

<https://doi.org/10.33472/AFJBS.5.3.2023.145-155>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

## Blackbuck Food and Foraging Ecology, Compression with Other Ungulates

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### Article Info

Volume 5, Issue 3, June 2023

Received: 28 April 2023

Accepted: 20 May 2023

Published: 22 June 2023

doi: [10.33472/AFJBS.5.3.2023.145-155](https://doi.org/10.33472/AFJBS.5.3.2023.145-155)

### ABSTRACT:

Blackbuck Antelope cervicapra is a species of genus Antelope which exhibits pronounced sexual dimorphism; the genders in the Blackbuck are readily distinguishable. The aim of the present study is to observe the food and Foraging ecology of Blackbuck spp. (Antelope cervicapra) in comparison with the one major Ungulates spp. (Chinkara and Nilgai) in reference to food habits. Present work is an attempt to explore the seasonal grazing nature of blackbucks. During the field work grazing areas, pastures and dung materials was identified. The research was done on a monthly basis from April 2022 to April 2023 several field surveys were carried out covering all the study sides.

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### 1. Introduction

Some kinds of wild ungulates and domestic animals, such as antelopes and deer found in Rajasthan. Nilgai **Boselaphus tragocamelus**, Four-horned Antelope **Tetracerus quadricornis**, Indian Gazelle or **Chinkara bennettii** and Blackbuck **Antelope cervicapra** are the Antelope species found in Rajasthan. In addition to their appeal, the importance of those creatures as herbivores and hence the primary prey base for wild predators has been emphasised. Nilgai is a popular face among residents in recent years, while Blackbuck also causes damage in some regions. Domestication of cattle and other tribal Bovine species has

made a substantial contribution to and played a key part in the development of human civilization (Prasad et. al., 2021).

The even-toed ungulates are the most successful group of large herbivores on earth. Rajasthan harbor's a large number of faunal elements. It is home to some species of wild and domestic ungulates, out of which some belong to deer species.

The existence of two ungulate species viz, the blackbuck or the Indian antelope (*Antelope cervicapra*, Linnaeus) and Chinkara (*Gazella bennettii*) in specific parts of the Western Rajasthan point out that these animals are properly adapted for survival in arid and semi-arid regions. Most of the suitable vegetation is annuals and grasses are abundantly accessible just for the duration of the monsoon. During the winter and summer, the earth seems infertile or is composed only of dried non-edible shrub species and a number of scattered timber and trees.

## 2. Method

Direct observations and field survey was carried out for Blackbuck Food and Foraging Ecology, Comparison with Other Ungulates. The parameters under consideration are feeding patterns, population status and distribution.

Blackbucks were counted in each study area and random research work was carried out in various grassland patches, shrub land and agriculture landscapes.

Most of the counts were taken uniformly in morning (06.00-09.00 h.) and evening (16.00-18.00 h.), when an average of 90% of the animals is actively feeding or moving. About four field visits were made in a month to know group size. Two major habitats were considered on a monthly basis.

The research was done on a monthly basis from April 2022 to April 2023 (a period of one year); several field surveys were carried out covering all the study sides. Information was gathered from the Forest Department and villagers on Blackbuck, Indian gazelle and Nilgai. Canon P 900 camera and binocular were used in survey.

Basic field observations were based on:-

1. Direct observation
2. Identification and interpretation of field survey

### **Animals dropping and Dung counts**

The dropping of herbivores are known as dung, animal dung is an indicator of animal presence which can be used to establish distribution trends and to examine the relative abundance of selected animals, dungs of different selected animals, were observed directly when freshly defecated and information was obtained from villagers (Berkmuller and sale, 1988).

### **Feeding sign**

Feeding signs in wild life habitat are very common in leaves, twigs and on bark of large trees. Blackbuck and other ungulates leave a sharp cut on the vegetation due to the combine action of incisors on both the jaws. During antler shedding the ungulates rub their antlers on tree trunks, which leave vertical furrows. Heights of furrow depend on the height of the animal.

### **Pugmark Study**

This is an indirect method for abundance of Blackbuck, Indian gazelle and Nilgai. The pugmarks of these animals were identified by regular observations for this purpose help of villagers were found much valuable.

### Counting of resting sites of animals

Every animal has a resting place, where it retires after performing the day to day activity. Resting sites of ungulates generally remain fixed in the territorial area and by counting them one can judge their distribution pattern and abundance in that particular area. Resting sites of ungulates were identified by observing the animals sitting on them or the presence of animals nearby bed sites. The bed sites of these selected ungulates were different in size.

### Information from local people

Local people inhabiting a particular area for a longer period so, during agricultural activities or grazing cattle, they have regular interaction with the wild animals (as these animals remain in or near agricultural fields). Thus the villagers can provide basic information/knowledge about them. Through a questionnaire and interviewing villagers, distribution, abundance and behavioural in formations were gathered as well from the people of hunting castes accurate information about all these animals was also obtained.

### Forage Preference

The food habits of Blackbuck was determined mainly by identifying the species of plants eaten while, the animal were actively foraging on them. Basically they feed or browse on fruit sedge and grass. It is relatively easy to determine the principal food species of the Blackbuck in given area, even though this changes with the season.

### Study Area

**Intensive study sites:** As such, four sites were selected for the intensive study of Indian Antelope cervicapra having a good population. These were identified for the detailed study of blackbuck. Four sites namely **Guda Bishnoiya, Kakani (JODHPUR) and Dungarpur and Dundhali (Rohat-PALI)** are closed and outside closed areas of Jodhpur district to obtain monthly data about food and Foraging ecology and every site were visited regularly for one years.

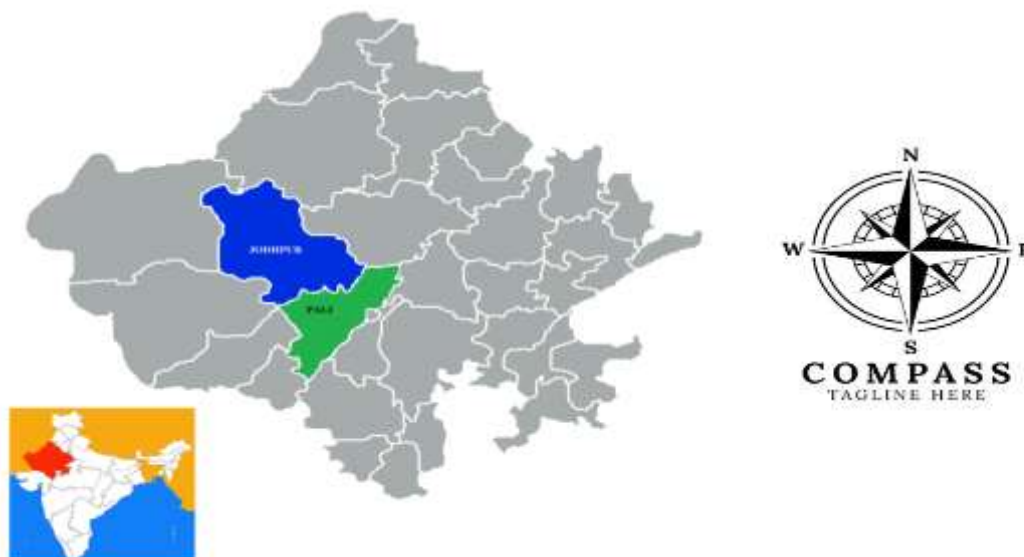


Figure: - 1. Intensive Study Area Jodhpur and Pali District.

## 3. Results and Discussion

**Food and feeding behavior of the Blackbuck**

**Composition and types of feed:** The composition of food intake of the Blackbuck is consisted of grass, herbs and agriculture crops, but they were also observed feeding on fresh leaves, fallen fruits and even the sprouts in the field. In the study area, it was observed that they feed largely on *Cynodon dactylon* (Dhob) and *Cenchrus setigerous* (Dhman).

Field visits showed that Blackbucks spend much of their time in the adjoining agricultural fields during monsoon, the season of growing crops such as Mung (*Vigna radiata*) and Bajra (*pennisetumglaucum*). They were observed to picking up the seeds in the agricultural land due to which many crops were lost before they sprouted and with the appearance of fresh leaves in the fields, to which they got attracted and grazed the entire field. This was one of the major reasons for man-animal conflict as it affected the economic condition of the farmers. Therefore, the forest department had planted these crops in the Guda Bishnoiya and Kakani limits to prevent the Blackbucks from grazing the nearby agriculture fields.

**Feeding methods:** Blackbucks are exclusive grazer; they cropped the grass very close to the ground and continued to graze for long stretches with their heads lowered when not disturbed. It was observed that they were very sensitive animals; they often raised their heads and looked around for their group to ensure safety. They spend more than 2/3<sup>rd</sup> of their time grazing. They would start grazing in the early hours of the day, rest in the afternoon and continue grazing till dark. Field visits revealed that they would not graze at the same place continuously, but while grazing, it was observed that they moved around 2-3 km of distance. This was also based on the size of the group, e.g., in large groups of around 40-50 in number, the movement would be slow and within a limited range and if solitary or paired, they wandered around the habitat cutting across different terrains. During the early hours of the day, it was observed that the Blackbucks grazed the agriculture fields and as the people movement started, they would slowly shift their grazing location to grasslands. In some instances, it was observed that they take a rest in the agriculture field, ruminating for a while and then continue grazing till the dark. Many times crop fields were also part of their territory, hence visiting the agricultural field was considered both a territorial activity and a feeding activity.

**Range and territories:** During the field visit, in the study area, it was observed that the solitary male or group of adult males tended to establish territories, whereas the female and the mixed groups (including sub-adult males and fawns) tended to have a home range rather than a territory. It was also observed that the males in these groups kept all the herd members intact in the limited range and when they encountered other groups that had dominant males, they would avoid intrusions from both the groups. The field observations made during 2022- 2023 confirmed that the size of home ranges change with the size of the herd, availability of food, topography of the terrain and intra-specific composition. It was difficult to monitor whether the groups were confined to a particular home range. The solitary males were observed to keep their territory almost on similar lines with the mixed herd. Still, it was often difficult to understand whether it kept its territory or part of a mixed group.

Field observations had proved that the male demarcated its territory by urinating at different corners of the territory. Pellet piles were another important territorial markings observed during the study. It was observed that these pellet piles were deposited in the strategic points of a territory and, in many cases, at the centre of the range of a group. They were also observed to urinate on these piles. Since the Blackbucks usually sat on these pellet piles, they acquired scent on their body which again signaled the opposite sex for breeding. Another prominent behavior observed for demarcation of territory was whipping the prominent reeds, twigs and grasses with the secretion of pre-orbital glands.

### **Food and feeding behavior of the chinkara**

Chinkara feeding habits are frequently documented by monitoring the plants consumed. At the same time, the animals graze or by noting the sites where animals grazed and afterwards investigating the spot to see what plants were consumed. Feeding observations were conducted on foot and by motorbike in the study regions of Guda Bishnoiya, Kakani, Dungarpur and Dundhali.

When a feeding animal was found, it was observed from a distance of 30 to 50 meters and the food plants ingested were documented. Types of food plants were partially or completely consumed were also recorded and analyzed. Throughout the day, from dawn to dusk, the activity of visible animals was recorded at regular intervals. All plant species used by Chinkara were collected and carried to establish a permanent record.

The availability of shrub and tree species was measured in a radius of 5 meters surrounding the freshly eaten plant. There was no attempt to quantify grasses, herbs, fallen leaves, flowers, or fruits. All grasses, herbs, fallen leaves, flowers and fruits were classified a separate group as 'grass', 'herbs,' and 'fallen leaves, flowers and fruits,' regardless of species.

### **Food and feeding behavior of the Nilgai**

Nilgai is partially gregarious creature, yet large groups and congregations are rare. Nilgai occur in groups ranging from one to 10 individuals and the mean group size observed.

According to Schaller (1967), nilgai groups are continually changing. Still, there are three basic types of groups: (I) one or two cows with small calves, (ii) three to six adult and yearling cows with calves and (iii) male groups ranging in size from two to eight.

As per studies on nilgai feeding habits, they are browsers who eat various foods. Nilgai can survive on various grasses, plants and browse as long as they get enough protein, which must not be less than 8% of their total diet. The nutritional overlap between nilgai and other wild ungulates is poorly understood. Rodgers (1991) claims that huge nilgai size allows them to survive on significantly lower-quality food, making them coarser browsers. They also have a penchant for raiding crops and are considered pests in agricultural regions. Their capacity to reach heights is up to 2.2 meters (bulls) aids in gaining access to feed in severely grazed areas. Female nilgai have been seen standing on their hind legs and feeding on *Zizyphus mauritiana* leaves and fruits occasionally.

### **Winter season diet**

The blackbucks were observed to consume 14 species of plants during the winter season. Among them 4 trees species leaves of namely *Prosopis cenario*, *Zizyphus mauritiana*, *Salvadora oleoides*, *Acacia tortillas* and Herbs & Shrub 6 species *Cynodon dactylon*, *Phaseolis aconitifolius*, *Eleusinecompressa*, *Crotalaria burhia* and *Cyperus rotundus*, It has been observed that 4 crops species like *Cicer arietinum* (Chana), *Triticum aestivum* (wheat), *Brassica compestris* (sarson), were taken by the blackbuck. However, *Cicer arietinum* (Chana) was more preferred than another available crop.

The Chinkara generally preferred the 4 tree plant species leaves of *Prosopis cenaria*, *Zizyphus mauritiana*, *Salvadora oleoides* and Herbs & Shrub 6 species *Crotalaria burhia*, *C. dactylon*, *D. bipinnata* and *S. marginatus*. *E. compressa* and *Z. mummularia* and many feeds on the standing crops of bajra (*Pennisetum typhoides*) and moth (*Phaseolis aconitifolius*).

During the winter season, Nilgai has a strong preference for *Triticum sativum* (wheat) and *Cicer arietinum* (Chana). It damages much more than eating the standing *Brassica niger* (black mustard) crops. A great liking of the nilgai for *Ricinus communis* (castor) crops has caused an aversion among farmers to grow this plant in the arid region of Rajasthan. Apart from consuming considerable quantities of standing crops, the nilgai also damages plants by its

habit of vigorously swinging its head left and right and thereby defoliating the adjacent plants with its horns. During early winter, they feed on sprouting and green food plants just after crop harvest and also feed on mulch of harvested crops

The nilgai eats 9 Herbs & Shrubs *Tephroga purpurea*, especially at the flowering stage, *Aerva persica* up to the pre-flowering stages, leaves of *Z. nummularia*, also consumed leaves and soft branches of *Maytenus emarginata*, *Lycium barbarum* and *crotalaria burhia*. Both green and dry and pods 3 plant species of *A. nilotica*, *P. cineraria* and *P. juliflora*.

### Monsoon season diet

During Monsoon, Blackbuck habitat turns green due to the sprouting of new grasses, shrubs and tree species. In the monsoon season, blackbucks consumed 13 species of plants, among them 5 tree leaves, fruit species *Salvadora oleoides*, *Acacia nilotica* *Tecomella undulate*, *Prosopis cineraria* and *Ziziphus mauritiana*. They also, feed on 8 herb & shrub species contributed to 95% of the monsoon diet *Cynodon dactylon*, *Cyperus rotundus*, *Capparis deciduas* *Leptadenia pyrotechnica* *Tephrosia purpuria* *Eleusinecompressa* *Cenchrus ciliaris*, were the main food plants.

The chinkara and Blackbuck feed on same noticed trees, herbs & shrubs clamber and crops. The foods of Indian gazelle consist of grass, leaves and succulent fruits. Chinkara is almost nocturnal in foraging habit. They can also raid at night at the nearby crop fields for foraging. It is a better browser than a grazer. It browses mainly on leaves of many plants such as Chinkara generally prefers the leaves of *C. burhia* and *Z.mummularia* and feed on *A. tortilis*. On the standing crops of bajra (*Pennisetum typhoides*) and moth (*Phaseolus aconitifolius*) *E. compressa* appeared to be the most preferred grass of the chinkaras. The young and sprouting shoots of the grasses *Eleusine compressa*, *Cyprus rotunds* provide the chinakra. The changeover from mainly browsing to a grazing habit of the Chinkara is noticed in this season. Chinkaras' low fibre and high protein content feeds may reflect their poor fibre digestibility.

In the Monsoon season, about 30 plant species (10 trees, herb & shrub 15, climber 5) observations have been done on the food Habits of Nilgai. During Monsoon, Nilgai preferred to graze on the perennial grasses than browsing because, in this season, Grasses are green and available in large quantities. During this season, Nilgai preferred grasses like *Dactyloctenium indicium*, *Cynodon dactylon*, *Eleusine compressa*, *Desmotachya bipinnata*, *Cenchrus biflorus*, *Cenchrus setigerous*, *Lasiurus indicus*, *Pentium turgidum*, *Cyprus rotundas*, *Indigofera cordifolia*, *Citrullus colocynthis* and *Crotalaria burhia*. Climber *Citrullus colocynthis* *Citrullus fistulosus* *Citrullus lanatus* *Cucumis callosus* and *Cucumis callosus* Nilgai prefers to browse growing *P. typhoides* (bajra) over mature bajra plants. It also likes *P.aureus* (moong), *P. aconitifolius* (moth) and *Cyamopsis tetragonoloba* (guar) crops.

### Summer Season diet

During the summer season, it was observed that blackbucks consume 15 species of plants. Feed on 5 trees species, 10 herbs & shrub species. When green grasses become scarce, the Blackbuck and Chinkara have also been noticed to pick up the highly nutritious green or dried pods shed by the *P. cineraria* trees (crude proteins 11.5%, gross energy value 6.5 kcal g). The case of *P. cineraria* seeds in chinkara pellets during the lean period, particularly in June (average 2.3 seeds g-1 dry fecal matter), is further proof of this animal's preferring *P. cineraria* pods. Blackbucks and chinkaras in their respective habitats frequently consume the moisture-laden nutritious flowers of *Tecomella undulata* shed by this tree from mid-March to April. The chinkaras selectively consume leaves of low fiber and high crude proteins content. These animals much relish the soft branches and leaves of *C. burhia*; when these plants dry up in summer, the chinkaras settle their feeding habit and feed on the green leaves of *Maytenus emarginatalata*. The blackbuck also takes soft, tender leaves of *Tephrosia purpuria*,

Cenchrus biflorus, Capparis decidua canchrus setigerous, Cenchrus ciliaris and salvadora oleoides species. The summer Grasses like C. dactylon and C.rotundus are also of crazy interest during this point.

Feeding observations were made on the Nilgai. It was observed from these observations 5 tree Prosopis cineraria, Capparis deciduas, Acacia nilotica, Salvadora persica and Prosopis juliflora. Herb & shrub 8 species noticed Teprosia purpuria, canchrus setigerous, Cenchrus ciliaris Maytenus emarginatalata Capparis decidua (Table-1). In Summer, due to scarcity of Grasses they became browser than grazers and browsed on fresh and dried leaves and twigs of Zizyphus nummularia, leaves, Flowers and fruits of Salvadora oleoides, Salvadora persica, Capparis deciduas, Calotropis procera, etc.

The Blackbuck competes with the chinkara and Nilgai for food. The Chinkara and Blackbuck play a significant role in the dispersion of seeds and the regeneration of numerous plants. Some forest areas lack fruits and seeds for birds and animals, causing the vegetation's regeneration cycle to be impeded.

It regulates seeds and piles them in a location where it ruminates, much like most other ungulates.

Although the Blackbuck and Chinkara have been spotted wandering and grazing in this region throughout the day, they have also been photographed feeding as late as 100 hours. In the sectors of agriculture (Kankane, 2000). According to Bohra et al., (1992), Chinkara consumes sections of 13 different plant species that contain between 61 and 86% moisture.

This guarantees that the feeders' prepared water contributes significantly to their total water balance. It was also said that the Chinkara may not need any free water for drinking since its feeding habits and physiological water efficiency are sufficient to maintain its water balance.

This study concluded that blackbuck's body condition and foraging activity depend on the seasonal food availability and quality. They feed on fresh tender leaves, grass (highly preferred) and occasionally on maize, leaves of shrubs and herbs. They primarily used short grasslands during monsoon compared to the winter season and the preferred grass species were Cynodondactylon and Desinostachya bipinnate in both seasons. Adult blackbucks needed approximately 2 kg dry matter per day for survival, good health and daily activities. The study recommended that for their long-term survival and viable population in study area concerned people should attempt controlled livestock grazing around captive area, cultivation of seasonal food, plantation of palatable plants, habitat extension and prepare management plans.

Table 1: Plant Species eaten by blackbuck, Chinkara and Nilgai

S.N.	Plant Name	Blackbuck	Chinkara	Nilgai
1.	Tecomella undulata	✓	✓	✓
2.	Acacia leucophloea	X	X	✓
3.	Acacia nilotica	✓	✓	✓
4.	Acacia Senegal	✓	✓	✓
5.	Balanites aegyptica	X	X	✓
6.	Prosopis cineraria	✓	✓	✓
7.	Salvadora persica	✓	✓	✓
8.	Salvadora oleoides	✓	✓	✓
9.	Zizphus mauritiana	✓	✓	✓
10.	<b>(Herb Name)</b>			
11.	Aerva persica	X	X	✓
12.	Brachiaria ramosa	✓	✓	✓
13.	Cenchrus biflorus	✓	✓	✓

14.	<i>Cenchrus ciliaris</i>	✓	✓	✓
15.	<i>Cenchrus prieurii</i>	✓	✓	✓
16.	<i>Cenchrus setigerus</i>	✓	✓	✓
17.	<i>Cistanche tubulosa</i>	X	X	✓
18.	<i>Convolvulus deserti</i>	✓	✓	✓
19.	<i>Cynodon dactylon</i>	✓	✓	✓
20.	<i>Cyperus bulbosus</i>			
21.	<i>Cyperus rotundus</i>	✓	✓	✓
22.	<i>Dactyloctenium aegyptium</i>	✓	✓	✓
23.	<i>Eleusinecompressa</i>	✓	✓	✓
24.	<i>Digera muricata</i>	X	X	✓
25.	<i>Eruca vesicaria</i>	X	X	✓
26.	<i>Euphorbia granulata</i>	✓	✓	✓
27.	<i>Euphorbia hirta</i>	✓	✓	✓
28.	<i>Heliotropium subulatum</i>	✓	✓	✓
29.	<i>Indigofera cordifolia</i>	✓	✓	✓
30.	<i>Indigofera oblongifolia</i>	X	X	✓
31.	<i>Lasiurus scindicus</i>	✓	✓	✓
32.	<i>Panicum turgidum</i>	✓	✓	✓
33.	<i>Pulicaria arabica</i>	✓	✓	✓
34.	<i>Tephrosia purpuria</i>	✓	✓	✓
35.	<i>Tragus biflorus</i>	✓	✓	✓
36.	<i>Trianthema portulacastrum</i>	X	X	✓
37.	<i>Tribulus terrestris</i>	✓	✓	✓
38.	<i>Trigonella foenum-graecum</i>	✓	✓	✓
39.	<i>Vigna trilobata</i>	✓	✓	✓
	<b>(Shrub)</b>			
40.	<i>Calligonum polygonoides</i>	X	X	✓
41.	<i>Calotropis Procera</i>	X	X	✓
42.	<i>Capparis decidua</i>	✓	✓	✓
43.	<i>Clerodendrum phlomidis</i>	X	X	✓
44.	<i>Datura stramonium</i>	X	X	✓
45.	<i>Leptadenia pyrotechnica</i>	✓	✓	✓
46.	<i>Maytenus emarginatus</i>	X	X	✓
47.	<i>Prosopis juliflora</i>	✓	✓	✓
48.	<i>Ziziphus mauritiana</i>	✓	✓	✓
49.	<i>Ziziphus nummularia</i>	✓	✓	✓
	<b>(Climber)</b>			
50.	<i>Citrullus colocynthis</i>	X	X	✓
51.	<i>Citrullus fistulosus</i>	✓	✓	✓
52.	<i>Citrullus lanatus</i>	X	X	✓
53.	<i>Cucumis callosus</i>	✓	✓	✓
54.	<i>Cucumis melo var. agrestis</i>	✓	✓	✓



**Note:** - The symbols ✓ and X indicate the degrees of preferences and non-preferences of the forage species

Table 2: Parts of Agricultural crops preferred by study Ungulate.

S.no.	Botanical name	Vernacular name	Blackbuck	Chinkara	Nilgai
1.	Pennisetum Typhoides	Bajra	✓	✓	✓
2.	Vigna radiata	Mung	✓	✓	✓
3.	Vigna Aconitifolia	Moth	✓	✓	✓
4.	Sesamum Indicum	Til	✓	✓	✓
5.	Cyamopsis Tetragonoloba	Ganwar	✓	✓	✓
6.	Cucumis Callosus	Kachri	✓	✓	✓
7.	Citrullus Lanatus	Matira	✓	✓	✓
8.	Cicer arietinum	Chana	✓	✓	✓
9.	Sorghum valgare	jawar	✓	✓	✓
10.	Brassica compestris	Sarso	✓	✓	✓
11.	Triticum sativum	Wheht	✓	✓	✓

**Note:** - The symbol ✓ and X indicate the degrees of preferences and non-preferences of the forage species

Table 3: Mostly Some Plant species seasonally eaten by blackbuck, gazelle and Nilgai.

Animal	Summer	Winter	Monsoon
<b>Blackbuck</b>	Cynodon dactylon (Dhob)	Cynodon dactylon Dhob)	Cynodon dactylon (Dhob)
	Desinostachya bipinnate(Dab)	Desinostachya bipinnate (Dab)	Cyprus rotundas(motho)
	Mollugo spp.	Dactyloctenium aegyptium	Cenchrus biflors (bhorat)
	Prosopis cineraria (pods)	Eleusine compressa (Ghora dhob)	Panicum turgidum (Murat)
	P. juliflora (pods)		Borrelia hispida
<b>Gazelle</b>	Prosopis cineraria (Khejri),	Crotalaria burhia( Sinia)	
	Zizyphus nummularia	Zizyphus nummularia	Eleusine compressa (Ghora dhob)
	Eleusine compressa	Tecomella undulate (flowers)	Cyprus rotundas (Motho)
	Heliotropium spp.		
<b>Nilgai</b>	Prosopis cineraria (pods)	Zizyphus mauritiana (Ber),	Dactyloctenium indicium,
	Prosopis cineraria (Khejri),	Prosopis cineraria (Khejri),	Cynodon dactylon,
	Prosopis juliflora (Vilayti Babool)	Prosopis juliflora (Vilayti Babool)	Eleusine compressa (Ghora dhob)
	Capparis deciduas (Ker),	Capparis deciduas (Ker),	Cenchrus setigerous (dhaman)

			Pentium turgidum
	Acacia nilotica (Kikar),	Ticomela undulate (Rohira)	Pulicaria angustifolia (soneli)
	Salvedora persics (Mitha jal)	Balanitis egyptica (Hingota)	

(A)



(B)



(C)



Figure: - 1. Food Comparison (A) Blackbuck and domestic ungulate (B) Chinkara (C) wild ungulates Nilgai

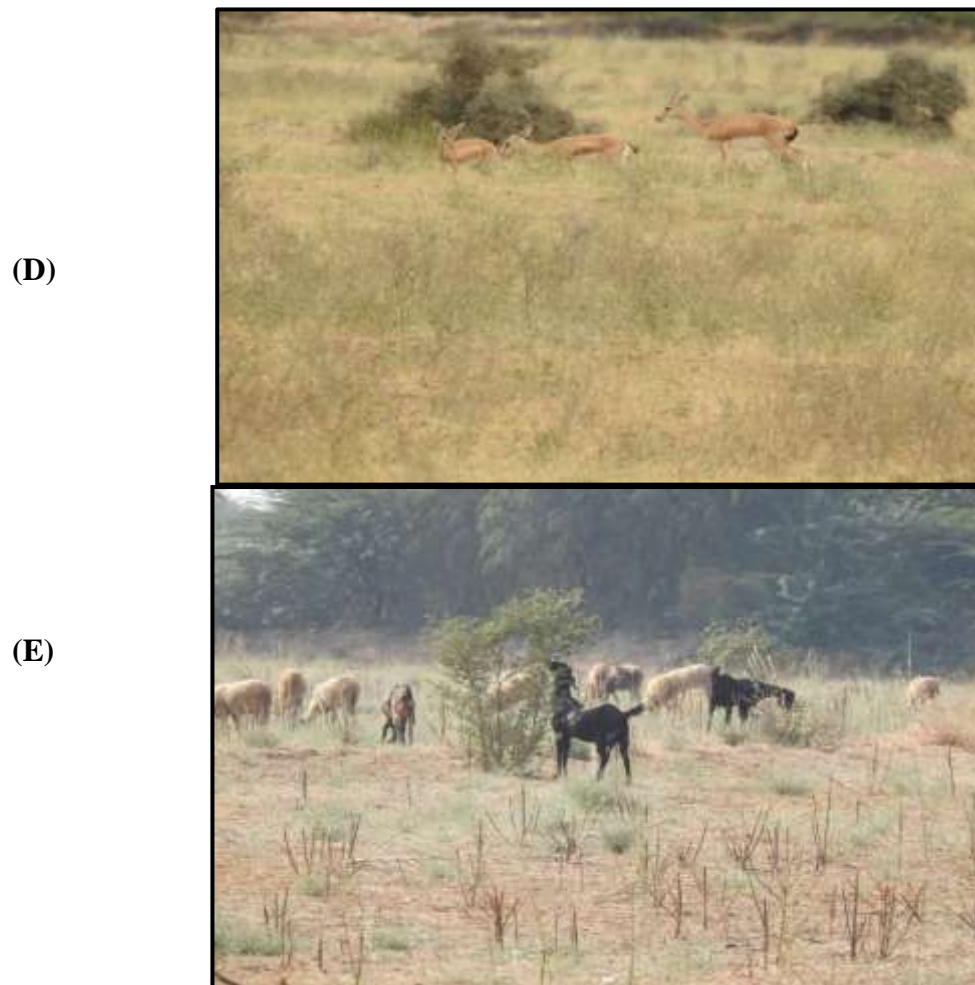


Figure: - 2. Blackbuck Comparison ungulates (D) Chinkara family (E) Domestic ungulates goat and sheep.

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