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ORIGINAL ARTICLE

Comparative Grazing Behavioral Pattern of Four Goat Breeds Raised Under Semi-Intensive Rearing System During Hot-Humid Season

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Abstract

The comparative grazing behavioral activities of Jamunapari, Barbari, Sirohi and Jakhrana goats were observed during hot-humid season in semi arid region of India. Time spent in various activities during grazing from 9:30 AM to 3:30 PM was recorded using video recorder and the entries for grazing, moving and resting activities were made at every 10 minutes interval. The grazing time differed significantly (P<0.01) between Sirohi and Jakhrana breed, as grazing time was lower in Sirohi goats and higher in Jakhrana goats (510.99 ± 10.93 Vs 543.55 ± 8.76 sec). Out of total grazing period, the percent time devoted in grazing by Jamunapari, Barbari, Sirohi and Jakhrana breeds were 82.46, 83.62, 78.88 and 84.10%, respectively. The mean time spent on moving was 23.65, 23.35 and 21.76 and 20.80 seconds with the percent time of 3.62, 3.65, 3.36 and 3.22% out of total time spent in grazing field in respective four breeds. The mean resting time was similar among breeds that accounts to 13.92, 12.73, 17.76 and 12.68% of time out of total time spent in grazing filed. In first half of grazing period, goats grazed for longer time and took lesser time for resting; however, the resting and moving time was increased in second half of the grazing period. The clear diurnal pattern of grazing behavioural activities in all four breeds in the present study clearly indicated that goats avoid climatic stress during peak hours in grazing fields.

Keywords: Comparative grazing behavior, Goat breeds, Hot humid season.

1. Introduction

The goat (*Capra hircus*) is thought to have been the first animal to be domesticated for economic purposes (De Silva and Weerasinghe, 2014) and provides their owners with a vast range of useful products like meat, milk, skin and hair, and services (Peacock, 1996). A proper understanding of the behavior is of paramount importance to determine management practices particularly housing systems that optimize the economic returns of the livestock farming (De Silva and Weerasinghe, 2014). Goats have shown themselves to be extremely adaptable animal. In contrast, behavior of goats and its effect on the production and animal welfare have received little attention. Animal's first reaction to the environmental change is by modifying their grazing pattern in field to avoid/minimize climatic stress (Sharma *et al.*, 1998; Bhatta *et al.*, 2001) and this strategy of changing their behaviour must be regarded as their adaptation (Solanki, 2000). Most of the studies conducted on grazing animals and their behavioral aspect were correlated with climate and ingestive behaviour (Malechek, 1990; Solanki, 1994; Penning, 1995; Sharma *et al.*, 1998), however, the information on comparative responses of different breeds of goats during stressful period is lacking. Therefore, the present study was planned to record the behavioural responses of four north-western goat breeds of India during hot humid season in the grazing field so as to optimize the grazing period for grazing goats during stress period for maintaining productivity through supplementation strategies in semi intensively reared goats.

2. Materials and Methods

The experiment was conducted at the ICAR-Central Institute for Research on Goats (ICAR-CIRG). Farah, Mathura, India (27°10′N latitude, 70°02′E longitude at an altitude of 169 MSL in Yamuna ravines. The climate of the area is semi arid to dry sub humid with distinct seasonal variability. The mean maximum, minimum, daily temperature, dry and wet

bulb temperature, relative humidity, vapor pressure, total rainfall, total sunshine and THI during experimental period (14-24 September, 2015) were 38.63, 25.75, 32.19, 32.92, 26.25°C, 60.42%, 22.25 mmHg, 6.0 mm, 90.8 h and 83.99, respectively. The THI, a measure of heat stress to animals, was calculated as per Marai *et al.* (2001). THI = DB - {(0.55 - 0.55 RH) (DB - 58)}.

Where DB = dry bulb temperature, ^{o}F and RH = relative humidity, %. The obtained THI values were categorized as: <82 = absence of heat stress; 82 to <84 = moderate heat stress; 84 to <86 = severe heat stress and over 86 = extreme severe heat stress. Based on the recorded THI value of 83.99 indicated that the study period falls under severe heat stress range.

Forty male goats, 10 each of Jamunapari, Jakhrana, Sirohi, and Barbari breed, aged 8 months were selected for the study. The natural pasture composition of the selected pasture area was *Cenchrus ciliaris, Cenchrus setigerus, Sida rhombifolia, Cynodon dactylon and Saccharum spontaneum.* From the available natural pasture land, the plants mostly preferred by goats are *Cenchrus ciliaris, Cenchrus setigerus and Cynodon dactylon.* The goats were housed breed wise separately under cemented roofed shed and were allowed for grazing from 9:30 AM to 3:30 PM during the daytime. After grazing, they were fed with ad libitum gram (*Cicer arietinum*) straw and were provided free access to water in the paddock.

One goat from each breed was selected randomly at the interval of two days, and the same selection pattern followed for five goats from each breed. The selected goats were point marked for easy identification and observed continuously by video graphy using digital video recorder (SONY Handi camcorder Model DCR-SR67 with 60X zoom) throughout the grazing hours for two days. Total recording time was 140 min/day (70 minute forenoon and 70 minute afternoon) during grazing hours. The entries of behavior activities were recorded for 10 minutes continuously with an interval of 2-5 minutes between entries. Goats were not interfered and disturbed during this recording period and provide complete freedom within the selected pasture land. The activities observed during study were defined as (1) Grazing - grazing and browsing while moving. (2) Moving - walking from one place to another without grazing or browsing. (3) Resting - standing and sitting for rest or rumination.

The data were analyzed using SPSS 16.0 software. The breed differences for each grazing behavioural traits were tested during forenoon, afternoon and their mean time using one way ANOVA test. The time differences (forenoon, afternoon) for each grazing behavioural traits were tested using independent t-test. The significance were considered for values having P<0.0001, P<0.001, P<0.01, P<0.05.

3. Results and Discussion

The information on time spent by different goat breeds during stressful period in grazing field will help in optimizing the grazing period for grazing goats for maintaining productivity through supplementation strategies in semi intensively reared goats. The mean time spent by goats on different activities during grazing period is presented in Table 1 and Fig 1. The total time spent by goats in grazing field in Jamunapari, Barbari, Sirohi and Jakhrana breeds were recorded to be 653.93, 639.69, 647.79 and 646.34 sec, respectively. Perusal of Table-1 revealed that the mean time spent by goats in grazing was similar among goat breeds except Sirohi goats spent significantly (P<0.05) lower time in grazing. The grazing time differed significantly (P<0.01) between Sirohi and Jakhrana breed, as grazing time was lower in Sirohi goats and higher in Jakhrana goats (510.99 ± 10.93 Vs 543.55 ± 8.76 sec). Sharma *et al.* (1998) reported that Barbari goats spent significantly more time in foraging than Jamunapari goats during rainy season. Out of total grazing period, the percent time devoted in grazing in Jamunapari, Barbari, Sirohi and Jakhrana breeds were 82.46, 83.62, 78.88 and 84.10%, respectively which is higher than the time spent on various grazing behavioural activities in goats (Solanki, 2000). The diurnal pattern in time spent in grazing by goats revealed that time spent in grazing in afternoon hours was significantly lower in Jamunapari (P<0.0001), Barbari (P<0.013), Sirohi (P<0.0001) and Jakhrana (P<0.001) goats, as compared to forenoon hours. The time spent by respective four breeds in grazing out of total period during forenoon hours were 88.80, 87.71, 87.86 and 88.94 % as compared to 78.13, 80.56, 71.39 and 79.70 % in afternoon hours.

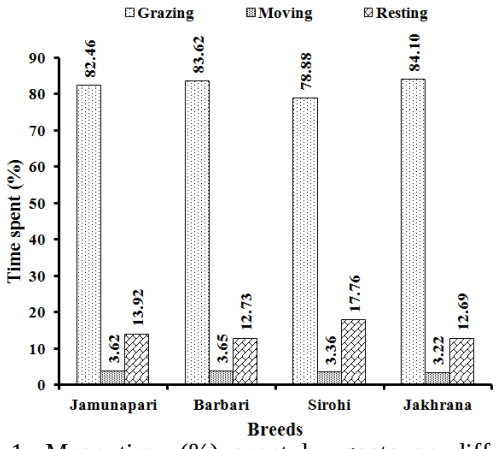

Fig 1: Mean time (%) spent by goats on different activities during grazing hours.

Table 1: Mean time spent (sec) by goats on different behavioral activities during grazing hours

Behavioural Activities	Time	Jamunapari	Barbari	Sirohi	Jakhrana
Grazing	Forenoon	566.85±9.48	559.07±10.17	555.33±8.19	562.15±8.92
	Afternoon	510.04^{A}±5.07	509.31^{A}±16.27	464.04^{aB}±8.78	523.85^{bA}±2.89
	P-Value	0.000	0.013	0.000	0.001
	Mean	539.26^{A}±9.45	534.90^{A}±8.70	510.99^{aB}±10.93	543.55^{bA}±8.76
Moving	Forenoon	21.43±1.65	20.07±3.03	18.41±1.14	17.16±1.51
	Afternoon	25.67±1.96	26.15±3.09	24.24±2.35	24.34±0.90
	P-Value	0.06	0.433	0.000	0.034
	Mean	23.65±1.94	23.35±2.04	21.76±1.52	20.80±1.76
Resting	Forenoon	50.04±12.70	58.23±11.54	58.31±7.33	52.74±9.54
	Afternoon	117.11^{A}±6.97	96.77^{A}±15.07	161.76^{B}±9.60	109.10^{A}±5.83
	P-Value	0.006	0.254	0.000	0.003
	Mean	91.03±10.81	81.44±8.70	115.04±11.27	81.99±9.54

Values bearing different superscripts in small case (P<0.01) and capital case (P<0.05) within rows differed significantly.

The time spent in moving of goats without grazing and browsing in grazing field did not differ significantly among breeds in the present study. The mean time spent on moving was 23.65±1.94, 23.35±2.04, and 21.76±1.52 and 20.80±1.76 seconds with the percent time of 3.62, 3.65, 3.36 and 3.22% out of total time in grazing period in Jamunapari, Barbari, and Sirohi and Jakhrana goats, respectively. Solanki, (2000) reported that Zalawadi goats spent 7.8% of total time in walking/moving without grazing/browsing in grazing fields. The movement of goats in afternoon hours was significantly higher in Jamunapari (P<0.06), Sirohi (P<0.0001) and Jakhrana (P<0.034) goats, as compared to forenoon hours.

Similar to the trend of moving of goats of all breeds in grazing field, the mean resting time was similar among breeds that accounts to 13.92, 12.73, 17.76 and 12.68% of time out of total time spent in grazing filed in respective four goat breeds which corroborates the findings of De Silva and Weerasinghe, (2014) in Jamunapari and Sannen crossbred goats. However, Sharma *et al.* (1998) opined that Jamunapari goats spent more time on resting than Barbari goats in different seasons. Similarly, the resting time in afternoon hours was significantly higher in Jamunapari (P<0.006), Sirohi (P<0.0001) and Jakhrana (P<0.003) goats, as compared to forenoon hours. The resting time was significantly (P<0.05) higher in Sirohi goats (161.76±9.60 sec) than all other breeds during afternoon hours. Similar trend of time spent on grazing, moving and resting was reported in Kutchi goats (Bhatta *et al.,* 2001) in semi arid range land.

4. Conclusion

The clear diurnal pattern of grazing behavioural activities in all four breeds in the present study clearly indicated that goats, irrespective of the breed, avoids climatic stress during peak hours in mid day in grazing fields by reducing the time spent on various behavioral activities in afternoon hours as compared to forenoon hours. The significantly lower time spent on grazing by Sirohi goats during hot humid season exerting severe heat stress suggests that the grazing time shall be started earlier in forenoon hours and supplementation strategies must be followed in sheds for Sirohi goats as compared to other breeds for maintaining optimum productivity during stressful period.

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