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Concentration heat shock protein and dairy performances in heat-stressed goats

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Abstract
Thermal shock is expressed through the response of high levels of a thermal shock protein (tolerant gene expression) in this way, the cell gets rid of heat. The current study aims to assess the relation between the concentration of heat shock protein and dairy performances in goats under hot environment. the study performed at dairy goat research farm of Cukurova University. Located in the province of Adana. Milk yields were weekly recorded. The average ambient temperature between 28.7 and 34.9C, THI were higher than 78. HSP60 and HSP70 were 4.4 and 8.7ng/ml, and 13.9 and 18.34ng/ml for Alpine and Saanen goats respectively. The cellular thermoregulatory response directly expressed by an increasing activation and format of HSP60 and HSP70 was demonstrated to be negatively correlated to lactation performances in the thermal stressed goats.

Keywords: HSP, Milk yelid, stress, Goat

1. Introduction
In tropical and subtropical area, dairy goat are frequently subjected to various stressful factors including such as nutritional, chemical, psychological and environmental stress. Environmental stress due to tremendous changes in climatic conditions have negative effects on dairy goats' productivity. The major environmental parameter affecting the thermo comfort of dairy goat are ambient temperature, relative humidity, intensity of solar radiation and wind speed. The changes in these climatic components alters the homeothermy balance of goats leading to physiological and cellular, molecular and hormonal changes (Agossou *et al*., 2017) [3]. This thermoregulatory response implemented by animals exposed to adverse environment help to reduce and dissipate body heat (Darcan and Güney, 2008) [5]. One of the crucial aspect of cellular thermoregulation in goat is the activation and formation of heat shock proteins, which are molecular chaperons that maintain native conformation of proteins and cell viability during stress period (Kishore *et al*., 2016) [6]. This study aims to assess the relation between the concentration of heat shock protein and dairy performances in goats under hot environment.

2. Materials and Methods
The research was performed at the Dairy Goat Research Farm of Çukurova University located in the province of Adana. The trials was carried out from June to August using 65 Saanen and 73 Alpine crossbred goats. Experimental animals were housed in semi-opened barn and fed based on total mixed ration with 40% roughage and 60% concentrate feed (18% crude protein and 2500 kcal ME/kg DM). 5-8 ml of blood were collected from jugular vein into heparinized vacutainers tubes. Blood samples were centrifuged for 15 minutes at 1500 rpm and 210ul and serum samples were extracted into microtubes. The serum samples were analysed to determine the concentration of HSP70 and HSP60 levels using ELISA test kit (Sun Red Biotechnology Co., Shanghai, China).
Milk yields were weekly recorded using an automatic milking system equipped with a graduated reader. Composite milk samples were monthly collected into plastic tubes of 50 ml, and taken to the laboratory for composition analysis. The automatic milk analyzer Milkoscan FT-120 (FT-120; Foss, Hillerød, Denmark) connected to a computer was used to assess the total solids, pH, protein and fat contents of the milk.

During the trials, the recorded meteorological data i.e. ambient temperature and relative humidity were used to calculate the temperature humidity index (THI) according to the following formula:

THI = db - (0.55 - 0.55 RH) (db - 58); db: the dry bulb temperature (Abdel-Samee, 1996) [1].

Statistical analysis following the GLM procedures in the Statistical Analysis System (SAS V. 2004). Differences were tested with Duncan's Multiple Range Test at a level of 5%.

3. Results and Discussion

The average ambient temperature range between 28.7 ± 0.1oC and 34.9 ± 0.1oC. The highest THI (82.65) were recorded in afternoon. The thermal comfort zone of goat is reach when the THI is equal or less than 70. In contrary, goat are subjected to severe heat stress when the THI higher than 78 induces distress. The current study showed that the THI were higher than 78. Consequently the goats were under severe thermal discomfort.

On the other hand the results indicated that HSP 60 and HSP 70 were 4.4 ± 0.42 and 8.7 ± 0.72 ng/ml, and 13.9 ± 0.36 and 18.34 ± 0.47 ng/ml for Alpine and Saanen goats respectively. In term of breeds, the results showed that the HSPs expressions in Alpine goats is significantly higher than Saanen goats. This may be due to the morphological and coat characteristics. Regarding the lactation performances, the daily milk yield in Saneen goats was significantly higher than Alpine (0.9±0.1 vs. 1.6±0.2 l/day). However, the percentage of total solid (12.1±0.53 vs.11.2 ±0.3%), solids not fat (8.2±0.21 vs. 7.9± 0.3%), Fat (3.9±0.48 vs. 3.1± 0.1%)

Protein (3.4± 0.32 vs.3.2± 0.2%) were significantly higher in Alpine group than Saanen. Furthermore, there was relative negative correlation coefficient between HSP concentrations and milk yield.

4. Conclusion

The cellular thermoregulatory response directly expressed by an increasing activation and formation of HSP 60 and HSP 70 was demonstrated to be negatively correlated to lactation perofmances in the thermal stressed goats.

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