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An assessment of surface features and vegetative cover in Alpine Rangelands of Cknp region, Pakistan

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Abstract

Rangelands of Central Karakorum National Park (CKNP) in Gilgit-Baltistan, is regarded as vital ecological resources of Pakistan. The present study was conducted in Hushe Valley of Baltistan during July-August of 2012 to investigate the surface features, distribution of vegetation cover, along altitudinal gradients (~500 m intervals) using quadrate methods (20 quadrates each per line transects) on three range sites named as Brumbrama (3955 masl), Jongfong (3488 masl) and Gambabramachan (3051 masl) of CKNP area Hushe. The average surface feature of the area was consisting of vegetation cover 32%, litter 4%, rock 22 % and barren cover was 41 %. Out of the 32% vegetation cover the average grass cover was maximum (24.20±3.34%) at the highest altitude Brumbrama followed by mid altitude Jongfong. The average cover of shrub (22.75±4.13 %) was much dominated at mid altitude Jongfong, whereas, forbs were much higher (20.75± 3.44%) at the lowest altitude.

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Introduction

Pakistan is primarily a dry-land country where 80 percent of its land area is arid or semi-arid, about 12 percent is dry sub-humid and the remaining 8 percent is humid. Two-thirds of the country is depending on dry-lands to support their livelihood mainly through agro-pastoral activities (GOP, 2006). Rangelands are vast natural landscapes in the form of grasslands, shrub lands, woodlands, and deserts. These are considered as part of land around the world having inappropriate for cultivation due to some physical characteristics but are good source of wood products, water and forage for livestock (Miller, 1997). Such areas hold a great diversity of plant species composition, productivity and a source of forage for livestock (Mohammad and Naz, 1985).

Rangelands cover about 50 % of world land surface and are essentially the larger tracts of natural vegetation, for animal production (Friedel *et al.,* 2000). It is regarded as vital ecological resources which have historically been the backbone of pastoral livelihoods (Tastad *et al.*, 2010). Pakistan has a total area of 88 million hectare, about 50.88 million ha, area under rangelands constituting (58%) country's landmass (Mohammad, 1989). Out of this a very small area (5%) lies in the high-rainfall rangelands of Alpine pastures (1.68 million ha) and Himalayan grazing lands (0.67 million ha). Rests of the rangelands are situated in arid and semi-arid areas of the country (Afzal *et al.*, 2008). Rangelands of these areas mostly receive <200 mm rainfall annually and are located on rock base soils with rough topography and desserts. The alpine pastures in Northern belt of Pakistan having a diversity of plant species and are one of the major sources of fodder for livestock. Gilgit-Baltistan possesses a large portion of landmass as rangeland covering 52% area under rangeland (IUCN, 2003). Livestock is playing a pivotal role in the household economy of this valley and rangeland in this valley is providing the major fodder for their livestock. The information about rangeland resources in Central Karakoram National Park (CKNP) area of Gilgit-Baltistan is scanty. Therefore, the present study was designed to assess the surface features and types of vegetation cover in rangelands of three potential sites at different altitudes. The data about rangeland cover will help to understand the trend of rangeland health for the proper conservation and management in the valley. This study is of its first kind in this valley which will provide baseline scientific information about rangeland cover. Further study need to be done to evaluate the rangeland productivity.

Materials and methods

Study Area

Gilgit-Baltistan covers 72,500 square km of mountainous land with some of the world's highest mountain ranges. The study valley, Hushey, is located 3174 meter above sea level, 34 km away from district headquarter, Khaplu, Ganche. Total household in the study area is 140 and is the last human settlement of Baltistan. The Valley surrounded by various peaks such as Mashabrum, K7, and Laila Peak (Fig. 1).

Average temperature and precipitation in the study area is presented in (Table 1).

Table 1. Average temperature and precipitation in Hushe valley during 2012.

	Temperature and Precipitation	Actual	Normal
January	Average	1°	2°
	Precipitation	71 mm	N/A
February	Average	5°	4°
	Precipitation	81 mm	N/A
March	Average	10°	8°
	Precipitation	50 mm	N/A
April	Average	14°	13°
	Precipitation	87 mm	N/A
May	Average	17°	18°
	Precipitation	50 mm	N/A
June	Average	21°	22°
	Precipitation	21 mm	N/A
July	Average	25°	24°
	Precipitation	11 mm	N/A
August	Average	24°	24°
	Precipitation	27 mm	N/A

http://www.accuweather.com/en/pk/hushe/642241/februaryweather/642241?monyr=2/1/2012

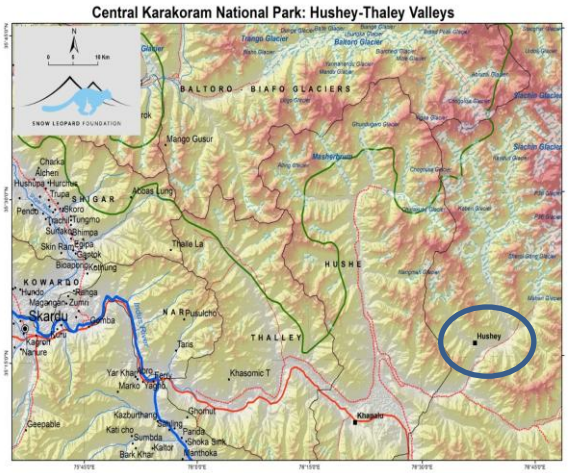

Fig. 1. Map of CKNP Region, showing study area of Hushe valley (Source: Snow Leopard Foundation Pakistan).

Data Collection

Field visits to the range sites of Hushe were conducted during summer 2012. Vegetation cover of shrub, grasses and forb were estimated. Total sixty (60) quadrats of 1 m² were laid down in three rang sites with 20 quadrats on each range sites by following standard methods (Mueller *et al.*, 1974; Kent and Coker, 1992) in Jongfong, (North) Brumbaram, (West) and Gambabramachan (East),aspects respectively for estimation of cover. The transect length were 25 meter in all four dimensions from the center point and 5 quadrats from each directions were selected with 5 meter intervals. Altitude and geographical coordinates at each sites were recorded through the Global Positioning System (GPS, model-E.trex.30). Measurement of vegetation cover was determined by using following equations (Shaukat *et al.* 1976: Chul and Moody, 1983).

$$\text{Percent cover} = \frac{\text{Total intercept length of vegetation}}{\text{Total Transect length}} \times 100$$

Data Analysis

The surface feature and vegetative cover distribution were analyzed for descriptive statistics, Analysis of Variance (Steel and Torrie, 1980) to check altitudinal variation among potential ranges by using SPSS 16.0 software package and MS Excel 2010.

Results

Surface Cover Feature of range sites at altitudinal gradients

Surface features of range sites such as vegetation cover, litter cover, rock cover and barren land cover were measured. The vegeattion based cover was found directly proportional to the increasing altitude in the Valley. The average surface feature was consisting of vegetation cover 32%, litter 4%, rock 22 % and barren cover was 41 %. The altitituidanl variation found varying results in all three ranges with maximum vegatation cover (40.45± 4.60) at Brumbram followed by mid altitude Jongfong (30.15±3.74) however, litter and rock based cover feature were more pronounced at lower range sites (Fig.2).

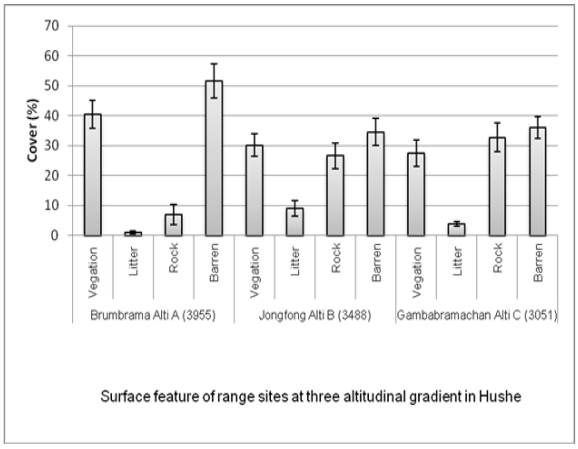

Fig. 2. Surface cover features of range sites at altitudinal gradient in Hushe Valley.

Distribution of Vegetation Cover

Out of the 32% vegetation cover in three range sites, the average grass cover was found direclty proportional to increasing altitudes with maximum (24.20±3.34%) at the highest altitude Brumbrama with Poa species followed by mid altitude Jongfong. The average cover of shrub (22.75±4.13 %) was much dominated at mid altitude Jongfong with *Salix Karlenii* species. The forbs were much higher (20.75± 3.44%) at the lowest altitude Gambabramachan (Fig. 3). The analysis of variance showed significant difference between cover parameters of shrub, grasses and forb at all three different altitudes (Table 2).

Table 2. ANOVA for vegetative cover parameters in rangelands of Hushe valley.

Parameters	Source of variation	Sum of Squares	df	Mean Square	F	Sig.
Cover of Shrub %	Between Groups	6225.83	2	3112.91	20.06	.000*
	Within Groups	8844.75	57	155.17		
	Total	15070.58	59			
Cover of Grasses%	Between Groups	5320.23	2	2660.12	25.88	.000*
	Within Groups	5857.95	57	102.77		
	Total	11178.18	59			
Cover of Forb%	Between Groups	3364.63	2	1682.32	8.25	.001*
	Within Groups	11613.30	57	203.74		
	Total	14977.93	59			

* Significant at P < 0.05

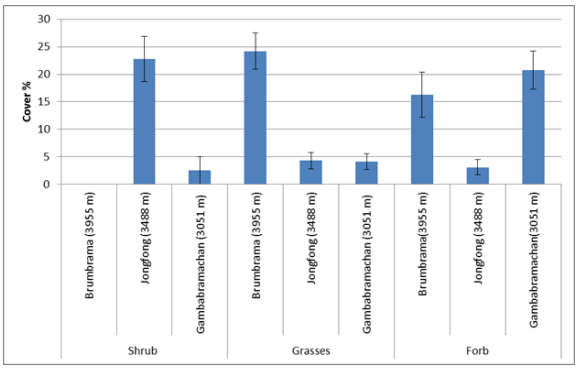

Fig. 3. Distribution of vegetative cover (%) shrub, grasses and forb at three different altitudes.

Discussion

The present study showed very interesting and variable results in all range sites. The vegetation cover for shrub and grasses were higher at higher elevations and fob cover at the lowest elevation. This comparatively high vegetation cover may be attributed to the health of a rangeland which is determined by measuring the vegetation cover (Holechek *et al.,* 1989). Vegetation cover not only relates to forage availability for livestock but it is also a useful indicator of how well a site is protected against erosion. The low percentage of vegetation cover and forage productivity in the study area would be due to the edaphic factors and obviously low level of precipitations in the Hushe range area. This supports by the findings of previous studies that the herbage productivity besides other factors is linearly related to the annual precipitation (Scholes & Baker, 1993; Farooq, 2003, Durrani *et al.*, 2005).

According to (Stoddart et. al. 1975) herbage (50%) is allocated for plant recovery while use of fifty percent remaining herbage is allocated between wildlife and livestock.

Overgrazing not only removes palatable plant cover but also causes compaction of soil and promotes erosion throughout the rangeland. Major factors influencing range productivity include stocking rate, grazing system, type of forage species, types of animals and season of use (Holechek *et al.*, 1998; Hussain & Badshah, 1998; Durrani *et al.*, 2005).

The main factors for rangeland degradation are the increasing in human and livestock population to satisfy the increasing demand for food, and shelter (Grainger, 1990; Alvi and Sharif 1995; PARC, 1998). Therefore more palatable species were destroyed resultantly thinning of the species dominating the low quality vegetation, hence causing the loss of livestock production each year. There is a potential for improving vegetation cover, in various range sites of Hushe by an integrated approach for rangeland management through combination of traditional knowledge and modern techniques. Furthermore extended monitoring and pasture survey is recommended to get more precise information about vegetation cover in Hushe valley.

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