

**FORAGE AVAILABILITY AND FEEDING PREFERENCES OF BLACKBUCK ANTILOPE  
CERVICAPRA (LINN) IN SORSAN, RAJASTHAN, INDIA**

**Renu Meena and Veena Chourasia**

Department of Zoology, Government College, Kota, Rajasthan, India

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**ABSTRACT**

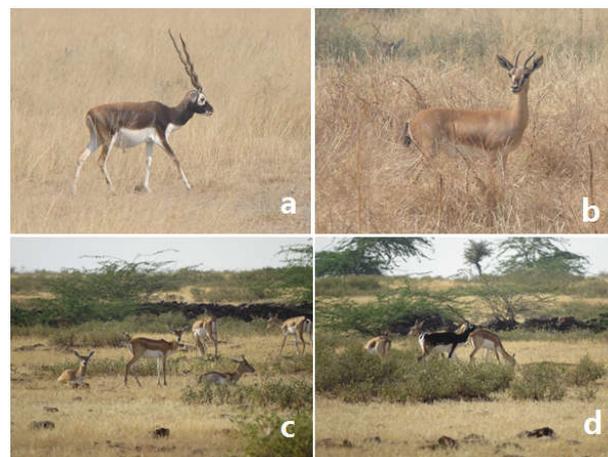
Blackbuck (*Antelope cervicapra*) is a graceful, gazelle-like animal, considered as the most handsome member of the 'Bovidae' family. The IUCN Red list has listed this animal in "Near threatened" category. Blackbucks choose short grasslands and avoid tall grasslands and wooded habitats. Blackbuck diet primarily consists of grasses and herbs and therefore, there is profound seasonality in its nutritional ecology. The present investigation was carried out in Sorsan region of Rajasthan. Maximum grazing activities were noted during months of July-Aug while major browsing activities were recorded during March- May in the summer season. During monsoon, high-quality grasses can be seen in agricultural land and water resource areas of Sorsan, while in summer it mainly feeds on herbs, shrubs, dry leaves and fallen pods of *Acacia sps* and *Prosopis juliflora*.

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**INTRODUCTION**

Blackbuck (*Antelope cervicapra*) is gazelle-like member of the 'Bovidae' family (Fig 1a and 1b). Blackbucks are principally grazers (Fig 1 c and 1d) and mainly forage in small area, but in summer may migrate to be the fastest animal in the world next to Cheetah. Blackbucks are generally restricted in distribution to the South Asian sub-continent where it is the only representative of the genus 'Antelope (Rahmani, 2001). Previously blackbuck population was distributed through the whole of the Indian subcontinent but during 20<sup>th</sup> century its population declined abruptly and they are now almost extinct in Bangladesh, Nepal and Pakistan. Attempts of their restoration have been taken in Pakistan and Nepal. More recent report suggest that, numbers is marginally increasing and the population can be reasonably described as secure due to increase in protected areas and better conservation policies in some places (IUCN, 2017). However, Blackbuck habitat is continuously decreasing due to increase in human population, increasing numbers of domestic livestock, and agro-economic development. The habitat available is decreasing and the species is projected to be close to meeting the 30% decline figure over ten years that would be suitable for Vulnerable under criterion A3c. The IUCN Red list has listed this animal in "Near threatened" category and is included in Appendix III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (IUCN 2017).

Blackbucks are principally grazers (Fig 1 c and 1d) and mainly forage in small area, but in summer may migrate to long distances for search of water and food (Jhala *et al.*, 1992; Isvaran, 2007). Information about of the foraging ecology of blackbuck, occupying a natural ecosystem would be of significant value for guiding habitat management efforts (Brashares and Arcese, 2002; Jhala and Isvaran, 2016). In this study forage habit, availability, seasonal influence and forage preference of the blackbuck were studied by observing feeding in different sites within Sorsan region of Baran District, Rajasthan, India.



**Figure 1a** Blackbuck Male 1b. Blackbuck female 1c & d. herd of blackbuck foraging in study area.

\*Corresponding author: **Renu Meena**

Department of Zoology, Government College, Kota, Rajasthan, India

**Study Area**

Sorsan is hunting prohibited and protected area, known for conservation of blackbuck. It is located in Anta tehsil of Baran district of Rajasthan. The protected area spreads between Amalsara and Sorsan village. It stretches over 35 sq. kms. between right main canal of the Chambal and the Parvan river (Fig 2). It is 50 km east of Kota (25.00 -25.8<sup>0</sup> N, 76.12- 76.18<sup>0</sup> E) having scrubby vegetation and numerous small water bodies, which harbour amazing varieties of birds as well as animals. Four specific sites (Amalsara, Niyana, Manpura and Sorsan) of Sorsan region were selected for the present investigation.

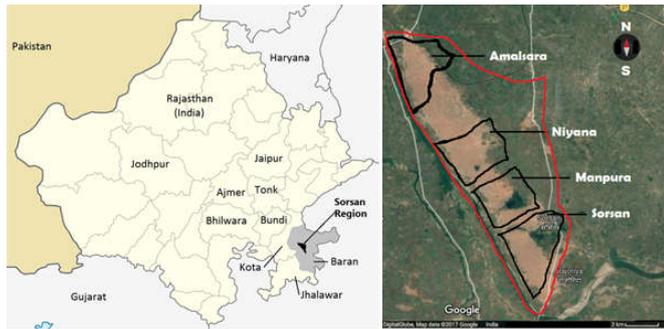


Figure 2 Map of Rajasthan state and Google map of study area

**MATERIAL AND METHODS**

Blackbucks are adapted to survive on short grassland systems but are restricted in their distribution by the accessibility of persistent surface water. For the present investigation, study sites were selected in different regions of Sorsan grassland differing in habitat types and vegetation composition. Forage preference was determined by a careful direct examination of feeding sites (Altman, 1974).

Food habits were investigated by observing blackbuck feeding within a radius of 25 m of the observer in selected habitat. A group of 10-20 blackbucks was observed uninterruptedly for a period of 24h - 36 h in each season. Scan animal sampling was used on these groups to determine the proportion grazing in different habitats (Altman, 1974). During study period x15- 30 field binocular was applied to record the grazing activities.

**RESULTS**

**Foraging habits**

During present investigation around 300 observations of foraging habits were recorded during each season (summer, monsoon and winter) from different sites (Table 1).

Table 1 Foraging habits of blackbucks observed during different seasons

Season	Study Site	Grazing	Browsing	Total Observations
Monsoon	Amalsara	46	28	74
	Niyana	53	23	76
	Manpura	45	30	75
	Sorsan	51	26	77
Winter	Amalsara	33	41	74
	Niyana	35	43	78
	Manpura	36	41	77
	Sorsan	34	42	76
Summer	Amalsara	27	46	73
	Niyana	26	49	75
	Manpura	25	49	74
	Sorsan	28	48	76

The blackbuck largely behave as grazer during monsoon season (July-Oct) due to high availability of grasses (64.5 %), which reduced to 45.2 % during winters (Nov-Feb) and minimum grazing trend was observed (35.6%) during summer (March-June). During summer grasses, a preferred food source is not available and blackbucks have to shift as browser and feeds on leaves, soft shoots, or fruits of high-growing, generally woody, plants such as shrubs. The maximum browsing (74.4 %) was observed in months of March-June (summer season) and lowest of 35.5 % was recorded in months of Nov-Feb (winter season) (Fig 3).

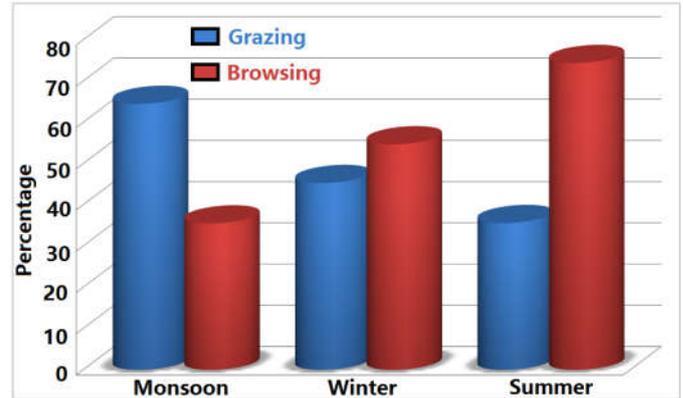


Figure 3 Percentage of browsing or grazing of blackbucks during different seasons in study area.

**Foraging Activity pattern**

Foraging activity of Blackbuck started at an average of 6:00 am in the morning and reduced around sunset during different seasons. The peak periods of foraging during summer were 9.00 am - 11.00 am and 6.00 pm - 07.00 pm when approximately 55% to 80% of the blackbucks were feeding. At the same time remaining organisms were either walking standing or lying. During Monsoon foraging activity was almost uniform throughout day, although around mid-afternoon it reduced significantly. Highest foraging activity was highest around 11.00 am - 12.00 am and 06.00 pm - 07.00 pm where 55% of the blackbucks were feeding at different sites. In winter season most of blackbucks opted to forage during late morning, 10:00 am-12:00 pm or during early evening, 5:00-7:00 pm. The highest foraging activity in winters was observed during 6:00-7:00 pm with maximum of 75% (Fig 4).

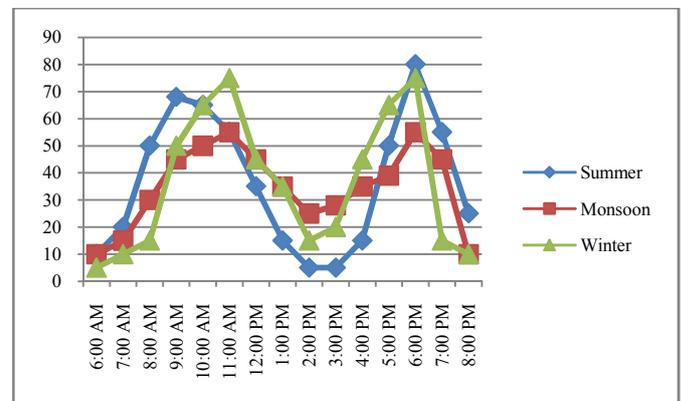


Figure 4 Foraging activity pattern of blackbucks from 6:00 AM to 8:00 PM

### Forage and grass availability

Sorsan region were found full with grasses during monsoon season with grasses like *Apluda mutica*, *Aristida funiculata*, *Brachiaria ramosa*, *Brachiaria reptans*, *Cenchrus biflorus*, *Cenchrus ciliaris*, *Chloris virgata*, *Cyperus rotundus*, *Cynodon dactylon*, *Dactyloctenium indicum*, *Dichanthium annulatum*, *Digitaria ciliaris*, *Echinochloa colona*, *Eragrostis tenella*, *Eragrostis ciliaris*, *Eragrostis pilosa*, *Kyllinga brevifolia*, *Oplismenus burmannii*, *Phalaris minor*, *Saccharum spontaneum*, *Setaria glauca*, *Sorghum halepense* and *Saccharum spontaneum*, *Typha elephantine* were commonly observed at different study sites.

Climbers which grow over trees and perennial herbs and shrubs observed were *Blastania fimbristipula*, *Cocculus pendulus*, *Citrullus colocynthis*, *Cucumis callosus*, *Pergularia daemia*, *Ipomoea pes-tigridis* and *Tinospora cordifolia*. Ephemerals like *Amaranthus spinosus*, *Cleome gynandra*, *Cleome viscosa*, *Commelina benghalensis*, *Euphorbia prostrata*, *Indigofera linifolia*, *Pedaliium murex*, *Sesamum indicum*, *Tribulus terrestris* were also seen in this region.

Major herbs that flourish during monsoon season and after winter there is fruiting and seed setting are *Acanthospermum hispidum*, *Anagallis arvensis*, *Argemone mexicana*, *Chenopodium album*, *Chenopodium murale*, *Datura innoxia*, *Fagonia cretica*, *Heliotropium ellipticum*, *Indigofera cordifolia*, *Portulaca oleracea*, *Pulicaria angustifolia*, *Phyllanthus fertanus* and *Trigonella polycerata*. Perennial herbs which were near water bodies and trees are *Achyranthes aspera*, *Amaranthus caudatus*, *Boerhavia diffusa*, *Datura metal*, *Euphorbia hirta*, *Farsetia hamiltonii*, *Indigofera linnaei*, *Pulicaria*, *Solanum nigrum* and *Tephrosia purpurea*.

Major shrubs in study area includes *Aerva tomentosa*, *Carissa carandas*, *Capparis deciduas*, *Crotalaria medicaginia*, *Calotropis procera*, *Hibiscus ovalifolius*, *Grewia tenax*, *Lantana indica*, *Lawsonia inermis*, *Leptadenia pyrotechnica*, *Verbesina encelioides*, *Withania somnifera*, *Xanthium strumarium* and *Ziziphus nummularia*.

Major trees observed in dense part sorsan region as well on near water bodies of study area are *Acacia catechu*, *Acacia leucophloea*, *Acacia nilotica*, *Acacia senegal*, *Acacia tortilis*, *Azadirachta Indica*, *Anogeissus pendula*, *Anogeissus latifolia*, *Aegle marmelos*, *Balanites aegyptiaca*, *Boswellia serrate*, *Balanites aegyptiaca*, *Ficus benghalensis*, *Ficus religiosa*, *Leucaena leucocephala*, *Madhuca indica*, *Maytenus emarginata*, *Moringa oleifera*, *Morus alba*, *Nyctanthes arbortristis*, *Pongamia pinnata*, *Prosopis juliflora*, *Ricinus communis*, *Tecomella undulate*, *Terminalia arjuna*, *Terminalia arjuna*, *Wrightia tinctoria* and *Ziziphus mauritiana*.

### Feeding preferences

There was a noticeable seasonality in species consumption by blackbuck. Most of annual and ephemeral plants were available during the monsoon and early winter while leaves, pods, fruit and litter of perennials, shrub and tree were only feeding options available to them. We found that during monsoon season the black buck were largely feeding on grasses like *Cyperus rotundus*, *Cynodon dactylon* and *Dichanthium annulatum* and ephemeral like *Cleome viscosa*, *Euphorbia prostrata* and *Pedaliium murex*. During winter herbs and leaves of shrubs are preferred. During summer season, blackbuck feeds on dry pods, fruits and fallen leaves of shrubs and trees

perennial like *Acacia nilotia*, *Anogeissus pandula*, *Prosopis juliflora* and *Ziziphus nummularia*.

## DISCUSSION AND CONCLUSION

Diet and habitat-niche relationship in large herbivores is influenced by several factors including availability, quality and nutritional value of plants (Ahrestani *et al.*, 2012). Foraging patterns of large herbivores vary depending on their population density. Large herbivores may have large effects on ecosystem functioning and density-dependent responses in life-history traits are the keys to understanding population regulation in wild mammals (Srether, 1997; Gaillard *et al.*, 2000). The dominance of plant species and its distribution pattern in a particular locality plays most important role in its preference rating (Martin, 1977; Chamaille-Jammes and Bond 2010).

In general during present investigation it was observed that blackbucks mainly behave as grazers during monsoon season when grass and other forage availability is very high and same animals spend most of time as browsers during summer when food availability is scarce. During winter season they behave as mixed feeders. Similar trends were reported in other ungulates (Janis, 2008). The positive relations of the foraging habits to food abundance explained the importance of food abundance when animals choose particular activity and behavioral pattern (Khan, 1994; Wegge, 2006).

In Sorsan region grasses are preferred during and after monsoon season while in summer mainly fallen leaves and pods of shrubs or tree meets the food requirements. Along with the seasonal fodder availability and its quality, the sun elevation in day time and temperature of area also acts as an important factor for foraging activity (Hem Singh and Jakhar, 2007; Jhala and Isvaran, 2016). This is explained by the high foraging activities during late morning and evening hours which diminish during early morning to late noon. Other reports also suggest that ungulates also show same pattern of foraging preferences with seasons (Hanley, 1982; Hobbs *et al.*, 1996; Jhala 1997; Isvaran, 2007).

Ecological studies are crucial for conservation of vulnerable animal. The present study concludes that feeding habits - grazing or browsing are directly correlated with food quality and quantity which varies with seasons. Large number of grasses, ephemerals, herbs, shrubs and trees are present in selected study area which provides various alternatives as food source. The study will help to prepare the policy for habitat utilization, conservation and to increase the number of blackbuck and their long term survival in Sorsan region of Baran.

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