

# Seasonal Variation in Coverage of Selected Grasses and Forbs in Relation to Grazing Intensities in India

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Grazing modifies the structure of many plant communities. Fundamentally the grasslands of India are biotic in origin and hence their response to grazing presents many management problems. There are various controversies regarding the ori-

gin of these grasslands. Many ecologists consider them to be asexual in stage and biotically controlled. The importance of grasslands in India from the range management and grazing points of view is very high as they are the chief source of fodder for cattle in this area. The pressure for fodder is sufficiently high that various practices are adapted to feed the livestock. They include grazing, scraping and trampling. The influence of grazing, however, is not always well understood.

Various workers have made it clear that individual plants are rarely spread at random within a grassland community (Blackman, 1935 and Clapham, 1936). Ray (1959) while making a phytosociological analysis in north-eastern Oklahoma concluded that the aerial coverage used in making the analysis gave the best relationship between various species. The phytosociological differences in the same or different grazing-ground vegetation are important in ecological studies.

The object of this experiment was to study the variations in coverage of the plant species under the influence of grazing on the grassland. The vegetation was charted on meter quadrats to know the actual position of the plants upon the field during the summer and the rainy seasons. Although this method was

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laborious, it gave quantitative results, and when used extensively, furnished a complete picture of the structure of the vegetation above the ground. Charts were taken on protected, medium grazed, and overgrazed fields during the summer and rainy seasons on the grazing grounds of Varanasi, India.

From each chart the area of each species was noted and averaged for each grazing treatment (Table 1).

**Discussion**

It is concluded that the plant species occurring in both seasons show increases or decreases in coverage during the rainy season as compared with the summer season. These plants may be grouped as follows:

(1) Plant coverage increases in the rainy season in each type of grazing ground. The reason for such increase during this season is higher availability of moisture which plays an important role in the growth of the plants. They are: *Alysicarpus monilifer*, *Convolvulus pluricaulis*, *Indigofera linifolia*, *Desmodium triflorum*, *Boerhaavia diffusa* and *Evolvulus nummularius*.

(2) Plant coverage decreases during the rainy season in each type of grazing grounds. The main reason for decrease in the coverage of each plant species during this season in spite of higher availability of moisture is higher inter-and intraspecific competition. The plants are *Bothriochloa pertusa*, *Dichanthium annulatum*, *Evolvulus alsinoides*, *Vernonia cenera* and *Cynodon dactylon*.

There are certain plant species which occur only during one season or the other. Their coverage is recorded in the respective seasons for the different grazing grounds. These are *Trichodesma indicia*, *Blumea lacera*, and *Volutarella divaricata*, occurring in the summer and *Dactyloctenium aegyptium*, *Eragrostis gangetica*

*Crotalaria medicagenia* and *Digitaria sanguinalis*, etc., occurring during rainy season.

The effect of grazing and other disturbances on the coverage of the grassland species also can be taken into consideration. The plants are grouped according to the intensity of grazing under the following heads:

(1) The coverage increases in response to moderate grazing but further grazing decreases the coverage. These are: *Desmodium triflorum*, *Boerhaavia diffusa*, *Dichanthium annulatum*, *Evolvulus alsinoides*, *Digitaria sanguinalis*, *Paspalidium flavidium*, *Eragrostis tenella*, *Setaria glauca*, *Sporobolus diander*.

(2) The coverage increases as the grazing intensity continues to increase. The species are:

*Evolvulus nummularius*, *Cynodon dactylon*, *Alysicarpus longifolium*, *Eragrostis elongata*, *Euphorbia hirta*, and *Heliotropium strigosum*.

(3) The coverage decreases as the grazing increases. These are: *Alysicarpus monilifer*, *Convolvulus pluricaulis*, *Indigofera linifolia*, *Vernonia cenera*, *Dactyloctenium aegyptium*, *Eragrostis gangetica*, *Crotalaria medicagenia* and *Euphorbia thymifolia*.

(4) Lastly there is *Panicum psilopodium*. Grazing and protection have no major effect on its coverage.

Thus the effects of grazing and season on the plant coverage are varied. The nature, extent, and frequency of damage caused to the coverage of the plant appear to set up a sequence of metabolic

**Table 1. Average area occupied by each species during summer and rainy seasons in three fields.**

Plant species	Protected		Medium grazed		Overgrazed	
	S <sup>1</sup>	R <sup>2</sup>	S	R	S	R
	square cm					
<i>Alysicarpus longifolius</i>	—	0.97	—	1.24	—	1.24
<i>Alysicarpus monilifer</i>	1.14	1.41	1.04	2.76	2.04	2.16
<i>Blumea lacera</i>	0.90	—	1.44	—	—	—
<i>Bonnaya brachyata</i>	—	1.73	—	2.38	—	0.72
<i>Boerhaavia diffusa</i>	1.44	1.80	12.60	12.80	1.86	5.66
<i>Bothriochloa pertusa</i>	—	2.69	—	4.61	1.86	2.48
<i>Convolvulus pluricaulis</i>	1.98	1.00	7.17	2.64	1.72	3.06
<i>Crotalaria medicagenia</i>	—	4.58	—	1.89	—	1.87
<i>Cynodon dactylon</i>	2.10	1.11	3.81	3.17	6.20	3.01
<i>Dactyloctenium aegyptium</i>	—	3.52	—	2.63	—	2.54
<i>Desmodium triflorum</i>	1.55	2.51	1.58	2.91	1.52	2.04
<i>Dichanthium annulatum</i>	3.06	1.79	6.13	3.57	2.18	1.17
<i>Digitaria sanguinalis</i>	—	1.08	—	3.78	—	1.80
<i>Eragrostis elongata</i>	—	1.20	—	1.21	—	1.68
<i>Eragrostis gangetica</i>	—	2.09	—	0.75	—	0.62
<i>Eragrostis tenella</i>	—	1.10	—	1.30	—	1.00
<i>Eragrostis viscosa</i>	—	—	—	1.08	—	0.95
<i>Euphorbia hirta</i>	—	—	3.08	0.77	—	1.82
<i>Euphorbia thymifolia</i>	—	3.96	—	1.76	2.20	—
<i>Evolvulus alsinoides</i>	1.82	1.04	2.90	2.72	2.10	1.50
<i>Evolvulus nummularius</i>	0.68	3.22	2.11	4.50	2.28	2.42
<i>Heliotropium strigosum</i>	—	—	1.52	1.50	1.74	3.12
<i>Indigofera linifolia</i>	1.60	4.17	3.16	3.34	1.50	3.13
<i>Paspalidium flavidium</i>	—	0.98	—	3.29	—	1.60
<i>Panicum psilopodium</i>	—	2.34	—	2.11	—	2.55
<i>Setaria glauca</i>	—	0.96	—	1.18	—	0.40
<i>Sporobolus diander</i>	—	0.71	—	0.90	—	0.58
<i>Trichodesma indicia</i>	—	—	3.52	—	1.52	—
<i>Vernonia cenera</i>	8.91	2.47	1.68	1.98	0.98	1.40
<i>Volutarella divaricata</i>	—	—	—	—	2.64	—

<sup>1</sup>S=Summer; <sup>2</sup>R=Rainy season.

events wherein the plant assumes vegetative and reproductive growth accordingly. Although the general cover of the herbage is proportional to the moisture supply—being the maximum in the rainy season—

yet within the same season it decreases according to the intensity of grazing.

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