



Research Article

EFFECT OF PROTEIN SYNTHESIS MODULATOR AND ACUTE HEAT STRESS ON SERUM BIOCHEMICAL PARAMETERS IN BROILER CHICKEN

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Abstract- An experiment was conducted to assess the effect of protein synthesis modulator and heat stress on serum biochemical parameters in broiler chicken. A total one hundred ninety two of CARI-BRO Vishal broiler chicken were reared up to five weeks of age on standard uniform condition and 36th day of age divided into three treatments including control, enhancer and inhibitor, receiving intraperitoneally normal saline (0.5 ml), glutamine (0.75 mg/Kg of BW) and quercetin (5 mg/kg of BW) respectively. After, 24 hours later each they were exposed to acute heat stress for 0, 2, 5 and 10 hours under 40±1°C; 55% RH. After exposure of heat stress immediately collected blood sample and serum were separated after that stored at -20°C until analyzed. The observations were analyzed by 2x3x4 factorial method for both interaction and main effect. Protein synthesis modulator at different period of heat stress (interaction effects) significantly (P<0.05) increase the serum triglycerides and glucose level but under main effect of Protein synthesis modulator glutamine, significantly (P<0.05) decrease the serum triglycerides level. Exposure and duration of heat stress significantly (P<0.05) increased the level of both serum glucose and serum triglycerides but the total protein level were unaffected.

Keywords- Protein Synthesis Modulator, Heat Stress, Total Protein, Triglycerides, Glucose

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Introduction

Poultry industry in India has been playing the leading role since last few decades among all other livestock and poultry production has garnered a significant landmark in animal production with annual growth rate of 8-10% as against 1-2% for agriculture. The total poultry population in the country is 729.2 million and has increased by 12.39% over the previous census [1]. Environmental stressors exert their effect directly or indirectly on the productive performance and well being of the domestic animals including poultry species [2]. High ambient temperature above the zone of thermo neutrality have deleterious effect on body weight, feed consumption, feed efficiency and egg production [3]. Heat stress exerts negative effects on the growth performance of broiler and these negative effects can be associated primarily with reduction in the feed intake [4]. [5] Reported that heat exposed birds reduced their feed intakes in order to reduce the thermogenic effects associated with nutrient absorption, assimilation and utilization. Furthermore the reduction in the feed intake associated with heat stress also effect lipid metabolism in broilers, in that lipids especially triglycerides, have the highest energy value. High ambient temperature significantly elevated the glucose and triglyceride concentration in heat stressed broiler chicken [6], [7] Hence, the current study was designed to investigate the effect of protein synthesis modulator and heat stress on serum biochemical parameters in broiler chicken.

Materials and Methods

A total of one hundred ninety two CARI-BRO Vishal broiler chickens with similar body weight were housed in cages and reared up to five weeks of age under standard managemental conditions. On 36th day divided into 6 groups with three treatments (32 birds in each group's) including control, enhancer and inhibitor,

receiving intraperitoneally normal saline, glutamine @ 0.75 mg/Kg body weight and quercetin @5 mg/kg body weight respectively. After, 24 hours of administration each of the six groups were again divided into two with three in each, one being exposed to acute heat stress (40±1°C; 55% RH) for different duration of 0, 2, 5 and 10 hours in psychometric chamber and another one were kept as unexposed to heat stress. After exposure of different duration of heat stress (n-4 for each exposure duration) 2 ml blood was collected from the jugular vein in centrifuge tube. Serum was separated and stored at -20°C until analyzed for various serum biochemical parameters like glucose, triglycerides and total protein.

Statistical Analysis

The data obtained from experiment were analyzed by 2x3x4 factorial method using SPSS V.20 for both interaction and main effect. The means were compared using Tukey test.

Results and Discussion

Mean values ± SE representing the interaction effect on serum biochemical profile is presented in [Table-1]. Results indicated that level of triglyceride was significantly (P<0.05) decreased with effect of protein synthesis modulator, heat stress exposure and duration of exposure while serum glucose level were significantly (P<0.05) increased (410.09 ± 43.86). With regards to serum total protein, no interaction effect could be observed. Influence of protein synthesis modulator on serum biochemical program is depicted in [Table-2]. Protein synthesis modulator showed significant effect (P<0.05) on serum triglyceride levels, however not any significant effect was observed with serum glucose and

total protein. Protein synthesis modulator namely enhancer (glutamine) significantly reduced serum triglyceride concentration (84.53 ± 1.52), while inhibitor (quercetin) treated and control groups remains unaffected. Present result are in agreement with earlier works reported by [8] who observed that supplementation of glutamine may lead to decreased level of triglyceride by decreasing the fatty acid oxidation. Contrary of our result of [9] reported that triglycerides were not affected by dietary glutamine under heat stress condition. In case of total protein concentration our finding was similar with [9] who reported that total protein concentration was not affected by dietary glutamine under heat stress condition. According to study of [10] total concentration of blood proteins in terms of reduced tension and this would reduce the feed consumption and imbalance of amino acids has been linked and it is reported that glutamine supplementation improved the entire process of making a protein in the blood are animals but it seems that

the lack of blood protein changes our research it might be due to the good balance of amino acids be used ration of this research. Mean values \pm SE of serum biochemical profile on effect of acute heat stress and its duration presented in [Table-3 and 4]. A significant effect ($P < 0.05$) of acute heat stress exposure and its duration could be observed on serum glucose and triglycerides. Serum glucose (327.02 ± 7.04 and 342.61 ± 8.54) and triglycerides concentration (89.68 ± 1.28 and 94.16 ± 3.21) was increased in response to acute heat stress exposure and duration of heat stress but total protein concentration remain unaffected. The present result is in agreement with [6] who reported that exposure of thermal stress significantly increased glucose concentration in heat stressed broiler chicken it might be due to increased secretion of glucocorticoid under exposure of thermal stress.

Table-1 Effect of protein synthesis modulator at different periods of heat stress exposure on serum biochemical profile in broilers

Heat stress	Protein modulator	Hours	Total protein	Triglycerides	Glucose
Unexposed	Control	0	4.87 ± 0.33	$91.13^c \pm 5.83$	$360.14^{de} \pm 35.38$
		2	4.66 ± 0.31	$90.81^c \pm 9.51$	$249.69^a \pm 7.20$
		5	5.45 ± 0.57	$87.65^{bc} \pm 6.75$	$319.09^{bcd} \pm 64.84$
		10	4.80 ± 0.10	$110.21^{fg} \pm 15.95$	$303.27^{abc} \pm 46.13$
	Enhancer	0	5.02 ± 0.23	$86.96^{bc} \pm 5.11$	$310.90^{bc} \pm 16.05$
		2	6.19 ± 0.94	$86.26^b \pm 5.11$	$301.65^{ab} \pm 27.25$
		5	5.01 ± 0.18	$80.34^{ab} \pm 5.65$	$272.41^{ab} \pm 19.14$
		10	4.68 ± 0.24	$79.99^a \pm 3.94$	$283.12^{ab} \pm 9.91$
	Inhibitor	0	4.95 ± 0.38	$81.07^{ab} \pm 1.92$	$321.98^{bcd} \pm 24.75$
		2	5.07 ± 0.14	$82.86^{ab} \pm 5.52$	$258.31^a \pm 27.46$
		5	4.87 ± 0.15	$86.59^b \pm 5.70$	$365.92^{de} \pm 15.94$
		10	5.32 ± 0.22	$81.15^{ab} \pm 4.06$	$296.16^{ab} \pm 36.42$
Exposed	Control	0	5.49 ± 0.30	$105.77^{ef} \pm 8.92$	$307.14^{bc} \pm 27.03$
		2	5.17 ± 0.09	$93.57^{cd} \pm 3.70$	$351.81^{cd} \pm 31.06$
		5	4.92 ± 0.10	$107.29^{fg} \pm 5.39$	$309.32^{bc} \pm 12.02$
		10	5.13 ± 0.09	$84.13^{ab} \pm 4.96$	$410.09^{fg} \pm 43.86$
	Enhancer	0	5.25 ± 0.07	$92.57^c \pm 3.13$	$261.67^a \pm 20.39$
		2	5.28 ± 0.21	$83.44^{ab} \pm 4.34$	$352.20^{cd} \pm 10.50$
		5	5.46 ± 0.22	$80.99^{ab} \pm 4.11$	$326.03^{cd} \pm 37.61$
		10	4.74 ± 0.14	$73.48^a \pm 0.74$	$408.97^e \pm 25.97$
	Inhibitor	0	5.33 ± 0.17	$106.24^{fg} \pm 18.67$	$271.41^{ab} \pm 12.78$
		2	5.35 ± 0.13	$88.05^{bc} \pm 3.95$	$324.52^{cd} \pm 20.91$
		5	5.20 ± 0.17	$86.01^b \pm 4.70$	$302.74^{abc} \pm 23.73$
		10	5.15 ± 0.04	$90.61^c \pm 11.69$	$407.74^e \pm 24.41$
			0.547	0.002	0.021

^{abcde}Mean values bearing different superscripts within columns differ significantly ($P < 0.05$)

Table-2 Effect of protein synthesis modulator on Serum Biochemical profile in broilers

Protein synthesis modulator	Total protein	Triglycerides	Glucose
Control	5.15 ± 0.08	$91.30^b \pm 2.24$	306.68 ± 9.11
Enhancer	5.19 ± 0.09	$84.53^a \pm 1.52$	315.97 ± 9.05
Inhibitor	5.07 ± 0.05	$89.72^b \pm 2.15$	325.35 ± 9.11
P- Value	0.270	0.034	0.503

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

10 hours	5.07 ± 0.06	$94.16^b \pm 3.21$	$342.61^b \pm 8.54$
P value	0.798	0.008	0.007

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

Conclusion

From the above finding under interaction effect, serum glucose and serum triglyceride level increased but in individual effect of glutamine decrease the level of serum triglyceride however protein synthesis modulator, glutamine increase the serum glucose and serum triglyceride level under heat stress exposure and different duration of heat stress.

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Table-3 Effect of heat stress exposure on Serum Biochemical profile in broilers

Heat Stress	Total Protein	Triglycerides	Glucose
Unexposed	5.13 ± 0.08	$82.01^a \pm 1.49$	$304.98^a \pm 7.11$
Exposed	5.15 ± 0.04	$89.68^b \pm 1.28$	$327.02^b \pm 7.04$
P-Value	0.825	0.035	0.029

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

Table-4 Effect of duration of heat stress exposure on Serum Biochemical profile in broilers

Duration of heat stress	Total protein	Triglycerides	Glucose
0 hour	5.18 ± 0.10	$84.90^a \pm 2.33$	$300.04^a \pm 8.42$
2 hours	5.16 ± 0.10	$85.96^a \pm 1.65$	$303.37^a \pm 8.08$
5 hours	5.14 ± 0.07	$86.38^a \pm 1.56$	$317.96^{ab} \pm 8.34$

exists in the manuscript and SB designed the proper format of the manuscript. All authors read and approved the final manuscript.

Abbreviations: CARI-BRO -Central Avian Research Institute Broiler, RH-Relative Humidity, °C – Degree Celsius, SPSS V.20 - Statistical Package for the Social Sciences Version 20, SE – Standard Error.

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors. Ethical approval for the study was obtained from Institutional Animal ethics Committee of ICAR-Indian Veterinary Research Institute, Izatnagar Bareilly-243122, Uttar Pradesh

Conflict of Interest: None declared

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