ACADEMY OF CLIMATE CHANGE EDUCATION AND RESEARCH
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Title of Thesis : **Impact of Heat and Nutrient Stress on the Growth and Reproductive Performance of Bucks**

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ABSTRACT

A study was conducted to assess the combined effect of heat stress and nutritional restriction on growth and reproductive performances in *Osmanabadi* Bucks. Twenty four adult *Osmanabadi* bucks (average body weight (BW) 16.0 kg) were used in the present study. The bucks were divided into four groups viz., C (n=6; control), HS (n=6; heat stress), NS (n=6; nutritional stress) and CS (n=6; combined stress). The study was conducted for a period of 45 days. C and HS bucks had *ad libitum* access to their feed while NS and CS bucks were under restricted feed (30% intake of C bucks) to induce nutritional stress. The HS and CS bucks were exposed to solar radiation for six hours a day between 10:00 h to 16:00 h to induce heat stress. The data was analyzed using repeated measures analysis of variance. Both C and HS groups showed significantly higher ($P<0.01$) body weight and body condition scoring (BCS) as compared to restricted feeding groups (NS and CS). The allometric measurements also were significantly ($P < 0.01$) lower in restricted fed groups (NS and CS) as compared to *ad libitum* fed groups in CS bucks as compared to other groups (C and HS). Among the scrotal measurements, Scrotal circumference afternoon (SCA) and scrotal length afternoon (SLA) differed significantly ($P<0.05$) between the groups. The highest semen volume ($P<0.01$) was recorded in C group bucks as compared to other groups. The significantly ($P<0.05$) higher mass motility and progressive motility was recorded in C group bucks. However, both mass motility and progressive motility did not differ between the

stress groups (HS, NS and CS). The highest plasma GH (P<0.01) was recorded in CS group and the lowest in rest all the groups (C, HS and NS). The highest plasma testosterone level was recorded in C group and the lowest in rest all groups (HS, NS and CS). The interaction between treatment and experimental days significantly (P<0.01) influenced body weight, BCS, allometric measurements, scrotal circumference, left testicular length and width, right testicular width, semen volume and growth hormone concentration. The higher expression of testicular Heat Shock Protein 70 (HSP70) Messenger Ribonucleic Acid(mRNA) was reported in HS goats. Testicular section showed significant changes for different stresses. The highest loss of spermatid density indicating decreased spermatogenesis was recorded in CS followed by HS and NS groups compared to C group. It can be concluded from this study that when nutrition is not compromised *Osmanabadi* bucks were able to withstand heat stress. This is evident from the non-significant difference on various growth and reproductive parameters studied between C and HS groups. Further, the study also revealed that *Osmanabadi* bucks possessed superior adaptive capability to combined stresses simultaneously. This is evident from the significant interaction of treatment and experimental days on majority of the parameters studied.

Key words: Combined stress, Goat, Growth, *Osmanabadi* bucks, Heat stress, Nutritional stress, Seminal traits, Testosterone.