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Thyroid hormones investigation under heat stress in broilers administered with probiotic (BIO-SAF) and prebiotic (BIO-MOS)

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ABSTRACT

Heat stress is one of the most severe complications in husbandry industry especially in poultry field. Hormonal turbulence in heat stress is among the side effects of this condition that harmfully influence broiler performance. The present study was designed to investigate thyroid hormones alteration under heat stress and probably effects of probiotic and prebiotic on this alterations. One hundred cab strain one day old broilers were randomly divided in 5 groups: control group under Normal Temperature (TN), Treatment group treated with heat stress (HS), group HS-BIOMOS (administered with BIOMOS prebiotic under heat stress), group BIOSAF-HS (administered with BIOSAF probiotic under heat stress) and group HS-CMB (administered with combined BIOMOS –BIOSAF probiotics under heat stress). Duration of this experiment period was 42 days. In days 21, 35 and 42 blood samples were collected via wing vein and after serum preparation, the samples was maintained in deep freez (under 18 0C).Thyroid hormones(T3 and T4) measurement was done by Eliza Kits (Stat Fax automated apparatus). The results showed that heat stress is significantly($p \leq 0.05$) effective in lowering the T3 and T4 hormones in comparison to control group but consumption of prebiotic and probiotic is positively and statistically ($p \leq 0.05$) effective in normalize the thyroid hormones .

Key words: Thyroid hormones, heat stress, broiler, probiotic, prebiotic

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INTRODUCTION

Like all animals, poultry are most comfortable in a specific temperature range called the thermo-neutral zone. The ideal environment for high growth rate after three weeks of age is 15 to 20ºC with a relative humidity of 50 % or less; however, their actual thermoneutral zone may extend up 27ºC, depending upon the relative humidity and the age of the bird. Birds kept in ambient temperatures outside their thermo-neutral zone have poorer productive efficiency [1]. Heat stress causes a decrease in plasma sodium and increase in plasma chloride. An alteration in sodium: chloride ratio resulted in blood alkalosis which also has a detrimental effect on productive performance [2]. Al-Daraji et al. (2003) concluded that supplementation of sodium bicarbonate and potassium chloride to drinking water had a positive role of relieve the effect of heat stress on broilers as indicated by positive changes in physiological traits[3]. In another study, the effect of heat stress on growth and feed efficiency was partially alleviated by potassium chloride supplementation to drinking water [4]. Naji et al. (2004) showed that early microbial exposure of broilers by Lactobacilli resulted in a significant improvement in body weight and feed conversion and significant decrease in mortality rate compared with the addition of salts or vinegar to drinking water [5]. Al-Daraji et al. (2005) reported that early microbial exposure of heat stressed broiler to Lactobacilli or adding

sodium bicarbonate and potassium chloride salts in to the drinking water resulted in a significant improvement in all blood and plasma parameters compared with control group [6]. However, Lactobacilli treatment surpasses the treatments of salts with regard to all hematological traits included in their study. The aim of this study was thyroid hormones investigation under heat stress in broilers administered with probiotics and prebiotics.

MATERIALS AND METHODS

Animals

In this study, 100 cab strain one day old broilers was randomly divided in 5 groups: control group under Normal Temperature (TN), Treatment group treated with heat stress (HS), group HS- BIOMOS (administered with BIOMOS prebiotic under heat stress), group HS-BIOSAF (administered with BIOSAF probiotic under heat stress) and group HS-CMB (administered with combined BIOMOS –BIOSAF probiotics under heat stress).Duration of this experiment period was 42 days. Temperature of first week was 32.5 0C. Every day the temperature of broiler environment increased to reach 34.5±10C and hold in this point for 4 hour per a day with %65 humidity rate. After the first week, the temperature was reduced 2.50C per a week until the temperature reached to 26.50C and this heat point maintained up to final day of study (42 days).control group (TN) was under the normal temperature and normal diet without any probiotic. Group HS-BIOSAF, was fed with maize, soya, %5 concentrate and BIO-SAF probiotic (Strain SC47, made in Lozafer Company in France with a minimum of 8×109 alive cells per gram of product). Group BIOMOS-HS was fed with maize, soya, %5 concentrate and BIO-MOS prebiotic (provided from Altech Company) and group HS-CMB was fed with maize, soya, and %5 concentrate, BIO-SAF and BIOMOS. Feeding period of broiler was designed to three period comprised starter (BIO-MOS in form of 2/1000 and, BIO-SAF 0.5/1000), growth (BIOMOS in form of 1/1000, BIO-SAF 0.5/1000) and final stage (BIO-MOS in form of 0.5/1000, BIO-SAF 0.5/1000). The broilers were vaccinated against bronchitis, influenza-newcastle and Gambro disease in days 1,9 and 14 respectively.

Blood collection and serum assessment

In days 21, 35 and 42 blood samples were collected via wing vein and after serum preparation, the samples was maintained in deep freez(under 18 0C).Thyroid hormones(T3 and T4) measurement was done by Eliza Kits (Stat Fax automated apparatus).

Statistical Analysis

The results were expressed as mean ± SD. Differences between means were analyzed using one-way ANOVA, and then the means were compared with Duncan. P values of 0.05 or less were taken as being statistically significant. Data were analyzed using version 16 of SPSS software (SPSS Inc., Chicago, IL, USA).

RESULTS

Heat stress suppressed amount of the T3 and T4 Hormones in comparison with control group ($p \leq 0.05$) in days 21, 35 and 42. Adversely probiotic (BIO-SAF) and prebiotic (BIO-MOS) increased the T3 level in serum of HS-BIOMOS group, HS-BIOSAF group and HS-CMB group compared to HS group. Prebiotic (BIO-MOS) showed that is capable of increase and normalize serum T4 level in HS- BIOMOS group and HS-CMB group contrasted to the HS group ($p \leq 0.05$) but probiotic (BIO-SAF) did not exhibit such influence.

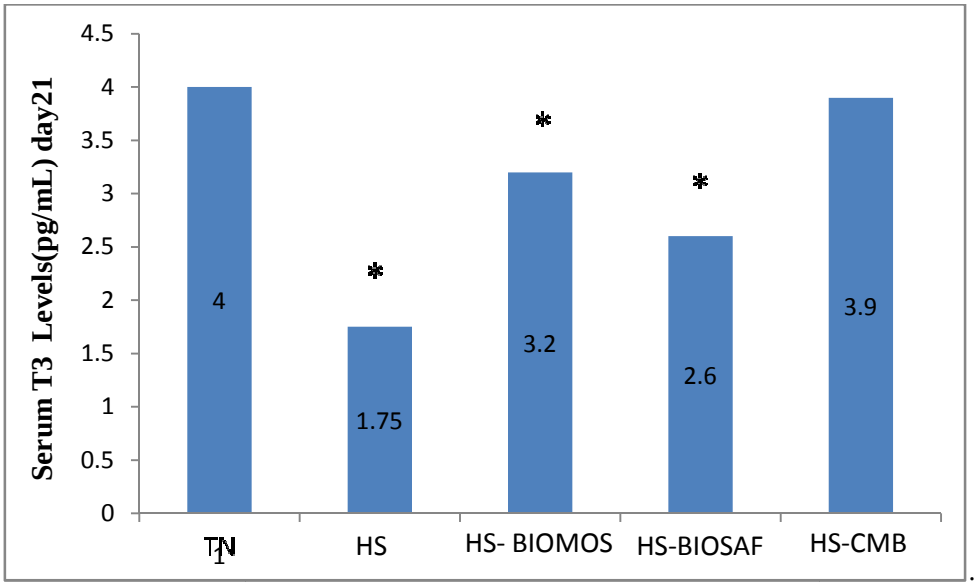

Fig. 1: SerumT3 level (pg/mL) in broilers in day 21, TN (control group under Normal Temperature), HS (Treatment group treated with heat stress), group HS- BIOMOS (administered with BIOMOS prebiotic under heat stress), group BIOSAF-HS (administered with BIOSAF probiotic under heat stress), group HS-CMB (administered with combined BIOMOS –BIOSAF probiotics under heat stress)
Indicating statistically difference compared to control group(TN**) **p<0.05***

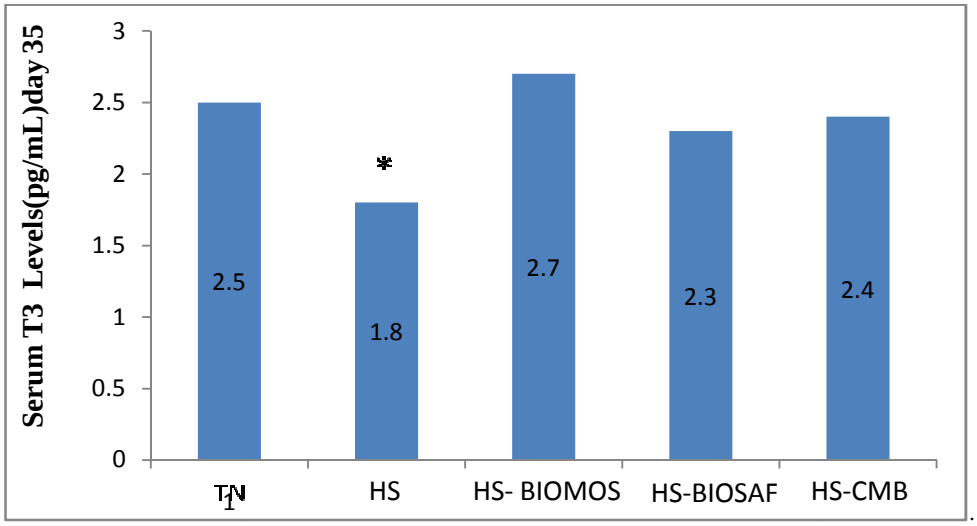

Fig. 2: SerumT3 level (pg/mL) in broilers in day 35, TN (control group under Normal Temperature), HS (Treatment group treated with heat stress), group HS- BIOMOS (administered with BIOMOS prebiotic under heat stress), group BIOSAF-HS (administered with BIOSAF probiotic under heat stress),group HS-CMB (administered with combined BIOMOS –BIOSAF probiotics under heat stress)
Indicating statistically difference compared to control group (TN**) **p<0.05***

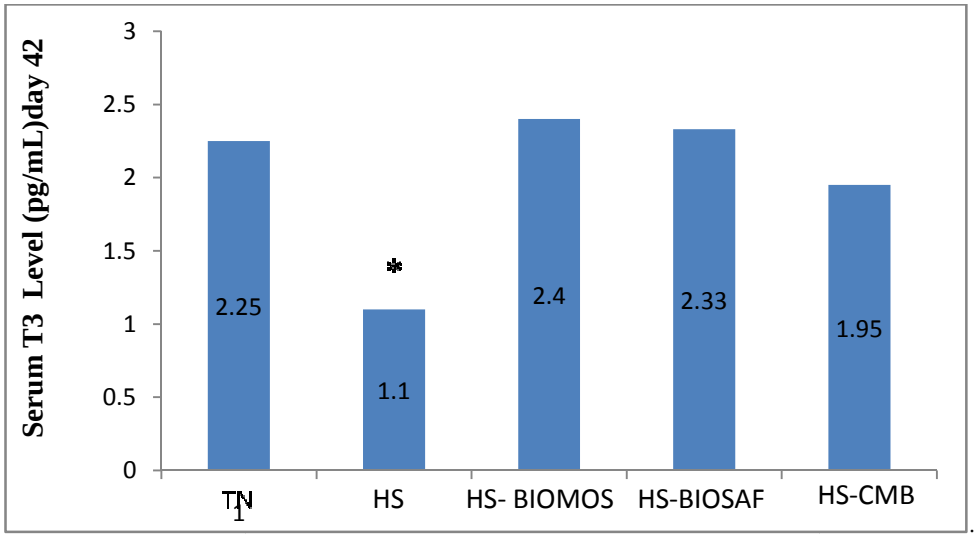

Fig. 3: SerumT3 level (pg/mL) in broilers in day 42, TN (control group under Normal Temperature), HS (Treatment group treated with heat stress), group HS- BIOMOS (administered with BIOMOS prebiotic under heat stress), group BIOSAF-HS (administered with BIOSAF probiotic under heat stress), group HS-CMB (administered with combined BIOMOS –BIOSAF probiotics under heat stress)
Indicating statistically difference compared to control group(TN) p<0.05***

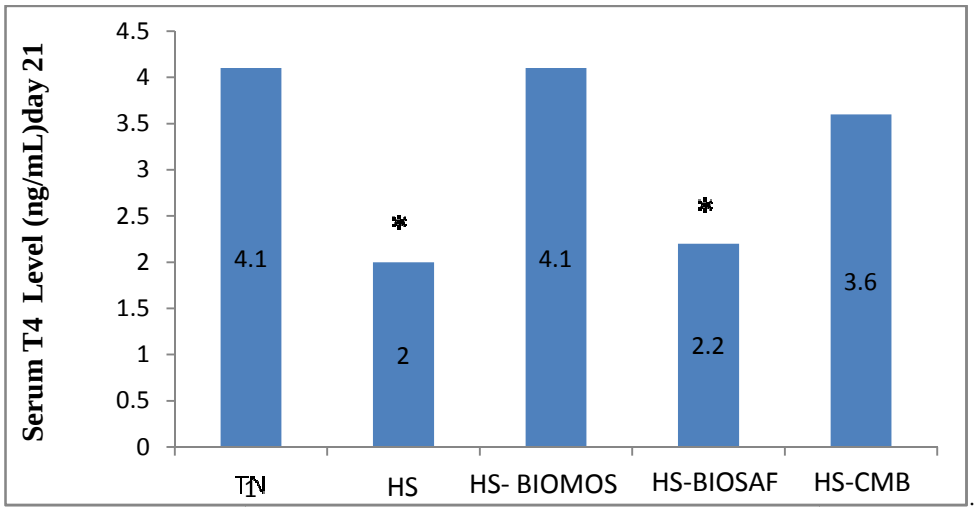

Fig. 4: SerumT4 level (ng /dL)in broilers in day 21, TN (control group under Normal Temperature), HS (Treatment group treated with heat stress), group HS- BIOMOS (administered with BIOMOS prebiotic under heat stress), group BIOSAF-HS (administered with BIOSAF probiotic under heat stress) group HS-CMB (administered with combined BIOMOS –BIOSAFprobiotics under heat stress)
Indicating statistically difference compared to control group(TN) p<0.05***

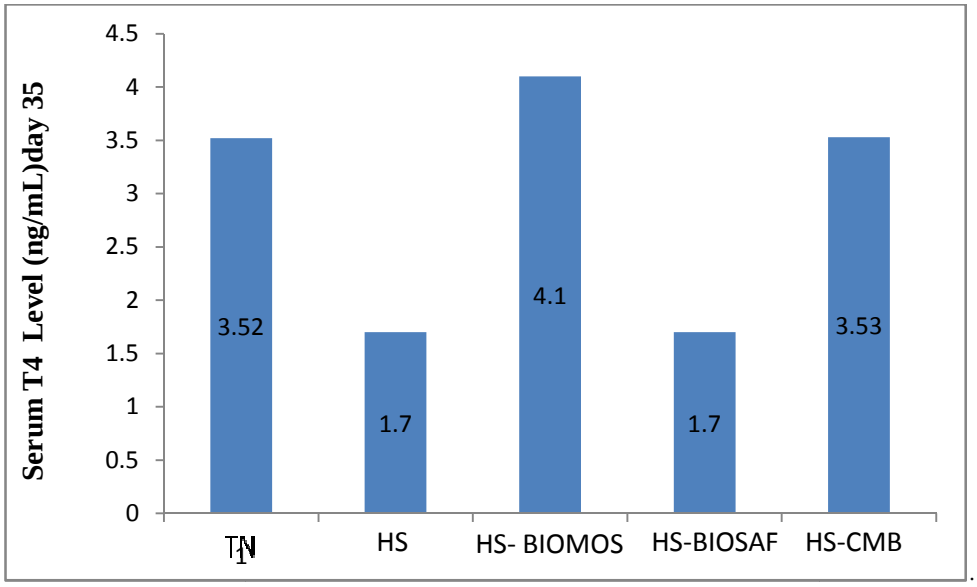

Fig. 5: SerumT4 level (ng /dL)in broilers in day 35, TN (control group under Normal Temperature), HS (Treatment group treated with heat stress), group HS- BIOMOS (administered with BIOMOS prebiotic under heat stress), group BIOSAF-HS (administered with BIOSAF probiotic under heat stress) group HS-CMB (administered with combined BIOMOS –BIOSAF probiotics under heat stress)
Indicating statistically difference compared to control group(TN) p<0.05***

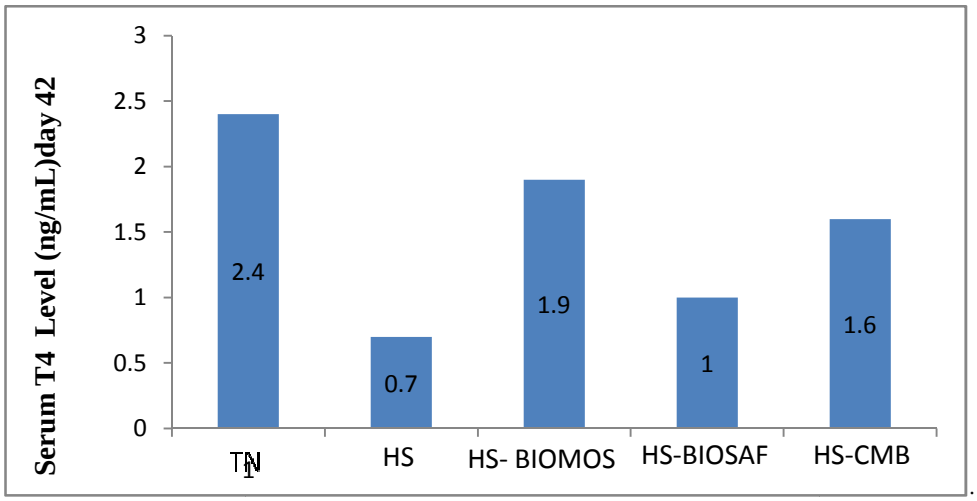

Fig. 6: SerumT4 level (ng /dL)in broilers in day 42, TN (control group under Normal Temperature), HS (Treatment group treated with heat stress), group HS- BIOMOS (administered with BIOMOS prebiotic under heat stress), group BIOSAF-HS (administered with BIOSAF probiotic under heat stress) group HS-CMB (administered with combined BIOMOS –BIOSAF probiotics under heat stress)
Indicating statistically difference compared to control group(TN) p<0.05***

DISCUSSION

Poultry production in tropical countries is affected by many challenges especially during the hot humid summer season. Economic losses result from decreased productivity and increased mortality due to acute heat stress. Among many factors, chick's age plays an important role in its resistance to acute heat stress. Heat loss from the surface of chicken to the environment increases from day one till four weeks of age and then decrease during the last two weeks of the growth period of broiler chicken [7]. Heavier broilers (approaching marketing age) are sensitive to high-temperature challenges. This sensitivity can be explained by the fact that broilers have greater difficulty keeping thermal homeostasis due to the large body mass and high rate of metabolism associated with rapid growth [8]. Low ability of heat loss of broiler chicks during the last two-weeks increases the impact and risk of exposure to elevated environmental temperature. The first attention for the probiotic importance was viewed by Elie Metchnikoff, he hypothesized that the long healthy life of Bulgarian peasants was resulted from consuming the fermented milk products[9]. Probiotic is a live microbial feed supplement that improves the intestinal microbial balance of the host [10]. Probiotic microorganisms inhibit growth of pathogenic microorganisms by competitive exclusion [11] by the occlusion of the receptor sites on the gut lining and also stimulate the immune system [12].

Also probiotics improve performance and feed conversion ration of poultry [13]. Recently, probiotics were used to improve production performance of Broiler [14, 15] and improve the physiological and biochemical parameters [16].This research approved that supplementation of prebiotics was able to normalize T3 and T4 serum levels in broiler undertaken heat stress. Similarly this phenomenon have been reported by Khalid et al. [17].Also we found that probiotic(BIO-SAF) could not be effective in increasing T4.In contrast with our study F. Khajali et al showed that apply the probiotics in broiler undergone in heat stress were capable of decreasing serum T3 level and also just like of our study reported that this supplements increased serum T4 level in broiler hold in heat stress condition[18].

CONCLUSION

Our data endorsed that application of probiotics (BIO-SAF) can normalize T4 level and prebiotic (BIO-MOS) and probiotic-prebiotic combination were able to normalize level of T4 and T3 hormones in broiler under heat stress.

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