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Food and Feeding Habits of Blackbuck (*Antilope cervicapra*) in Agricultural Crops and Associated Habitats in Telangana

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ABSTRACT

Blackbuck (Antilope cervicapra) has increasingly come into conflict with agricultural practices, particularly in the areas where open grassland areas border the farm lands. Due to habitat loss, fragmentation, and diminishing forage availability in the wild, blackbucks often stray into cultivated lands in search of food. They feed on a variety of agricultural crops such as groundnut, maize, cotton, red gram and green gram, causing significant damage and yield losses. It is a predominantly graminivorous species, consuming forbs, shrubs, and agricultural crops, i.e., feeding mainly on fresh grass blades and tender parts of crops depending on seasonal availability. This study evaluates the dietary patterns of Blackbuck in Mahbubnagar, Telangana, India, highlighting the impact of seasonal variations, habitat preferences, and competition with livestock. Observations were conducted fortnightly from 2019 to 2022 using a modified bite count method, with plant species identification confirmed through field surveys. Results suggest that Blackbuck adapt their feeding habits to optimize nutrient intake, with notable dietary overlap with livestock. Blackbuck consumed 32 plant species, including 14 graminoids, 12 forbs, and 6 browse species. During summer in Mahbubnagar, they additionally feed on legumes of the exotic Prosopis juliflora, berries of Ziziphus species. Conservation and habitat management strategies should account for these interactions to maintain ecological balance and minimize human-wildlife conflict.

Keywords: *Agricultural crops, Blackbuck, Diet, Food and feeding habits, Forbs, Habitat, Shrubs, Telangana*

INTRODUCTION

The blackbuck (*Antilope cervicapra)* is a medium-sized ungulate species of antelope native to and endemic to the Indian subcontinent [6]. It typically inhabits open grass lands and semi- arid plains [12]. It is a key herbivore, primarily subsisting on grasses but exhibiting dietary flexibility in response to seasonal vegetation changes. It is recognized for its ecological significance as well as its aesthetic value due to its striking appearance and sexual dimorphism. Although once widespread across India, the distribution of blackbuck has been considerably reduced due to habitat loss, fragmentation, and increasing human encroachment [9, 10]. Despite being listed as "Least Concern" by the IUCN, the species continues to face threats in several parts of its range due to expanding agriculture and infrastructure development [5]. Understanding the feeding habits of herbivores like blackbuck is essential for their conservation, especially in landscapes where natural and human-modified habitats intersect. Blackbucks are primarily grazers but they have shown a remarkable ability to adapt their diet to include a variety of grasses, herbs, shrubs, and even cultivated crops depending on seasonal availability and habitat conditions [4, 7]. This dietary flexibility allows them to survive in fragmented and anthropogenically influenced environments, but also creates conflict when they forage on standing crops, leading to economic losses for farmers.

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In regions like Telangana, where agricultural land often borders protected areas or open scrublands, blackbuck frequently venture into cultivated fields, feeding on crops such as groundnut, sorghum, pulses, and millets. This behavior not only influences their nutrition and habitat use patterns but also has implications for human-wildlife conflict and wildlife management policies. Therefore, a detailed investigation into the food preferences and feeding ecology of blackbuck in such landscapes is vital for developing conservation strategies that balance ecological sustainability with agricultural livelihoods. This study aims to quantify the seasonal dietary composition of Blackbuck in Mahbubnagar and evaluate the impact of livestock grazing on their food preferences.

MATERIAL AND METHODS

Study Area

The study of the food and feeding habits of Blackbuck was conducted in the Mahbubnagar district (erstwhile) of Telangana from June 2019 to March 2022. The study extended into the surrounding area of the habitat under cultivation of different seasonal crops.

In this study, Blackbuck diets were estimated using a modified bite count procedure [14, 15]. Observations were conducted from a distance of 50 meters during daylight hours with 30-minute intervals between observations. These intervals allowed for the inspection of feeding sites and the counting of fresh bites on plant species. Foraging activity was monitored using binoculars. After each feeding session and once the animals had moved away, the plant species consumed by the group were identified and recorded. To assess diet preferences, the number of feeding attempts on each plant species was documented across different seasons.

Quadrat sampling was employed on both sides of a line transect to systematically evaluate the vegetation and feeding behavior.

RESULTS AND DISCUSSION

Food Items

The variety of food items consumed by Blackbuck in different seasons in the study area is outlined in Table 1. With the onset of monsoon in June, the menu expands to include plants such *as Cymbopogon caseius*, *Cyperus rotundus*, *Cynodon dactylon*, and *Aristida* species. As *Rabi* crops begin to grow, the availability of food items increases further. Despite the simultaneous cultivation of various crops, the stages of growth vary, presenting Blackbuck with ample opportunities to feed on fresh leaves and fruits, with preferences for crops like *Phaseolus aureus*, *Cajanus indicus*, *Phaseolus aconitifolius*, *Arachis hypogea*, *Vigna catjang*, and *Andropogon sorghum*. Additionally, Blackbuck visit areas for fresh weeds such as *Cynodon dactylon*, *Cyperus rotundus*, *Digitaria marginata*, *Bothriochloa* species, *Heteropogon contortus*, *Eragrostis pumila*, and *Iseilema* species.

Seasonal Feeding Patterns

Subsequently, Blackbuck begins feeding on groundnut and jowar leaves, continuing until harvest. In summer, when most grasses on grasslands are dry and crops are harvested, they turn to green herbs, shrubs, and tree fruits. *Tridax procumbens*, a major plant species in grasslands and fallow lands, is heavily consumed during this season, whereas it was not observed being eaten in other seasons. Additionally, species like Calotropis (leaves and flowers), *Xeromorphis spinosa* (leaves), Acacia (dry pods), *Prosopis juliflora* (dry pods), and Phoenix (ripe fruits) are consumed during summer.

Additional Observations

Andropogon, *Themeda*, *Chrysopogon julvus*, and *Heteropogon contortus* as plant species eaten or possibly eaten by Blackbuck in Kanha National Park [10, 12]. In a Pakistan experiment that out of 22 plant species, Blackbuck consumed 19, with most feeding time allocated to five species, two of which occur at low densities in natural habitats. In Rajasthan, Blackbuck prefer perennial grasses like *Cynodon dactylon*, *Desmostachya bipinnata*, *Dactyloctenium aegyptium*, *Cenchrus cillaris*, and *Cyperus* species. Additionally, they consume sprouts and leaves of *Crotalaria* species, *Convolvulus* species, *Heliotropium strigosum*, and the bright orange-yellow flowers of indigenous trees like *Tecomella undulata* and *Capparis decidua*, which are rich in proteins and essential micronutrients.

Dietary Versatility

Blackbuck exhibits dietary versatility, consuming grasses, herbs, shrubs, and crops. Seasonal variations in dietary items appear to be influenced by plant species succession and phenological events. Young grass leaves contain higher protein percentages than dead leaves and shoots, likely contributing to Blackbuck's preference for fresh grass sprouts over herbs and shrubs (Table 2).

Food Habits of Blackbuck and Impact of Livestock Grazing

Botanical Composition of Blackbuck and Livestock Diet

Blackbuck consumed 32 plant species, including 14 graminoids, 12 forbs, and 6 browse species, mirroring the diet of livestock in the study area. They favour open fields, agricultural lands, and cultivated areas in accordance with the findings of the habitat preference analysis [1].

Seasonal variations in dietary preferences of Blackbuck and livestock are illustrated in Table 3. At Mahbubnagar, both Blackbuck and livestock exhibited seasonal changes in their dietary preferences. During summer, Blackbuck favored 66% graminoids, 24% forbs, and 10% browse, while in winter, graminoids constituted 81% and forbs 19%. In the monsoon season, graminoids, the livestock consistently showed a preference for graminoids, ranging from 55% to 87% in all seasons, with forbs comprising 26% to 27% in summer and winter, and browsing species accounting for 10% to 16% of their preferences.

A detailed examination of forage species utilization by Blackbuck and livestock revealed that Blackbuck primarily consumed seven species of graminoids: Aristida, *Cynodon dactylon*, various Cymbopogon species, *Cyperus rotundus*, *Chloris virgate*, *Digitaria marginata*, and *Heteropogon contortus*. Additionally, five forb species, including *Alcyonema*, *Euphorbia hirta*, various *Oldenlandia* species, *Tridax procumbens*, and *Ziziphus*, constituted the main forage species at Mahabubnagar. In this study location, Blackbuck and livestock exhibited higher use of graminoids during monsoon (88-97%) and winter (66-88%) compared to other forage classes. However, livestock showed a comparatively higher preference for forbs (23%) during winter. The utilization of browse varied between 5% and 11% during monsoon and winter. In summer, Blackbuck predominantly consumed graminoids (66%), forbs (24%), and browse (8%), while livestock showed preferences for graminoids (60%), forbs (28%), and browse (13%). Principal forage species included *Cynodon dactylon* and *Cyperus rotundus*, with *Tridax procumbens* and *Carissa* species being significant forbs for Blackbuck in summer. Throughout the seasons, livestock displayed a significant preference for forbs and browse species (Table 3).

A comparison of the botanical composition of Blackbuck and livestock diets revealed overlapping preferences for the same plant species, suggesting no remarkable dietary shifts in Blackbuck due to livestock preferences. Blackbuck exhibited a tendency to consume small amounts of many species rather than large amounts of a few species. This generalistic foraging behavior may help mitigate the consequences of changes in forage availability due to cattle grazing [3]. However, in other studies, such as cattle grazing, this resulted in the elimination of important forage species for mule deer. Competition for forage plant species between Blackbuck and cattle was noted in different habitats. Grasses that grow after the rain were also used as feed by the blackbucks [11]. The dietary preferences of these species can be useful in elucidating a wide range of ecological processes, such as predator-prey interactions [8, 13] and eco-morphological diversification [2].

Conclusion

In Mahbubnagar, livestock grazing occurred throughout the year, further intensifying competition for food and increasing the risk of disease transmission from livestock to Blackbuck. Additionally, the hoof action of cattle in dry soil areas caused soil erosion and damage to grass clumps and rhizomes. However, in this study, the diet of Blackbuck in livestock-grazed areas remained highly diversified, possibly due to competition from livestock, prompting Blackbuck to seek alternative dietary sources.

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Table 1. Dietary items of Blackbuck at Mahbubnagar

S.No	Name of the plant species	Summer	Monsoon	Winter
	Graminae			
1.	*Aristida adsenscionis*	+	+++	+
2.	*Bothriochloda sps*	+	+	-
3.	*Chloris virgate*	-	++	+
4.	*Cynodon dactylon*	++	+++	++
5.	*Cymbopogon casins*	+	+++	++
6.	*Cyperus rotundus*	++	+++	++
7.	*Cyperus sps*	++	+++	++
8.	*Dactyloctenium aegyptium*	+	++	+
9.	*Digitaria marginata*	+	+++	++
10.	*Eragrostis plumose*	-	++	+
11.	*Heteropogon contorus*	+	++	+
12.	*Iseilema prostratum*	-	++	-
13.	*Setaria glauca*	-	+	-
14.	*Sporobolus sps*	-	++	+
	Forbs			
15.	*Alycicarpus sps*	+	-	-
16.	*Boerhavia diffusa*	+	-	+
17.	*Euphoria hirta*	++	-	+
18.	*Evolvulus alsinoides*	-	-	+
19.	*Indigofera enneaphylla*	-	-	+
20.	*Oldenandia umbellate*	-	+	++
21.	*Portulaca quardifide*	-	-	+
22.	*Tephrosia purpurea*	+ L, F	-	-
23.	*Tribulus terreistris*	+ L	-	-
24.	*Vernonia cinerea*	++ FL,L	-	-
25.	*Tridax procumbenses*	+++ F,L	-	-
26.	*Ziziphus numulaaria*	+ F	-	-
	Browse			
27.	*Acacia arabica*	++ F	-	-
28.	*Acacia nilotica*	+ F	-	-
29.	*Calotropis gigantea*	+ F,L	-	-
30.	*Phoenix sylvestris*	++ F	-	-
31.	*Prospis juliflora*	++ Pods	-	-
32.	*Carissa sps*	++ L	-	-
	Crops			
33.	*Oryza sativa*	-	-	+
34.	*Paspalum scrobiculatum*	-	++	+
35.	*Andropogon sorghum*	-	-	+++
36.	*Phaseolus aurela*	-	++	-
37.	*Phaseolus aconitifoleus*	-	++	+
38.	*Cajanus indicus*	-	++	-
39.	*Vigna catjung*	-	++	-
40.	*Arachius hypogea*	+	++	+
41.	*Ricinus communis*	+	+	++

+++ High F Fruits
++ Medium L Leaves
+ Low FL Flowers
- Underline indicates regularly eaten

Table 2. Phenological events of plants at Mahbubnagar during the study period 2019-2022.

S.No	Name of the species	Sprouting	Flowering	Fruiting	Leaf Senescence
1.	*Aristida adscenscionis*	III week of May -IV week of Jun	III week of Jul -II week of Sep	I week of Oct - III week of Nov	III week of Dee
2.	*Bothriochloa sps*	III week of May -II week of Jul	II week of Aug	I week of Sep -IV week of Sep	I week of Jan onwards
3.	*Cechrus species*	III week of Jun -IV week of Jul	III week of Aug	II week of Sep II week of Nov	IV week of Dec
4.	*Chloris barbata*	II week of Jun -I week of Jul	II week of Aug -IV week of Aug	------	III week of Dec
5.	*Chlorsis virgata*	II week of Jun -I week of Aug	II week of Aug -I week of Sep	II week of Sep -II week of Nov	II week of Jan
6.	*Cymbopogon caesius*	II week of Jun -I week of Jul	II week of Aug -IV week of Aug		II week of Jan -IV week of Jan
7.	*Cynodon dactylon*	All round the year	II week of Aug -IV week of Aug	II week of Sep -II week of Nov	-------
8.	*Cyperus rotundus*	Throughout the year	II week of Aug -IV week of Sep	III week of Aug -II week of Oct	-------
9.	*Cyperus aristatus*	IV week of Jun	II week of Aug -IV week of Sep	IV week of Aug -II week of Oct	IV week of Nov
10.	*Dactylocetenium aegyptium*	IV week of Jun -III week of Jul	III week of Aug -I week of Sep	IV week of Sep -II week of Oct	IV week of Dec
11.	*Digitaria marginata*	III week of May -I week of Jul	I week of Jul -IV week of Sep	I week of Sep -I week of Oct	IV week of Feb -III week of Mar
12.	*Eragrostis plumose*	I week of Jun -IV week of Jul	II week of Aug -IV week of Sep	I week of Sep -III week of Oct	III week of Feb -II week of May
13.	*Heteropogon contortus*	I week of Jun -II week of Sep	IV week of Aug -II week of Nov	I week of Nov -II week of Mar	III week of Dec
14.	*Iseilema prostratum*	I week of Jun	IV week of Aug	II week of Sep -II week of Dec	I week of Dec -II week of Feb
15.	*Sacchram species*	IV week of May -IV week of Jun	IV week of Aug -III week of Sep	III week of Oct -III week of Nov	-------
16.	*Soporobolus species*	IVI week of Jun	III week of Aug -III week of Sep	III week of Sep -II week of Nov	IV week of Dec -II week of Jan

17.	*Boerhavia diffusa*	III week of Jun -II week of Aug	III week of Sep -II week of Oct	III week of Dec -I week of Jan	-------
18.	*Evolvulus alsonoides*	III week of Aug	III week of Sep -II week of Oct	IV week of Dec	-------
19.	*Euphorbia hirta*	June to Nov and Jan to May	Aug to Nov and Feb to May	-------	IV week of Jan -III week of Feb
20.	*Indigotera enneaphylla*	III week of Jun -III week of Jul	III week of Sep -IV week of Oct	III week of Nov -IV week of Dec	III week of Jan -IV week of Feb
21.	*Tephrosia purpurea*	III week of Jul -III week of Aug	III week of Sep -III week of Oct	IV week of Dec -IV week of Jan	-------
22.	*Tribulus terriestris*	III week of Jun -IV week of Jul	III week of Sep -IV week of Oct	IV week of Nov -III week of Dec	-------
23.	*Tridax procumbens*	June to Oct and Feb to May	Aug to Nov and Feb to May	-------	Jan to Feb
24.	*Vernonia cinerea*	IV week of Jun -II week of Jul	IV week of Sep	IV week of Dec	II week of Nov -III week of Feb
25.	*Ziziphus numularia*	Throughtout the year	-------	IV week of Sep -III week of Dec	-------
26.	*Parthenium species*	III week of Feb	II week of Apr -IV week of Sep	-------	I week of Nov -III week of May
27.	*Cassia auriculata*	III week of May -IV week of Jun	II week of Aug -II week of Oct	II week of Sep -IV week of Nov	IV week of Feb -III week of May
28.	*Carrisa species*	II week of Feb -II week of Jun	III week of Mar -II week of Jul	II week of Aug -III week of Oct	-------
29.	*Phoenix sylvestris*	-------	III week of Dec -I week of Feb Ripe fruits from II week of April onwards	I week of Feb I week of Jun	-------

Table 3: Seasonal percent composition of the diet of blackbuck and livestock at Mahbubnagar during the period 2019-2022

S.No	Name of the plant species	Summer		Monsoon		Winter	
		BB	LS	BB	LS	BB	LS
	Graminae						
1.	*Aristida adscenscionis*	10.8	6.3	15.6	11.2	14.8	6.1
2.	*Bothriochloa sps*	9.3	6.0	9.6	9.2	6.9	6.8
3.	*Chlorsis virgata*	2.4	2.9	6.4	7.2	2.9	4.1
4.	*Cynodon dactylon*	12.9	8.3	14.7	11.7	19.2	10.4
5.	*Cymbopogon caesius*	9.7	7.7	10.5	7.9	10.7	9.0
6.	*Cyperus rotundus*	9.9	6.6	7.9	5.2	13.9	0.4
7.	*Cyeprus sps*	2.0	2.6	5.2	5.1	3.4	2.7
8.	*Dactyloctenium aegytium*	2.7	2.6	5.6	4.6	2.7	2.1
9.	*Digitaria marginata*	1.7	3.1	6.1	5.7	2.1	2.1
10.	*Eragrostis plumose*	1.5	2.9	5.1	5.2	1.9	1.5
11.	*Heteropogon contortus*	1.5	1.8	3.4	3.8	1.7	1.7
12.	*Iseilema prostatum*	1.1	1.9	4.3	4.2	0.0	3.8
13.	*Setaria glauca*	0.0	1.4	2.9	3.3	0.5	1.2
14.	*Sporobolus sps*	0.0	1.2	1.1	2.8	0.0	1.9
	Forbs						
15.	*Alycicarpus sps*	4.9	4.2	0.2	1.6	1.8	2.1
16.	*Boerhavia diffusa*	3.0	4.2	0.3	1.4	2.1	3.4
17.	*Euphoria hirta*	5.2	4.8	0.4	0.8	3.7	3.6
18.	*Evolvulus alsinoides*	0.5	1.3	0.2	0.9	0.9	1.4
19.	*Indigofera enneaphylla*	0.0	0.9	0.0	0.0	3.1	4.0
20.	*Oldenanddia umbellate*	0.8	0.6	0.5	1.2	3.4	4.9
21.	*Portulaca quadrifide*	0.0	0.6	0.3	1.0	1.2	2.0
22.	*Tephrosia purpurea*	3.1	1.4	0.2	0.5	0.9	1.3
23.	*Tribulus terreistris*	1.2	1.8	0.0	0.3	0.7	1.1
24.	*Vernonia cinerea*	0.5	4.4	0.0	0.5	1.3	1.1
25.	*Tridax procumbens*	5.3	2.9	0.0	0.2	0.0	1.8
26.	*Ziziphus numularia*	1.8	4.6	0.0	0.1	0.0	1.5
	Browse						
27.	*Acacia arabica*	1.4	4.7	0.1	1.9	0.0	3.6
28.	*Acacia nilotica*	1.2	2.3	0.1	1.2	0.0	2.9
29.	*Calotropis gigantea*	1.1	1.9	0.0	0.7	0.0	0.8

30.	*Phoenix sylvestris*	1.7	1.7	0.0	0.2	0.0	0.0
31.	*Prospis juliflora*	2.9	3.1	0.0	1.0	0.0	1.7
32.	*Carissa sps*	1.8	2.4	0.0	0.5	0.0	1.9

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