ÇUKUROVA UNIVERSITY
INSTITUTE OF NATURAL AND APPLIED SCIENCES

PhD THESIS

Hafsa Mohammed Mohammed AL YAMANI

ASSOCIATION OF HEAT SHOCK PROTEIN WITH SOME PHYSIOLOGICAL PARAMETERS IN THE GOATS

DEPARTMENT OF ANIMAL SCIENCE

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We certify that the thesis titled above was reviewed and approved for the award of degree of the Master of Science by the board of jury on 17/08/2018.

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ABSTRACT

PhD THESIS

ASSOCIATION HEAT SHOCK PROTEIN WITH SOME PHYSIOLOGICAL PARAMETERS IN THE GOATS

Hafsa Mohammed Mohammed AL Yamani

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Climate change impairs health and productivity in farm animals. The study was conducted under semi intensive dairy goat research unit of Çukurova University, Agriculturalk Faculty in Adana (36 59’, 35 18’ E). During the experiment some physiological parameters (BT, ST, PR, RR, HT), behavioral aspects (water intake, feed intake) aspects, body weight, milk production, milk composition, concentration of HSP60 and HSP70 and correlation between HSP60 and HSP70 with water intake and milk production were investigated on 60 heads of Alpine, Saanen and Boer does (20 heads for each) in research farm.

In terms of physiological data among breeds, it has been detected that Saanen breed was less influenced for seasons than Alpine and Boer breeds, as respect to the feed intake, Saanen breed also consumpted more feed in the summer while compared to Alpine and Boer breeds and this point influenced to milk production; Saanen breed had higher milk production whereas milk production was 1.6 l. for Saanen breed, 0.9 l. for Alpine breed, 0.7l. For Boer breed within T groups and 1.5 l. for Saanen breed, 0.9 l. for Alpine breed and 0.5 l. for Boer breed within G groups during the summer.

As a conclusion concentration level of both HSP60 and HSP70 had significant effect on milk production and adaptation criteria of different breeds ($p<0.001$).

Key Words: HSP60, HSP70, Physiological Parameters, Milk Production, Feed Intake, Adaptation

ÖZ

DOKTORA TEZİ

ASSOCIATION HEAT SHOCK PROTEIN WITH SOME PHYSIOLOGICAL PARAMETERS IN THE GOATS

Hafsa Mohammed Mohammed AL Yamani

ÇUKUROVA ÜNİVERSİTESİ
FEN BİLİMLERİ ENSTİTÜSÜ
ZOOTEKNI ANABİLİM DALI

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Barınaklarda oluşan iklimin olumuz etkileri sonucu ortaya çıkan mikroçevreler hayvan sağlığını ve performanısını olumsuz etkilemektedir. Çalışma, Adana'da bulunan Çukurova Üniversitesi Ziraat Fakültesi Döner Sermaye İşletmesine bağlı süt keçiciliği araştırma uygulama çiftliğinde yarı entansif koşullarda sıcak ve nemli koşulların etkisini belirlemeye yönelik olarak başlatılmıştır (36 59 ', 35 18' E). Deneme boyunca 20’şer baş Alpin, Saanen ve Boer keçisinin bazı fizyolojik parameterler (Rektal sıcaklık, solunum sayısı, nabız sayısı, deri sıcaklığı) davranış özellikleri (su tüketimi, yem tüketimi) canlı ağırlık, süt kompozisyonu, HSP60 ve HSP70 konsantrasyonu ve bunların korelasyonları üzerinden durulmuştur.

Fizyolojik verilere göre, Saanen ırklar arasında sıcaktan en az etkilenen ırk olmuştur. Bu yem tüketiminde tam tersidir. Saanenler özellikle sıcak ve nemli koşullarda diğer ırklardan daha fazla yem tüketimişlerdir. Bunun sonucu olarak laktasyon perromansları da daha yüksek düzeyde gerçekleşmiştir; Saanenin günlük süt verimi 1.6 l., Alpinin 0.9 l., Boerin ise 0.7l. Düzeyindedir. Buna ek olarak su tüketimleri d’artış göstermiştir.

Sonuç olarak HSP60 ve HSP70 konsantrasyonlarının keçilerde süt verimi ve adaptasyon kriterleri üzerinde etkili olduğu ortaya çıkmıştır ($p<0.001$).

Anahtar kelimeler: HSP60, HSP70, fizyolojik Parametreler, Süt Üretimi, Yem tüketimi, Adaptasyon

EXTENDED SUMMARY

The study of heat stress protein is related to the importance of studying climate change, which directly or indirectly affect the organism in general. In terms of performance, production and productive. It also a effects the economic aspects of livestock production, so this study aimed to study impacts of heat stress on the some physiological parameters, study association of heat shock protein (HSP60 and HSP70) with some physiological parameters in Goats, investigated in the ability of the animal upon acclimated to maximum temperatures during summer season and minimum temperatures in the winter. Moreover that comparison between summer and winter seasons at private farms in Adana. The average daily temperature humidity and wind speeds in the summer were 36.2◦C and 72.2% and 1.0km/h in July respectively. THI was 82.65 in the peak summer, and the THI was 54.47 in the cold stress. The results of recent study indicated that there were different significantly for physiological parameters, whereas ST was 33.6◦C, 32.84◦C, and 33.8◦C for Alpine, Saanen and Boer breed in the spring within Tgroups respectively. ST was 39.7◦C, 38.4◦C, 39.1◦C for Alpine, Saanen, and Boer breed within T groups during summer respectively.

RR was the strength indicator for measurement responses physiological parameters to change climatic, which achieved high significant ($p<0.001$) and was 106.6, 106.2, 89.3 breath/min. for Alpine breed, Saanen breed and Boer breed in the summer and RR was decreased with decrease of temperature, whilst RR was 56.1, 54.0, 67.4 during winter for Alpine, Saanen and Boer breed in the winter.

The response of growth (live body weight) was changed significantly within groups and inside breeds too.As respect to feed intake was high significant ($p<0.001$). the highest feed intake for T group 6.9, 6.8, 6.5kg for Alpine, Saanen and Boer breeds in the summer and for G group BW was 6.5, 6.8, 5.2kg for Alpine, Saanen and Boer breeds in the summer, while that the lowest feed intake in group G in the winter (4.7kg) for Alpine breed, (4.0kg) for Boer breed, (6.0kg) for

Saanen, then in group T during winter to (4.8, 5.5, 5.9kg) for Boer, Saanen, Alpine respectively. This increased feed intake during summer may be attributed to the period that coincides with lactation (mid of lactation).

The behaviors response reflected effect of regional changes and their response of water intake at different levels ($p<0.001$) there were significant differences for water intake between breeds in the variation seasons, which were the highest ($p<0.001$) in the winter as compared to the spring and summer. While there was no change ($p>0.05$) level of heat tolerance for water intake within groups for the summer and the winter except the spring.

The results showed that milk production was high significant different ($p<0.001$) within the breeds in the seasons (summer and spring). These differences did not appear ($p>0.05$) within the groups, it was the highest ($p<0.001$) average of milk production in the Saanen breeds (1.6, 1.1kg) for Tgroup and 1.5, 1.3kg for G group in the summer and the spring respectively. The increased milk production for the Saanen breed can be explained in the climate of this region due to the fact that it was hybridized with local breed.

The variances of the milk compositions are significantly higher in the summer than is spring , this explained by the summer heat stress and causes of the effects may be due to the way of handling animals during the process of milking, heat stress and seasonal changes, management, nutrition, feed additive, quantities of water consumption.

The recent study reported that is no significant correlation between milk composition and water intake in the spring with the exception of protein and Urea (0.467, -0.032), but this correlation was high significant ($p<0.001$) and has most compositions and there was relative negative correlation coefficient between water intake and milk composition in the summer.

The present study shows that some indicators has been achieved to evaluate adaptation range by using physiological parameters, behaviors, milk production and milk compositions and concentration of level of both HSP60 and

HSP70 for Alpine breed, Saanen breed and Boer breed during different seasons. According to our findings and indicators of this study, the adaptation of level for Saanen breed was the highest than Alpine breed and Boer breed that was based on results of physiological parameters, whereas whilst Saanen bred was less impact. However, THI was 82.56 during the summer, Saanen breed capacity for heat tolerance evidence through results of milk production and milk compositions accordin to table 4.6, feed intake, which Saanen breed was the highest for production and performance.

The THI was 54.47. It was in cold stress, for the physiological parameters in the winter in all of breeds were lower than the other seasons and Saanen breed the least influenced. On the other hand, it was found neglect different with other breeds within groups slight decrease with decrease AT in the winter, as lowering water intake with the decline AT, whereas the lowest water intake for the Boer breed was equal for of both Alpine and Saanen breed. As respect to milk production according to systems of farm of university the goats were pregnant in this period, thereby couldn't to investigate this factor in the winter. The mean of concentration of level HSP60 was the least one (6.7), but it was equal in both spring and winter (21.1, 21.6) respectively, while the lowest concentration of level HSP60 for Saanen (4.3) in the winter and the highest level for Boer (9.1). It was similar for level of concentration HSP70, which was the least level for Saanen (14.1) and the highest level for (36.8) during the winter, which led to that the Saanen breed much adapted than Alpine breed and Boer breed in the winter too, and the reasons could be attributed to the same reasons for adaptation during the summer.

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SYMBOLS AND ABBREVIATIONS

AT	: Ambient temperature
BMCs	: Blood Mononuclear Cells small
BT	: Body Temperture
BW	: Body Weight
HS	: Heat Stress
HSP	: Heat Shock Protein
HT	: Head Tempreture
PR	: Rate
RH	: Relative Humidity
ST	: Skine Tempreture
T	: Treatment
THI	: Temperature Humidity İndex
SNF	: Solids- Not- Fat
Pbmc	: Prepheral blood mono nucluer cells
RNA	: Ribonucleic acid
DNA	: Deoxyribonucleic acid
TS	: Total Sold

1. INTRODUCTION

Stress is always called an organic component of the forces that drives the course of evolution. Alteration in the physical environment produces stress, which in turn impacts homeostasis. It was fast environmental alter that causes the massive diversification of life on earth. Therefore, the research of biological stress encompasses the nature of a changing environment, the mechanisms living organisms employ to survive and the consequent evolutionary effect (Fridberg, 2003). Stress is a wide meaning, implying negative connotations. It is a group of cumulative negative effects to number of factors, which turn affect the health and performance of animals (Kumar et al, 2010).

The health and homeostasis of the gastrointestinal tract of both humans and livestock species is influenced by multiple disease states, environmental, and genetic factors. These aforesaid factors predispose mammals to physiological, metabolic, or immunological stresses. Collectively, these stresses can cause reductions in wellbeing, physical performance (humans), growth, reproduction and lactation performance (livestock), chronic illness, or ultimately death if severe and prolonged (Pearce, 2014). Certain sorts of stressors like hypoxia, inflammation, and oxidative stress are specially contrived by environmental hyperthermia Pearce (2014). In spite of a lot of obstacles faced by animal producers, including environmental challenges, diseases, economic pressure, and feed availability, it is still expected that animal production in improving countries will continue to sustain the future growth of the world's meat production (Renaudeau et al., 2012).
According to statistical studies, milk production is expected to increase from 664 million tons in 2006 to 1077 million tons in 2050, as is the expectation that meat production will increase from 258 million tons to 455 million tons worldwide (Alexandratos and Bruinsma, 2012).

According to Renaudeau et al (2012), heat stress is a significant issue for many livestock enterprises. The effect of heat stress on dairy animals have been well documented and include reduced feed intake but greater nutritional energy requirement, reduced fertility, increased respiratory and heart rates, panting activity, increased peripheral blood flow and sweating, reduced milk production, lower milk quality (Dunn et al, 2014; West et al, 2002). Collectively, these apprehensions have increased even more in recent years with the increased global warming and strive of dairies to maximize milk production. Although with the rise of milk production and dry matter intake increase, cows metabolic heat output increases, which further increase sensitivity to heat stress (Liu et al, 2014). That not only affects herd milk production and Income, but effect on cow fertility, health and welfare that lasts well beyond seasonal hot weather and can double these losses (Liu et al, 2014).Sequential external factors affect the productivity of dairy cattle, increasing the rise in temperature and humidity affect feed intake and water consumption thus reduce the production of milk (Prathap et al, 2016). When a cell experiences environmental stress, it stops or at least slows down most of its original functions, such as transport processes, DNA, RNA and protein synthesis. However, there are proteins which preferentially expressed under these restrictive conditions like slick hair gene (Dikmen et al., 2008), ATP1A1 (Liu et al, 2014; Kashyap et al, 2015), ATP1B2 (Wang et al, 2011) and heat shock proteins (HSPs). HSPs are highly conserved proteins activated by numerous physiological and physical stressors (Yang et al, 2006). HSP acts as molecular chaperones by participating in the assembly of proteins without being part of the final protein structure; confer thermo tolerance and the ability of the cell to survive injury and oxidative stress by reducing the accumulation of damaged or abnormal polypeptides within cells (Ellis, 1987; Lindquist and Craig, 1988). They play a crucial role in intracellular transport by maintaining proteins in an inactive form and preventing protein degradation (Neuer et al, 2000). HSP70 is an essential molecular chaperone of primary importance to all mammalian cells.

Comprehensive researches indicate that HSP70 can works as a molecular chaperone and protects the cell against exposures to deadly thermal shock, which is capable of denaturing proteins.HSP70 along with HSP27 and HSP90 proteins is predominantly anti-apoptotic (Garrido et al, 2001). The cytoprotective functions of HSP70 have been established in many organs such as intestine (Tsuruma et al, 1999), brain (Yenari et al, 1999), kidney (Beck et al, 2000) as well as in embryo (Luft and Disc, 1999). HSP60 is localized in mitochondria and cytosol, while HSP70 is localized in cytoplasm, nucleus, endoplasmic reticulum and mitochondria (Itoh et al, 2002).

The heat shock proteins which are needed for the protection of the organism from stress, also provides the balance between the folded and misfolded protein (Adıyaman, 2014). The Use of improved technologies in molecular analysis had allowed the improvement in the accuracy and intensity of use of genetic markers. Heat shock protein (HSPs) are widely used to evaluate stress tolerance, it constitutes a new approach to investigate stress and improves stress tolerance in farm animals (Pawar et al, 2013). So the present study aims to:

- Assess the impacts of heat stress on some physiological parameters.
- Evaluate the correlation between HSP70, HSP60 and some physiological parameters in the dairy goats.
- Investigate the ability of the animal to acclimate to the seasonal variation of extreme temperatures through the year.

2. LITERATURE OVERVIEW

2.1. History of HSP

In the early 1960s, were in origin explained the define of heat shock proteins (HSPs) by the work of Ritossa on the fruit fly Drosophila melanogaster (Ritossa, 1963 Expression of HSPs was detected as being caused after discover the different types of stress like heat shock and could be shown after that in any cellular organism. However, other stress conditions, including toxic stress, nutrient deprivation, hypoxia, irradiation, oxidative and heavy metals. Exposure and infections to inflammatory cytokines can cause HSP expression (Lindquist and Craig, 1988). Members of the HSP70 family were recognized for the first time as being up-regulated in bacteria in response to cellular stress (Craig and Gross, 1991).

2.2. Heat Shock Protein (HSP)

In spite of the fact that the idiom “heat shock” protein is a misnomer, it stays as a legacy of Ritossa’s serendipitous find (Ritossa, 1996), that heat shock created chromosomal breaths of salivary gland cells in Drosophila. Heat stress ('5° above ordinary raise temperature) up regulates the swift synthesis of a multigene family of proteins, in radix named heat shock proteins Tissieres et al (1974). Previously sub fatal heat stress seasonality being elevated the ability of a cell to withstand a variance fatal many heat challenge. This alterations, or thermo tolerance, has role in reached to several rich topics in vivo and vitro in experimental styles in which identical relation was show up of both keeping and the heat shock response against either ischemia or simulated hypoxia. In reality, various stresses led to reasons many physiological problems including inflammation, amino acid analogues, oxidative/ischemic stress, and heavy metals, breed the expression of HSP genes. Moreover, stress proteins or HSPs are highly kept and exist in all cells of all organisms. Chosen HSPs, also famed as escorts, has considerable roles in folding/unfolding of proteins, collection of proteins complexes, transport/ separation of proteins into right subcellular compartments, signaling and cell-cycle oversight and, protection of cells against stress/apoptosis (Srivastava, 2004).

2.2.1. Heat shock protein family

Rating on their molecular mass and nature of functions, HSPs are classified widely into six main families namely HSP70, Hsp60 (chaperonins), HSP40 (J-proteins), HSP90, HSP100 (Clp proteins), and small heat shock proteins (sHSPs). They execute their functions cooperatively by forming a delicate molecular network (below figure) thereby, sustaining the overall cellular protein homeostasis. A precise introduction for every HSP family has been in listed below.

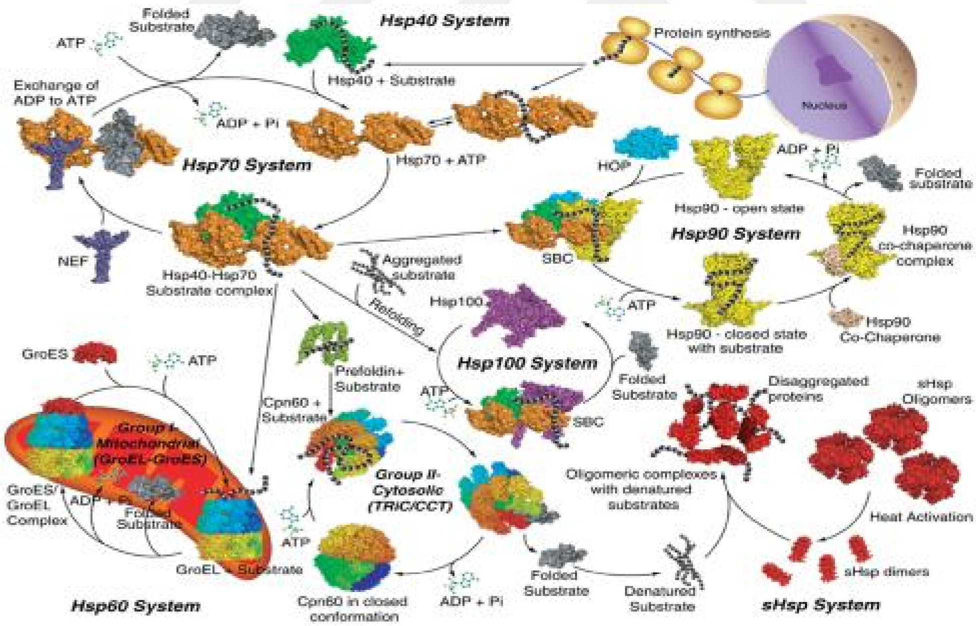


Figure 2.1. A functional HSP family network required for the maintenance of cellular protein quality control. http://pdslab.biochem.iisc.ernet.in

2.2.2. HSP70 Protein family

Heat shock proteins belonging to 70 KDa (HSP 70s) are the well characterized and the most plenty HSPs in bacterial and eukaryotic systems. Presence of various kinds of HSP70s has been shown in all living organisms, and they are typically dialed 1-2 per cellular compartment (Haslbeck et al., 2005). Stress proteins one of many genes families which numbers in molecular size from 10 to 150 kDa and are in all main cellular closet. The stress proteins are being different molecular sizes: HSP27, HSP70, and HSP90; while heat shock protein genes are specified: HSP27, HSP70, and HSP90 viewed by (Hightower and Hendershot, 1997). HSP70s include two protected functional domains. The (NBD) N-terminal Nucleotide binding domain and substrate binding domain (SBD) at the C-terminus linked via a highly conserved linker region. The SBD consists of a variable helical region which performs a function as a 'lid' over the peptide binding cavity and regulates the substrate interaction (Haslbeck et al, 2005). The specificity of HSP70s is highly determined by their partner J-proteins, and together they do the function as a 'molecular chaperone machine'. The members of J-protein family in organisms, are found in mass numbers and often override the members of HSP70s. Thus, every HSP70 is able of interacting with multiple J-protein partners in link to several physiological functions, thus forming a complicated network of chaperones (Bukau et al., 2006).

2.2.3. HSP60/Chaperonin family

Folding of multimeric proteins with complex topologies predominatingly require a specialized class of oligomeric folding chambers called chaperonins. Chaperonins are more categorized into two distinct subgroups based on structural organization. Group I chaperonins (GroEL/ES) found in prokaryotes and endosymbiotic organelles like chloroplast and mitochondria. On the other hand, group II chaperonins (TRiC/CCT) is present in archaeal and localized in the cytosolic compartment of eukaryotic systems (Hartl and Hayer, 2002).

2.2.4. HSP function

HSPs are distributed over a large area. They are occurring in all member of different subcellular. Their predominating functions are the folding and unfolding of protein substrates as viewed in (Lindquist and Craig, 1988), Srivastava (2005). As his study viewed that effected the members to sudden rise in heat through synthesizing of a group of proteins is HSPs. The HSP response has been protected growth as his report (Parsell and Lindquist, 1993). HSPs renowned as chaperones, play pivotal roles in folding or unfolding of proteins, association of proteins complexes, carry, ranking of proteins into correct subcellular compartment, cell-cycle monitoring and coding, and safeguard of cells against stress/ apoptosis

2.2.4.1. HSP70 function

Protein family HSP70, family members grap78, Dnak, Bip, hsc70, Ssa, Kar2, Ssc, Ssb, monomer size (kd) 67-76 in the eukaryotic location, These different members have different compartments like nucleus, cytoplasm, chloroplasts, mitochondria, ER. The stress functions are molecular chaperone need for protein collection, secretion, import into ER and organelles, Heat-inducible proteins need for growth at moderately high temperatures (yeast, E.Coli), Promotes survival at extreme temperatures (Yeast, Drosophila, mammals), Facilitates proteolysis of abnormal proteins (E.Coli), passively regulates hsp synthesis (E.Coli, yeast, Drosophila). And other comments such as Monomer, dimer, higher-order oligomerization may serve to inactivate protein, Binds unfolded proteins and peptides, Cooperates with HSP60 in mitochondrial protein assembly and the folding of denatured substrates, Association with Dnal and GrpE influences interaction with substrates and prompts ATP hydrolysis, Associates with HSP90, ATPase activity (Parsell and Lindquist, 1993).

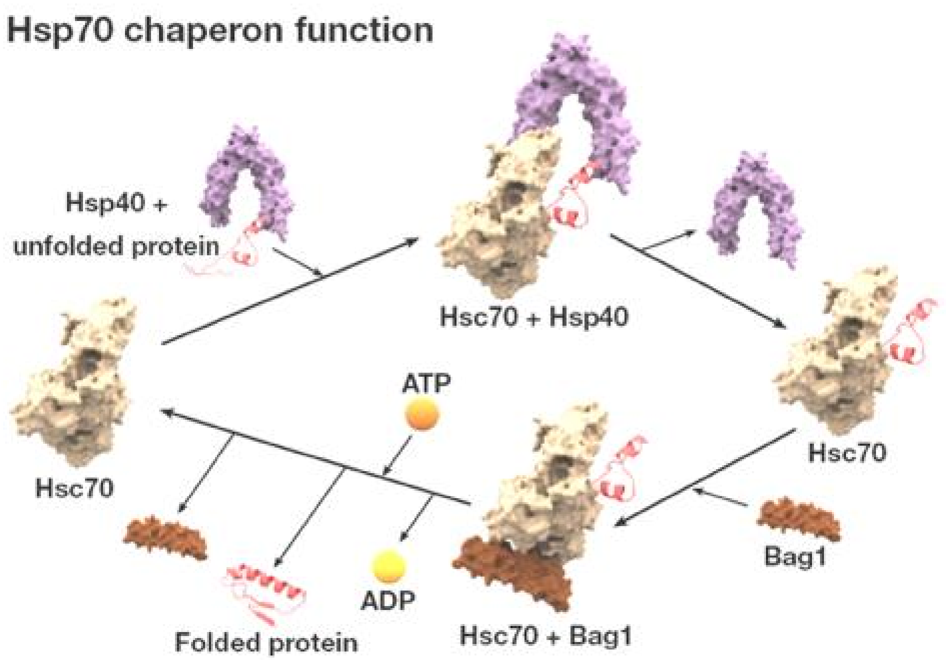


Figure 2.2. Hsc70 functions as chaperone by collaborating with Hsp40 and Bag1, http://ipr.pdbj.org.

2.2.4.2. HSP60 function

2.2.4.2.(1). Intracellular HSP60s

The 60 kDa heat-shock proteins are multiplicity in eukaryotes and prokaryotes and are asked for in the folding, translocation, and collection of native proteins. Eukaryotic interbreeding are nuclear encoded but show their function in particular organelles and on the cell surface as well as the cytosol and in the extracellular space (Karlin and Brocchieri, 2000: Merendino et al, 2010) in both study they are viewed (HSP60s) an intrinsic ATPase activity modulation an ATP-driven rise in aggregated substrate molecules or the free energy of misfolded reported by (Priya et al, 2013). HSP60 (HSPD1) is a component of the internal genetic membrane, known as nascent polypeptides and responsible for the transfer of cytoplasm to the matrix of mitochondria at the same time (Bukau and Horwich 1998). In spite of this issue, GroEL was to arrest ("hold") inactive RuBisCO and to release the refolded RuBisCO enzymes after addition of ATP and its co-chaperone GroES. This "holdase" activity is know for HSP60s and other chaperone families as they have the capacity to effeciently prevent protein aggregation in the absence of ATP (Hartl et al, 2011). Recent investigations showed an "unfoldase" activity of HSP60 meaning that HSP60s have the capacity to know stable misfolded or aggregated proteins and to unfold them effectively in such a way as to enable them to refold spontaneously to natively refoldable molecules (Line et al, 2008). As demonstrated for GroEL and the eukaryotic CCT chaperonins, the energy obtained from ATP hydrolysis is utilized to catalyze the unfolding of the nonnative proteins (Natalello et al, 2013). It is useful to know that an ATP-independent unfoldase activity of HSP60s has recently been explained for TRiC and GroEL. Priya and collaborators came to know that apo-TRiC and apo-GroEL act as efficient unfoldases that fastly convert misfolded proteins into unfolded intermediates that are released from the chaperonin in order to get the native state outside the folding chamber. As over-sticky intermediates have been recogniz to occasionally stall the catalytic unfoldase sites, GroES mobile loops and ATP are obviously required to dissociate the inhibitory species and regenerate the unfoldase activity (Priya et al, 2013) in this context, several investigations revealed a spontaneous heat-induced aggregation of thermolabile proteins such as firefly luciferase and malate dehydrogenase thereby inhibiting the putative formation of deleterious protein aggregates (Sharma et al, 2011). Evidence has emerged that thermo tolerance of prokaryotic organisms is attributed, amongst others, to the catalytic function of HSP60s. In cyano bacterial species, thermo tolerance of both, unicellular and filamentous, is enhanced upon pre-treatment at sub lethal temperatures, suggesting a critical involvement of heat-shock genes/proteins in thermo tolerance (Blondin et al, 1993). In the filamentous nitrogen-fixing cyano bacterium Anabeana, thermo tolerance is obviously affected by the differential expression of the two HSP60 proteins in an N-status-dependent manner. As shown by Apte and Rajaram (2003), exposure to heat stress has a bacteriostatic impact on Anabaena which shows growth arrest at 42 °C, most likely due to diminished photosynthetic and nitrogenase activities under nitrogen-fixing conditions (Rajaram and Apte, 2003). As demonstrated by Shastri and Kunisawa (2003), the group II chaperonin TRiC binds proteolytic intermediates and protects them from degradation in the MHC I antigen processing pathway. In addition, cytosolic as well as mitochondrial isoforms of HSP60 play crucial roles in pro-apoptotic and pro-survival pathways (Chandra et al, 2007). The group of Francesco Cappello provided further insight into the anti-apoptotic role of HSP60 in tumor cells by demonstrating the existence of an HSP60/pro-caspase 3 complex before and after oxidative stress which blocks maturation and activation of pro-caspase 3 (Campanella et al, 2008).

2.2.4.2.(2). Surface and extracellular HSP60s

Apart from their intracellular location, HSP60s also appear on the cell surface of normal Soltys and Gupta (1997), and malignant cells (Piselli et al, 2000). While intracellular HSP60s play a key role in proteomic homeostasis, membrane-bound and extracellular HSP60s have been shown to act as potent stimulators of immune responses (Pockley et al, 2008), When released into the extracellular milieu, HSP60 increases levels of CD4+CD25+Foxp3 cells and suppresses cytotoxic T (Aalberse et al, 2011), Increased cell surface expression of HSP60 serves as a danger signal for the immune system culminating in the stimulation of dendritc cells (DCs) and, ultimately the induction of T cell-mediated anti-tumor immune responses (Pockley et al, 2008). A wealth of evidence demonstrated that extracellular HSP60s can stimulate cellular cytokine synthesis with the generation of pro- and/or anti-inflammatory cytokine networks. In this concern, HSP60s have been reported to find out that it stimulates antigen-dependent T cell activation and production of pro-inflammatory IFN-γ (Breloer et al, 2001). Upon stimulation with HSP60, downregulation of Fas and upregulation of NO expression happens in gamma-deltaT lymphocytes isolated from oral cancer patients followed by activation of caspase-9 and loss of mitochondrial membrane potential culminating in T cell death. Anti-inflammatory functions of HSP60 are found especially in chronic inflammatory diseases like multiple, sclerosis, diabetes, rheumatoid arthritis (RA), and cardiovascular diseases leading to remission of the inflammatory process (Pockley et al, 2008).

These findings have been confirmed in animal studies demonstrating a down regulation of inflammation by an HSP60-induced T cell response which includes the production of regulatory Th2 cytokines (IL-4 and IL-10) by CD4+ Th2 lymphocytes (to know, see van Eden et al, 2005).

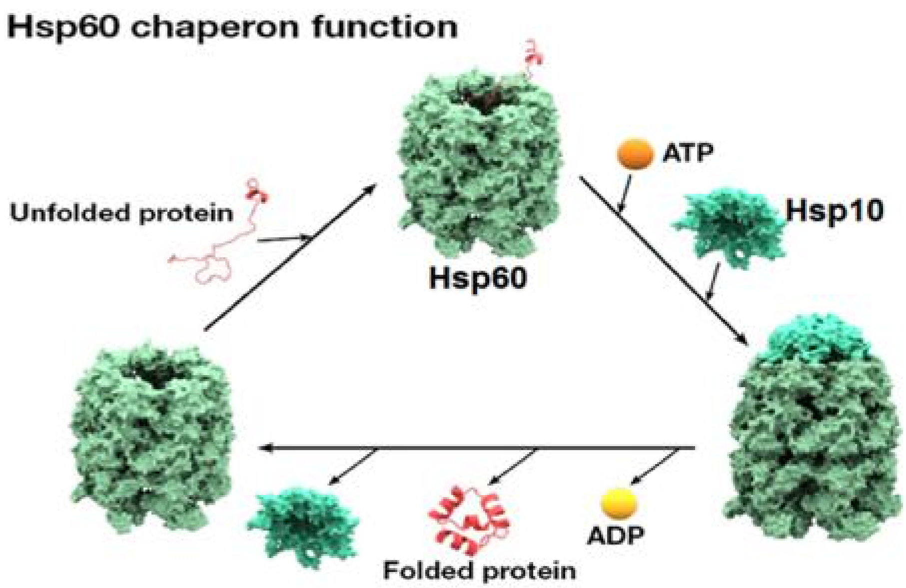


Figure 2.3. HSP60 GroEL functions as chaperone by collaborating with GroES http://ipr.pdbj.org

HSP/peptide complexes from normal cells are also internalized via non-specific or receptor-mediated endocytosis followed by lysosomal degradation and subsequent presentation to CD4+ T cells through MHC class II molecules with or without the presence of co-stimulatory molecules. As a result, a T cell-mediated immune response takes place accompanied by the release of immunosuppressive

Th2 cytokines. HSPs from pathogens harbor non-self-epitopes that are presented to pro-inflammatory CD4+ Th1 cells by APCs culminating in the release of pro-inflammatory cytokines like IFN-γ and the induction of an inflammatory T cell response. As HSP-chaperoned tumor antigens, APC maturation via a second receptor precedes antigen presentation. It is useful to note that induction of innate immune responses is able to upregulate HSP60 expression and secretion that in turn causes conversion of naïve T cells into CD4+CD25+Foxp3+ T cells, (Ohue et al, 2011; Quintana and Cohen, 2005).

2.3. Mechanism of HSP expression during stress

Heat shock factors (HSFs) available in the cytosol, are bound by HSPs and sustained in an inactive state. A wide array of physiological stimuli ("stressors") are estimated to activate HSFs, inducing them to separate from HSPs. HSFs are phosphorylated by protein kinases and translocate into nucleus. In the nucleus trimerization happens. These HSF trimer complexes bind to heat shock elements (HSE) in the promoter region of the HSP gene. HSP mRNA is then transcribed and leaves the nucleus for the cytosol, wheare new HSP is synthesized.

Suggested mechanisms of cellular protection for HSPs include their functioning as molecular chaperones to help in the collecting and translocation of newly synthesized proteins within the cell and the repair and refolding of damaged (e.g., stress denatured) proteins (Figure 2.4) . Numerous transcriptional systems other than HSF-1 are affected by heat shock. At least three mechanisms have been identified through which heat shock specifically affects these systems: 1) changes in the level of expression of transcription factors themselves (through a variety of mechanisms, 2) changes in activity of transcription factors that are already expressed (for example, by phosphorylation), and 3) changes in cellular location of transcription factors (such as translocation to the nucleus or sequestration in the cytoplasm) (Sonna et al, 2002).

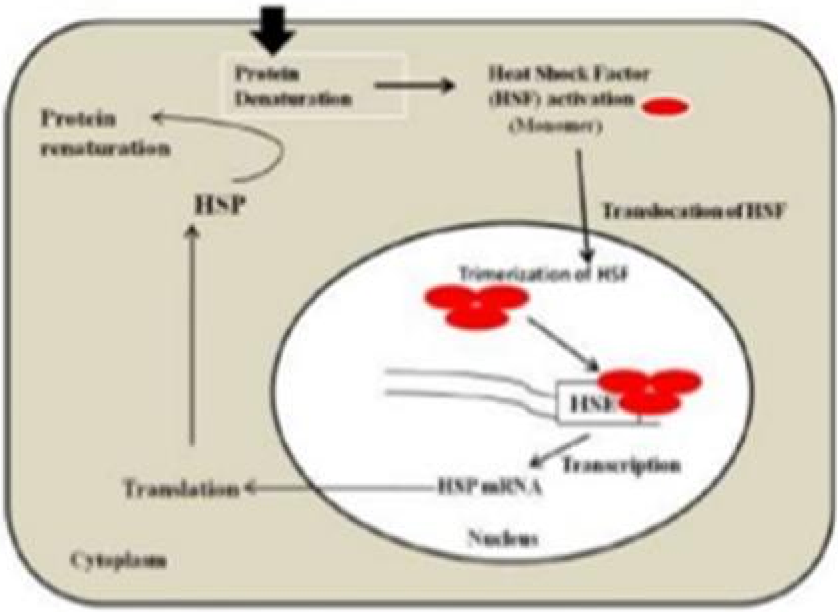


Figure 2.4. Molecular Mechanism

HSP: expression of many HSPs including HSP32, Hsp40, Hsp60, HSP70, HSP90, HSP10 (Shrma et al., 2013)

Cèreactive protein (CRP), p83, p21, interleukin-6, interleukin-8, VEGF (Vascular endothelial growth factor), cNOS, iNOS)Sonna et al., 2002)

2.4. Expression Profile of HSP Genes in Seasons

The increased expression of HSPs has been attributed to the accumulation of abnormal cellular proteins related to several diseases, viz., Parkinson′s disease, Huntington′s disease, Alzheimer′s disease and other polyglutamine diseases (Gao and Hu, 2008). HSPs expression acts as a potential indicator of animal adaptation to harsh environmental stress (Hansen, 2004).

2.4.1. Expression of mRNA for HSP60

Dangi et al (2012), demonstrated that in summer season in tropical region goats, the mRNA expression of III (3.98) age group was found crucially higher

($P<0.05$) in comparison to I (1.68) and II (1.8) age group. In spite of that, in winter season, mRNA expression level among the three age groups was found non-significant ($P>0.05$) I (0.360), II (0.647) and III (0.828) the mRNA expression of all age groups during summer season was significantly higher ($P<0.05$) I (0.904), (2.61) and (3.41) respectively than the corresponding values during winter season. In temperate goats, the mRNA expression within all age groups in winter was statistically non-significant ($P>0.05$). However, during summer, the mRNA expression within all age group was statistically important ($P<0.05$) and expression level rised with the increase of age of animals, The mRNA expression values in all age groups during summer season were detected to be significantly higher than winter season ($P<0.05$). Dangi et al (2014), mentioned that the relative mRNA expression of HSP60 and HSP90 increased significantly ($P<0.05$) within 1 h after exposure to heat stress at 41 and 45 °C and decreased significantly ($P<0.05$) elevated even at recovery for 6 h post exposure in comparison to pre exposure level, as noted same of study that the relationship between the short-term heat exposure hours, THI, RT, HR, RR, and relative mRNA expression of HSPs recorded during the 12-h study. It is clear from the table that THI has an important ($P<0.01$) positive correlation with RR, RT, and relative mRNA expressions of HSP60, HSP70, and HSP90. Furthermore, the RT, RR, and relative mRNA expressions of HSP60 and HSP105/110 have a significant ($P<0.01$) positive correlation with heat stress exposure hours. The relative mRNA expression of HSP60 has a significant ($P<0.01$) positive correlation with THI, RR, and relative mRNA expressions of HSP70 and HSP90. According to Dangi et al (2016), the HSP60 was higher ($p<0.05$) on initial heat stress acclimation (2.9) and long term heat stress acclimation (3.1) while in short term heat stress acclimation was (1.0).

Table 2.1. The temperature during summer and winter

Reference	Summer	Winter	Temperature	Country
Dangi et al. (2012)	3.41	0.567	-	India
Paul et al. (2015)	I (2.90) II (4.6) III (6.6)	I (1.28) II (0.8) III (1.02)	12 – 13° C winter 18 -25° C moderate 28 -41° C summer	India

2.4.2. Expression of mRNA for HSP70

Some of studies indicated to impact heat stress on the expression of mRNA for HSP70 (Cao et al., 2009), Dangi et al (2014), mentioned that higher heat stress level led to higher concentration of HSP70 in epididymis of mice and the testis. In spite of that, during summer season, the mRNA expression within all age groups was detected importantly higher (P<0.05) I (1.06), II (1.32) and III (1.48) respectively than mRNA the values in the winter I (0.331), II (0.412) and III (0.436) respectively, In temperate goats, the mRNA expression between I (0.945), (0.998) and III (0.943), (1.33) age groups both in winter and summer season was detected statistically non-significant (P>0.05) while mRNA expression in I (0.998), (0.945) and III (1.33), (0.943) age groups during summer and winter seasons was found to be significantly higher (P<0.05) than II (0.137), (0.325) age group. Nevertheless, no important difference was found in the mRNA expression between summer and winter seasons in all the three age groups. Jagan Mohanarao et al (2013), demonstrated that the HSP70 protein expression was significantly (p<0.01) induced in the heat challenged goat PBMCs that was 2.5- fold more to the normal cells. Even though HSP70 protein expression was noted in the cold challenged PBMCs, its expression was 2.5- fold lower than the normal PBMCs. And during analysis of HSP70 expression in cold (10◦C) was 2.5, normal (38.5◦C) was 5.0 and heat (42◦C) was 7.5 challenged PBMCs of goat. Rajoriya et al (2014), demonstrated that HSP70 mRNA expression in Tharparkar bull’s sperms in the summer was no significantly higher in comparison to the winter. Parkunan et al (2015), in both Ghungroo (4.22±0.73) y and Large White Yorkshire (2.50±0.11) x the HSP70 mRNA expression was detected to be risen importantly ($P<0.05$) in the summer s in thigh as well as in colon region (5.72±0.35) y, (2.31±0.11) x and in the winter in colon was in Ghungroo (2.23±0.79) x and Large White Yorkshire (0.80±0.18) x while in thigh in the same winter was in Ghungroo (1.08±0.12) y and Large White Yorkshire (0.39±0.15) x. Nevertheless, the expression value was importantly higher ($P<0.01$) in Ghungroo in comparison to Large White Yorkshire in both seasons for thigh muscle and colon tissue. Banerjee et al (2014), demonstrated that relative HSP70 gene changes the heat- and cold-adapted goat with a moderate change between breeds and revealed a good response to increased or decreased ambient temperature. Statistical analysis showed a change seasons ($P<0.01$) for all HSP70 gene. The same study indicated that Increase of HSP70 gene in summer was more in cold-adapted goat breeds (Chegu and Gaddi) as they experience higher stress in summer than heat-adapted goats (Barbari and Sirohi). On the contrary, in the winter, the profile of HSP70 genes was more in heatadapted goats than the cold-adapted goats (Barbari and Sirohi). Also Sejian et al (2015) shown that the relative hepatic HSP70 mRNA transcript was significantly ($P<0.05$) higher in GIII (2.8 fold) in comparison to GI (1 fold) kids (Yadav et al, 2015) NOS (cNOS, iNOS, and eNOS), HSP70, and HSP90 mRNA were expressed in the goat PBMCs in all seasons studied. Relative mRNA of iNOS, cNOS, eNOS HSP70, and HSP90 no changeed expression in the summer in comparison to moderate. Kunnath et al (2017), demonstrated that the findings showed that rumen HSP70 mRNA expression was clearly noted in C (1 fold), HS (1.23 fold), NS (0.34 fold) and CS (1.29 fold). On a comparative basis, the rumen HSP70 mRNA expression was importantly different only within the stress groups. The HSP70 mRNA expression was significantly ($p<0.05$) lower in the NS group in comparison with both HS and CS group.

Table 2.2. Some different studies about expression of HSP70

References	HSP70 summer	Winter	Temperature °C a.m–p.m	Country
Dangi et al. (2012)	1.48 fold	0.436	18 °C- 25 °C	India
Dangi et al. (2014)	6.27-6.75 fold	-	41^0 C-45^0	India
Shilja et al. (2015)	1.5 fold	-	26.93^0 C-35.6^0	India
Sejian et al. (2015)	2.5 fold	-	24^0 C-38^0	India
Parkunan et al (2015)	2.50 fold	0.80	16 w -34 c	India
Paul et al. (2015)	I (2.6)	I (1.5)	12- 13 C	India
-	II (1.41)	II (0.27)	18 - 25C	-
-	III (1.38)	III (0.35)	28 – 41 C	-
Shaji et al. (2016)	1.51 fold	-	34.03 C- 38.33^0	India
Dangi et al. (2016)	3.0 fold	-	42 c	India
Kunnath et al. (2017)	1.23 fold	-	21.50 C-38.33^0	India

2.5. Heat Stress

Temperature stressed animals tolerant a sequences of metabolic and physiological changes .it is necessary for help on adaptation and survivability of the Animal. Nutritional equilibrium of the Animal is an essential factor in thermal stress, the disturbance of which may be deleterious to performance (Beede et al, 1983).

Heat stress in animals induces reduces in feed intake and efficiency; in extreme cases. It can even induce death. These losses range to millions of dollars every year. A subsequent analysis of the death losses was performed to identify the risk factors attributed to loss of the individual animals (Brown and Brandl et al, 2006). Bohmanova et al (2007), reported that HS is caused by many of environmental impacts (temperature, relative humidity, solar radiation, air movement, and precipitation). Domestic animals undergo various kinds of stress like physical, chemical, nutritional, psychological and thermal stress. Among all, thermal stress is most concerning now a day in the ever altering climatic scenario. In tropical and sub-tropical regions high ambient temperature is the major obstacle on animal production (Marai et al, 2007; Nardone et al, 2010) where extreme low temperature in temperate regions is also detrimental to livestock. Thermal stress is the perceived discomfort and physiological strain associated with an exposure to an extreme hot or cold environment. Thermal stress includes both heat stress as well as cold stress during extreme summer season and during extreme winter season. High environmental temperature is the main concern in tropical and arid areas where at the same time very low environmental temperature in temperate areas is also lethal that challenges the animal’s ability to maintain thermal, energy, hormonal, water and mineral balance (Silanikove, 1992). Climate change is one of the major threats for survival of various species, ecosystems and the sustainability of livestock production systems across the world, especially in tropical and temperate countries. Intergovernmental Panel on Climate Change IPCC. . Banerjee et al (2014), Thermal stress is one of the obstacles that cause the decline in productivity and reproduction, causing stress in radical changes in the functions of the. According to Patel et al (2016), mentioned Stress is reaction of body to stimuli that disturb homeostasis and adversely affects the animal body system. To cope up such situation animal body shows many neuro-endocrine responses which may alter the biochemical reactions to acclimatize to its surrounding. According to Dangi et al (2016), showed that HSP70 level was the highest in long term HS acclimation (5.0), followed by initial heat stress acclimation (4.0) and short term heat stress adaptation (2.0). In heat stress with Betaine group.

2.6. Influences of HS and cold stress on the physiological parameters

The variation in the biological functions of animals because of exposure to heat stress contain depression in feed intake and utilization, disturbance in water, protein, the metabolism of energy, enzymatic reactions, and mineral balances, , hormonal secretions and blood metabolites (Habeeb et al, 1992; Marai et al, 2000).

2.6.1. Growth

2.6.1.1. Body Weight

Growth, the excess in live body mass or cellular multiplication, is managed genetically and environmentally. The available vitamins, hormones and enzymes, as well as, expanded ambient temperatures are taken into consideration as some of the environmental elements which could have an impact on ADG (Hafez, 1991; Habeeb et al, 1997). There are four means through which a body can benefit or lose heat from the environment: radiation, conduction, convection and evaporation.

In warm environments cooling through evaporation is the most effective means of heat loss, but it is a whole lot much less powerful in high humidity. Okouwa (2014), pronounced the preliminary stay body weight on the graduation of the have a look at was now not substantially ($P>0.05$) laid low with treatment corporations. The final stay body weight had notably ($P<0.05$) impact on remedy groups, the goats on treatment1 (8.66kg) had the highest final stay body weight, accompanied through treatment2 (7.80kg) after which T3 (6.40kg). Concerning the impact of warmth pressure on stay body weight, exposure of goats to solar radiation for specific time daily declined very last stay bodyweight on this exam. The charges of alternate in stay body weight recorded had been 0.04, -0.74 and –2.02kg for goats on treatment1, treatment2 and treatment3 respectively. As Helal et al (2010), suggested that on the begin of look at (pre-publicity to sun radiation) the average body weight became 29.86±2041and 49.22±1.74 kg for Balady and Damascus goat, respectively. Evaluation of variance indicated that breed had exceptionally ($p<0.01$) significant effect on LBW. Regarding the effect of heat stress on LBW. Exposure to solar radiation for 4 days declined LBW to 29.01±2.44 and 47.58±1.53kg for Balady and Damascus goats, respectively. The rate of change in LBW recorded -2, 85 and -3, 33% for Balady and Damascus goats, respectively.

According to Rana et al (2014) reported that initial and final body weight was 12.3±0.60 and 12.5±0.57, 12.33±0.33, 12.83±0.33, 12.66±0.88 and 13.0±0.57 kg for T0, T4 and T8, respectively. No significant differences ($p>0.05$) had been found for frame weight, among the remedy companies. Srikandakumar et al (2003), confirmed that the effect of heat pressure at the adjustments in frame weight The THI at some stage in the cooler month of December become 72 and THI extended to ninety-three in July. The frame weight of Merino sheep became higher ($P<0.01$) than the Omani sheep, changes in least square approach of environmental and physiological parameters in Omani and Merino (breeds) sheep while subjected to warmth pressure changed into BWT (kg) 41.5 a ± 2.2, 35.2 b ± 1.7 for cool A and cool Band became BWT (kg) 42, 5 a ± 1.6, 35.5 b ± 1.6 for hot A and hot A. In any other look at indicated Sunagawa et al (2015), that the body weight within the warm surroundings drastically reduced ($p<0.05$) in which consequences of warm surroundings on body weight (kg) of first thermoneutral (20°C) became 40.2a, of warm environment (32°C) become 35.1b and of surroundings 2d thermoneutral (20°C) changed into 40.3a .

2.6.1.2. Body condition

Some research studies Marai et al (2007), stated that the discovered consequences of heat pressure and cold pressure at the frame circumstance .The mammalian pores and skin is an essential pathway for heat trade between the body surface and the surroundings. pores and skin temperature is the result of the adjustment of the skin blood float that ends with law of the warmth among the frame middle and pores and skin (Habeeb et al, 1992). The observed boom in skin temperature for goats on Treatment3 changed into also attributed to the publicity to warmth strain, which has been mentioned to motive vasodilatation of skin capillary mattress and consequently boom the blood glide to the skin surface to facilitate warmth dissipation McManus et al (2009): Al-Samawi et al (2014), indicated that frame temperature: Statistical evaluation of the outcomes revealed that Coat, skin, Vaginal and Rectal had been substantially ($P<0.0001$) better for the duration of summer time (37.51± 0.15; 37.36± 0.05; 39.15± 0.03; 39.22± 0.03, respectively) than all through winter season (25.88± 0.34; 27.48 ± 0.55; 38.83± 0.02; 38.89± 0.03, respectively.

2.6.1.3. Feed Intake

Lu (1989), cited that despair of voluntary feed consumption in ruminants due to heat strain is expected. It is able to be taken into consideration as a protective mechanism against hyperthermia or an adaptive conduct in opposition to warmness pressure. Several research indicated to effect warmness pressure on the feed consumption within the goat. within the studies (West et al.,2003; Spiers et al., 2004; Maria et al., 2007; Rhoads et al., 2009; Sunagawa et al., 2015),

Padua et al (1997), mentioned that the daily feed intake and feed conversion also significantly decreased in Suffolk lambs below hot conditions in a climatic chamber (30.5 ◦C), compared to a collection beneath safe haven (19.3 ◦C), in the course of spring. As has been indicated to grazing time (minutes grazing/hour of the day) was considerably higher from 7:00 to 11:00 than from 11:00 to 15:00 and from 15:00 to 19:00, in comparison to 11:00 to15:00 all through the day and in wintry weather (20.1–11.4 ◦C), than in summer season (35.4–18.nine ◦C), also Graham et al (1982), proven that shorn sheep uncovered to cold stress all through grazing elevated feed intake by using 20 to 40% to compensate for warmth loss. As Hirayama and Katoh (2004), indicated that consequences of warmth publicity on dry matter consumption (g/d) throughout heat exposure turned into of warm environment (35°C) 477±33b, of impartial environment (20°C) 985±118a and values of neutral surroundings of (20°C) and restricted feeding of identical ranges as hot surroundings 421±27b. Ozawa et al (2005), indicated that the average of the goats inside the heat-stress institution become drastically multiplied as compared with that Feed intake (ml/kg BW/day) of the controls ($p<0.001$), while Feed consumption (ml/kg BW/day) in control organization become 24.6± 0.4, even as Feed consumption (ml/kg BW/day) in warmth-pressure group turned into 9.6±1.7. Reverdin et al (2013), suggested that dry be counted consumption (DMI) changed into now not modified by using temperature, however water consumption increased by 40% when the temperature multiplied, the percentage of dry matter intake at some stage in the primary three hours after the afternoon feeding did no longer vary, however there has been a lower in the proportion of water under the influence of alcohol. All of the goats started to devour earlier than drinking.

2.6.2. Dairy performances

2.6.2.1. Milk production

Numerous studies confirmed consequences of warmth. Strain and bloodless strain on the milk yield (West et al., 2003; Spiers et al., 2004; Rhoads et al., 2009). Collier et al (1981), demonstrated that most lower in milk yield all through warmth pressure takes place 48 hours after the initiation of the pressure. Milk production turned into reduced in 14 kg/d and manufacturing regularly declining in the first 7 d in summary, these results imply that the discount in dry be counted intake can simplest account for approximately forty to 50% of the discount in milk yield while cows are beneath warmness pressure conditions and that the ultimate 50 to 60% will be explained through different adjustments caused via warmth pressure. The drop in milk yield is lower than 0.32 and 0.26 kg in keeping with the cow in keeping with day mentioned by (Ingraham et al, 1979 : Johnson, 1985) for every factor increase in THI values. Avendaňo-Reyes (2012) reported that the day by day milk yield reduced from 4, 48 to 3. 65kg by way of 18.2% as the THI elevated from ≤ 74 to 83 ≥ in summer. The night grazing allowed the goats to growth milk yield in evaluation with D and H agencies, wherein in ewe's milk yield from night animals become higher than house organization, but did not fluctuate from Day group. However, night ewes produced extra milk than day ewes (1052 vs. 820 g/d; P<0.05) in the duration when THI reached the highest value.

Milk production of housed animals had been the bottom for both species, presumably due to the fact the fold used for housing animals changed into no longer ok to restriction the warmth stress, however additionally due to the fact the forage supplied inside the morning, just after mowing, become much less fed on throughout the hotter hours, and the forage supplied in the afternoon had been much less palatable, having misplaced its preliminary freshness due to air exposure Di (Grigoli et al, 2009: Mabjeesh et al, 2013) reported that milk production became significantly higher within the SDPP than the LDPP institution (2,172 vs. 1,550 g/d) throughout the 12-wk experimental period. Have shown Thompson and Thomson (1977) that milk secretion charge, of the left half of the udder best, was envisioned from the measured milk yield on the closing three milkings of the 2 experimental days i.e. 16.00 h day 1, 07.30 h day 2 and 16.00 h day 2. Milk accumulated inside the first milking of the primary day i.e. 07.30 h day 1, changed into left out because it likely included a few milks that turned into secreted before the environmental treatment started, wherein shown equal observe that milk secretion of its thermoneutral cost, 7+0.078, mild bloodless 0.477 + 0.068 and moderate bloodless 0.312 + 0.089 . Sunagawa et al (2015), clarified that the milk yield in the hot environment substantially decreased ($p<0.05$) as compared to the primary and 2nd thermoneutral environments in which effects of hot environment on milk yield (g/day) of first thermoneutral (20°C) was 1,880.0, of hot surroundings (32°C) 1,611.7 and 2nd thermoneutral (20°C) 39.192 . As delivered Sevi et al (2001), to that milk yield became now not stricken by solar radiation and time of feeding, however, the EXPM institution had approximately 20% lower ($p<0.05$) yield of milk compared with the 3 other organizations for the duration of wk. 3 and four due to smaller volumes of milk, the EXPM remedy resulted in reduced yields of milk casein and fats ($p<0.05$), where milk yield prom institution was 784.1, EXPM 706.3, PROA 767.four and EXPA 765.7 respectively. In agreement Reverdin et al (2013), pronounced that raw milk yield changed into not modified through warmness pressure, but the fat content material and the fat yield reduced, .protein content and protein yield has been no longer suffering from the boom in temperature.

2.6.2.2. Milk composition

Buxadera et al (2012), viewed that heat tolerance decreases, even as the genetic level for milk trends increases. Losses due to warmness pressure have been equivalent to 1.9 and three.1% inside the every year yield of fat and protein for MG and PYA, respectively. The milk production, fats percent, protein percentage and SNF percent as a characteristic of THI had a terrible slope that is satisfactorily expressed by the equations: Milk yield (kg consistent with buffalo consistent with day) = 6.167 - 0.028 THI (R_2= 0.238); Milk fat (% in step with buffalo per day)= 11.018- 0.047 THI (R2= 0.28); Milk protein (% according to buffalo in keeping with day) = 3.061-0.00014 THI (R2 = 0.053); and the milk SNF (% in line with buffalo in step with day) = 9.464 - 0.0048 THI (R2= 0.009) (Hitesh et al, 2013). Those regressions suggest that during standard for every point increase in THI cost, there was a decrease, in milk yield of 0.028 kg; in milk fats of 0.047 in line with cent; in milk protein of 0.00014; and in milk SNF of 0.0048 in keeping with the cent in line with buffalo consistent with a day. The regressions of milk yield on THI and milk fat percent of the temperature humidity index have been good sized ($P<0.05$) with an R2 of 0.172 and R2 of 0.292, respectively. However, the regression of milk protein percentage on THI and milk SNF percentage on THI have been no longer enormous ($p<0.05$) with an R2 of 0.00011 and 0.037, respectively) (Hitesh et al, 2013). With regard to milk composition, milk from night goats was decreased in fats than milk from house goats, due to a dilution effect, and the decrease in area than the opposite experimental businesses, wheres night ewe milk resulted better in casein Di (Grigoli et al, 2009). Those outcomes appear to indicate a tendency towards a higher efficiency in dietary nitrogen usage of night time grazing animals, desired by means of mild temperatures, according to (Maria et al, 2007). As Mabjeesh et al (2013), pronounced that milk protein and fats contents had been similar in both organizations and averaged 3.63 and 4.34%, respectively, while milk lactose became higher inside the LDPP group (4.77 vs. 4.67%). Heart rates had been comparable between remedies and averaged 112.6 beats in keeping with minute (BPM). Sunagawa et al (2015), shown that the milk composition inside the hot surroundings significantly reduced ($p<0.05$) compared to the primary and second thermoneutral environments where outcomes of hot surroundings on milk composition (g/day) of first thermoneutral (20°C) 12.24a, of warm environment (32°C) 10.99 and 2 thermoneutral (20°C) 11.42. In contrast, Sevi et al (2001), confirmed that milk composition became not suffering from sun radiation and time feeding. In addition, within the look at no huge effect ($P<0.05$) on milk protein and SNF possibilities turned into observed because of summer season warmth stress (3.08 vs.2.9 in line with cent protein and 9.08 vs 9.05 in line with cent SNF, respectively, for the wintry weather and summertime (Hitesh et al., 2013).

2.6.3. Adaptation

2.6.3.1. Respiration Rate

Numerous research works confirmed outcomes of various significantly at the breathing price in the goats where respiration charge changed into now not significantly ($P>0.05$) distinct among T1 (16.04 breaths/min), T2 (18.98 breaths/min) but T3 (23.01 breaths/min) turned into significantly ($P<0.05$) higher than Treatment1 and T2 (Fahmy 1994; Maria et al., 1997b; Banerjee et al., 2015; Habibu et al., 2016; Silja et al., 2016). Ozawa et al (2005), viewed that the common of the goats in the warmness-pressure group changed into substantially extended in comparison with that respiration fee(breaths/min) of the controls ($p<0.001$) wheres breathing price (breaths/min) in control group was 33.8±1.2 even as breathing charge(breaths/min) in warmness-pressure group turned into 190.3±3.6. Okourwa (2014) : Maria et al (2007), noted that the RR suggest variation for t Holstein farm animals among morning and afternoon was the very best for all breeds (5.7) and the bottom (0.38) was for the Junqueira. In McManus et al (2005), lowest variations had been found for the Pantaneiro breed. Variations right here can be because of the better afternoon temperatures on this experiment and the reality that no vast time of day breed results was located in the earlier look at. Ogebe et al (1996), said that respiratory rate become ($p<0.05$) tormented by both season, wherein breathing fee in moist season (July, August September) of girl goats turned into 38.5±0.21while breathing fee in Dry season (January, February, March) of female goats was 48 ±0.26. In Egyptian Rahmani, Ossimi, and Ossimi × Suffolk crossbred ewes Maria et al (1997), reported that, the identical fashion changed into located and breathing rate become markedly lower at 8:00 than at 12:00 and 16:00, of which the latter charge become similar in Rahmani, Ossimi and Ossimi × Suffolk crossbred ewes in the course of wintry weather and summertime. AS Panda et al (2016), shows that the respiration /panting price/minute on top of things (T1) were (45 .00b±1.28), T2 (124.3±2.38) and T3 (132±0.98) and turned into stages of extensively specific ($P<0.05$). The breathing charge tended to boom with T2 warmness stress, became increased with T3 warmness stress compared to the control institution. The relative distinction among our effects might be because of using different experimental situations and/or breed and age of goats. Alam et al (2011) viewed that the breathing charge tended to increase with T4 (111ab ± 2.0) heat pressure, became accelerated with T8 (119.3 ± 0.8) heat pressure in comparison to the manipulate organization (32.7 ± 2.2). Darcan et al (2008), said that respiratory quotes of the goats had been detected as comparable at night time in all businesses (manage 46.68 ± 2.00c, 54.40 ± 2.12, 47.60 ± 1.31c., OTS 44.48 ± 0.79, 51.14 ± 0.74, 41.88 ± 0.53 and TTS 43.06 ± 1.31, 8.00 ± 1.32c, 39.76 ± 1.20 respectively) the differences between morning and afternoon respiration quotes exceed 5-8 units most of the 3 companies, while diurnal distinction varied via 10-18 gadgets of breaths. No matter growing environmental temperatures inside the sunlight hours, there have been no huge changes concerning diurnal respiratory prices in sprayed goats. Srikandakumar et al (2003), confirmed that the impact of heat strain and funky stress at the adjustments in respiration rate in Omani and Merino sheep when subjected to chill strain are 50 ± 2.1 for coolA, 34 ± 1.2 for coolB and while subjected to heat strain are 128 ± 2.5 for hotA, 65 ± 1. 3 for hotB, the significance of the increase in breathing charge turned into better ($P < 0.01$) for Merino (78 devices) than in Omani (31 devices) sheep when they have been subjected to warmth pressure. As have proven Mabjeesh et al (2013), that respiratory quotes were lower in the morning (58.4 BPM) compared with the afternoon (91.2 BPM) and had been now not influenced via photoperiod. also Mellado et al (2014), mentioned that the respiratory fee (breaths/minute) of the does under bloodless pressure common 1.3º C better ($p<0.01$) (26.8 ± 9.6) than the ones below moderate temperatures (19.1 ± 6.4), in step with Al-Samawi et al (2014), indicated thatrespiratory and heart quotes: The effects showed that there has been a full-size ($P<0.0001$) increase in HR and RR during summer season (107.50± 1.92 and 41.90± 1.71, respectively) than during winter season (90.30± 1.26 and 29.08± 0.91, respectively). Dangi et al (2014), reported that the effects of short-term heat exposure on RR of the goats the RR recorded for six consecutive days preexposure periods was 24.86±3.4 the preexposure RR values recorded in goats was not significantly ($P>0.05$) one of a kind from each other among days, The RR of the goats rose regularly from the preexposure value of 25.33±2.86 breaths/min to a height price of 122±5.22 breaths/min in the course of the 4th hour of warmth publicity; thereafter, the RR fluctuated between 112 and 119 breaths/min and have become normal after 6-h recuperation period at room temperature. But, no sizeable trade became found in heart price in identical aspect. Sunagawa et al (2015), confirmed that results of warm surroundings on the respiratory rate of the animals within the first thermoneutral environment and the second one the thermoneutral surroundings changed into 38±11.3, 20±6.9 breaths/min; in comparison to the thermoneutral surroundings, the respiratory fee (146±15.3 breaths/min) within the warm surroundings both elevated notably ($p<0.01$). Sevi et al (2001), delivered that

EXPM and EXPA ewes had significantly better respiration fees (27.5 breath/min, $p<0.01$) compared with PROA ewes in the course of wk. 3, 4, 5, and six of the experiment, increased breathing rates were additionally discovered in each EXP companies in comparison with prom group for the duration of wk. 3 and 4.

2.6.3.2. Pulse Rate

Numerous research studies Alexiev et al (2004), McManus et al (2009): Banerjee et al (2015): Silja et al (2016), viewed that impact heat stress and bloodless stress at the pulse rate in the goats. The pulse rate displays generally the homeostasis of circulating alongside the general metabolic fame. The rate will increase on exposure to excessive environmental temperature (Aboul-Naga, 1987). This will increase blood go with the flow from the core to the surface to give a hazard for greater heat to be misplaced by practical (loss with the aid of conduction, conference, and radiation) and insensible (loss by means of diffusion water from the skin) manner. Ogebe et al (1996), mentioned that pulse price (beats min) turned into ($p<0.05$) suffering from each season, where respiration price in the wet season (July, August September) of female goats turned into 68.7±0.28 at the same time as pulse rate (beats min) in the Dry season (January, February, March) of female goats became 72.0±0.11. Ozawa et al. (2005), viewedthat the common of the goats in the warmness-pressure group turned into notably accelerated compared with that heart ratio(breaths/min) of the controls ($p<0.001$), while coronary heart ratio(breaths/min) on top of things institution turned into 74.5±1.7, at the same time as heart ratio (breaths/min) in heat-strain institution was 64.2±2.3. Okoruwa (2014), Indicated to that pulse charge which became considerably ($P<0.05$) highest in T3 (91.04 beats/min) and lowest in T1 (78.38 beats/min). Dangi et al (2014) reported that the effects of short-term heat exposure on HR of the goats are shown in the HR recorded for six consecutive days preexposure periods was 78.6±4.5, the preexposure HR values recorded in goats was not significantly ($P>0.05$) distinctive from one another among days. In accordance to

Taniguchi et al (2004) particularly, reported hepatic blood float to tend to be extra at 35 than 20 ◦C. The absorption of acetate and propionate, as well as the O2 uptake by using the portal-drained viscera, were considerably better at 35 than 20◦C. The extended O2 uptake may be a reason for warmth load underneath warm temperatures, in sheep. Reported Ismail et al (1995), to that in summer, the heartbeat rate became extensively higher than for the duration of wintry weather, in Barki sheep. indicates Panda et al (2016), the pulse rate in control (T1, T2, T3) were 85.73±1, 42, 93.73±2.42, 98.73±1.02 respectively and turned into stages of substantially unique ($P<0.05$). Alam et al (2011), pronounced that goats exposed to heat publicity confirmed higher ($P<0.05$) pulse price within the T4 (82.3 ± 2.2) and T8 (87.3 ± 0.8) as compared to the manipulate organization (74.3 ± 1.2). The pulse rate displays in the main the homeostasis of circulating alongside the general metabolic fame. In every other study proven Mellado et al (2014), that the resting fireplace fee (beats in keeping with minute) of the does underneath, cold stress averaged 1.3º C higher ($p<0.01$) (95.6 ± 16.2) than those beneath mild temperatures (82 .4 ± 14.6). In same component, Sunagawa et al (2015), confirmed that outcomes of hot surroundings at the heart price of the animals in the first thermoneutral environment and the second the thermoneutral surroundings was 96±9.8, 92±9.3 beats/min as compared to the thermoneutral surroundings, in the warm surroundings each, multiplied appreciably ($p<0.01$) at the same time as heart charge (70±8.9 beats/min) decreased. On evaluation, Popoola et al (2014), reported that the pulse charge of the goats become now not drastically affected ($p<0.001$) through THI. But, the pulse charge expanded with the alternate in values of THI.

2.6.3.3. Rectal Temperature

Numerous studies Otoikhian et al (2009): Banerjee et al (2015), Habibu et al (2016): Silja et al (2016), viewed that impact of warmth strain and cold pressure in the goats. In research of Panda et al (2016), confirmed the RT (0F) on top of things (TI) were 101.20±2.10 and excessive temperature (T2 and T3) exposed goats ,where were 102.45±1.46, 104.70 2±1.63 respectively there had been no adjustments (N.S) to rectal temperatures in goats uncovered to warmness remedies. Alam et al (2011), indicated that which inconsistent with other studies that the rectal temperature in control T0 (1 00.1 ± 2.1) and excessive temperatures- T4 (102.9 ± 2.1) and T8 (104.3 ± 1.2) exposed goats. There have been no adjustments (NS) to rectal temperatures in goats exposed to heat treatments. Darcan et al (2008), viewed that the rectal temperatures of manipulate goats (08.00-09.00b turned into 8.77 ± 0.04, 16.00-17.00., 39.65 ± 0.08 and 4.00-01.00., 39.37 ± 0.07) expanded unexpectedly until afternoon (almost +1°C) and slightly decreased in the dead of night, whilst OTS (08.00-09.00., 38.51 ± 0.05, 16.00-17.00., 39.10 ± 0.07 and 24.00-01.00., 38.63 ± 0.05) TTS(08.00-09.00., 38.70 ± 0.04, 16.00-17.00., 38.93 ± 0.06 and 4.00-01.00., 38.73 ± 0.05) increased between 0.2 – 0.5 at day time and again to morning stages at midnight time. The TTS and OTS goats maintained their rectal temperatures in the course of the day at the same time as manage goats' midnight rectal temperatures were recorded +0.6°C extra than morning measurements. Mellado et al (2014), pronounced that the rectal temperature of the does below cold strain averaged 1.3ºC (39.2 ± 0.4) better ($p<0.01$) than the ones under slight temperatures (37.9 ±0.4). In equal aspect Sunagawa et al (2015), showed that outcomes of hot environment on rectal temperature of the animals of first thermoneutral surroundings and the second one thermoneutral surroundings changed into 39.1±0.15, 38.9±0.11°C compared of thermoneutral surroundings, rectal temperature (40.2±0.17°C) of warm environment each improved significantly ($p<0.01$). Sevi et al (2001), reported that solar radiation ($p<0.001$), time of feeding ($p<0.05$), and solar radiation time of feeding ($p=0.01$) had great results on RT. protected businesses had decrease RT (0.4°C) than exposed companies at some stage in the take a look at duration, but have been only drastically distinctive over the past 4 wk of the experiment. On common, EXPM ewes had higher rectal temperatures (41. °C) than EXPA ewes (39.8°C, $p<0.001$), which in flip exhibited higher RT in comparison with promenade and PROA ewes (39.5°C, $p<0.001$). in contrast Dangi et al (2014), showed that the effects of short-term heat exposure on RT of the goats are shown the RT recorded for six consecutive days preexposure periods were 101.7±0.09 The preexposure RT, values recorded in goats were not significantly ($P>0.05$) 1-of-a-kind from each other amongst days. The RT recorded in the course of exposure hours became significantly ($P<0.05$) better than pre- and postexposure hours. The RT rose regularly from the pre-exposure value of 101.6± 0.08 °F to a height fee of 103.05±0.29 °F throughout the 6th hour of warmth publicity; thereafter, the RT reduced to preexposure stage.

2.6.3.4. Skin Temperature

Some research works Fahmy (1994): Darian et al (2009), Schutz et al (2011), clarified sizable outcomes of warmth strain at the pores and skin temperature. Okoruwa (2014) show that pores and skin temperature values of 36.63, 38.99 and 40.680◦C that have been obtained for T1, T2 and T3 respectively, was extensively ($P<0.05$) highest in T3 and lowest in T1. As confirmed Marai et al (1997b, 2000) throughout the day, the skin temperature becomes decrease at 8:00 than at 12:00 and 16:00—of which the latter two had been comparable, throughout summer situations. In assessment stated Alam et al (2011), that the skin temperature of manage T0 (99.6 ± 2.1) and excessive temperatures- T4 (102.3 ± 1.2) and T8 (103 ± 2.0) uncovered goats. There have been no changes (NS) to pores and skin temperatures in goats uncovered to warmth treatments.

2.6.3.5. Head Temperature

Ocak et al (2009), presented that in sprinkle+ fan group decline RR, RT, TT and HT. Darcan et al (2007), achieved that head temperature was change significantly ($p<0.033$) within groups it was based on rising air temperature, head temperature was high in the control group (35.7), 35 for OTS and 33.8 for TTS. In the other study for Darcan et al (2009), reported that during midday the temperature was highest compared other hours in day and head temperature surpass was 36.48°C for pigment group, whilst head temperature higher 37.5°C in the non-pigmented groups.

2.6.4. Behavioral

Ogebe et al (1996), reported that rumination charge (chews/ min) was ($p<0.05$) affected by each season, wherein breathing fee in the wet season (July, August September) of doe goats become 77.5±0.21 at the same time as rumination rate in Dry season (January, February, March) of doe goats changed into 98.4±0.02 consistent with Panda et al (2016), pronounced that the ingesting time and chewing fee in control T1 (14.60±0.80 two), and excessive temperatures T2 (13.00±0.70) and T3 (10.6±1.04) exposed goats and also suggests the rumination time, wide variety of rumination according to minute on top of things T1 (14.60±0.82), and excessive temperatures- (T2 and T3) exposed goats. There were no changes to rumination time in goats exposed to exclusive warmness treatments. The range of rumination consistent with hour changed into reduced by T2 and T3. Rumination time is reduced motive of heat exposure. The mendacity time on top of things T1 (12.63±0.22), and excessive temperatures- T2 (8.52±0.17) and T3 (9.84±0.25) uncovered goats. Warmness-handled goats confirmed an elevation in status and lying time compared to goats. As display Alam et al (2011), the consuming time and chewing rate of manipulating T0 (300.0 ± 15.1 and 90.3 ± 2.3) respectively, and excessive temperatures T4 (366.7 ± 6.0, 92.3 ± 2.2) and T8 (380.0± 5.0, 92.1 ± 1.1) respectively uncovered goats. No giant adjustments had been located in chewing of goats from any of the warmth remedy agencies. Goat exposure to heat takes greater time for eating, however, general dry count number consumption is low, in the equal examine display impact of heat strain on rumination time (min/hr) parameter of goat variety of rumination per minute, number of boli in step with rumination, bolus time, and wide variety of chunk consistent with bolus on top of things T0 (0.33 ± 0), and excessive temperatures- (T4 (0.29b ± 0) and T8 (0.21c ±

0)) uncovered goats. There had been no changes to rumination time, bolus time, and range of chunk according to bolus in goats exposed to distinct warmness treatments however, relative to control companies (11.3 ± 1.2), the range of rumination in line with hour and boli per rumination turned into decreased by using T4 (9.7 ± 1.2) HS and T8 (8.3 ± 1.2) HS. there has been a regular interruption of breathing corresponding to rumination contractions, inside the same look at also display Alam et al (2011), the standing time and lying time in control (T0 (390.0 ± 5.0 and 90.0± 2.0)) respectively, and excessive temperatures- (T4 (444.7 ± 2.0) and (35.3 ± 2.2) and T8(430.0 ± 5.0) and (50.0 ± 1.0)) respectively exposed goats.

2.6.4.1. Water consumption

Several studies West et al (2003): Rhoads et al (2009), clarified that outcomes of warmth pressure and bloodless strain on the water consumption. Water is one of the most critical vitamins required for the protection of lifestyles and is worried in lots of physiological capabilities important for optimum performance of livestock. Water requirements vary and are regulated by means of many factors which includes consumption of DM, environmental temperature and loss of water from the body tissues. Sheep consume much less water according to unit of dry depend intake (DMI) than farm animals, but the intake increases with a boom in ambient temperature. Sheep eat 2 kg water/kg DM at temperatures among 0 and 15◦C. This ratio increases to 3:1 at temperatures above 20◦C (Conrad, 1985). During the primary few weeks of lactation, ewes drink about four kg water/kg DM at temperatures of between 15 and 30◦C. Water intake increases markedly at some stage in being pregnant, because of the intense heat stress, with a corresponding water. Frame temperature is, but, regulated for the duration of pregnancy under acute warmness pressure situations with the aid of the loss of warmth to ingested water and probably also through elevated respiration (Conrad, 1985). Khan and Ghosh (1989), pronounced that consumption of water is nine and 11% of the overall body weight at some point of the wintry weather and 19–25% in the course of summertime in 3-12 months-vintage sheep and the boom in water rotation was recorded to be 6% within the wintry weather and 7% in summer time. Benlmlih (1988), viewed that mountain (Timhadit) and wasteland sheep breeds (Duguay) surpass the arid breeds (Sardi and Beni Guil), in phrases of the water turnover. For the duration of pregnancy, the water turnover is lower than for the duration of lactation, beneath heat strain situations. Shafie et al (1994), clarified that Water intake boom became determined to be 50%, even as water loss reduced via approximately 25% within the faeces and 40% in urine, during warmth pressure. Ogebe et al (1996), reported that respiration rate become ($p<0.05$) stricken by both season, in which water intake (g kg of live weight day) in most season (July, August September) of female goats changed into 172.0±6.5, at the same time as water consumption (g kg of stay weight day) in dry season (January, February, March) of female goats became 188.0±17.09. Maria et al (1997b, 2000) mentioned that insensible water loss (by diffusion of water from the pores and skin) became two times better at 35◦C, than at beneath 18◦C. Water intake (frequency/h) became notably better at 11:00 to 15:00 and 15:00 to 19:00 than at 7:00 to eleven.00 and in the summertime than all through the iciness. Have shown Thompson and Thomson (1977) that the effect of cold on water voluntary intake had been of thermoneutral 4762 + 781, within the mild cold 2579± 400. As Hirayama and Katoh (2004), viewed that results of heat exposure on water consumption (L/d) at some stage in heat publicity changed into of hot surroundings (35°C) 2.4±0.4, of neutral surroundings (20°C) 1.9±0.3 and values of impartial surroundings of (20°C) and confined feeding of same levels as hot surroundings 1.3±0.1°C. Ozawa et al (2005), viewed that the common of the goats within the warmness-strain organization become appreciably increased compared with that water consumption (ml/kg BW/day) of the controls ($p<0.001$), whereas water consumption (ml/kg BW/day) on top of things institution changed into 55 .7±3.3, at the same time as water consumption (ml/kg BW/day) in warmness-strain organization turned into 361.8±40.3. Sunagawa et al (2015), reported that the water intake drastically accelerated ($p<0.05$) of hot surroundings compared to the primary and 2day thermoneutral environments where had been effected of warm surroundings on water consumption (kg/d) of first thermoneutral (20°C) 7.7 ,of hot surroundings (32°C) 14.8 and of environment and thermoneutral (20°C) 9.6 .

2.7. Adaptation to hot climate

Acclimation to heat is a biphasic manner regarding a transient perturbed segment accompanied by a long-lasting period at some stage in which acclimatory homeostasis is advanced (Horowitz et al, 2004). The variation of recent sheep breeds to unusual environments might also regularly be both a matter of risk or due to trial and error—thanks to the high-quality complexity of the surroundings and the unexplained idiosyncrasies of breed in appreciate to elements like terrain (Hafez, 1987), The possibility of a breed to conform in a sure place can be predicted by building climographs, i.e. plotting method of monthly most and minimum THI values within the authentic and new locations. Similarities in function, shape, and vicinity of the two patterns so shaped after joining for 365 days, indicate this type of opportunity. The monthly manner of temperature and relative humidity had been one after the other utilized in plotting the climographs. However, disease and parasite standards, feed availability, costs of inputs and products and the marketplace scenario, must be considered. Sheep tailored to warm climatic situations should keep the expression of their hereditary functional capacity, in the course of lifestyles. In different words, animals must show the least variation from every day in trends, when raised underneath such situations. To recognize this the animals ought to be morphologically and physiologically equipped to withstand a growth in warmness and drought, i.e. such tendencies have to help excess body warmness dissipation, as a whole lot as viable (Habeeb et al, 1997: Maria and Habeeb, 1998). The morphological characteristics desired to the new climate breeds have to include a big skin vicinity to stay weight ratio, shielded eyes, pigmented skin and eyelids (to lessen susceptibility to eye cancer) and a mild colored or white body . in addition, the capacity of animals to stroll lengthy distances, to adjust to low water intake, to excessive consumption of salts both in ingesting water or in forages, to poor best food, to harsh remedy and to withstand ticks and different pests, need to be worried (Habeeb et al, 1997).

3. MATERIALS AND METHODS

3.1. Location, Animals and Experimental Setup

The study were carried out at dairy goat research farm of Agricultural faculty of Çukurova university, Adana (36 59 N.35 18E, Turkey). The experiment implemented upon two phases: during the first phase have been selected Animals 65 Saanen and 73 Alpine female goats in the age of 1-2 years old and 22 Boer aged of 1-8 years old. In the second phase have been selected only 24.from femal goats in the age of 2 year. The experiments were carried out in three season of year viz. -winter (25 January to 18 Feb), spring (March) and summer (15 July to 15 August)- when the ambient temperature were lowest, transitory (thermo neutral) and highest respectively. The average temperature, relative humity (RH) and wind speed in morning were 22.6°C, 73.7%, 9.6 $km.s^{-1}$ respectively. As for, the average temperature, RH, wind speed recorded in the afternoon, they were 26.2°C, 45.0%, 14.1 $km.s^{-1}$ mid-summer (June). During to the morning time, average temperature was (29.024°C), humidity (71.143%), wind (7.64 $km.s^{-1}$) and 35.05°C, 45.7% and 17.55 $km.s^{-1}$ in afternoon, respectively.

Table 3.1. Distributed according to breed and sub group inside the breed were subjected to the same conditions from breeding, management and healthy

Animal	**Breed**	**Number (age)**
Goats	Saanen	8 (12-24 month)
	Alpine	8 (12-24 month)
	Boer	8 (12-36 month)

Figure 3.1 Experimental animal materials (Saanen, Alpin, Boer) for collection blood

Figure 3.2 Distribution goats to groups according to breed and as sup group according to type of protein (HSP60 as (T) group and HSP70 as (G)

The meteorological data during three seasons (spring, summer and winter) are reported in the table 3.2. The temperature humidity index (THI) as indicator of adverse climatic conditions was calculated from dry bulb temperature (db, °F) and relative humidity (RH% /100) by the following formula: (Abdel-Samee, 1996).

Table 3.2. Depicts ambient temperature (°F), average relative humidity and temperature humidity index of the study period

Month	Ambient temperature (°C) →(°F) (Range) Mean	RH (%) (Range) Mean	THI
Spring (11-26/5/2017)	(20- 25 °C) → (68- 77°F) 23 °C→ 73.4 °F	(73– 48) 61	70.097
Summer (18/7/2017 -6/8/2017)	(28-35 °C)→ (82- 95°F) 32°C→ 89.6 °F	(67- 53) 60	82.648
Winter (28/1/2018-18/2/2018)	(9- 15° C) → (48.2- 59°F) 12 °C→ 53.6 °F	(74-53) 64 For winter wind was 11ksm	54.47

3.2. Management of Animal

Animals were collectively grouped and housed according to their breed, physiological status under semi-intensive system. All the animals were clinically healthy and free from any physical abnormalities. The animals were subjected to similar management conditions and monitored closely over the period of study. All the groups were kept in separate parts of the pen. Roughage and concentrate feeds are adequately supplied every day depending on the condition of all animals (TMR 1-2 kg, 40% roughage + 60% concentrate). A large water trough was provided for each group to supply fresh water available represented as adequate. The houses have been well ventilated and the space per animal is adequate. Cleaning and hygienic management have been maintained regularly throughout the trials period. The floor, stall, water trough, and feeder were cleaned every day. Before starting the collection of experimental data, all animals have been subjected for acclimatization with the environment (e.g., daily routine activities) for about 1 week. During this, the initial weight of the animals was taken and animal were identified with eartags. During the adaptation period the animals were subjected to the same diet applied during the experimental period. At the end of this stage, the animals were weighed again and then started the three times a week experimental period.

Figure 3.3 Grouped goat abased on breed and type of protein (T and G) groups.

The composition (DM%) total mixed ration used in the study was Barley 5.2%, Corn 14.2%, wheat bran 15%, DDG5.9%, Corn bran 6%, Cotton seed Meal 2.8%, Sunflower Meal 6%, Lime 1.2%, Salt 0.5%, Vitamin- Mineral Premix 0.1% Alfalfa hay 40% and chemical compositions were Dry Matter 89.9%, Ash 6.8%, Ether extract (EE) 2.4% crud protein 14.8%, Acid Detergent Fiber 23.0%, Neutral Detergent fiber 38.0% and crude fiber for vitamin mineral premix contains 15000000 vitamin, 3000000 IUD, 60000mg vitamin E, 50000 mg Fe, 10000mg Cu, 50000 mg Mn, 150 mg Co, 150000 mg Zn, 800, 1.150 mg Se, 50000 mg Mg per kg.

3.3. Ethical Permission

The animals were treated following the compliance of the institue's norms for ethical treatment. Norms regarding the ethical treatment of animals during the whole operation were strictly followed.

3.4. Duration of the Experiment

For determination to heat shock protein 160 heads female of Saanen, Alpine and Boer goats. Then animals were divided into 3 groups, containing 8 goats in each main group according to breed and 4 goat for each breed tow type group as a sub group one group represented T group as (HSP60) and the sacend group represented G group as (HSP70) inside a breed so that each sub group. Animals' body temperature (BT), respiration rate (RR), skin temperature (ST), pulse rate (PR) and heat temperature (HT) were determined in three different seasons: winter (December-January), spring (May) and summer (July-August). All the animals have been given one a week for their psychological adjustment before starting the real experiment for data collection.

3.5. The Physiological Data

PR, BT, RR, ST, HT were recorded in the morning at 07:00-08:00, at midday at 13:00-14:00 during trial (Table 3.3). RR and PR were recorded by using a stethoscope. ST was measured by infrared thermometer (Testo BP-960) at a distance of 8 cm from the head and skin. The behaviour of the animals was observed and classified as follows: eating, ruminating, drinking, standing, walking, and lying. Behavioural observations were recorded for 12 h during the day, twice a week, using a visual observation.

Breathing score is an effective management tool to assist in the assessment of stress management. It has the potential to be used in the assessment of the welfare status of animals (Gaughan, 2003; Brown-Brandl et al., 2006).

Table 3.3. Physiological data according to performance

Performance data	include
Milk production	Milk yield – Milk composition
Adaptation	RR – PR- ST- BT- HT
Behavioral	Water consumption- feed intake
Concentration of HSP	HSP60- HSP70

Figure 3.4. Measurment for skine tempreture and milk production

3.6. Blood sampling and separated serum

Blood samples (5–8 ml) were collected from–experimental goats, using lithium-coated vacutainer tubes (BD Biosciences) containing heparin as anticoagulant. Blood samples were collected from jugular vein and immediately transported to laboratory under refrigeration. For isolating serum, the blood samples were processed within 2 h after sample collection following the standard procedure. Samples were allowed to clot for one hour at room temperature and centrifuge for 10 minutes at approximately 1000 rpm. Using clean pipette technique 210ul of serum has been taken into labelled microtubes and immediately freezes at –80°C. The frozen serum samples were transferred using Transfer to the laboratory for analysis. Serum HSP70 and HSP60 protein levels were determined using commercially available ELISA kits (StressGen Biotechnologies Corp). The concentrations of HSP70 protein were determined by comparison with a standard curve according to manufacturer's instructions. The standard curve has a range of 0.319-2.192 ng/mL for HSP60 while this mass concentration ranges between 0.276 and 2.192ng/ml for HSP70.

Figure 3.5. Collection of blood from goats

Figure 3.6. Collection of serum from blood

Figure 3.7 Distributed serums according to type of breed and type of protein

3.6.1. Materials Supplied in the Test Kit

Standard (48ng/ml) 0.5ml ,standard diluent 3ml, Microelisa strip plat 12we11x8strips, Str- HRP-Conjugate Reagent 6ml, 30xwash solution 20ml, Biotin-HSP60 Ab 1ml, Chromogen Solution A 6ml,Chromogen Soulation B 6ml, Stop solution 6ml, Instruction 1, Closure plate membrane 2, Sealed bags 1.washing method automatic washing method.

3.6.2. ELISA KIT

Sensitivity: 0.11ng/ml for HSP60 and 0.47ng/ml for HSP70 (the sensitivity of this assay was defined as the lowest protein concentration that could be differentiated from zero. It was determined by sub-tracing two standard deviations to the mean optical density value of 20 standard replicates and calculating the corresponding concentration.). Assay range: 0.15ng/ml-40ng/ml for HSP60 and 0.5ng/ml-150ng/ml. inter-assay precision: 3 samples with low, middle and high level goat HSP60 were tested 20 times on one plate, respectively. inter-assay precision: 3 samples with low, middle and high level goat HSP60 were tested on 3 different plates, 8 replicates in each plate.CV(%)=SD/meanX100, Intra-Assay: CV<10%, Inter-Assay: CV<12% for HSP60 and CV(%)= SD/meanX100, Intra-Assay: CV<10%, Inter-Assay: CV<12% for HSP70.

3.6.3. Assay procedure

Standard dilution: this test kit was supplied one original standard reagent. It has been diluted it according to the instruction .24ng/ml- standard No. 5 - 120µ 1 standard diluents. 12ng/ml standard No.4 - 120µ 1 standard No.5 + 120µ1 standard diluents. 6ng/ml- standard No. 3 120µ 1 standard No.4 + 120µ1 standard diluents. 3ng/ml standard No.2 120µ 1 standard No.3 + 120µ1 standard diluents. 1.5ng/ml standard No. 1 120µ 1 standard No.2 + 120µ1 standard diluents. The quantity of the plates depends on the-number of samples that will be assessed and the standard. Every sample was made according to required quantity. Inject samples; blank well didn't add samples and HSP60-antibody labelled with biotin, streptavidin-HRP, only chromogen solution A and B, and stop solution were allowed; other operations are the same. Standard well: added standard 50µ1, streptavidin- HRP 50 µ1 (since the standard already has combined biotin antibody, it was not necessary to add the antibody); to be tested wells: added sample 40 µ1, and then added both HSP60-antibody 10µ1 and streptavidin-HRP 50 µ1. Then seal the sealing memberance, and gently shaking, incubated 60 minutes at 37 c. confection: dilute 30 times the 30xwashing concentrate with distilled water as standby. Washing removed thememberance carefully, and drain the liquid, shake away the remaining water. Added chromogen solution A 50 µ 1, then chromogen solution B 50 µ 1, to each well. Gently mixed, incubate for 10 min at 37°C away from light. Stop: added stop solution 50 µ1 into each well to stop the reaction (the blue changes into yellow immediately).final measurement: taken blank well as zero, measure the optical densit (OD) under 450 nm wavelength which should be carried out within 15 min after adding the stop solution. According to standards, concentration and the corresponding OD values, calculate out the standard curve linear regression equation to calculate the corresponding samples concentration. It was acceptable to use kinds of software (Gen 5) to make calculations. And the all were the steps typically for HSP70.

Figure 3.8.Analysis of HSP60 and HSP70

3.7. Severity of Heat Stress in the Study Areas

Means of estimation of the severity of heat stress using both ambient temperature and relative humidity is termed temperature humidity index (THI) (LPHSI, 1990; Marai et al., 2001). The values obtained indicate the following :< 22.2=absence of heat stress; 22.2 to <23.3= moderate heat stress: 23.3 to <25.6=severe heat stress and 25.6 and more= extreme severe heat stress (Marai et al., 2001). In the present study during experimental period average temperature was 28.74°C and average relative humidity was 87.83%. Hence, THI value was 28.17.Where have been calculated THI by conversion average temperature from °C to °F (Fahrenheit) as in the pictures Figure 4.1 (heat index (Apparent Temperature).

3.8 Statistical Analysis

Data were statistically analyzed separately for goats. Data of experimental animals were analyzed by using 2-way repeated-measures ANOVA procedure and standard least-squares model (JMP®, SAS Institute Inc., Cary, NC). ANOVA disclosed a significance difference in least-square means; the differences were tested using Duncan’s Multiple Range Test (SAS).

$\hat{Y}ijk= \mu+\alpha i +\beta j +yk+ (\alpha\beta)\ ij + (\alpha y)\ ik+ (\beta y)\ jk+ (\alpha y)\ ik+ (\alpha\beta y)\ ijk+eijkI$

Where, ˆYijkl: observed value.

μ: mean of population.

αi: Breed effects

βj: Season effects

yk: T group and G group effects

(αβ)ij: interaction of breed and season

(αy)ik: interaction of effects breed and T, G groups

4. RESULTS AND DISCUSSION

4.1. Ambient Temperature

The value of THI had calculated according to the formula developed by Abdel-Samee, (1996) who stated that THI values below 72 are not stressful, while THI ranging between 72 and 78 are stressful. For the present study shows the ambient temperature during three seasons (spring, summer, winter).Calculation method for the experiment was according to conversion the temperature from ^{0}C to °F, which was the highest THI values in the summer (82.65) and THI vaules was in the spring (70.097) and winter (54.47). This means that THI during summer according to THI's formula the index was stressful. Avendano- Reyes et al. (2006), realized that the homoeothermic capability of goats begins to come to terms when THI override 80%. Silanikove (2000), reported that the THI is a good indicator of stressful thermal climatic conditions and extreme distress and animal are unable to preserve thermoregulatory mechanisms and normal body temperature. THI at values more than 78 and THI values 75- 78 stressful and THI values of 70 or less are considered comfortable.

Table 4.1. Values climatic data and THI of each of the experimental

Seasons	Hours a.m p.m	Air temperature (°C)	Relative humidity (%)	THI
Spring	8:00- 9:00 1:00- 2:00	20.7 ± 0.2 26.8 ± 0.3	73.1 ± 1.3 46.3 ± 1.4	70.097
Summer	8:00- 9:00 1:00- 2:00	28.7 ± 0.1 34.9 ± 0.1	73.4 ± 0.6 46.3 ± 0.6	82.65
Winter	8:00- 9:00 1:00- 2:00	9.4 ± 0.2 16.2 ± 0.3	64.3 ± 1.6 52.6 ± 0.5	54.47

According to (Abed Al-Samee, 1996) demonstrated that THI value was 80.7 in the hot-humid summer and THI values are considered as stressful. This value was lower as compared to the THI value in the present study.

The results of this study were higher than those of Okoruwa (2014), who shown that there is significantly ($p<0.05$) between the ambient temperature in afternoon (33.01°C) and the in morning (21.98°C) and evening (23.24°C) and the RH ranged between 59.98 and 62.51% and it was significantly lower in the afternoon compared to morning and evening. In addition similar trends were found by Habibou et al (2017), indeed, the AT and THI were lower than those found in the present study. The same authors demonstrated that the recorded AT (39.21°C) and THI (84.62) in the afternoon during the hot dry season were highest, while THI was lower in the morning during. The highest RH (77.36%) was obtained in the morning, while the lowest THI (56.76) was observed in the morning during dry season. In the same study that may be attributed to the adequacy of such changes different a physiological system determines the adaptation of the breeds to the given environment. In the same context, Schultz et al (2013), and Sejian et al (2014), reported that reduction of zonal THI may be because the goats were exposed to cold stress in the tropics, as season’s change, breeds of animals subjected to some physiological alterations fundamental for survival.

4.2. Physiological response

The comparison of all breeds (Alpine, Saanen, Boer) during all seasons (spring, summer, winter). The skin temperature (ST), body temperature (BT), pulse rate (PR), for spring and skin temperature, body temperature, pulse rate, respiration rate (RR) and head temperature (HT) for summer and winter of the animals material were seen in the tables below 4.2, 4.3, 4.4.

The difference of skin temperature for all breeds (Alpine, Saanen, Boer) and both groups (T and G) during spring and summer was 0.1. The skin temperature was not significantly different within breeds and within groups during spring. In contrary, during summer and winter the skin temperature was found to be highly significant ($p<0.001$) within both breeds (0.1, 0.11, 0.12 %) and groups (0.1, 0.1, 0.1 %) in the summer. During the winter the difference within Alpine, Saanen, Boer breeds was respectively 0.3, 0.2, and 0.3 % for T group and 0.3, 0.3 and 0.2 % respectively for G group. These differences are due to different of experimental breeds, which in turn are different in the colour skin (pigment), and the degree of tolerance.

Table 4.2. Physiological reaction of experimental goats in the spring for two group (T) and (G)

Group	Hours a.m p.m	Skin temperature (c^0)	Body temperature (c^0)	Plus rate (beat/min)	P-value			
						B	G	B*G
Alpin (T)	**07:00 - 8:00** **13:00 – 14:00**	**29.8 ± 0.52^{BC}** **33.6 ± 0.6^{A}**	**37.27 ± 0.15^{B}** **38.41 ± 0.3^{A}**	**105.1 ± 0.2^{BA}** **105.5 ± 3.5^{A}**	**S.T** **B.T** **P.R**	**N.S** **N.S** ******	**N.S** ****** ******	**N.S** **N.S** ******
Saanen (T)	**07:00 - 8:00** **13:00 – 14:00**	**28.70 ± 0.44^{C}** **32.84 ± 0.64^{A}**	**36.5 ± 0.21^{C}** **38.1 ± 0.3^{A}**	**93.5 ± 2.9^{B}** **100.9 ± 3.1^{BA}**	**S.T** **B.T** **P.R**	**N.S** **N.S** ******	**N.S** ****** ******	**N.S** **N.S** ******
Boer (T)	**07:00 - 8:00** **13:00 – 14:00**	**30.55 ± 0.52^{B}** **33.8 ± 0.65^{A}**	**37.33 ± 0.2^{B}** **38.4 ± 0.3^{A}**	**95.9 ± 3.5^{BA}** **98.6 ± 3.0^{BA}**	**S.T** **B.T** **P.R**	**N.S** **N.S** ******	**N.S** ****** ******	**N.S** **N.S** ******
Alpine (G)	**07:00 - 8:00** **13:00 – 14:00**	**29.64 ± 0.5^{A}** **34.2 ± 0.6^{A}**	**37.1 ± 0.14^{C}** **38.5 ± 0.3^{A}**	**99.9 ± 3.9^{B}** **110.4 ± 3.2^{A}**	**S.T** **B.T** **P.R**	**N.S** **N.S** ******	**N.S** ****** ******	**N.S** **N.S** ******
Saanen (G)	**07:00 - 8:00** **13:00 – 14:00**	**35.5 ± 6.3^{A}** **33.1 ± 0.5^{A}**	**36.9 ± 0.13^{C}** **38.09 ± 0.22^{A}**	**98.4 ± 2.7^{B}** **100.2 ± 3.1^{B}**	**S.T** **B.T** **P.R**	**N.S** **N.S** ******	**N.S** ****** ******	**N.S** **N.S** ******
Boer (G)	**07:00 - 8:00** **13:00 – 14:00**	**29.9 ± 0.4^{A}** **34.2 ± 0.6^{A}**	**37.2 ± 0.2^{C}** **38.1 ± 0.3^{A}**	**91.3 ± 2.7^{B}** **97.6 ± 3.2^{B}**	**S.T** **B.T** **P.R**	**N.S** **N.S** ******	**N.S** ****** ******	**N.S** **N.S** ******

B(Breed), G(Group), B*G(interaction Breed*Group), *p<0.05,** p<0.01, N.S, no significant

Table 4.3. Physiological reaction of experimental goats in the summer for two group (T) and (G)

Group	Hours	Skin temperature (c^0)	Body temperature (c^0)	Plus rate (beat/min)	Respiration rate (per/min)	Head temperature (c^0)	p-value			
								B	G	B*G
Alpine	07:00 - 8:00	35.3 ± 0.21^{C}	38.0 ± 0.13^{C}	101.4 ± 1.5^{C}	69.2 ± 3.1^{C}	34.9 ± 0.3^{DC}	S.T	**	**	N.S
(T)	13:00 – 14:00	39.7 ± 0.3^{A}	40.9 ± 0.11^{BA}	116.5 ± 1.9^{A}	106.6 ± 3.3^{A}	39.6 ± 0.3^{A}	B.T	**	*	N.S
							PR	**	**	*
							R.R	**	**	**
							H.T	**	**	**
Saanen	07:00 - 8:00	34.3 ± 0.2^{D}	37.4 ± 0.12^{C}	103.5 ± 1.7^{CB}	68.4 ± 2.6^{C}	33.2 ± 0.60^{D}	S.T	**	**	N.S
(T)	13:00 – 14:00	38.4 ± 0.5^{B}	40.2 ± 0.4^{B}	105.4 ± 2.0^{CB}	106.2 ± 3.5^{A}	37.7 ± 0.1^{B}	B.T	**	*	N.S
							P.R	**	**	*
							R.R	**	**	**
							H.T	**	**	**
Boer	07:00 - 8:00	34.5 ± 0.2^{DC}	37.37 ± 0.1^{C}	107.9 ± 1.4^{B}	63.9 ± 1.8^{C}	35.1 ± 0.3^{C}	S.T	**	**	N.S
(T)	13:00 – 14:00	39.1 ± 0.2^{BA}	40.9 ± 0.4^{A}	113.7 ± 2.3^{A}	89.3 ± 2.7^{B}	40.8 ± 1.2^{A}	B.T	**	*	N.S
							P.R	**	**	*
							R.R	**	**	**
							H.T	**	**	**
Alpine	07:00 - 8:00	35.3 ± 0.2^{C}	38.0 ± 0.09^{C}	105.7 ± 1.6^{B}	67.9 ± 2.4^{C}	28.7 ± 0.3^{B}	S.T	**	**	N.S
(G)	13:00 – 14:00	38.9 ± 0.2^{A}	40.9 ± 0.1^{A}	113.8 ± 2.3^{A}	106.9 ± 2.9^{A}	35.0 ± 1.2^{A}	B.T	**	*	N.S
							P.R	**	**	*
							R.R	**	**	**
							H.T	**	**	**
Saanen	07:00 - 8:00	34.7 ± 0.1^{D}	37.6 ± 0.09^{C}	103.9 ± 0.9^{B}	80.7 ± 2.9^{B}	34.9 ± 0.9^{C}	S.T	**	**	N.S
(G)	13:00 – 14:00	38.0 ± 0.1^{B}	39.9 ± 0.1^{B}	108.5 ± 1.04^{B}	$113.8 \pm 3.4.^{A}$	37.9 ± 0.2^{B}	B.T	**	*	N.S
							P.R	**	**	**
							R.R	**	**	**
							H.T	**	**	
Boer	07:00 - 8:00	35.3 ± 0.1^{C}	37.9 ± 0.1^{C}	105.4 ± 1.4^{B}	56.6 ± 1.9^{B}	34.9 ± 0.2^{C}	S.T	**	**	N.S
(G)	13:00 – 14:00	39.0 ± 0.3^{A}	40.6 ± 0.1^{A}	105.4 ± 1.4^{B}	67.8 ± 3.3^{A}	39.7 ± 0.3^{A}	B.T	**	*	N.S
							P.R	**	**	*
							R.R	**	**	**
							H.T	**	**	**

B(Breed), G(Group), B*G, (interaction Breed*Group), *(P<0.01), **(p<0.001), N.S, no significant.

Table 4.4. Physiological reaction of experimental goats in the winter for two group (T) and (G)

Group	Hours a.m p.m	Skin temperature (c^0)	Body temperature (c^0)	Plus rate (beat/min)	Respiration rate (per/min)	Head temperature (c^0)	P-value			
								B	G	B*G
Alpine (T)	08:00 - 9:30 13:00 - 14:00	19.1 ± 0.3^{E} 26.8 ± 0.3^{B}	35.7 ± 0.05^{B} 36.3 ± 0.06^{B}	98.01 ± 3.2^{C} 106.2 ± 2.6^{B}	53.3 ± 2.4^{B} 56.1 ± 1.1^{CB}	18.5 ± 0.2^{a} 25.1 ± 0.3^{b}	S.T B.T P.R R.R H.T	** N.S N.S ** **	** ** N.S ** **	N.S N.S * ** *
Saanen (T)	08:00 - 9:30 13:00 - 14:00	18.8 ± 0.22^{E} 24.4 ± 0.33^{C}	34.7 ± 5.0^{A} 36.1 ± 0.1^{B}	109.3 ± 1.5^{B} 115.9 ± 0.8^{A}	52.6 ± 1.1^{C} 54.0 ± 1.3^{CB}	18.9 ± 0.4^{D} 24.2 ± 0.2^{B}	S.T B.T P.R R.R H.T	** N.S N.S ** **	** ** N.S ** **	N.S N.S * ** *
Boer (T)	08:00 - 9:30 13:00 - 14:00	20.1 ± 0.3^{D} 28.1 ± 0.3^{A}	34.1 ± 0.1^{B} 35.8 ± 0.1^{B}	107.5 ± 2.1^{B} 112.7 ± 1.6^{BA}	58.4 ± 2.0^{B} 67.4 ± 2.3^{A}	21.2 ± 0.6^{C} 27.5 ± 0.42^{A}	S.T B.T P.R R.R H.T	** N.S N.S ** **	** ** N.S ** **	N.S N.S * ** *
Alpine (G)	08:00 - 9:30 13:00 - 14:00	18.9 ± 0.2^{D} 26.3 ± 0.3^{A}	35.3 ± 0.2^{A} 35.9 ± 0.1^{A}	111.3 ± 1.5^{A} 104.3 ± 2.5^{BC}	55.82 ± 2.2^{B} 56.3 ± 1.1^{b}	25.3 ± 0.3^{B} 25.1 ± 0.3^{B}	S.T B.T P.R R.R H.T	** N.S N.S ** **	** ** N.S ** **	N.S N.S * ** *
Saanen (G)	08:00 - 9:30 13:00 - 14:00	17.9 ± 0.4^{e} 24.8 ± 0.3^{B}	34.6 ± 0.01^{A} 39.3 ± 3.5^{A}	104.6 ± 2.6^{BC} 112.0 ± 1.4^{A}	51.9 ± 1.1^{C} 58.2 ± 1.1^{B}	18.3 ± 0.2^{C} 24.2 ± 0.2^{B}	S.T B.T P.R R.R H.T	** N.S N.S ** **	** ** N.S ** **	N.S N.S * ** *
Boer (G)	08:00 - 9:30 13:00 - 14:00	19.7 ± 0.4^{C} 25.8 ± 0.4^{A}	34.8 ± 0.2^{A} 36.3 ± 0.1^{A}	100.1 ± 3.1^{C} 110.3 ± 1.7^{BA}	58.7 ± 1.6^{B} 65.9 ± 1.8^{A}	19.5 ± 0.3^{C} 28.8 ± 3.3^{A}	S.T B.T P.R R.R H.T	** N.S N.S ** **	** ** N.S ** **	N.S N.S * ** *

B(Breed), G(Group), B*G(interaction Breed* Group), *($p<0.01$), **($p<0.001$), N.S, no significant.

According to Schutz et al (2011), and McManus et al (2009), the thermal radiation increased at the peak of the summer and declined in the winter. As indicated that skin temperatures were 36.36 and 38.99°C for T1 and T2 respectively, which significantly ($p<0.05$) higher in T2 and lowest in T1.The obtained increasing in skin temperature for goats in T2 was attributed to exposure to heat stress. That might cause vasodilatation of skin capillary bed and consequently increase the blood flow to the skin surface to facilitate heat dissipation. The skin temperature could also be elevated due to solar radiation as skin temperature has been shown to be directly related to solar radiation levels.

Regarding the body temperature our study showed that there were no significant differences within the breeds for both the spring and the winter. These significant differences ($p<0.001$) were high within group of all breeds: 0.03, 0.04, and 0.03 % for Alpine, Saanen, Boer breeds respectively in T group and 0.04, 0.03, and 0.02 % for the same breeds in G groups during spring. Across the summer period, the finds demonstrated that the body temperature was 0.07, 0.07, 0.09 % for Alpine, Saanen, Boer breeds respectively in T groups and while, it was 0.1, 0.1 and 0.1 % for Alpine, Saanen, Boer breeds respectively in G groups in the summer. Minka et al (2016), shown that body temperature of goats was significantly ($p<0.05$) higher than that of the sheep in all the season. In the same context, Piccione et al (2013), and Jessem (2001), indicated similar results in the cold dry season. The feet play a more crucial role in thermoregulation compared with other parts of body, probably because vasoconstriction occurring in the feet, which is a good mechanism of heat conservation.

As respect to pulse rate the values of pulse rate 99.8, 107.1, 107.3 beat/min during the spring, the summer, the winter respectively. Pulse rate was 0.004, 0.07, 0.03% and 0.1, 0.02, 0.1% beat/min for Alpine, Saanen, Boer breeds within groups T and G respectively during the spring, pulse rate was 0.13, 0.02, 0.05% beat/mint and 0.1, 0.04, 0.0 beat/mint for Alpine, Saanen, Boer breeds within groups T and G respectively during the summer. Pulse rate was 0.1, 0.1, 0.05% beat/mint and 0.1, 0.07, 0.1% beat/mint for same breeds within the same groups respectively during the winter As indicated, present study shows that Pulse rate significantly ($p<0.001$) within breeds and significantly lower ($p<0.05$) within groups during the spring, and that pulse rate significantly high within breeds ($p<0.001$) and during the summer, also pulse rate is not significant within breeds and groups in the winter. Darcan (2000), stated that at the same conditions, the pulse rate, respiration rate tended to increase, when ambient temperature rises up to 30°C and variation between morning and afternoon. Pulse rate and respiration rate of the goats are found to be about 20-65 breath/min Basal respiration rate is nearly 25-30 breaths/min.

According to what obtained in the present study that the respiration rate in goats for the summer and the winter was significantly high ($P<0.001$) within breed and within groups too, whereas respiration rate values increase THI. table 4.2 and 4.3 indicate that the highest respiration rate values have Alpine goats (0.4% breath/min) and lowest respiration rate values in Boer breed (0.2% breat/min) during the summer, as respiration rate value decreases in THI, whereas respiration rate was lowest. Alpine has breed and highest respiration rate values have Boer goats (0.13% breath/min) during the winter. The difference may be due to the difference in the duration of residence of three breeds at the place of implementation of the experiment, which varies between the strain and the other, where the Boer breeds is modern while the Saanen is the oldest for residence and followed by Alpine. In addition to that, purity of breeds has a role too in this effecting.

These results were consistent with previous studies. Respiration is of particular interest as a physiological response increase. Respiration rate has been associated with increases of solar radiation.

Maurya et al (2013), reported that response respiration rate of lambs a significant increase ($p<0.05$) in respiration rate for groups, but the respiration rate values of increase was greater for G1 as compared to G2 lambs where respiration rate was in day 0 a.m. 35.3, 32.0 in open and p.m. was 62.4 in open and 57.8 in closed, at day 15 was 41.6, 37.6 a.m. in open and increased p.m. (60.in open, 56 in closed) in day 30 increased also a.m. 39.3 in open, 36.2 in closed and p.m. 64.3 in open and 61.8 in closed, the reason could be that the homoeothermic animals initially react to cold stress by enhancing the thermoregulatory mechanism, such as increase in respiration rate. These results are inconsistent with those of Okourwa (2014), who stated that respiration rate was significantly ($p>0.05$) between T1 (16.04 breaths/min) and T2 (18.98 breath/min), but T3 (23.01 breaths/min) was significantly ($p<0.05$) higher than T1 and T2.

Al- Haidary et al (2012), reported that respiration rate can be used to estimate the adverse effects of environmental temperature and as showed of heat stress.

Marai et al (2007), thus, the observed acceleration of respiration rate of goats on T3 indicated that they were exposed to severe heat stress which increases their panting. Panting is the major evaporating heat loss mechanism and respiratory frequencies tend to follow closely the heat loss by evaporation. Panda et al (2016), shown that the skin temperature had no significant differences the treatments, but respiration rate and pulse rate increased with the increase of heat stress within treatments ($p<0.05$), whereas respiration rate was 45.0, 123, 132 respectively.

The relative difference between the present study and previous studies might be due to different breeds, place, ages of goats, climatic changes and trial conditions.in previous a study on the same city as the present study. Darcan et al (2009), reported that in hot and humid climate skin temperature, respiration rate, pulse rate had significantly lower physiological data which was pulse rate 74.08 vs, 84.10 beat/min and respiration rate 65.65 vs 88.23 breath/min. In the cold the goats were just able to maintain the normal core temperature. Skin temperature on the wing decreased by 3-5c. Respiration rate and blood pH decreased. Elevation in heart rate (18beat/ min) and a cold tremor indicated a rise in heat production as given by (Bianca and Kunz 1978).

The average values of rectal temperature, respiration rate and pulse rate were observed to be lower in heat-adapted breeds than in cold-adapted breeds. During the summer, the values of rectal temperature and respiration rate were significantly ($p>0.01$) increased in all four goat breeds from their values during the spring and decreased during winter. But pulse rate increased both during the summer and winter from the values of the spring.

The increase in physiological responses rectal temperature, respiration rate and pulse rate during the summer was higher in cold-adapted breeds than in heat-adapted breeds. The decrease in rectal temperature and respiration rate during the winter was higher in heat-adapted goats than in cold-adapted goats. This may be attributed to breed difference and adaptation to different climatic conditions. Sirohi and Barbari goats are adapted to dry hot environment, while Gaddi and Chegu goats are native to the relatively cold and hilly regions. So, the results indicate that the difference in basal level and the variations in physiological responses under different environmental condition may be considered as an indication of adaptability of that animal to that environmental conditions and the level of stress (Banerjee et al 2015).

The present study reported that there was high significant ($p<0.001$) effect on the HT during the summer heat stress and cold stress during the winter was evident ($p<0.001$) in the breeds and also in the groups, where the highest value heat temperature of Alpine strain in the group of G (0.2°C) during the summer season, and the highest value in the Alpine strain also in the T group and has the Boyar strain in group G (0.32°C) during the winter. This may be due to variation in strain type, and to the difference in animal exposure times to thermal radiation during experiment implementation. Darcan et al (2008), stated that of both HT and udder temperature increased consequently from morning to afternoon (+3.2 and +2.5). Then, it at midnight returned to normal level. However, the head and udder temperatures of both cooled goats were significantly lower than non- cooled ones ($p<0.05$). That may be attributed to surface radiation effects of the earth, because the goats are subjected to heat the whole day by way of both convection and radiation.

4.3. Growth (Body Weight (BW) - Feed Intake) Responses

4.3.1. Body Weight

The impact change thermal climatic effect on body weight. Okoruwa (2014), shown that the rates of change in live body weight were 0.04, -0.74 and -2.02kg for goats on Alpine T, Saanen T and Boer T respectively. This detected that the rate of reduced for change in live BW was higher in Boer T compared with Saanen T. For present study the response body weight to change thermal climatic was changed significantly in goats during experiments. Body weight was different before and after experiment in Boer breed during spring and summer for T group, while the body weight was higher in Saanen breed for T group, but for G group there was no difference within all breed and within all seasons too as seen in table 4.6.

Ocak et al (2009), stated that the reason loss of live body weight because during exposed to solar radiation increase energy spend for heat dissipation through respiratory evaporation and subsequently to decrease in the amount of water available for storage. Helal et al (2010), indicated that exposed of goats to solar radiation for 12h losing in live BW and packed cell volume (PCV) of the goats. Maurya et al (2013), showed a significant ($p<0.05$) difference and that effect of cold stress on body weight and average daily gain is 14.89 (kg) in open during initial experiment and 17.12 (kg) in closed in final experiment. Reverdin et al (2013),

Table 4.5. Mean values of body weight (kg) initial trail and final trail during three Seasons for two type of groups (T) and (G)

Breed / Season	**Weighting period**	**Spring**	**Summer**	**Winter**	**P- value**					
					B	S	G	S*B	B*G	S*G
Alpine (T)	Initial	39.4 ± 4.4 ^{c}	48.4 ±2.2 ^{Bc}	66.2 ± 4.1 ^{A}	**	**	**	N.S	*	*
	Final	38.1 ± 2.9 ^{c}	48.9 ±1.9 ^{Bc}	68.5 ± 4.3 ^{BA}						
Saanen (T)	Initial	43.5 ± 2.5 ^{Bc}	44.8 ± 2.2 ^{c}	63.4 ± 2.9 ^{BA}	**	**	**	N.S	*	*
	Final	43.8± 2.9 ^{Bc}	47.3 ±1.9 ^{Bc}	66.3 ± 1.1 ^{A}						
Boer (T)	Initial	56.9 ± 5.2 ^{Bc}	52.9 ± 2.2 ^{c}	78.5 ± 5.4 ^{A}	**	**	**	N.S	*	*
	Final	54.3±3.8 ^{BAc}	57.0 ±2.6 ^{Bc}	77.9 ± 5.9 ^{BA}						
Alpine (G)	Initial	36.8 ± 2.6 ^{A}	39.6 ± 1.9 ^{A}	54.3 ± 4.2 ^{A}	**	**	**	N.S	*	*
	Final	37.8 ± 4.9 ^{A}	43.3 ± 2.2 ^{A}	57.1 ± 4.5 ^{A}						
Saanen (G)	Initial	45.7 ± 3.5 ^{A}	44.1 ± 3.0 ^{A}	59.1 ± 5.6 ^{A}	**	**	**	N.S	*	*
	Final	45.8 ± 3.5 ^{A}	45.6 ± 3.4 ^{A}	54.7 ± 2.5 ^{A}						
Boer (G)	Initial	39.2 ±11.0 ^{A}	44.8 ± 7.2 ^{A}	57.3 ± 4.0 ^{A}	**	**	**	N.S	*	*
	Final	46.9 ± 8.8 ^{A}	47.5 ± 7.4 ^{A}	57.4 ± 4.1 ^{A}						

B(Breed), S(Season), G(Group),S*B(intreactionSeason *Breed), (P<0.01)*, (P<0.001) **, N.S, no significant.

Observed there were high significantly for breed impact on live- weight (Alpine: 58.3 kg vs Saanen: 64.2 kg; SEM = 0.52; P < 0.001).

4.3.2. Feed Intake

According to NRC (2007), that in exposure goats to heat stress that reducing feed intake lead to increased maintenance requirements necessary for extra activities (e.g. muscle movements for panting, greater sweating, increased chemical reactions in the body and the production of heat shock proteins that consumes large amounts of ATP).

The results of the present study indicated that there was a significant increase in seasonal changes ($p<0.001$) in the amount of feed intake in goats. This effect was evident in the interaction between groups and seasons and breeds too, whereas the highest feed intake in group T during summer (6.9, 6.8, 6.5kg) for all breeds than in group G also during summer (6.5, 6.8, 5.2kg) for all of breeds, but the lowest amount of feed intake in group G during winter (4.7kg) for Alpine, (4.0kg) for Boer, (6.0kg) for Saanen then in group T during winter to (4.8, 5.5, 5.9kg) for Boer, Saanen, Alpine respectively, while were amount of feed intake moderate during spring for all breeds and for T and G groups too as seen table 4.6 blew. This increase in summer for feed intake in goats could be attributed to the period that coincides with lactation (mid of lactation), which increases the needs for feed intake and water intake for dual physiological performance (production performance and chemical performance) due to maintain balance and resistance to thermal stress.

There was no agreement to a finding of the previous study between Hirayama and Katoh (2004), who stated that the during heat exposure in goats reducing feed intake, but increased digestibility. However, when goats received the same restricted feeding in thermo neutral as they received in hot environment, digestibility increased and attributed that to this increase in apparent digestibility may be a complement to the low levels of energy resulting from the decreased feed intake at the similar context.

Nardon et al (1991), shown that in the spring and under shelter the daily feed intake and feed conversion significantly increased in kid (19.3°C) as compared to a group under climatic chamber in hot conditions (30.5°C). Reducing feed intake is a way to decrease heat production in warm environments because the heat increase of feeding, especially in ruminants, is an important source of heat production (Kadzere et al 2002),. Dairy goats under HS experienced losses in feed intake (−22 to −35%) and body weight (Brasil et al 2000; Hamzaoui et al 2012, 2013b),. Unpublished behavioural data indicated that the reduction in feed intake during HS is not due to a decrease in the frequency of feeding (both TN and HS goats had 41 eating bouts on average per day). However, eating time for each bout was dramatically reduced by 40%, explaining the lower amount of feed intake under HS conditions. Salama et al (2014), realized that goats preserved in heat tolerance in climatic pen long-practiced losses in feed intake by 22-35% and produced 3-10% lower milk with decline contents of fat, protein, and lactose and added to that despite the lessing in feed intake, blood non esterified fatty acids and blood glucose did not alteration in heat-stressed goats. Lower insulin secretion after meals as well as muscle dissolution are possible mechanisms to preserve the blood glucose levels in heat stress. Heat stress increased digestibility, which might partly recompense the lowering in feed intake. Reverdin et al (2013), suggested that there was significant change ($p<0.001$) for feed intake, which was in Alpine goats more dry matter per kg of body weight than Saanen (49.3 vs 45.9 g DMI/kg BW; SEM = 1.15; P = 0.02) and attributed that to promote the post-prandial heat production.

Table 4.6. Mean of feed intake (kg) interaction between groups and seasons

Breed	Season	T group	G group	p-valuese				
				S	B	G	B*G	S*G
Alpine	Spring	5.3 ± 0.4^{BA}	5.3 ± 0.4^{BA}	**	**	*	**	N.S
	Summer	6.5 ± 0.5^{A}	6.5 ± 0.6^{A}	**	**	*	**	*
	Winter	5.9 ± 0.4^{A}	4.7 ± 0.3^{Bc}	**	**	*	**	*
Saanen	Spring	5.5 ± 0.3^{BA}	5.8 ± 0.3^{BA}	**	**	*	**	N.S
	Summer	6.8 ± 0.3^{A}	6.8 ± 0.4^{A}	**	**	*	**	**
	Winter	5.5 ± 0.5^{BA}	6.0 ± 0.3^{A}	**	**	*	**	*
Boer	Spring	5.3 ± 0.4^{A}	5.1 ± 0.4	**	**	*	**	N.S
	Summer	6.9 ± 0.4^{A}	5.2 ± 0.5	**	**	*	**	**
	Winter	4.8 ± 0.4^{Bc}	4.0 ± 0.4	**	**	*	**	*

S(Season), B(Breed), G(Group),G*B(intreaction Breed*Group), * $p<0.05$, ** $p<0.01$, N.S, no significant

4.4. Behaviours Response

4.4.1. Water Intake

Table 4.7 below reflects the effect of regional changes and their response of water intake at different levels ($p<0.001$) of season in the different breeds in goats, for the results of the experiments carried out under the same climatic.

There were significant differences for water intake between the breeds in the seasonsnal variation, which were the highest ($p<0.001$) in winter as compared to the spring and summer, while there was ($p>0.05$) no change level of heat tolerance for water intake between groups for summer and winter except spring

($p<0.01$), which had change levels of response on water intake within groups (T and G).

Table 4.7. Mean of interaction water intake (L) between season and breeds

Season / Breed	Alpine	Saanen	Boer	P-value					
				B	S	G	B*S	B*G	S*G
Spring	16.2 ^{A}±0.5	15.8 ^{A} ±0.6	10.7 ^{B} ±0.7	**	**	*	*	N.S	*
Summer	34.8 ^{B}±1.0	48.8 ^{A} ±1.8	34.9 ^{B} ±1.2	**	**	N.S	**	N.S	*
Winter	11.2 ^{A} ±0.6	9.9 ^{B} ±0.7	7.0 ^{c} ±0.7	**	**	N.S	**	*	*

B (Breed), S (Season), G (Group),B*S (interaction breed*season), * ($p<0.01$), (**$p<0.001$), N.S, no significant

There were significant differences for water intake between the breeds in the seasonal variation, which were the highest ($p<0.001$) in winter as compared to the spring and summer, while there was ($p>0.05$) no change level of heat tolerance for water intake between groups for summer and winter except spring ($p<0.02$), which had change levels of response on water intake within groups (T and G). As seen in the table 4.7, that the highest water intake was for Saanen breed (49.31, 48.4L) in the two groups (G, T) where it was in the group 4 saanen gooats that mean 4 goats group for T group and 4 goats for G group for each breed, then in Boer breed (36.6, 32.9L) in the group (T, G), and then Alpine breed (35.7, 34L) in the group of T, G. On the other hand, the lowest water intake was found in Boer breed (6.8, 7.3L) for of both groups (G, T), then for Saanen breed (9.9, 10.1L) in the two groups (G, T) and Alpin (11.0, 11.4L) in both groups (G, T) during the winter. That may be attributes to that there is physiological and biochemical positive correlation between the rate of breathing and water intake under hot conditions to help on balance and increase water consumption, especially in the afternoon at the peak of the heat stress, which exceeds THI up of 80 as obtained in the present study. THI was 82.65 during summer.

The body needs to provide enough energy to complete the biological and physiological processes of balance until it reaches the normal range. The increase in water consumption in the summer season can be explained too by the increase in the proportion of water lost by the water through sweating to get rid of excess heat and increase urination, so that the body compensates for what may be lost water. The present results were in agreement with previous studies.

Table 4.8**.** Interaction water intake (L) between three seasons and three breed for two group (T, G)

Breed	**Season**	**T**	**G**	**P-value**					
				B	S	G	S*G	S*B	B*G
Alpine	Spring	$15.9^{BA} \pm 0.7$	$16.6^{A} \pm 0.8$	**	**	*	*	*	N.S
	Summer	$35.7^{B} \pm 1.6$	$34^{B} \pm 1.3$	**	*	N.S	*	**	N.S
	Winter	$11.4^{A} \pm 0.8$	$11^{A} \pm 0.9$	**	*	N.S	*	**	*
Saanen	Spring	$14.3^{B} \pm 0.9$	$17.2^{A} \pm 0.4$	**	**	*	*	*	N.S
	Summer	$48.4^{A} \pm 2.3$	$49.3^{A} \pm 2.7$	*	*	N.S	*	**	N.S
	Winter	$9.9^{A} \pm 0.8$	$10.1^{A} \pm 0.9$	*	*	N.S	*	**	*
Boer	Spring	$10.4^{c} \pm 0.9$	$11^{c} \pm 0.9$	**	**	*	*	*	N.S
	Summer	$36.6^{B} \pm 1.7$	$32.9^{B} \pm 1.8$	*	*	N.S	*	**	N.S
	Winter	$7.3^{B} \pm 0.8$	$6.8^{B} \pm 0.9$	*	*	N.S	*	**	*

B(Breed), S(Season), G(Group), S*G(intreaction Season*Group) * ($p<0.05$), ** ($p< 0.01$), N.S, no significant

Hirayama and Katoh (2004), imply that the effect heat exposure on water intake response, where water intake was (2.4) higher ($p<0.05$) compared with thermo neutral environment (1.9). (Ghosh 1982; NRC 1981), reports of water intake agree that climatically factors during beak summer and low precipitation increase water consumption to regulate body temperature. A strong relationship between respiratory rate and water consumption in goats is observed. As respiratory rate increased and more water was vaporized, more water was consumed. Consequently, a dramatic increase in water intake (+77%) and water evaporation (+207%) was observed in dairy goats (Hamzaoui et al., 2013a), while the results of the current study is inconsistent with Alamer (2009), who concluded that lactating Aardi goats possess a high capacity of withstanding water restriction when it was coupled with higher environmental temperature. Moreover, Reverdin et al (2013), noticed change effect on goats, whereas there was significantly for almost all the results, when Alpine breed expressed on a dry matter intake drunk more water than Saanen breed 2.82 vs 2.46 L/kg DMI; SEM = 0.073; P = 0.01). This may be attributed to either by their higher level of feed intake which promote the post-prandial heat production, or by the difference in cumin heat dissipated through sweating joined to coat color.

4.5. Milk Production

The difference of the milk production of three breeds (Alpine, Saanen and Boer) within two groups (T and G), where for per group there was 4 goats and for per goat have been done milking 4 time under the experiment during the spring and summer seasons was conducted as in table 4.9. Generally, the results of the current statistical analysis showed that there were high significant difference ($P<0.001$) within the breeds in the seasons (summer and spring). These differences did not appear ($p>0.05$) within the groups. It was the highest ($P<0.001$) average of milk production in the Saanen breeds (1.6, 1.1 kg) for T group, and (1.5, 1.3 kg) for G group during summer and spring respectively. Otherwise, in the Boer breeds it has been the least average of milk production (0.5, 0.5 kg) in the group of G, and in the group of T (0.7, 0.7 kg) too during the summer and the spring respectively .The increased milk production for Saanen breed can be explained in the climate of this region due to the fact that it was hybridized with a local breed. Saanen breed is also considered to be goat for milk production compared with Alpine and Boer goats. In addition, adapted Saanen breeds on the climatic of region. In contrast to the same reason for the Boar breed, which is the latest breed imported on the farm. In addition to that, goat is raised for the purpose of meat production more than milk production. Our results might be due to using different experimental conditions or age of goats and specific genes for breeds , as the present study stated that the recent results probably due to that lactation phase has played a role with amount yield milk which has increased or decreased influence by cycle of lactation. According the present study and system of farm in university its normal and physiological that reached the greater yield for milk production to peak at mid lactation which is faced with the summer seasons specifically in July and also increasing milk production during summer by effect at expermential goats have been artificial insemenitated. These results are similar to mean milk yield per day was 1.21±0.02 l, and mean total milk yield per day was 463±12 l. specifically. SEP had the lowest number of milking ewes ($P<0.01$) and, total milk yield per day was fewest among the five lambing periods ($P<0.001$). However, milk yield per ewe per day was significantly ($P<0.01$) greater (1.13FEP, 1.20APR, 1.26JUL, 1,32SEP, 1.16NOF L) in that period than it was in the FEB, APR, or NOV. Yield was highest in JUL and fewest in FEB lactations.

Abecia et al (2017), indicated same as the researcher that in lactations initiated in JUL and SEP, milk yield per ewe per day was significantly ($P<0.05$) higher in early lactation than it was in the others; however, in APR and SEP, per ewe production was highest ($p<0.01$) in mid-lactation, and conclude that it has been attributed influence of meteorological conditions on milk yield in sheep cannot be understood without evaluation production among milking periods in the same year and the phases of lactation, specifically if milking periods are long (Abecia et al, 2017).

This conclusion was agreement with our findings in the present study. And added to that, the feed system on the farm offered food to ewes therein the same diet year-round, which altering any probability for changes in food quality to have an influence on milk yield, which is a basic source of variation in milk secretion (Abecia et al, 2016).

Peana et al (2017), achieved that during winter, daily milk yield was negatively affected by wind chill index and the persistency of wind chill index at values fewer or equal. .During spring, milk yield declines at average and maximum THI higher than 65 and 68, respectively, and as hours of consequently at mild Discomfort level and discomfort level increased. Wind speed equal to or higher than 2.5m/s in winter and 4 m/s in spring and maximum wind speed equal to or up of 8 m/s in both seasons were detrimental to milk yield. Average wind amount between 1.5 and 4 m/s had beneficial responded during spring. Radiation up of 24 MJ/m2 was detrimental to milk yield during spring, where rain had a negative responded only in winter.

Milk yield decrease was as high as 19% for T max, 17% for Tavg and 15% for minimum wind chill index in winter and 19% for Tmax, and 17% for both Tmin and maximum THI during spring. The effect immediately (0 day and 1 day) to all unfavorable conditions in winter. And the timing of effect was more variable during spring, and shown that all these reasons return to many effect of factors (different seasonal meteorological conditions, pasture production, different management, supplementation as observed in the two seasons). Brown et al (1988), indicated that the exposure of goats to moderate heat stress for 5 weeks (34°C and 25% humidity, THI=79) decreased milk yield in Alpine but not in Nubian goats. Sano et al (1985), reported that Saanen goats exposed to moderate heat stress for 4 days (THI, 81 or 89) lost milk yield by 3 or 13% respectively.

As shown in Salama et al (2014), that milk yield in goat decreased as THI value increased. Also for each 1 unit increment of THI there is a decrease of 1 % in milk yield. According to NRC (2007), there is 30% increase in conservation requirements

Table 4.9. Amount of milk production during two seasons for three breed and for two group (lt) (T, G)

Breed (Group)	**Average milk production**		**P-value**			
Breed (Group)	Spring	Summer	season	breed	Season*breed	(T) * (G)
Alpine (T)	$0.7^{BC} \pm 0.1$	$0.9^{A} \pm 0.1$	**	**	**	N.S
Saanen (T)	$1.1^{BC} \pm 0.2$	$1.6^{B} \pm 0.2$	**	**	**	N.S
Boer (T)	$0.7^{C} \pm 0.1$	$0.7^{B} \pm 0.2$	**	**	**	N.S
Alpin (G)	$0.8^{BA} \pm 0.2$	$0.9^{B} \pm 0.1$	**	**	**	N.S
Saanen (G)	$1.3^{A} \pm 0.2$	$1.5^{A} \pm 0.1$	**	**	**	N.S
Boer (G)	$0.5^{B} \pm 0.2$	$0.5^{C} \pm 0.1$	**	**	**	N.S

* P<0.05, ** p<0.001, N.S, no significant

Under heat stress. Consequently, energy intake would not be enough to daily requirements for milk production especially in early lactating goats. HS during the dry period negatively affected immune cell functions in dairy cows before calving and also extended to the following lactation (Tao and Dahl, 2013).

In case of dairy goats under HS, it is unknown how much of the decrease in milk yield is due to reduced feed intake. However, dairy goats with feed restriction (−35% DMI) and supplemented with 1,3- butanediol had lower blood insulin, greater blood NEFA, and produced −22% lower milk yield than goats without feed restriction (Drackley et al, 1989). It seems that reduced feed intake could explain all of the milk yield losses under HS in dairy goats, but this assumption should be confirmed by pair-fed experiments in dairy goats.

Table 4.10. Pearson's correlation coefficients (r) of water intake with milk production in the spring

Spring	Spring	Water intake	Milk production
	1		
water intake	0.095	1	
Milk production	0.06	-0.43**	1

(p<0.01), * (p<0.001) **

Table 4.11. Pearson's correlation coefficients (r) of water intak with milk production in the summer

Summer	Summer	Milk production	Water intake
	1		
Milk production	-0.203	1	
Water intake	0.00215	0.489**	1

p<0.01, * (p<0.001) **

Ehrlenbruch et al (2010), reported that there was high positive correlation between daily drinking water intake and daily milk production (R=2.1, p<0.001) in the experimental period 1 and (R=1.9, P<0.001) in the experimental period 2, whereas Dahlborn (1987), attributed that's to conservation a normal osmolality in the extracellular fluid when consuming a much amount of dry feed.

The individual has to increase its drinking water intake and added to that Paquay et al (1970), stated that goats eating fiber much diet have to consume more water even the higher reduce of faecal water. Our study implies that high positive correlation and regression between daily water intake and daily milk yield (p<0.001), which was (r=-0.52% (p<0.001) spring/summer table 4.10 and 4.11. above and we explained that due to effect heat stress on goats which lead to consuming more of water , which influence on quantitate of milk. The results are inconsistent with Osborn et al (2002), who suggested that water intake was 3.40-

5.95% more ($p<0.05$) for per time heated versus ambient drinking water was provided to all trials.

On other hand, milk yield was more ($p<0.01$) in spring and summer when cows were consuming the ambient water treatment. Moreover, it is concluded that the continuous heating of the drinking water in dairy cows does not increase milk yield.

4.5.1. Milk Composition

During the current study, a statistical analysis of the milk composition of three breeds (Alpine, Saanen and Boer) was carried out during the spring and summer seasons and within two groups (T and G). Four-time for per season (spring and summer) the chemical analysis of the samples milk were conducted at TS%, SNF%, Fat%, protein%, Lactose%, Casein%, Urea mg/d1 %) as seen in table 4.12 and 4.13. In below.

The results of the statistical analysis showed that there were significant differences in some of this composition and disappeared in others.

In the spring, there were significant differences within the breeds (Alpine, Saanen and Boer) ($p<0.001$) of some milk components (SNF%, Protein%, Casain% and ($p<0.01$) for lactose% within T group during spring, while they disappeared ($p>0.05$) in the TS%, Fat% and Urea mg/d1% within Tgroup in the spring, and the absence of the change differences ($p>0.05$) of the all milk composition between the group G during spring table 4.12, On the same frame, there are noticeable changes ($p<0.001$) within the breeds for most of milk composition except TS% ($p<0.01$), Protein%, Urea mg/d1% ($p<0.001$) for T group in the summer. And there is also the absence of these differences ($p>0.05$) for all milk components in group G during the summer as seen table 4.13.

In general, the variances of the milk compositions were significantly higher in the spring than in summer. The current study indicates that the causes of the effects may be due to the way of handling animals during the process of milking ' seasonal changes, management and nutrition, feed additives and lactation stage also the quantities of water consumption. The heat stress goats produced milk with lower protein (−6 to −13%) and lactose (−1 to −5%) contents (Brasil et al 2000; Hamzaoui et al 2013a). Hamzaoui et al (2012), observed greater reductions in milk fat at early lactation (−12%) than at late lactation (−1%). (Joshi et al 1968), observed increased sweat secretion that contains protein and urea together with decreased protein intake under HS and that might have limited the availability of amino acids for milk protein synthesis. The effect of heat stress on milk fat is less clear and seems to be affected by the stage of lactation. The heat stress resulted in greater values of digestibility of DM, CP, NDF, and ADF (+3 to +9 points) in dairy goats and male goats (Hamzaoui et al 2013b). Mayer and Fiechter (2012), imply of earlier investigate on seasonal variations of goat milk compositions, that average main contents of Saanen goat milk in Austria were much higher than that of milk from the Saanen goat flock. In the study conducted by Kljajevic et al (2018), on seasonal variation of Saanen goat milk composition and the impact of climatic conditions. It is stated that all observed physic-chemical traits of Saanen goat milk except density, were significantly with seasonal variations over the year was milk composition (Fat%, Lactose%, NFDM%, Proteins%, pH, Freezing point (°C), Ash% and Tirable acidity (sh)) 3.59, 4.23, 7.70, 2.82, 6.73, -0.486, 0.63, 5.82, but Density ($p>0.05$) was 1.0273(g cm-3) in early lactation respectively, and 2.99, 4.05, 7.38, 2.70, 6.72, -0.462(c), 0.60, 5.80(sh), but density was 1.0270 for same physic-chemical characteristics in mid-lactation respectively and 3.66, 4.24, 7.76, 2.84, 6.69, -0.490, 0.64, 6.72 except density (1.0279) for same characteristics in late-lactation.

Respectively, and attributed that the higher freezing point temperature in mid-lactation was effect by the goats. Bjerg et al (2005), suggested that increase water intake during hot climatic and greater solar radiation. That was similar to our study. It was observed by Chen et al (2014), that the average values, range and climatic variation for composition of raw milk was higher total solids in autumn than in summer, but there is no difference is seasonal variation over the spring and winter. Less variability between fat is concluded. The protein and case in concentrations, ranging between 2.89% and 3.56%, however changes higher protein content was noticed during spring compared with the summer and autumn (DairyCo, 2013).

Table 4.12. Mean values milk composition in the spring season for group T and G

Bread	TS %	SNF %	Fat %	Protein %	Lactose %	Casein %	Urea mg/d1 %
Alpin (T)	**10.8± 3.1 ^{A}**	**6.5±2.2 ^{A}**	**4.4±0.9 ^{A}**	**2.7±0.9 ^{B}**	**3.1±1.1 ^{A}**	**2.1±0.7 ^{A}**	**0.33±0.02 ^{A}**
P value	N.S	**	N.S	**	*	**	N.S
Saanen (T)	**9.5± 3.8 ^{A}**	**5.9.9±1.9 ^{B}**	**3.6±2.5 ^{A}**	**2.3±0.8 ^{B}**	**3.1±1.04 ^{BA}**	**1.8±0.8 ^{B}**	**0.33±0.02 ^{A}**
P value	N.S	**	N.S	**	*	**	N.S
Boer (T)	**11.4± 3.7 ^{A}**	**7.5±2.4 ^{C}**	**3.8±1.4 ^{A}**	**4.11±1.4 ^{A}**	**2.9±0.9 ^{B}**	**3.01±0.9 ^{B}**	**0.33±0.03 ^{A}**
P value	N.S	**	N.S	**	*	**	N.S
Alpin (G)	**10.7±3.4 ^{A}**	**6.6±2.2 ^{B}**	**4.2±1.2 ^{A}**	**2.8±0.9 ^{B}**	**3.3±1.1 ^{A}**	**2.2±0.7 ^{B}**	**0.3±0.03 ^{A}**
P value	N.S	N.S	N.S	N.S	N.S	N.S	N.S
Saanen (G)	**10.3±3.1 ^{A}**	**6.1±2.1 ^{C}**	**4.2±1.1 ^{A}**	**2.5±0.9 ^{C}**	**3.1±1.1 ^{B}**	**1.9±0.7 ^{C}**	**0.3±0.02 ^{A}**
P value	N.S	N.S	N.S	N.S	N.S	N.S	N.S
Boer(G)	**11.6± 4.2 ^{A}**	**7.15±2.4 ^{A}**	**4.5±1.8 ^{A}**	**3.3±1.2 ^{A}**	**3.3± 1.1 ^{A}**	**2.9±0.9 ^{A}**	**0.37±0.02 ^{A}**
P value	N.S	N.S	N.S	N.S	N.S	N.S	N.S

*p<0.05, ** p<0.01, N.S no significant

Descriptive statistics of metrological measurements indicated that statistically significant differences of milk qualitative characteristics FA profile, lacto dynamo graphic and physiological parameters compared between seasons are shown that the average milk composition was DM. 10.86%, total nitrogen 2.82%, casein 71.58% of total nitrogen, fat 2.90, Lactose 4.41%, ash 0.73% as stated also that no significant changes for the two seasons on milk yield and gross composition, except lactose,

Table 4.13. Mean values milk composition in the summer season for groups Tand

Bread	**TS %**	**SNF %**	**Fat %**	**Protein %**	**Lactos %**	**Casein %**	**Urea mg/d1 %**
Alpin (T)	**12.1±0.53** ^{A}	**8.2±0.21** ^{B}	**3.9±0.48** ^{A}	**3.4± 0.32** ^{B}	**4.3± 0.3** ^{A}	**2.6 ±0.2** ^{B}	**0.45±0.002** ^{A}
P value	*	**	N.S	N.S	N.S	N.S	**
Saanen (T)	**11.2 ±0.3** ^{B}	**7.9± 0.3** ^{B}	**3.1± 0.1** ^{A}	**3.2± 0.2** ^{B}	**4.3± 0.1** ^{A}	**2.4±0.2** ^{B}	**0.42±0.002** ^{B}
P value	*	**	N.S	N.S	N.S	N.S	**
Boer (T)	**12.3± 0.5** ^{A}	**8.9 ±0.14** ^{A}	**3.4± 0.5** ^{A}	**4.1± 0.02** ^{A}	**4.2±0.1** ^{A}	**3.1± 0.1** ^{A}	**0.41±0.002** ^{B}
P value	*	**	N.S	N.S	N.S	N.S	**
Alpin (G)	**12.24±2.1** ^{A}	**8.6± 1.9** ^{B}	**3.6± 1.8** ^{A}	**3.8± 1.8** ^{B}	**4.2± 0.9** ^{A}	**2.9± 0.1** ^{B}	**0.42± 0.8** ^{A}
P value	N.S	N.S	N.S	N.S	N.S	N.S	N.S
Saanen(G)	**11.5±0.2** ^{A}	**8.2± 0.2** ^{C}	**3.1± 0.03** ^{A}	**3.5±0.2** ^{C}	**4.2± 0.1** ^{A}	**2.6±0.1** ^{C}	**0.41±0.001** ^{B}
P value	N.S	N.S	N.S	N.S	N.S	N.S	N.S
Boer(G)	**12.6± 0.7** ^{A}	**9.3± 0.01** ^{A}	**3.1± 0.7** ^{A}	**4.4± 0.1** ^{A}	**4.4± 0.1** ^{A}	**3.4±0.04** ^{A}	**0.42±0.01** ^{A}
P value	N.S	N.S	N.S	N.S	N.S	N.S	N.S

(*p<0.05), ** (p<0.01), N.S no significant

Which was significantly lower during summer. Concerning the morphometric analysis of the fat, the average diameter of milk fat globules (2.27±0.28µm) remained constant in both the period as considered by Salari et al (2016).

The noticed FA trends may be in part correlate to the difference in the pasture during two seasons. In fact, occurring the altering in milk fat composition is regarded on complex interactions between the composition of basal diet (forages, starchy concentrates), the FA profile of the diet and the lactation phase Chiliard et al (2014).

4.5.2. The Correlation between Water Intake and Milk Composition in Goats

The recent results of the study showed that there was no significant correlation between milk composition and water intake in goats during the spring, with the exception of SNF% and Protein% (-0.59, -0.39), which have relative a negative correlation coefficient ($p<0.001$) in the spring table 4.14 below, but this correlation of relationship was high significant ($p<0.001$) and has most compositions milk table 4.14 below. There was relative negative correlation coefficient between water intake and milk composition TS% and Protein% (-0.48, -0.4) in the summe, but no significant correlation coefficient for all of most milk components during the summer table 4.15 below and it could be explained that there was correlation by that increasing of water intake due to increased temperature during the summer. There has been correlation with deterioration quality of milk composition or type of breed milking way and type of nutrition components in the farm, that was in agreement with Kučević et al (2016), who attributed that the composition of milk also affected by a number of other factors such as the nutrition of dairy goats, breed and farm management.

On other hand, these results are inconsistent with Ali et al (2015), who shown that no change significant influence on milk composition for all treatment groups. Nejad et al (2015), in study of effects of water restriction following feeding for 2h and free access to water on feed intake, stated that milk yield and composition in Holstein cows under heat stress conditions that fat corrected milk (4% FCM) was greater ($p<0.05$) in 2hWR (41.1) as compared to FAW (36.6) treatment, milk fat% and more ($p<0.05$) for 2hWR (4.1) than FAW (3.5) group, for milk protein, urea nitrogen and solid nonfat were non-significant ($p<0.05$) between treatment and attributed increased fat% for 2hWR treatment led to more FCM could be related to higher apparent digestibility of fibre and ether extract and can be due to the effects of prolonged heat stress.

Moreover, Golheret et al (2014), stated that milk SNF, protein and solids percentages were changed significantly higher in cows consuming warm drinking in T2 (15-20c) and in T3 (35-40°C) as compared to cows consumed ambient cool drinking water. In addition, the crossbred cows consuming warm water (35-40) performed better as compared to the cows consuming comparatively cold water. But Reverdin et al (2013), concluded that Raw milk yield (p1=3.55, p2=3.61 and SEM=0.031) was not modified by heat stress, but the fat content (p1=33.3, p2=30.2 and SEM=0.31) and the fat yield declined, Protein content (p1=31.9, p2=31.3 and SEM=0.09) and protein yield were not affected by the increase in temperature.

Table 4.14. Pearson's coefficients of correlation coefficients (r) water intake with milk composition in the spring

	Spring %	Water intake %	TS %	SNF %	Fat %	Protein %	lactose %	Urea mg/d1%
Water intake	-0.72**	1						
TS%	-0.17	0.22	1					
SNF%	-0.44	-0.59**	-0.12	1				
Fat%	-0.23	0.09	-0.2	-0.069	1			
Protein %	-0.22	-0.39*	0.006	0.89**	-0.056	1		
Lactose%	0.200	0.16	0.07	0.12	-0.20	0.52*	1	
Casein%	0.20*	-0.16	-0.08	-0.11	0.21	-0.51*	-0.99**	1
Urea gm/di%	0.41*	-0.49	0.08	0.78**	-0.19	0.52*	-0.4	0.37

*(p<0.01), ** (p<0.001).

Table 4.15. Pearson's coefficients of correlation (r) water intake with milk composition in the summer

	Summer	Water intake %	TS %	SNF %	Fat %	Protein%	lactose %	Urea gm/d1 %
	1							
Water intake	ˉ-0.10	1						
TS%	-0.023	-0.48**	1					
SNF%	0.16	0.09	-0.63**	1				
Fat%	0.23	0.14	-0.34*	0.48**	1			
Protein%	0.09	-0.4**	0.33*	0.43**	-0.083**	1		
Lactose%	-0.18	ˉ-0.35	0.67**	ˉ-0.48**	-0.66**	0.09	1	
Casein%	0.18	-0.014	-0.47**	0.96**	0.51**	0.59**	-0.51**	1
Urea mg/d1 %	0.14	0.38**	-0.90**	0.79**	0.68**	-0.16	-0.76**	0.69

*(p<0.01), ** (p<0.001).

4.6. Concentration of Protein HSPP60 and HSP70

In the current study, PBMCs of Saanen goats, Alpine goats and Boer goats were utilized as cellular in vitro model for explain the comparative cellular tolerance during heat stress and cold stress, the cell viability and transcriptional induction of HSP70 and HSP60 were utilized as indicators to evaluate the differential cellular tolerance ability of different breed type. A comparison is supposed to be conducted between the three breeds to three seasons (spring, summer and winter) of heat stress proteins, to know the relationship between expression stability, goat types and seasonal variations. qPCR, expression data was produced in PBMCs samples across Saanen goats, Alpine goats, Boer goats. High quality RNA was obtained for all the PBMCs samples as shown by ration of 20.4, 9.1for HSP60 during summer and winter respectively and 30.6, 36.8 for HSP70 in summer and winter respectively. Additionally, apart from analyzing no shown significant during spring for HSP60 in the all-breeds, while was effects seasonal variations (summer and winter) were more clear. And this is what was for HSP70 for all breed in the summer and the winter, but the seasonal variation is slight significant in spring for HSP70 table 4.16 below. The percent decline in cell viability specifically post-heat stress was highest in PBMCs of Saanen breed followed by Alpine and Boer breed, the values (18.34, 13.9, 30.6) respectively, and (14.1, 14.7, 36.8) for Saanen, Alpine and Boer in the winter. Several different dairy goats' breeds analyzed. In the current study, Saanen breed present minimum concentration change with high significant ($p<0.001$) for all the HSP genes, (fold change for HSP60 (Saanen p=1.12, Alpine p=0.52, Boer p=1.75) in the spring. As compared to the summer season, whereas Boer breed indicated to maximum difference in concentration of HSP60 (concentration= 20.4, p=1.36) HSP70 (concentration= 30.6, p=0.77, $p<0.001$) in the summer, while Alpine breed showed minimum difference in concentration of HSP60= 4.4, p=0.42 and concentration of HSP70 (concentration = 13.9, p= 0.36) in the summer, but in the winter Saanen breed maximum difference in concentration of HSP60 (concentration= 4.3, p= 0.65) and concentration of HSP70 (concentration= 14.1, p =0.41) in the winter.

The current results reported that the Saanen breed is the highly adapted to the climatic changes in the study area, most of which withstand stress during peak summer and at low temperatures during the winter. This was demonstrated by the following percentage. The rate of heat exposure was 5.64% by thermodynamic protein (HSP60 and 31% HSP70), while the Alpine was 12.54% for HSP60 and 38% HSP70 followed by 9.81% for HSP60 and 27% HSP70 for Boer table 4.16 below. The high degree of exposure of the Alpine breed to heat stress can be explained by the Alpine hair dye, which has a role in gaining summer temperatures and resistance in the winter.

This impact climatic change may impact on performance of goats due to the assumption In addition to that, there is HSP70 in peak summer in order to stability the native conformation of proteins and maintenance of cell survivability (Beckham et al, 2004). The present results are in agreement with Paulo and Lopes (2014), who concluded that Saanen goats have adjusted their activities in response to local climate condition. But these results are inconsistent with Darcan et al (2009), who concluded that unpigmented goats are more adversely impacted by climatic stress. One of the most recognized cellular responses to hyperthermia is the increase in expression of heat shock proteins (HSP). Those HSP exert cytoprotective effects to assist folding of newly synthesized proteins and repairing and refolding damaged proteins under stress conditions (Kregel, 2002). That is in agreement with the results of present study and confirm the findings of Kishore et al (2016), who studied the relationship between expression stability of animal types and seasonal variations, whereas the high quality RNA was for all the PBMCs samples as finding by A260/A280 ratio of 2.07 for Sahiwal cows, 2.10 for HF cows and 2.08 for Murrah buffaloes. It is reported that several changes HSP genes analyzed, HSP70 exhibit changes in expressional level with fold change of 4.55 in HF cows ($p<0.001$), than fold change of 1.73 in Murrah buffaloes ($p=0.31$) and fold change of -0.31 in Sahiwal cows ($p=0.50$) during summer compared to winter. The related expression data HSP70 mRNA reported maximum induction in HF cows in summer season.

Table 4.16. Concentration of HSP60 and HSP70 for Alpine, Saanen, Boer breeds in the different of seasons

Hsp	HSP60 NG/ML						Hsp70 NG/ML					
season	spring		summer		winter		spring		summer		winter	
	Mix	Min	Mix	Min	Mix	Min	Mix	Min	Mix	Min	Mix	Min
Means for all breed	**7.5**	**1.13**	**11.1**	**0.85**	**6.7**	**0.62**	**21.1**	**0.66**	**20.9***	**0.53**	**21.6***	**0.76**
Saanen	9.4^{A}	1.12^{BA}	8.7^{A}	0.72^{A}	4.3^{B}	0.65^{A}	26.9^{A}	0.66^{A}	18.34^{A}	0.47^{B}	14.1^{A}	0.41^{B}
Alpine	8.7^{A}	0.52^{BA}	4.4^{B}	0.42^{BA}	6.5^{BA}	0.43^{A}	12.7^{A}	0.50^{A}	13.9^{B}	0.36^{B}	14.7^{A}	0.61^{BA}
Boer	4.3^{A}	1.75^{A}	20.4^{A}	1.36^{A}	9.1^{A}	0.78^{A}	23.6^{A}	0.83^{A}	30.6^{A}	0.77^{A}	36.8^{A}	1.26^{A}

The average with different letters within the same Colum differ significantly ($p<0.01$)

Table 4.17 with all the figurers below represents the strongly R^2 between seasonal changes and the impact of heat shock protein (HSP60, HSP70) concentration for different breeds (Alpine, Saanen, Boer), whereas figures describe extent of regression strength between them.

Table 4.17**.** Shown PCR efficiency for HSP for three breed during three seasons

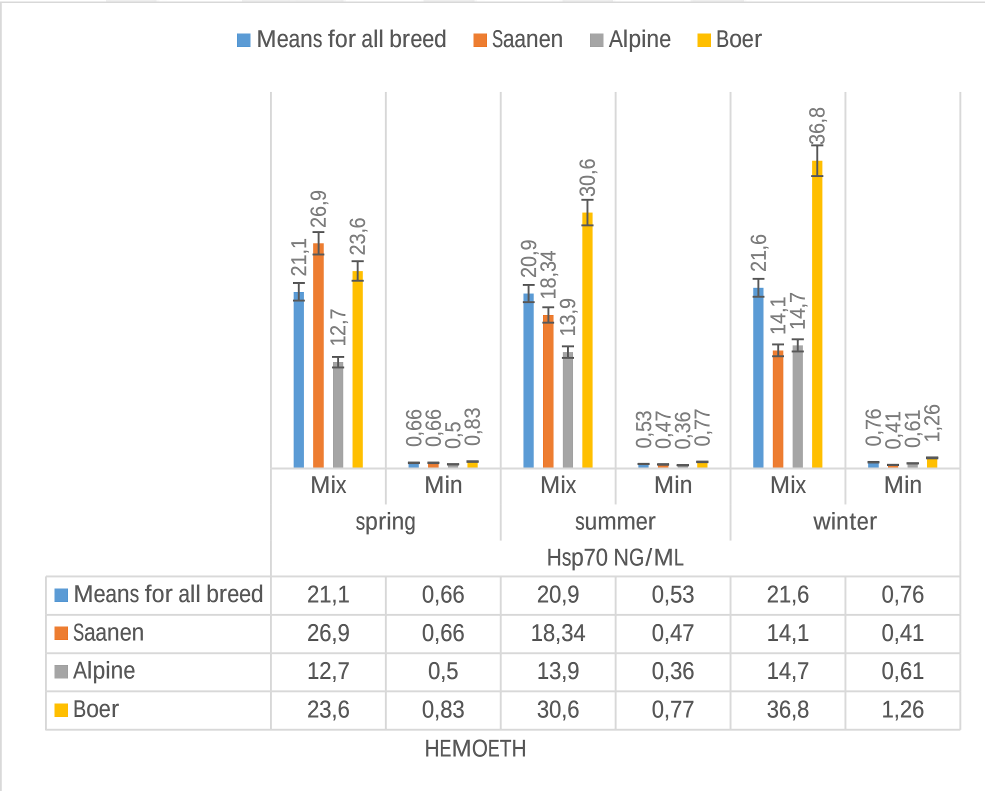
Season	HSP60 R^2**	season	HSP70 R^2**
Spring	0.9982	spring	0.9901
Summer	1	summer	1
Winter	0.9999	winter	0.9998

For example, the regression line were strong regression direction in spring. In other word, whenever increasing in seasonal changes occurred, that led to the changes in increasing of concentration of heat shock protein (HSP60 (R^2=0.9982), HSP70 (R^2=0.9901)), while in the summer regression was full direct proportion between seasonal changes and changes in concentrations of HSP60 (R^2=1) and HSP70 (R^2=1). But in winter also regression between seasonal changes and changes in concentration of HSP60 (R^2=0.9999), HSP70 (R^2=0.9998) sturdy direct proportion. The current results were in agreement with Kishore et al (2014), whereas regression between mRNA expression level HSP60 and season was (R^2=0.997), and mRNA expression level HSP70 was (R^2=0.991).

While Kishore et al (2016), the regression between mRNA expression level and HSP60 (R^2=0.996) and HSP70 (R^2=0.985). Sodhi et al (2013), stated that the lower expression for HSP70 in cattle provided an evidence for its better cellular.

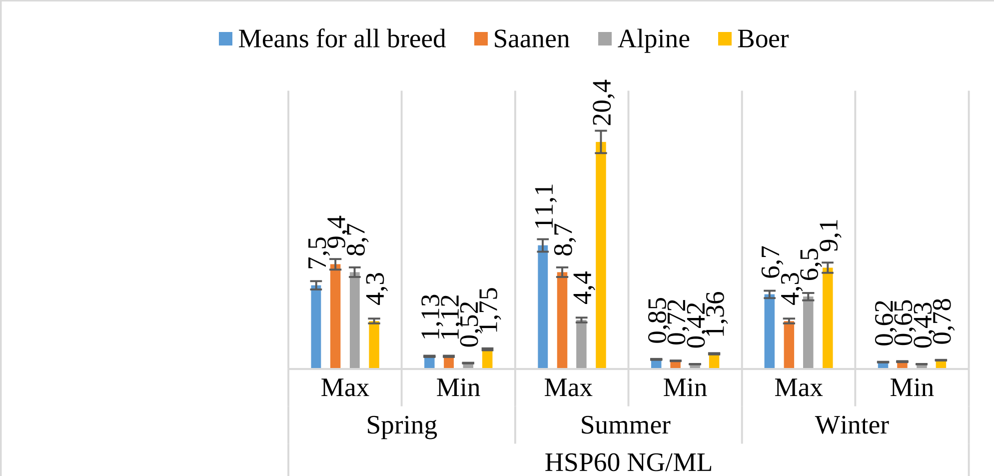
Accor's result of statistical analysis figure 4.2 showed that concentration of heat shock 60 and heat shock protein 70 for Saanen, Alpine and Boer breeds during spring, summer and winter.

Sahiwal analyzes many changes in dairy animals as cows and shows minimum expression fold change with no difference for all the HSP genes (fold change for HSP60=0.22, P=0.59, HSP70=0.31, P=0.51) during the summer as compared to winter season, while, HF cows indicated that maximum change in HSP70 (fold change=4.55, p<0.001) and Murrah buffaloes showed maximum change in HSP60 (fold change=1.07, p=0.03) in the summer and winter. He attributed that to the obtained higher abundance of HSPs that is crucial in providing cytothermal protection in the summer stress (Collier et al 2008; Sonna et al, 2002) in inconsistency with the present study. Yilmaz et al (2018), reported that mRNA gene expression levels for HSP60 in Saanen goats was 1.72 in the winter, whereas, mRNA expression level measured more than mRNA gene expression level measured during the spring



	spring Mix	spring Min	summer Mix	summer Min	winter Mix	winter Min
Means for all breed	21,1	0,66	20,9	0,53	21,6	0,76
Saanen	26,9	0,66	18,34	0,47	14,1	0,41
Alpine	12,7	0,5	13,9	0,36	14,7	0,61
Boer	23,6	0,83	30,6	0,77	36,8	1,26

Figure 4.1. different concetration HSP70 within breeds and within seasons



	Spring Max	Spring Min	Summer Max	Summer Min	Winter Max	Winter Min
Means for all breed	7,5	1,13	11,1	0,85	6,7	0,62
Saanen	9,4	1,12	8,7	0,72	4,3	0,65
Alpine	8,7	0,52	4,4	0,42	6,5	0,43
Boer	4,3	1,75	20,4	1,36	9,1	0,78

HSP60 NG/ML

Figure 4.2. Different concentration of HSP60 within breeds and within seasons
.

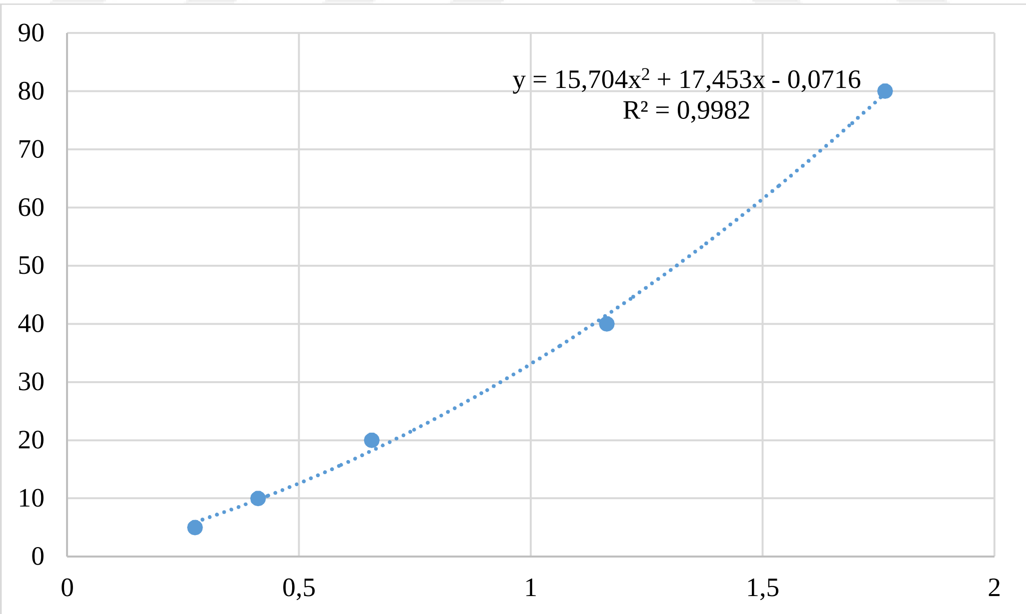


Figure 4.3. HSP60 in spring

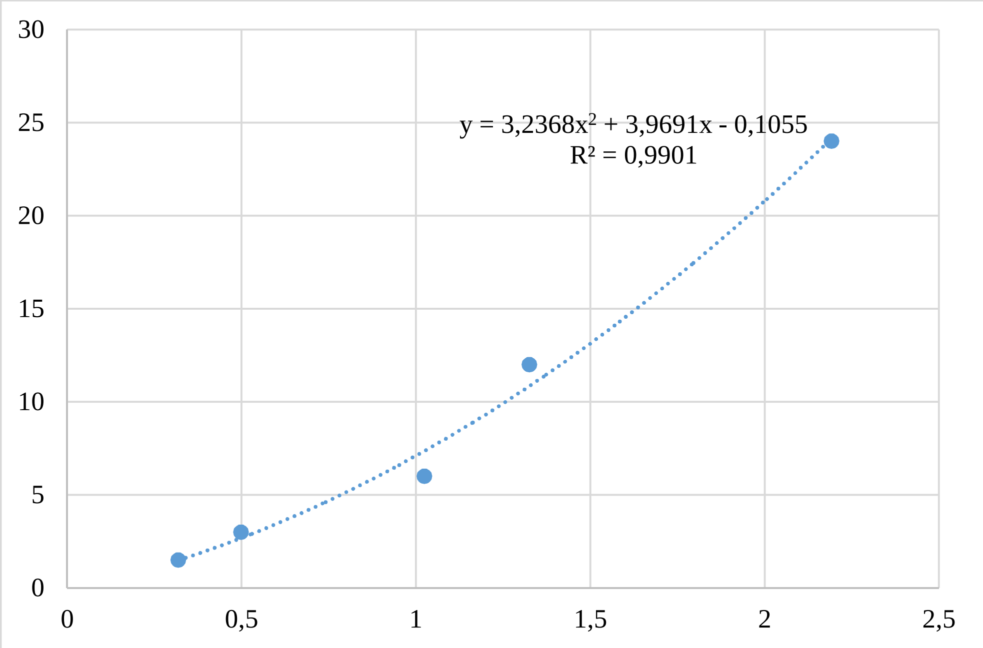


Figure 4.4. HSP70 in the spring

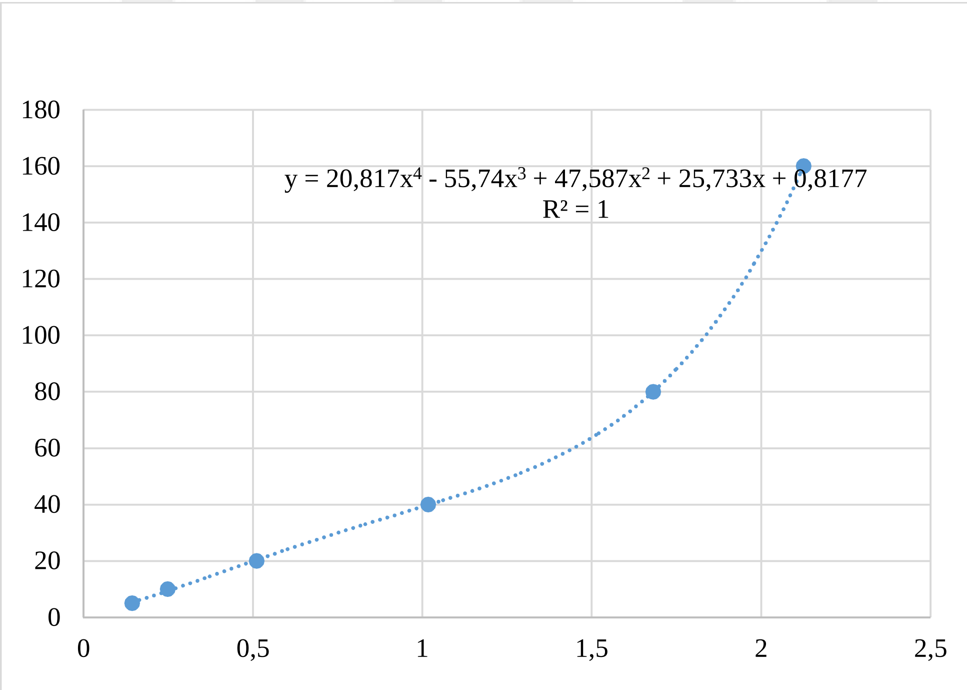


Figure 4.5. HSP60 in the summer

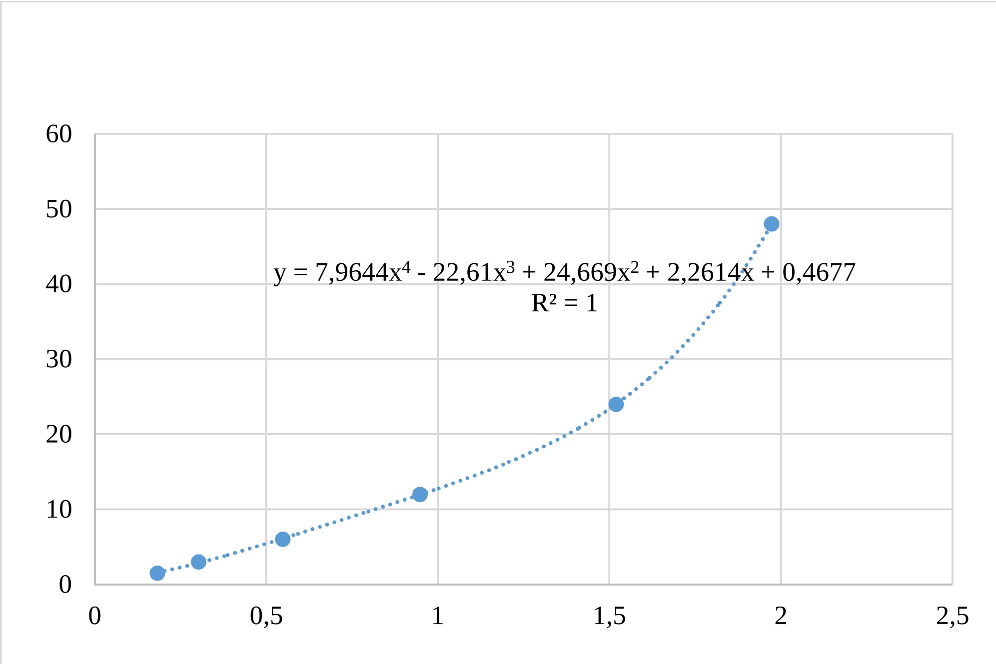


Figure 4.6. HSP70 in the summer

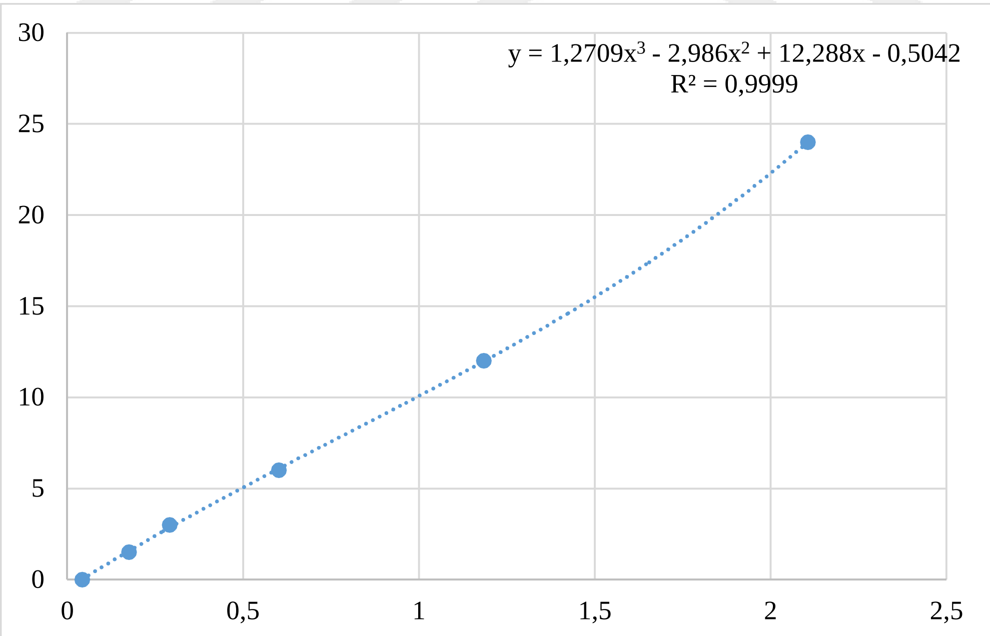


Figure 4.7. HSP60 in the winter

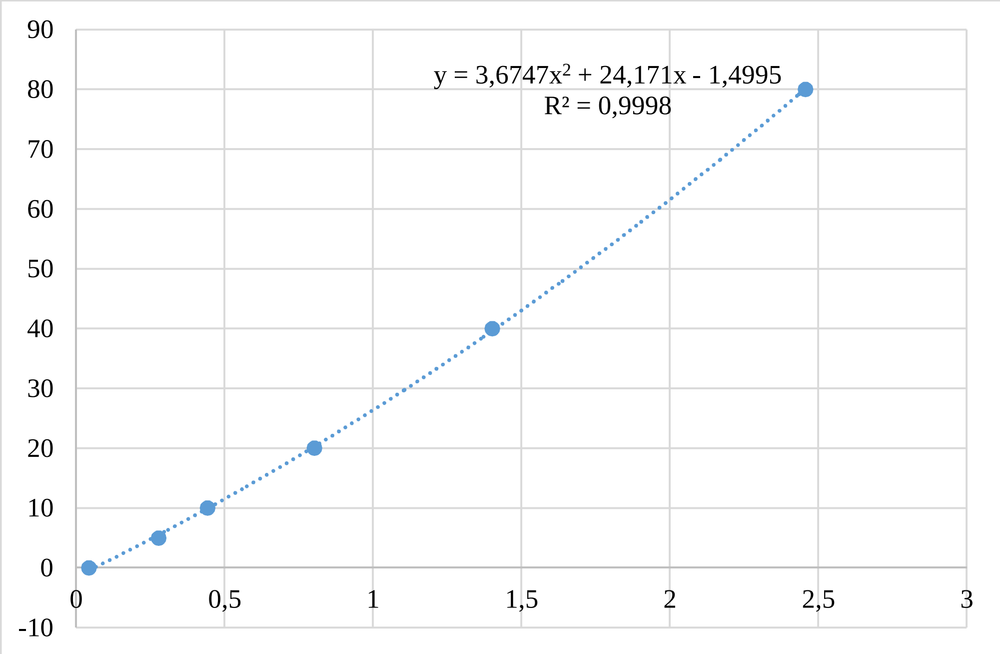


Figure 4.8. HSP70 in the winter

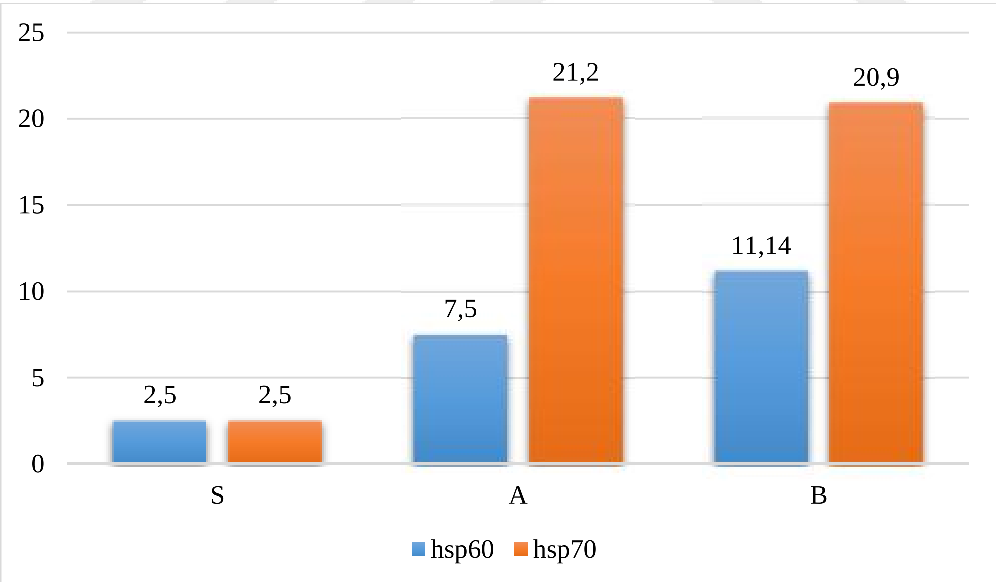


Figure 4.9. HSP60 and HSP70 within breeds

On the other hand, it is statistically no significant, which mRNA gene expression level was slight more (1.2 times) during the summer compared with mRNA gene expression level in the spring. While mRNA gene expression level for HSP70 was higher (1.68 times) than mRNA gene expression level in the spring, but it was insignificant for mRNA gene expression level in the summer and in the fall too, and attributed increase mRNA gene expression level for HSP60 in the winter due to the pregnancy of the goats. Dangi et al (2012), in comparison to I and II age groups in tropical region goats in the summer, stated that the expression of III age groups was (3.98) significantly higher ($p<0.05$), as compared to mRNA expression level 0.826 among the III age groups was non-significant ($p<0.05$) in the winter. On other hand, this mRNA expression was highly significant ($p<0.05$) of all groups in the summer as compared with the winter.

In investigation of Dangi et al (2012), it is shown that HSP70 mRNA expression 1.33 in tropical goats in the summer was significantly higher ($p<0.05$) in all groups corresponding the winter, and at the same study it is stated that could be for breed specific differences. Cao et al (2009), reported that higher heat stress level led to higher concentration of HSP70 in the testis and epididymis of mic. Dangi et al (2012), indicated to possible involvement of them to ameliorate deleterious impact of thermal stress so as to maintain cellular integrity and homeostasis in goats. Interestingly, increased expression of HSP70 during hypothermic stress has been observed in humans, and this increased expression of heat shock proteins was possibly a natural protective and homeostatic response of the cell to the deleterious effects of the hypothermic stress (Rada et al, 2010).

Manjari et al (2015), reported that the expression of HSP70 in Tarai buffalo was high significant ($p<0.05$) in the summer (2.37) compassion with what was in the winter (0.29). As concluded at the same study that the expression positively correlated coefficient with physiological parameters (RR, PR and RT) and added to that RR and HSP70 may act as characteristic physiological and cellular markers of heat and humidity stress in buffaloes. The same mechanism possibly holds well in case of temperate region goats too. Kumar et al. (2017) stated that HSP60 gene expression was significantly higher ($p<0.01$) for Sirohi (7.8) and Jhakrana (5.3) as compared with Barbari (2.1) goats.

On the other hand, HSP60 gene expression was significantly ($p<0.05$) higher former than the later in the summer, HSP70 gene expression. It was change significantly higher ($p<0.01$) for Sirohi (3.2) and Jhakrana (2.8) goats as compared with Barbari (1.7) goats during the summer. Further more It is stated that the morphologically, the small size and white coat color of Barbari goat may be attributed to better adaptability in semi- arid region that has better heat dispersion capacity even to be more efficiently Acharya et al (1995) ; McManus et al (2011), and this explanation was similar to that of the current study.

4.6.1. Correlation between Milk Production and Concentration of HSP60 and HSP70

According to the current study, there are no correlation, among the milk production and change in concentration of HSP60 and HSP70 during the spring and the summer seasons in goats. This correlation can be described in table 4.18, 4.19 below, with an adverse negative correlation among milk production and influence concentration of HSP60 and concentration of HSP70 by seasons change. Moreover, the correlation among milk production and concentration of HSP60 during the summer is lower than in the spring.

Table 4.18. Pearson’s coefficients of correlation concentration HSP60 and with milk productionin the spring and summer

	HSP60	Milk production	spring	summer
HSP60	1			
Milk production	0.14	1		
Spring	0.1	-0.05	1	
Summer	-0.09	-0.21	0.1	1

(P<0.05)

Table 4.19. Pearson’s coefficients of correlation between concentration HSP70 and milk production in the spring and summer

	HSP70	Milk production	spring	summer
HSP70	1			
Milk production	0.05	1		
Spring	0.1	-0.05	1	
Summer	-0.023	-0.21	0.1	1

(P<0.05)

In addition, the negative correlation with concentration of HSP60 was higher as compared to concentration of HSP70. This suggests that the relationship is inverse between concentration of HSP60 and concentration of HSP70 in goat.

Jyotiranjan et al. (2017) reported that exposure to high temperature is a major constraint in the productivity of the goats, and high ambient temperature accompanied with high humidity results in decline in feed efficiency and utilization, imbalanced.

Energy homeostasis, hormones secretions and production of blood metabolites. This led to direct and indirect losses total livestock owners as it reduces quality, impairs milk production and reproductive performance.

Salama et al. (2014) concluded that The RNA sequencing (RNA-seq) of milk cells that altering in milk composition were chaperon by down-regulation in the gene expression of casein, fat and lactose synthesis, and up regulation in the expression of genes concerning to milk composition.

4.6.2. Change in Concentration of HSP60 and Concentration of HSP70 in Goats with Difference Age in Different Seasons

Dangi et al (2012), has shown that no significance ($p<0.05$) for HSP60 mRNA expression within age groups in winter in tropical (0.360, 0.647, 0.826) and temperate (0.278, 0.441, 0.567) region goats, and the HSP60 mRNA expression level is higher with the increase in age of the goats, in tropical and temperate goats.

Additionally, HSP60 mRNA expression was change significantly ($p<0.05$) higher for age groups in tropical (1.68, 1.8, 3.98) and temperate (0.904, 2.61, 3.41) region during the summer as compared to the winter in goats.

This study was discordant with our findings for the current study, whereas reported that the concentration of both HSP60 and HSP70 expression level increased with the decrease in age of goats in three seasons (spring, summer, and winter) as shown in table 4.20 below. It might be the explanation of the difference of region and also specific difference strains goats for this study with previous studies. And it was inconsistent with our results.

Chung and Ng (2006), was in agreement with the findings of increase expression level of HSP60 with the increase of age that were noticed in male Fischer 344x Brown Norway rats, and attributed that may happen, as in old age, that apoptosis of cells increase and HSP60 will play an anti-apoptotic role. So its expression was increased with the increase of age. Indicated the current study indicates with significance ($p<0.05$) the change concentration of HSP60 and HSP70 level for both the spring and the winter, exceptionally the summer season and as a general it was concentration of both HSP60 and HSP70 level higher in the age of one year than in the age of two year for Alpine and Saanen goats.

Pfister et al (2005), reported that increased HSP60 mRNA expression might trigger its transcription in PBMCs to stop cell from damaging impact of heat stress as denaturation of proteins. Moreover HSP60 has role in refolding of proteins and block aggregation of denatured during the heat stress in goats.

Dangi et al (2012), found out that the HSP70 mRNA expression was significantly ($p<0.05$) lower in all age groups (age of 2 (0.331), age of 3 (0.412), age more than 3 (0.436) in tropical and in the age of 2 (0.945), age of (0.137), age more than 3 (0.943) in the moderate in winter compression to summer which were 1.06, 1.32, 1.48 in tropical for all age respectively and 0.998, 0.325, 1.33 for all age in the moderate respectively in the summer. Rada et al (2010), indicated that increased expression of heat shock proteins was possibly a natural protective and homeostatic stress.

Coa et al (2009), added that increasing heat stress level led to increasing concentration of Hsp70 in the testis and epididymis of mice, and it was in accordance with our findings as seen in table 4.20. Hyeder et al (2017), reported that amount of stress the expression of HSP70 varies with species, breed, age and type of tissue indicating the different thermo tolerance.

Paul et al (2015), demonstrated across study of expression of TLRI-10 gene and HSP60 and HSP70 in PBMCs in different seasons for three different age groups (group I, II and III in the age of 0-2, 2-5, and >5yrs respectively) for black Bengal goats, whereas stated that the mRNA expression of almost all the II TLR1-10, the mRNA expression of HSP60 in the winter 1.28, 0.8 and 1.02 times comparison with calibrator in the three age groups (0-2, 2-5 and more than 5 yrs) and the mRNA expression of HSP60 was higher (2.90, 4,6 and 6.6 times, respectively) than calibrator in the summer, and reported also that the mRNA expression in the winter was 1.5, 0.27 and 0.35 times compression with calibrator in three age groups

Table 4.20. Altering concentration of HSP60 and HSP70 according to age for Alpine and Saanen goats in the age of one and two in different seasons

Breed	**season**	**Age**	**HSP60**	**HSP70**
Alpine	spring	1	54.37±9.46	54.37±9.46
		2	19.94±3.21	19.93±3.21
Saanen		1	39.39±9.5	39.31±9.5
		2	27.89±4.89	27.89±4.89
Alpine	summer	1	9.16±2.23	22.04±8.34
		2	8.98±2.5	19.13±10.43
Saanen		1	7.49±1.39	6.67±1.29
		2	6.7±1.06	6.35±1.19
Alpine	winter	1	5.27±0.82	5.59±0.75
		2	5.27±0.82	3.25±0.86
Saanen		1	5.05±0.73	4.8±0.7
		2	2.52±0.68	2.99±0.74

(0-2, 2-5 and more than 5yrs respectively), as respect to the mRNA expression HSP70 was 2.6, 1.41 and 1.38 times more increased than calibrator in the summer and attributed that to short day length in the winter which causes decreased of immunity even reduced food availability and excessed thermoregulatory demands.

Table 4.21**.** The correlation Coefficients between age and HSP60

	breed	age	HSP60
Breed	1		
Age	-0.25*	1	
HSP60	0.05	- 0.35*	1

(p<0.01)*, (p<0.001) **

Table 4.22. The correlation Coefficients between age and HSP70

Seasons	breed	age	HSP70
breed	1		
Age	-0.05	1	
HSP70	0.05	- 0.36**	1

($p<0.01$)*, ($p<0.001$) **

The results of the statistical analysis of the current study showed that there was a correlation between age and concentration of HSP60 and HSP70 level, and that there was a negative correlation between the concentration of HSP60 (-0.25) and concentration of HSP70 (-0.3619) level and the goat age in the spring and this was evident with high significant ($p<0.01$) (-0.35) for HSP60 and (-0.307) for HSP70 during the winter season, while this significant disappeared ($p>0.05$) in the summer season. This is due to the reasons mentioned above. In a similar way, Yilmaz et al (2017), stated that both HSP60 and HSP70 mRNA expression decreased with the increase in age, whereas the highest HSP60 and HSP70 mRNA expression recorded in the youngest goats group I (1-2) year old as acompared to group ll (3-4years old) and group lll (5-6 years old). However, it was the same healthy Saanen breed subjected to the same management condition. Rea et al (2001), in their study at the individuals between 20 and 96 years old shown that the level HSP60 and HSP70 decrease with a decrease with age and that was similar with our findings as the results in this study confirm the finding. Njemini et al (2011), in their study upon humans in different age concluded that HSP70 level reduction depending on aging. And at the similar way Effros and Walford (1994), suggested that mRNA expression levels for HSP70 in aged on aging T lymphocytes.

4.7. Adaptation to Climates in the summer

Some studies states that readjustment encompasess two phases; ephemeral anxious phase followed by a prolonged period in which acclamatory homeostasis is advanced (Horowitz et al, 2004). The acclamation of new goat breeds to uninhabitable environments may be due to effect some factors which were management, environmental or was genetic factors. However, the present study shows that some indicators has been achieved to evaluate adaptation range by using physiological parameters, behaviors, milk production and milk compositions and concentration of level of both HSP60 and HSP70 for Alpine breed, Saanen breed and Boer breed during different seasons. According to our findings and indicators of this study, the adaptation of level for Saanen breed was the highest than Alpine breed and Boer breed that was based on results of physiological parameters as seen tables 4.3,4.4,4.5, whereas whilst Saanen bred was less impact. However, THI was 82.65 during the summer, Saanen breed capacity for heat tolerance evidence through results of milk production table 4.10 and milk compositions accordin to table 4.9 ,and tables 4.12, 4.13 feed intake table 4.7, water intake table 4.6 which Saanen breed was the highest for production and performance. Moreover, specific Darcan et al (2009) observed genetic and color of hair and residence in the region of study given Saanen breed eligibility and facilitated it for adapted on new environment. sheep for readjusted to climatic harsh conditions have to preserve the expression of their heredity performance potential, in the life, animal have to be show the least differential of original characteristics under such conditions. To achieve this, the animals have to be morphologically and physiologically equipped to resistance and increase in climatic, i.e. such traits should be supported by extra body heat dissipation as much as possible (Habeeb et al, 1997; Marai and Habeeb, 1998).

Concerning Alpine breed there was slight difference between Saanen and Alpine breed adaptation Alpine breed followed by Saanen breed in acclimation the previous tables have been explained that above, but as seen in results of concentration of level HSP60 and HSP70 Alpine breed was the least level in the summer and in the winter as depicted in the figures above. While Boer breed was the least adaptation due to several reasons such as specific genetic, is new in the region of study, the aim of the breeding.

4.8. Adaptation to Climates in the winter

The THI was 54.47, up index for winter. It was in the cold stress, for the physiological parameters in the winter in all of breeds were lower than the other seasons and Saanen breed the least influenced. On the other hand, it was found neglect different with other breeds within groups slight decrease with decrease AT in the winter, as lowering water intake with the decline ambient tempreture, whereas the lowest water intake for the Boer breed was equal for of both Alpine and Saanen breed. As respect to milk production according to systems of farm of university the goats were pregnant in this period, thereby couldn't to investigate this factor in the winter. The mean of concentration of level HSP60 was the least one (6.7) figure 4.7, but it was equal in both spring and winter (21.1, 21.6) respectively, while the lowest concentration of level HSP60 for Saanen (4.3) in the winter and the highest level for Boer (9.1). It was similar for level of concentration HSP70, which was the least level for Saanen (14.1) and the highest level for (36.8) during the winter, which led to that the Saanen breed much adapted than Alpine breed and Boer breed in the winter too, and the reasons could be attributed to the same reasons for adaptation during the summer.

5. CONCLUSION

As respect to physiological parameters and behavioral response to heat shock protein, the respiration rate and water intake were most evidenct as index for response heat stress and cold stress. Also as respect to milk production and composition, it couldn’t be based on them as index response heat stress due to need for that full year even ability understanding physiological strategies for all phases lactation over the year of cattle.

HSP60 and HSP70 concentrations could be utilized as a marker for thermal adaptation in goats, and information generated could be utilized for identification of specific breeds to cope up with the challenges of climate change.

Formulation of physiological to promote adaptability of goats to heat stress for enabling them express their full genetic possibility exposure to high temperature is a major constraint in the productivity of the goats in high ambient temperature accompanied with high humidity results in decline in feed efficiency it can be concluded that Saanen goats possessed better adaptability in the summer and in the winter too compression with Alpine goats and Boer goats in the raised under semi-intensive conditions, while Boer goats were lowest adaptability.

According to current study, Saanen breed is the most adaptability in comparison with Alpine breed and Boer goats, across physiological parameters, milk production, milk compositions, and changes in concentration of HSP60 and HSP70 levels during different seasons, which were slight different between Saanen breed and Alpine breed, and this could be attributed to hybridizing these breeds with yearling breeds. Therefore, they were less elevation under harsh conditions.

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