
Submitted : 25-08-2016

Accepted : 11-12-2016

Published : 15-02-2017

Effect of Thermal Stress on Serum Biochemical and Haematological Parameters in Broiler Chicken

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Abstract

The present study was conducted to assess the effects of thermal stress on the serum biochemical and haematological parameters in broiler chicken. Forty CARIBRO- *Vishal* broiler chicken were divided into two groups with twenty birds each. The control group was kept at room temperature and treatment group was exposed to thermal stress under 40 ± 1 °C for 4 hours at 35 day of age. The exposure of thermal stress significantly increased ($P<0.05$) the value of serum biochemical parameters (glucose, cholesterol and triglyceride), heterophills, H/L ratios and basophills, however the value of total leukocyte, haemoglobin, haematocrit value, and monocytes decreased significantly ($P<0.05$).

Key Words: Thermal stress, Biochemical, Haematological parameters, Broiler chicken.

Introduction

High ambient temperature is of great distress in all types of poultry operations. Poultry birds suffer more from heat stress as compared to other animals because of higher body temperature, feathered body and the absence of sweat glands. When the temperature and relative humidity exceed the comfort level of a bird, it loses its ability to dissipate heat. High ambient temperatures compromise performance and productivity through reduction in feed intake, decreasing nutrient utilization induces marked changes in the blood biochemical parameters in chickens and growth rate which lead to economic losses in poultry (Sahin *et al.*, 2009). It has been shown that heat stress causes alteration in the serum cholesterol, triglycerides (Sands and Smith, 2002), haemoglobin, total white cells and packed cells volume (Dinu *et al.*, 2004). Considering the above facts in view a study was conducted to evaluate the effect of acute heat stress on blood biochemical and haematological parameters in broiler chicken.

Materials and Methods

The experimental material comprised of forty CARIBRO-*Vishal* broiler chicks that were housed in multi-tier brooder cages up to five weeks of age and reared under uniform husbandry conditions. After 35 days birds were divided into two groups each containing twenty birds. First group served as control was kept at room temperature and second group served as treatment was exposed to heat stress at 40 ± 1 °C for 4 hrs in psychometric chamber. After exposure to heat stress 2 ml

blood was collected from the jugular vein in centrifuge tube. Serum was separated and stored at -20°C until analysed. Serum biochemical parameters and blood haematology was carried out following routine standard methods in use .The data obtained from experiment were analysed by one- way ANOVA using SPSS V.20 and means were compared by using Duncan test.

Results and Discussion

Effect of thermal stress on biochemical and haematological parameters is presented in table 1 and 2 respectively.

Table 1:-Effect of thermal stress on blood biochemical parameters (Mean ± SE) in broiler chicken.

Parameters	Control (Unexposed)	Treatment (Exposed)
Glucose (mg/dl)	210.24 ^a ± 7.34	284.02 ^b ± 9.27
Cholesterol (mg/dl)	165.31 ^a ± 9.53	187.42 ^b ± 6.43
Triglyceride (mg/dl)	116.15 ^a ± 7.65	128.43 ^b ± 5.43

^{ab}Mean values bearing different superscripts within rows differ significantly (P<0.05).

Data presented in table 1 revealed that all the three biomolecules ieglucose ,cholesterol and triglyceride significantly (P<0.05) increased after thermal exposure . The present result is in agreement with Olanrewaju *et al.* (2010), Shim *et al.* (2006) and Rashidi *et al.* (2010). On the contrary Faisal *et al.* (2008) reported that mean value of serum triglyceride and cholesterol significantly

Table 2:- Effect of thermal stress on haematological parameters (Mean ± SE) in broiler chicken.

Parameters	Control	Treatment
Haemoglobin (gm/dl)	10.240 ^b ± 0.125	8.347 ^a ± 0.141
Haematocrit (%)	30.027 ^b ± 0.322	26.071 ^a ± 0.542
Lymphocyte (%)	56.315 ^b ± 0.31	48.438 ^a ± 0.45
Heterophills (%)	32.130 ^a ± 0.823	40.071 ^b ± 0.523
Eosinophils (%)	1.713 ± 0.021	1.727 ± 0.017
Monocytes (%)	10.041 ^b ± 0.203	8.147 ^a ± 0.011
Basophills (%)	1.201 ^a ± 0.039	1.617 ^b ± 0.028
H/L Ratio	0.570 ^a ± 0.046	0.827 ^b ± 0.016

^{ab}Mean values bearing different superscripts within rows differ significantly (P<0.05).

decreased during heat stress condition, which may be due to experimental conditions such as mode of heat stress and duration of heat stress.

Table 2 revealed that exposure to thermal stress significantly reduces ($P < 0.05$) the level of haemoglobin and hematocrit values. These findings are in agreement with Dinu *et al.* (2004), who reported that reduction in the level of haemoglobin and hematocrit values are the consequence of the heat stress, during thermal stress condition reduced value of hematocrit may be due to the decreased production of erythrocyte or the decreased erythrocytes number and size both (Altan *et al.*, 2000). Due to exposure to thermal stress significant reduction ($P < 0.05$) were observed in lymphocyte number which are in agreement with the finding of Khan *et al.* (2002) who reported that exposure to thermal stress causes reduction in number of lymphocyte by reduction in size of lymphatic organs such as spleen, thymus and bursa. The numbers of basophils significantly increased ($P < 0.05$) when birds were exposed to thermal stress. Present result are in agreement with earlier reports of Mitchell *et al.* (1992) and Maxwell *et al.* (1992), who also observed significantly increased basophils after thermal exposure. After thermal stress significant reduction of monocyte ($P < 0.05$) was observed whereas the eosinophil count not affected significantly. The increased value of H/L ratio is the most reliable measure of stress in poultry (Siegel, 1995).

The results of present study showed significant increase ($P < 0.05$) in Heterophil/lymphocyte ratio due to thermal stress. These findings are in agreement with Maxwell *et al.* (1992) and Maxwell (1993) who suggested that an increase in the H/L ratio may be a response to mild or moderate stress but at the same time Maxwell and Robertson, (1998) reported that in severe stress, H/L ratio cannot be used as a reliable measurement of stress because in severe stress heteropenia and basophilia may develop.

Acknowledgements

Authors are thankful to the Director, Central Avian Research Institute, Izatnagar, Bareilly, for providing necessary facilities to carry out this work.

Conflict of Interest: All authors declare no conflict of interest.

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