

## ECOLOGICAL STUDIES ON THE PROTECTED AND OVERGRAZED GRAZINGLANDS OF THE TAL CHAPPAR SANCTUARY

PRADEEP KUMAR and S. S. KATEWA

Department of Botany, College of Science, M.L. Sukhadia University, Udaipur-313001, Rajasthan, India.

A study of the behaviour of different plant species with respect to composition and cover under natural condition of grazing and under protection of the grazinglands of Tal Chappar Sanctuary situated at a distance of 85 Kms from Churu district has been carried out. The sanctuary is located on the fringe of the Great Indian Desert and is famous for the most elegant antelope of India "The Black-Buck." The climate of the sanctuary is typical tropical arid. It was observed that grazinglands of Tal Chappar Sanctuary have saline clayey soil and supports *Sporobolus - Dichanthium* type of grassland. A community of *Sporobolus marginatus* in the protected grazingland has a total basal cover of 12.2 percent as against 5.6 percent in the unprotected grazingland. In the protected grazingland 61 percent more species were recorded as compared to the unprotected grazingland where they are eliminated on account of overgrazing. Unprotected grazinglands subjected to overgrazing by the enormous live-stock population and with unscientific management practices support more shrubby and under shrub species which are generally less palatable and less nutritious.

**Keywords:** Black buck; Grazinglands; Overgrazing; Tal Chappar Wildlife Sanctuary.

### Introduction

Adequate management of a grazingland can only be achieved with a thorough understanding of the existing natural vegetation, its composition, cover and vigour in relation to the environmental conditions viz. climatic, edaphic and biotic. So far the evaluation of the rangelands in India has been attempted only on generalized concepts of climax and subclimax<sup>1-4</sup>. These concepts are often applied even for short term management, though the successional trend concepts are based on long term data.

Very little work on the ecology of Indian rangelands has been recorded<sup>5</sup>. Ahuja<sup>6</sup> recorded two time increase in forage production in Rajasthan under protection with controlled grazing (having 70% utilization). Das *et al.*<sup>7</sup> indicated that moderate grazing in the rangelands increase the density, cover and number of species when compared with ungrazed plots. Ahuja *et al.*<sup>8</sup> studied the effects of different aspects of grazing on rangelands at Chandan. Prajapati<sup>9</sup> dealt with the aspect of cover and behaviour of principal plant species *vis-à-vis* animal production as influenced by grazing treatments at Jaisalmer. Khan and Bhati<sup>10</sup> studied effect of closure on the growth of grasses. No work on the comparison of protected and overgrazed rangelands in Rajasthan has so far been recorded though such studies were carried out in the United States<sup>11-13</sup>. The present study, therefore are

aimed at studying the behaviour of different plant species with respect to composition and cover under natural condition of grazing and under protection in the grazingland of Tal Chappar Sanctuary. This may give an indication to the level to which the grazing may be allowed without deterioration to the primary producers.

### Material and Methods

The climatic, edaphic and other characteristics features of Tal Chappar Sanctuary are given in Table 1. Botanical composition and ecological attributes of the vegetation were studied by line intercept method<sup>14</sup> during different seasons of the year 2009. A minimum of 10 lines of 10 m each, placed randomly in each area were studied both in the enclosure as well as in area just outside the enclosure. Since the vegetation outside consisted mainly of prostrate bushy form, the crown spread of these species was measured along the line string. The number and basal cover of intercepting plants were recorded. The percentage cover and composition was determined as followed by the Curtis and McIntosh<sup>15</sup> and Shankarnarayan and Satyanarayan<sup>4</sup>.

### Observations

Percentage basal cover of grasses (perennial and annual) forbs, under shrubs, shrubs and trees is given in Table 2. This shows that the basal cover decreased under unprotected grazingland. Percentage composition of vegetation is given in Table 3, which shows that there is

Table 1. Characteristic features of the area studied.

Place of study	Soil type	Habitat	Vegetation type	Grass community	Plant community	Rainfall (mm)
Tal Chappar Sanctuary	Heavy clay saline soil	Low lying depression area	Halophytic shrub desert	<i>Sporobolus marginatus</i>	<i>Suaeda fruticosa</i> <i>Prosopis cineraria</i>	370

Table 2. Percentage basal cover of principal plant species in the protected and overgrazed grazinglands.

Name of species	Tal Chappar Sanctuary	
	P	G
(A) Grasses		
(a) Perennial grasses		
<i>Cenchrus ciliaris</i>	-	-
<i>Cenchrus setigerus</i>	-	-
<i>Cynodon arcuatus</i>	-	-
<i>Cymbopogon jawarancusa</i>	-	-
<i>Dactyloctenium indicum</i>	0.09	0.048
<i>Desmostachya bipinnata</i>	-	0.149
<i>Dichanthium annulatum</i>	0.306	-
<i>Eleusine compressa</i>	0.127	0.308
<i>Eremopogon foveolatus</i>	0.068	-
<i>Heteropogon contortus</i>	-	-
<i>Lasiurus indicus</i>	-	-
<i>Panicum turgidum</i>	-	-
<i>Oropetium thomaeum</i>	-	0.327
<i>Sporobolus marginatus</i>	8.387	1.078
(b) Annual grasses	2.811	0.401
(c) Sedges	0.346	-
(B) Forbs and under shrubs		
(a) Forbs	0.106	1.488
(b) Under shrubs	0.021	1.430
(C) Shrubs and trees		
(a) Shrubs	-	0.348
(b) Trees	-	-
Total % cover	12.262	5.583

P - Protected, G - Grazed

Table 3. Percentage composition of principal plant species in the protected and overgrazed grazinglands.

Name of species	Tal Chappar Sanctuary	
	P	G
(A) Grasses		
(a) Perennial grasses		
<i>Cenchrus ciliaris</i>	-	-
<i>Cenchrus setigerus</i>	-	-
<i>Cynodon arcuatus</i>	-	-
<i>Cymbopogon jawarancusa</i>	-	-
<i>Dactyloctenium indicum</i>	0.06	0.87
<i>Desmostachya bipinnata</i>	-	2.67
<i>Dichanthium annulatum</i>	2.53	-
<i>Eleusine compressa</i>	1.04	5.51
<i>Eremopogon foveolatus</i>	0.53	-
<i>Heteropogon contortus</i>	-	-
<i>Lasiurus indicus</i>	-	-
<i>Panicum turgidum</i>	-	-
<i>Oropetium thomaeum</i>	-	5.90
<i>Sporobolus marginatus</i>	68.72	19.27
(b) Annual grasses	23.04	7.22
(c) Sedges	2.84	-
(B) Forbs and under shrubs		
(a) Forbs	0.86	26.61
(b) Under shrubs	0.19	25.52
(C) Shrubs and trees		
(a) Shrubs	-	6.23
(b) Trees	-	-

hardly any change in the protected and unprotected grazinglands as far as this attribute is concerned.

Table 4 gives the number of species under protected and unprotected condition and from this table also it is evident that under unprotected condition the total number of species is less as compared to the protected grazingland.

#### Result and Discussion

Tal Chappar Sanctuary is low lying depressional area having saline clayey soil. It supports *Sporobolus* - *Dichanthium* type of grassland. A community of

*Sporobolus marginatus* in the protected grazingland has a total basal cover of 12.2 percent as against 5.6 percent in the unprotected grazingland. *Sporobolus* contributes a major part to the cover (8.4%) in the protected grazingland, which is reduced to only 1.08 percent in the unprotected area, while other species like *Tragus biflorus*, *Oropetium thomaeum*, *Desmostachya bipinnata* and *Suaeda fruticosa* contributes to a major part of the cover. In the protected grazingland 61 percent more species were recorded as compared to the unprotected grazingland where they are eliminated on account of overgrazing. These species such

Table 4. Number of plant species in protected and overgrazed grazinglands.

Plant group	Tal Chappar Sanctuary	
	P	G
(A) Grasses		
(a) Perennial grasses	5	5
(b) Annual grasses	7	3
(c) Sedges	2	-
(B) Forbs and under shrubs		
(a) Forbs	5	2
(b) Under shrubs	2	1
(C) Shrubs and trees		
(a) Shrubs	+	2
(b) Trees	-	-
Total no. of species	21	13
Difference	8	
% Increase (+) or Decrease (-) with overgrazing	- 38%	

as *Digitaria adscendens*, *Dichanthium annulatum*, *Eremopogon foveolatus* etc. are palatable to the livestock. Percentage composition of *Sporobolus marginatus* in the protected range is 68.7 percent while it is only 19.3 percent in unprotected grazingland. Under shrubs and shrubs contribute to 31.8 percent in the unprotected grazingland as against 0.19 in the enclosure. Absence by *Oropetium thomaeum* and presence of *Dichanthium annulatum* in the enclosure is an indication of progressive trend with protection, which is further confirmed by the percentage cover of 8 percent in the enclosure against 1.08% in the unprotected area.

Unprotected grazinglands subjected to overgrazing by the enormous livestock population and with unscientific management practices support more shrubby and under shrub species which are generally less palatable and less nutritious. These species are the main contributors to the basal cover in Tal Chappar grazingland due to the fact that with constant browsing they assume a prostrate habit and thus show more in the basal cover.

Basal cover of palatable perennial and annual species viz. *Dichanthium annulatum*, *Lasiurus indicus*, *Eleusine compressa*, *Sporobolus* sp. etc. decreases considerably in unprotected range. Palatable grasses and forbs are present only under thorny bushes which are inaccessible to the livestock, while the annuals and seasonals are nibbled as soon as they germinate soon after

the effective monsoon showers.

In the unprotected grazingland less palatable or non-palatable species with poor nutritive value like *Tephrosia purpurea* and *Oropetium thomacum* etc. are the increasers and may be regarded as indicators of over grazed condition in the grazingland. From the unprotected grazingland some species are either completely eliminated or show decrease in their percentage composition and basal cover. Such species are *Cenchrus setigerus* and *Eremopogon foveolatus*.

This shows that such species are palatable and are taken up by the animals at sometime or the other during the year. The number of species in protected grazingland in some cases is less as compared to unprotected grazingland which may perhaps be due to the fact that many species from the protected grazingland have been eliminated during the succession changes due to protection and more aggressive perennial species, forming the optimum stage, take their place.

In order to assess the performance of dominant species and their response to environmental condition, the total basal cover of perennial and dominant grasses is higher in enclosures as compared to unprotected grazingland. The basal cover and percentage composition of the vegetation alone does not reflect the actual condition, since, in some cases the percentage composition and basal cover is higher in unprotected range as compared

to protected enclosure. Therefore, the data has to be supplemented with yield per unit area, plant height, leaf length etc., which shall furnish a valuable information in evaluating the condition of the grazingland for future management.

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