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Research Article

DIURNAL AND SEASONAL ACTIVITY PATTERN OF THE BLACKBUCK (*ANTELOPE CERVICAPRA*) IN THE SORSAN GRASSLAND, RAJASTHAN

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ABSTRACT

The present paper investigates the diurnal and seasonal activity of blackbuck (*Antelope cervicapra*) in Sorsan grassland, Baran, Rajasthan. Data were gathered for eight days per month starting from early in the morning to late evening. Activity pattern of the selected blackbuck of particular age/sex was recorded by using focal animal sampling method. Observations were conducted on selected adult males, adult females, sub-adult males, sub-adult female and fawn. This study suggests that blackbuck dedicated significantly more time to foraging than to other diurnal activities. Blackbuck of all age classes devoted the least time to standing and spent the similar amount of time moving. Present investigation proposes that there is a definite pattern of activities in the fixed hours of the day which shows variation with the seasons.

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INTRODUCTION

The blackbuck (*Antelope cervicapra*) is a medium-sized antelope native to the Indian subcontinent. It is considered to be most handsome member of the 'Bovidae' family (Jhala and Isvaran, 2016). Over last hundred years the range and numbers of blackbucks have declined (Jhala, 1992, Meena *et al.*, 2017a). The more recent report suggest that numbers are marginally increasing and the population can be reasonably described as secure due to increase in protected areas and better conservation policies in some places (Bashistha *et al.*, 2012). Blackbuck is listed in Red Data Book of International Union for Conservation of Nature and Natural Resources as least concern (IUCN, 2017) and in Convention of International Trade for Endangered Species (CITES) of Wild Flora and Fauna is categorized in Appendix III. In India, hunting and poaching of blackbuck are prohibited under Schedule I of the Wildlife Protection Act of 1972 (Meena and Chourasia, 2017a).

Blackbucks are found in wide range of habitat but it attains greatest densities in semi-arid grasslands (Jarman, 1974). Blackbuck requires water regularly, which restricts its distribution, to only those areas where surface water is available almost throughout the year. It is easily adaptable to wastelands, marginal agricultural fields and cultivated areas (Meena *et al.*, 2017b). Blackbucks are principally grazers and

mainly forage in the small area, but in summer may migrate to long distances for the search of water and food (Jhala *et al.*, 1992). Blackbucks have evolved mechanisms for water conservation and when deprived of water, they can increase the concentration of urea in their urine and reabsorb water from their faeces. Strong eyesight and speed are the primary defense features of blackbuck against predators. Blackbucks are mainly active during the day, and for most of the times, they live in small herds (Meena and Chourasia, 2017b). It has imperative ecological roles in the grassland ecosystem. Blackbuck performs various activities during the daytime. The present investigation deals with diurnal, seasonal and annual activity pattern in selected individuals of blackbuck of different age/sex class.

MATERIAL AND METHODS

Study area

Present investigation of a diurnal, seasonal and annual pattern of activities in blackbuck was performed in Sorsan grassland. Sorsan grassland is known for the conservation of blackbuck and chinkara. It is located in Anta tehsil of Baran district of Rajasthan (Figure 1). The protected area spreads between Amalsara and Sorsan village. It stretches over 35 square kilometres between right main canal of the Chambal and the

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Parvan River. The state government in 1984 has banned poaching or hunting of animals in Sorsan region under wildlife act 1972. It is 50 km east of Kota (25.00 -25.80 N, 76.12-76.180 E) having scrubby vegetation and numerous small water bodies, which harbour amazing varieties of birds as well as animals.

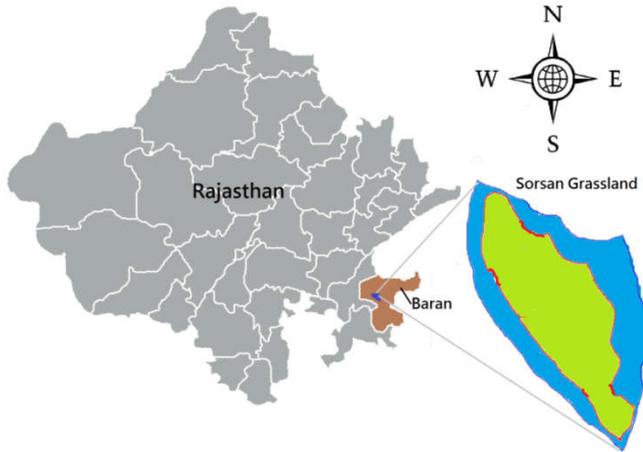


Figure 1 Location map of Sorsan grassland in Rajasthan, India.

The Selected habitat has a dry climate except in the monsoon seasons. The winter season spreads from the end of November to mid of February and summer season spans from mid-March to end of June. The period from the end of June to mid of September is the monsoon season followed by the months October to mid of November constitutes the post-monsoon or the retreating monsoon. The average rainfall in and around study area is 824.31 mm. January is the coldest month with the average daily maximum temperature of 24⁰ C and the average daily minimum temperature of 10⁰ C.

Activity budget and diurnal activities

During present investigation, data were recorded on basic diurnal activities. The behaviour of the selected blackbuck of particular age/sex was recorded by using focal animal sampling method (Altman, 1974). Starting with an initial observation (time 0), the behaviour of the individual male and female recorded continuously for 5 minutes with an interval of 10 minutes (Prasad, 1985), thus making 4 observations in 1 hour. Each observation site was chosen to minimize the risk of disturbance to the blackbuck while maximizing the chances of observations. So, most observations were made within 50-200 m of the focal animal or individual.

Activities were divided into following major activity categories: Foraging, walking, standing, resting and others. Foraging includes grazing (head down, eating grass and other vegetation) and browsing (eating bush, plant and tree material without grass). Walking refers to the movement of blackbuck resulting in a change in location which includes running and trotting. Standing includes static at a place which includes scanning, social or matting activity. The animal was considered to be at rest when it was lying on the ground, resting also includes ruminating. The category "others" included such behaviours as, grooming, play, sparring, aggression, chase, dominance display, scratching, urination-defecation, rubbing, marking, and alertness to the observer (that primarily occurred

at the start of observation). Multiple behaviours were recorded if observed at the same time, but the dominant behaviour was used for timing.

Observations were conducted on selected males, females, sub-adult males, sub-adult female and fawn. Individual activities of all age-sex categories of blackbuck were analyzed in hourly, monthly and seasonal basis and percentage activity was calculated by dividing total time spent / number of time in particular activity in that hour/month/season by total time spent / total number of records in all activities in that hour/month/season.

Field binoculars and mobile-based GPS were used throughout the study for observation of the study animal in the field. Photographs of blackbucks were taken using a high-resolution camera.

RESULTS

Activity budget

During the present investigation, it was observed that blackbuck invest maximum time in foraging followed by rest, walk and standing (Table 1 and Figure 2). The maximum foraging percentage \pm SD was observed in Adult female (34.49 \pm 0.35). There was no significant difference in foraging percentage in the adult male, sub-adult male and sub-adult female. The pattern of walking, standing or resting was almost similar in all studied age/sex individuals. Fawn spends their maximum time in resting (31.28 \pm 2.50) as compared to rest of individuals. Fawn in general also spends more time in walking and standing as compared to other individuals.

Table 1 Percentage frequencies (Mean \pm SD) of the important activities of blackbuck in Sorsan

	% Foraging \pm SD	% Walking \pm SD	% Standing \pm SD	% Resting \pm SD	% Other \pm SD
Adult Male	31.90 \pm 1.58	17.51 \pm 1.36	14.54 \pm 0.80	28.05 \pm 2.51	7.87 \pm 0.95
Adult Female	34.49 \pm 0.35	17.82 \pm 1.53	13.33 \pm 1.18	26.59 \pm 2.24	7.77 \pm 0.60
Sub-adult Male	31.05 \pm 1.49	18.49 \pm 0.50	12.62 \pm 1.41	28.75 \pm 3.06	9.05 \pm 0.70
Sub-adult female	31.62 \pm 1.10	18.92 \pm 0.77	11.69 \pm 2.76	30.77 \pm 3.07	7.00 \pm 1.11
Fawn	24.25 \pm 3.06	18.97 \pm 0.23	16.00 \pm 3.75	31.28 \pm 2.50	9.44 \pm 0.85

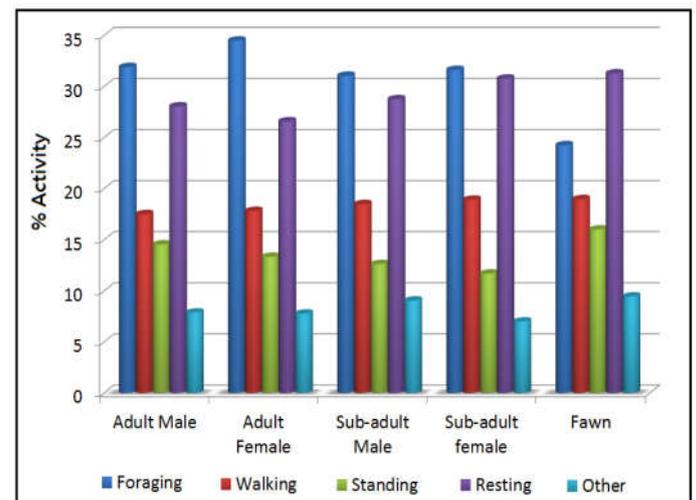


Figure 2 Percentage activities of the individuals of different age-sex categories of blackbuck (*Antelope cervicapra*)

Seasonal diurnal activity pattern

Foraging activity of Blackbuck started at an average of 7:00 am in the morning and reduced around sunset during different seasons. The adult male shows maximum foraging in summer during 9.00 am -10.00 am (70%), while in monsoon the foraging peaks during 12.00 pm (62 %) and during winters foraging were maximum around 10:00-11:00 am and 5:00-6:00 pm (55%). The similar trends of foraging activity were noted in adult-female, the sub-adult male, sub-adult female and fawns (Figure 3-6).

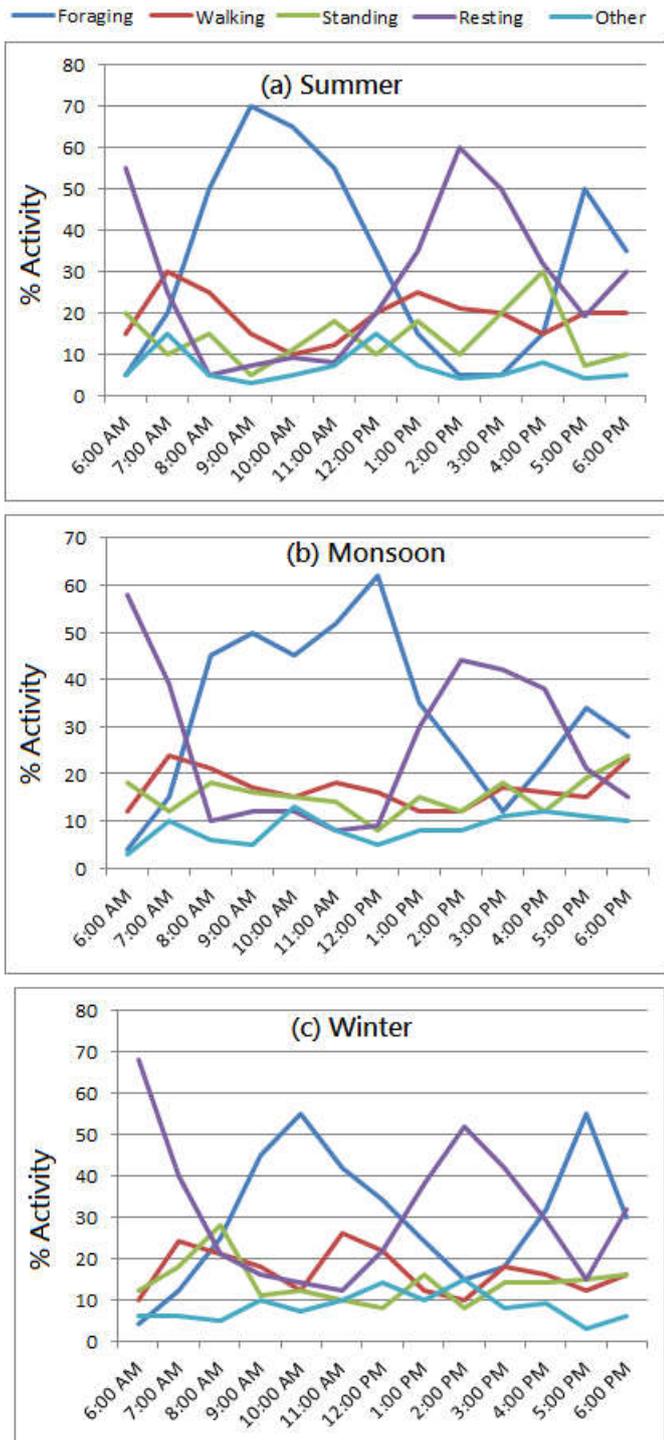


Figure 3 Activity percentage throughout the day for male blackbuck at Sorsan on (a) summer (b) monsoon and (c) winter.

Walking and standing activities were almost uniformly distributed throughout the day; the peak of walking in summer maximum was observed during 7:00-8:00 am while in winters it was recorded around 8:00-9:00 am in different age/sex individuals. In all cases, maximum resting was observed at early morning prior to starting any activities. In summer peak for resting was observed during afternoon 1:00-3:00 pm. In general, fawn showed overall maximum rest during all seasons (Figure 3-7).

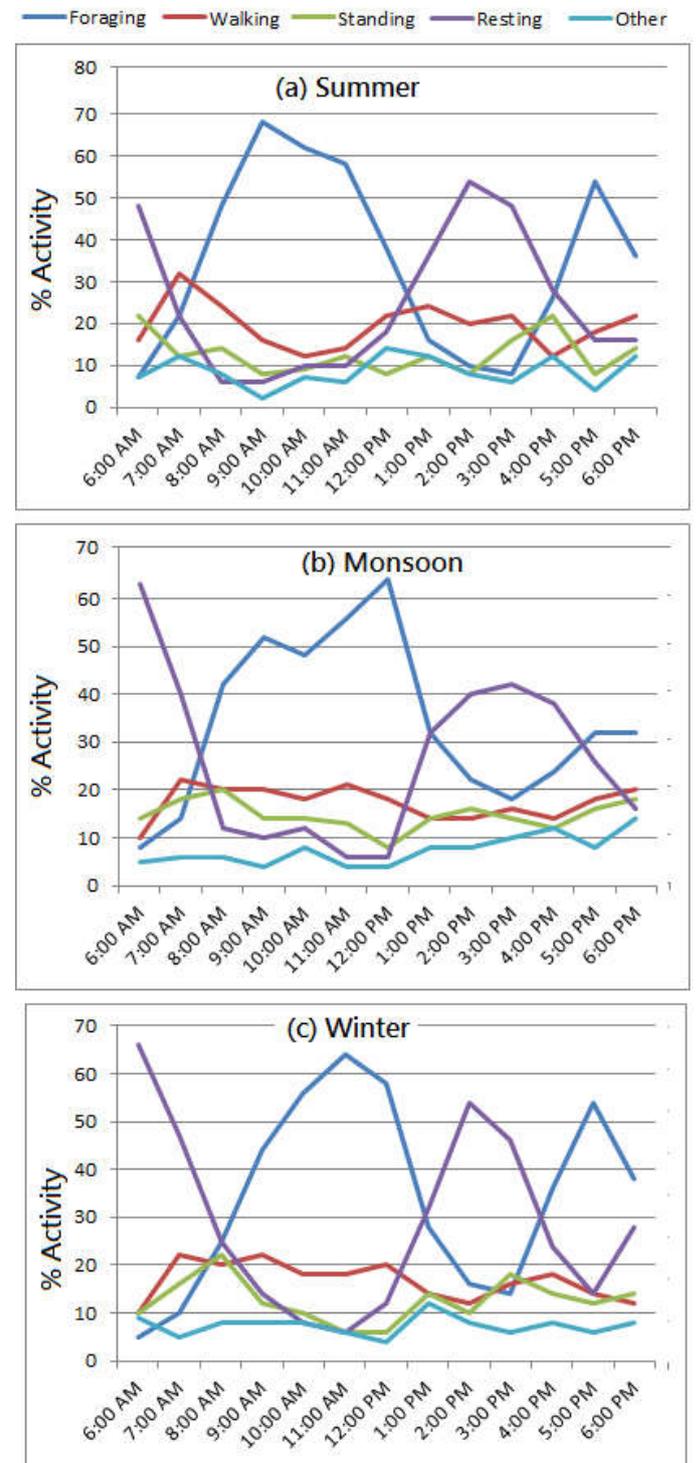


Figure 4 Activity percentage throughout the day for female blackbuck at Sorsan on (a) summer (b) monsoon and (c) winter.

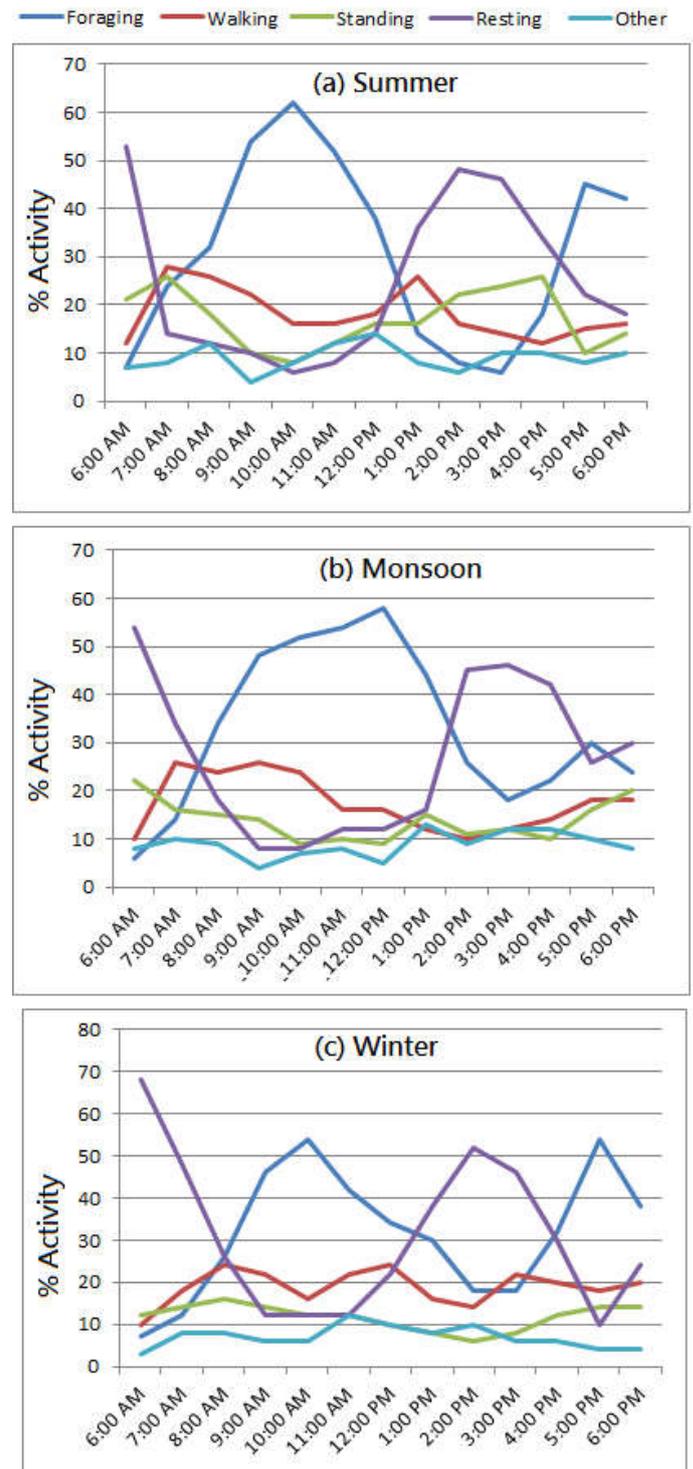
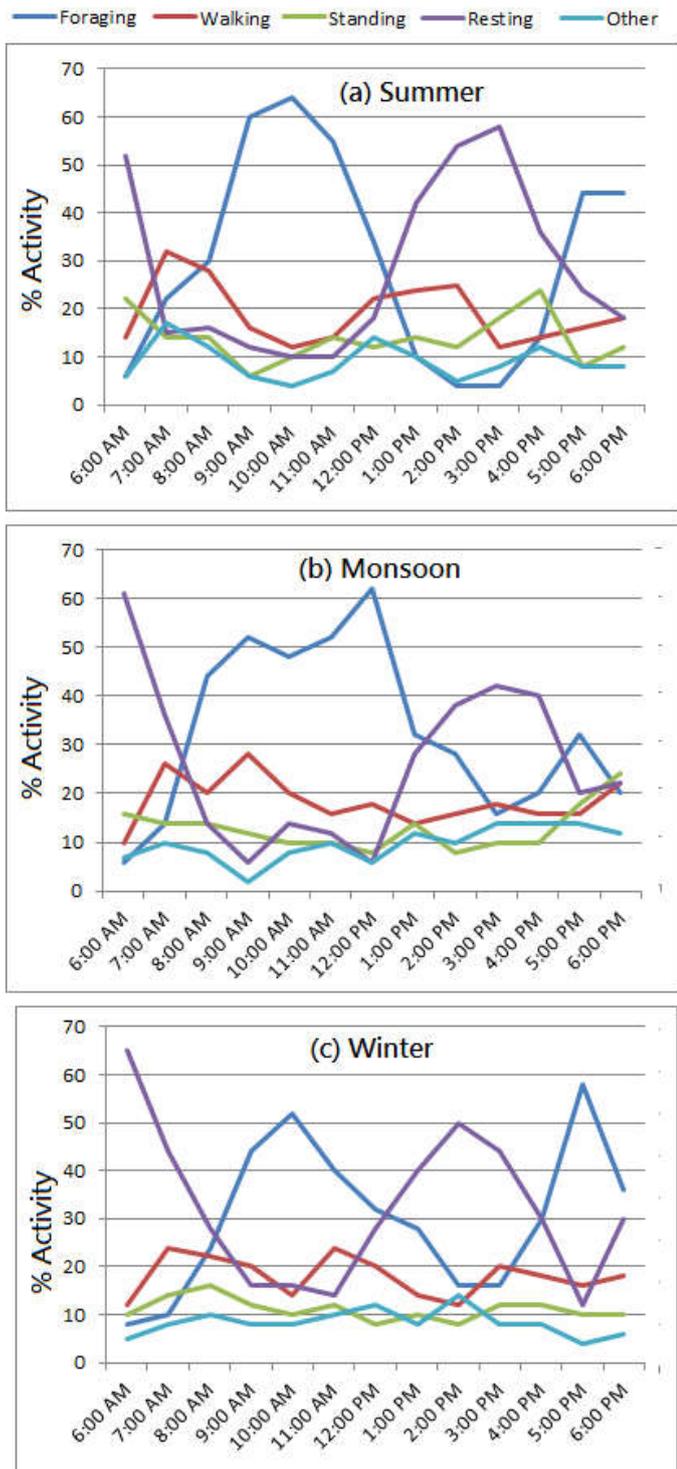


Figure 5 Activity percentage throughout the day for sub-adult male blackbuck at Sorsan on (a) summer (b) monsoon and (c) winter.

Figure 6 Activity percentage throughout the day for sub-adult female blackbuck at Sorsan on (a) summer (b) monsoon and (c) winter.

Annual Activity of blackbuck

Foraging activity among the adult male blackbuck was observed highest in months of April (36.1%) and lowest was observed during the months of June (28.3%). Foraging activity was almost similar from months of July to October. During months of the winter season (November-February) foraging activity was lowest (29.55 – 30.95%) as compared to other months.

Adult female also shows highest foraging activity in months of March-April (37%). The foraging trends of sub-adult male and sub-adult female are similar and show maximum foraging activity during months of August-September. The foraging activity in fawn is less as compare to adult or sub-adults and show almost uniform trend throughout the year (Figure 8).

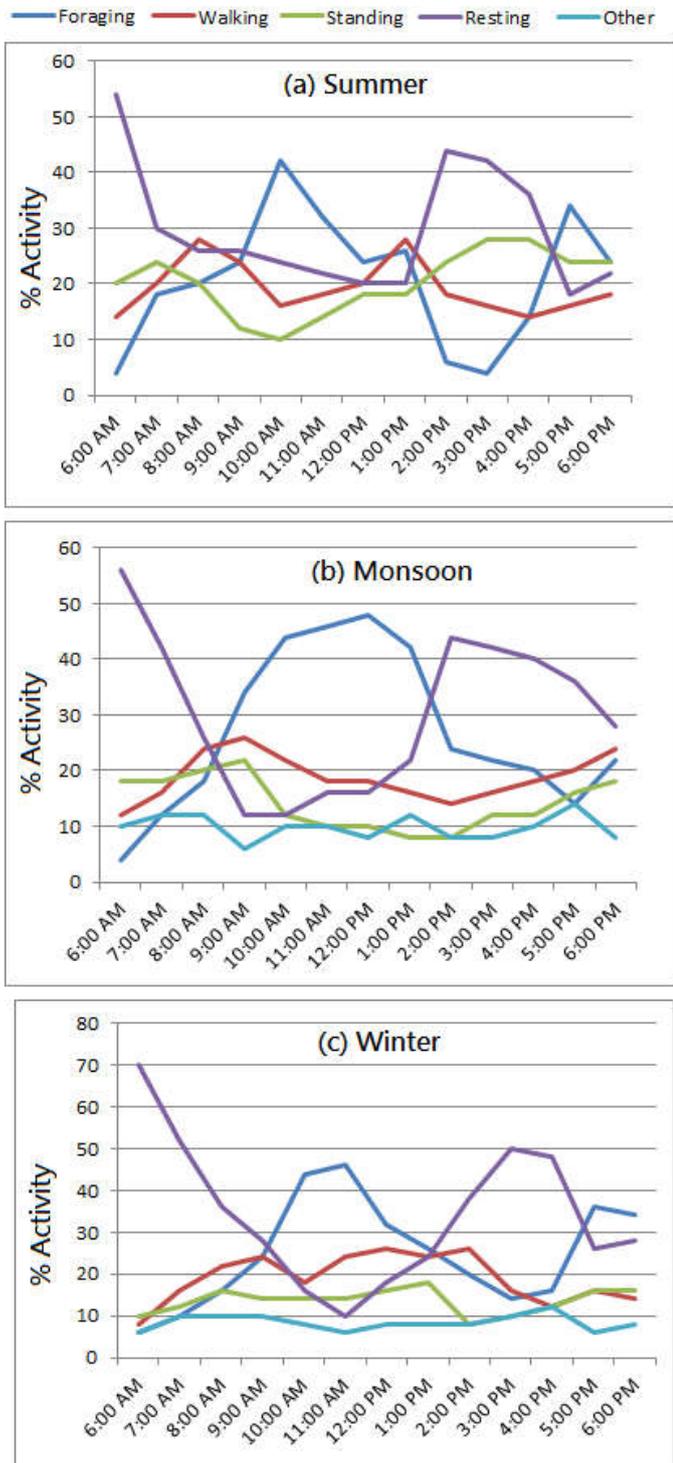


Figure 7 Activity percentage throughout the day for fawn of blackbuck at Sorsan on (a) summer (b) monsoon and (c) winter.

Walking among adult male maximally (20.24%) was observed in months of March and least was observed in months of January (15.04%). The adult female walks maximally during months of April (20.15%) and minimum during months of winter (16-17%). Walking in sub-adult male, sub-adult female and fawn are almost constant throughout the year. Standing in adult male ranged from 13-15 % throughout the year, while in the adult female it was a little bit lower in months of January-February (12%). Sub-adult male and sub-adult female show maximum standing/scanning activities in months of April-May. Fawn shows maximum standing activities among all age/sex

individuals with the maximum of 22% in months of March. Resting activity was at its peak in months of December-January in all individuals, followed by months of June-July and least resting activity was observed September-October (Figure 8).

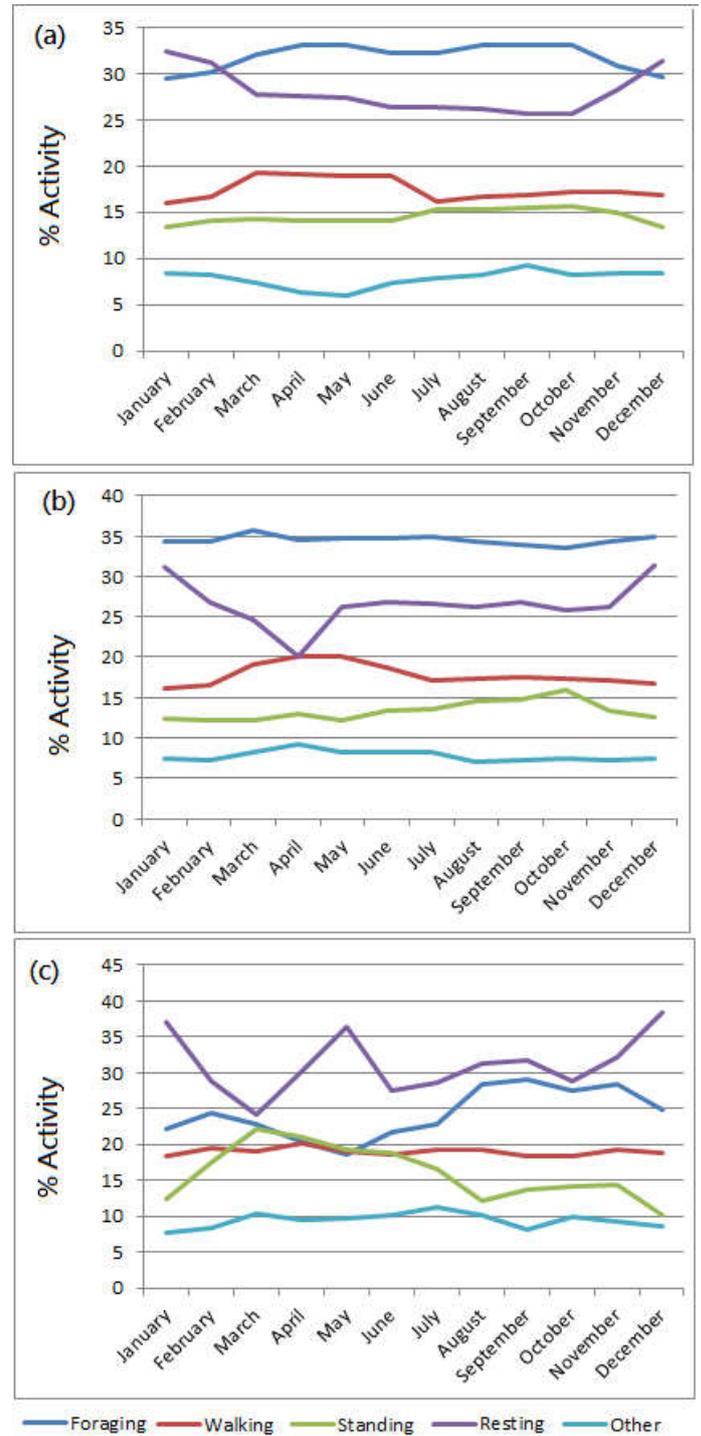


Figure 8 Annual Activity Pattern of blackbuck in Sorsan (a) Adult male (b) Adult Female (c) Fawn

DISCUSSION AND CONCLUSION

An analysis of how blackbuck distributes its time among various activities is essential to any characterization of its life cycle (Ahrestaniet al, 2012), and provides a foundation for interrelating their ecology and behavior (Jhala and Isvaran, 2016). Harcourt (1956) suggested a common pattern for the

majority of diurnal animals is one of early morning and late afternoon peaks of feeding separated by midday period. The similar trend was investigated during present investigation. The mean percentage activity of individual blackbuck observed during each hour of observation at the study area was determined; the trend was a bimodal distribution in activity to occur, with a maximum in morning peak from 08.00-10.00 am and an evening peak at 4.00-6.00 pm. Jarman (1974) suggested foraging is the major component of all activities and has described by physiological control of daily and seasonal feeding in blackbuck. During present investigation results were same, that maximum investment was in foraging activity followed by resting, although fawn invests their maximum time in rest. The activity patterns of blackbuck may also be influenced by sex and age of the animals. The investigation outlined the activity pattern in both sexes, male and female. Different age groups namely- adult, sub-adult and fawn age groups were also investigated. The activity pattern of male adult and fawns was different from rest of age/sex groups.

The present investigation at Sorsan grassland indicates that the diurnal activity pattern of blackbuck is of polyphasic nature where foraging is interspersed with resting, standing and walking. Standing and walking occurred almost throughout in between the foraging activities. Present investigation suggests that there is a definite pattern of major activities in the fixed hours of the day which varies with the season. Raising local people's awareness of blackbuck ecology and behavior might be a necessary component in the species successful management and conservation.

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