًا سليمًا قسمت إلى خمسة عشر ذكر وخمسة عشر إنثى وتشير إلى أن ذكر *Gallinula Chloropus* لديه مستويات مرتفعة من خلايا الدم الحمراء (RBC) والهيموجلوبين (Hb) وحجم الخلاياالمرصوصة (PCV) مقارنة بالإناث ، بينما سجلت تراكيز البروتين الكلي والألبومين والجلوبيولين والكالسيوم والفوسفور وثلاثي يودوثيرونين (T3) ارتفاعًا ملحوظًا في الإناث عن الذكو ر. بالإضافة إلى ذلك ، لا يوجد فرق في مستويات هرمون المحفز للغدة الدرقية TSH وسكر الدم.

الكلمات المفتاحية: الطيورالمهاجرة (Gallinula Chloropus) ، قيم الدم , والكيمياء الحيوية والغدة الدرقية.