

Eco-Comparison of Main University Campus with Naseem Bagh Campus of the University of Kashmir

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ABSTRACT

The campus of the University of Kashmir ($34^{\circ} 5' - 24^{\circ} 6' N$ and $74^{\circ} 8' - 74^{\circ} 9' E$) is differentiable into two micro-climatic habitats - the open savanna type grassland (Main University Campus) and *Platanus orientalis* dominated woodland (Naseem Bagh Campus). Various physico-chemical parameters of the soil in the two areas were compared and it was found that pH, organic carbon, total phosphorus, total nitrogen, moisture content and loss on ignition were slightly higher in Naseem Bagh. The conductivity, Ca, Mg, field capacity, soil temperature and atmospheric temperature were higher in case of main University Campus because of being an open Landscape, where ground surface is in receipt of direct sunlight. Plant species were identified in both the areas. It was observed that *Platanus orientalis* was dominating species in Naseem Bagh and *Cynodon dactylon* dominated in the main University Campus. Fairly good number of *Platanus orientalis* in Naseem Bagh campus were found to be damaged due to various factors including natural calamities and appropriate steps are needed for the restoration of the glory of this campus.

Keywords: Main University Campus, Naseem Bagh Campus, *Platanus orientalis*.

INTRODUCTION

The present landscape of Kashmir valley is a happy combination of the mighty splendour of mountains, of lovely glades and forests. Kashmir is famous throughout the world for its classical Chinar tree (*Platanus orientalis*) and saffron. The valley represents a panoramic view characterized by lovely lakes, shimmering streams, springs and fabulous falls. Vegetation of Kashmir is determined by its climate, rainfall, soil and altitude.

Mountain climate dominates the lesser Himalayas, the valley of Kashmir and greater Himalayas. The Pir Panjal does not allow the monsoon to cross over. Altitude and the temperature are the major determinants of climate in the mountainous tracts. Climate varies from temperate to tundra depending upon the altitude.

The campus of the University of Kashmir is clearly differentiable into two

microclimatic habitats - Chinar dominated woodland of Naseem Bagh Campus and the mini savanna type of the landscape of Main University Campus. The present study was conducted in order to investigate the edaphic and floristic features of the campuses.

Not much literature is available on Kashmir university campus, which is situated on the outskirts of Srinagar City, at Hazratbal. It is situated about 12 km from the city centre Lal-Chowk between the world famous Nagin and Dal lake and has a delightful natural surrounding with the Himalayan mountain range in the background. It has a beautiful campus spread over an area of 250 acres of land and includes the Naseem Bagh, a famous Mughal Garden built by the emperor Akbar.

Situated between 34° 5' to 34° 6' N latitude and 74° 8' to 74° 9' E longitude at an altitude of 1586m the campus is divided into two comparable micro habitats namely Main University Campus and Naseem Bagh Campus. Chinar forms the dominant component of Naseem Bagh Campus and can be regarded as a woodland habitat, while the Main University Campus is almost a type of open grassland. The soil of Hazratbal reportedly contains 14% clay and sand portion ranges between 16.5 and 23%. During Autumn i.e. September to mid November, when temperature is low and the soil moisture level increases due to occurrence of dew and frost, the chinar trees shed their leaves and add to the organic matter of the soil. Besides chinar some grass species and weeds form the ground cover. During rainfall, the moisture content in the soil increases and it is not lost rapidly, as the sunlight does not reach directly the soil surface due to canopy of chinar trees.

The apparently dominant species of the main University Campus are grasses, conifers, judas trees, cyperus and species of flowering plants, which add to its ornamentation. The soil is clay loam with some coarse brown sand containing little organic matter, nitrogen and moisture as compared to soils of Naseem Bagh. Being open sunlight falls directly on the soil surface and moisture content is lost rapidly.

MATERIAL AND METHODS

Composite surface soil samples were collected from Main University Campus and Naseem Bagh Campus upto a depth of 15 cm with the help of spade during a period of six months from May to October 2002. The soil samples were taken in thick polyethylene bags to the laboratory for regular physico-chemical examination. The two sites were named as MUC (Main University Campus) and NBC (Naseem Bagh Campus).

Field capacity and moisture content was determined by the method prescribed by Michael (1984). pH and conductivity were calculated by the method given by APHA (1998). Loss on ignition was calculated after Hanna (1964). Ca/Mg was determined by the method prescribed by Simard *et al.* (1990). Organic carbon was determined by the method given by Wallkley and Black (1934). Total nitrogen was determined by the method prescribed by Jackson (1962). Total phosphorus was estimated by method prescribed by Hooda and Kaur (1999). Atmospheric temperature was determined by minimum and maximum thermometer. Soil temperature was determined by soil thermometer.

Census of chinar trees was performed by block census method as is generally done in forest areas. The Naseem Bagh Campus was demarcated into nineteen blocks and the trees were counted manually. Girth of chinar trees was measured at chest height. Status was determined by recording various features of individual chinar trees in different blocks. Identification of other associated plant species was done by visual examination and by preparing a herbarium and getting the plants identified from both fresh and preserved specimens.

RESULTS AND DISCUSSION

Microclimate in an ecosystem is never uniform and even relatively low degrees of structural differences in aspect and topography (Duffey *et al.*, 1974) and the difference of insolation (Geiger, 1965) in combination with physico-chemical nature of soil types may be of great significance. The physico-chemical features of the surface soils of the two microhabitats are given in Table 1 & 2. The field capacity of the soils of both the campuses was almost identical, while the moisture content appeared to be slightly higher in NBC soils. Average percent loss on ignition and organic carbon were also higher in the NBC area. A slightly high range (7.40 and 7.55) of pH in soils of NBC was probably due to the presence of humic acid from decomposition of leaves of *Platanus orientalis* and the litter of under canopy herbal flora. The rate of humus formation and its accumulation are known to be governed by nature of microorganisms in decomposition, temperature, moisture, aeration and pH of soil. In about mid Autumn *Platanus orientalis* shed leaves which add to the organic matter of the soil. Consequently soil of NBC is comparatively richer in organic carbon than MUC. MUC soil too has slightly higher values of calcium as well as magnesium content, probably the grasses take up the ions from soil and in autumn upon decomposition, the nutrients are released back into the soil unlike NBC where chinar trees are dominating species and nutrients probably get locked into them. Moreover, calcium is not a component of protein and, thus, is not dependent on mineralization for its mobility as is nitrogen. Cycling of calcium is, thus, relatively

Table - 1. Physico - Chemical Parameters of soil of Naseem Bagh Campus

S. No.	Month	Field Capacity (%)	Moisture Content (%)	Loss on ignition (%)	PH	Conductivity (μ siemens/ Cm)	Ca (mg/g)	Mg (mg/g)	Org. Carbon (mg/g)	Total Nitrogen (mg/g)	Total Phosphorus (mg/g)	Aim. Temp (°C)		Soil Temp. (°C)
												Max.	Min	
1.	May	41.34	15.85	11.11	7.40	560	2.06	0.0010	1.54	4.76	65.08	24.30	9.30	25
2.	June	38.88	15.25	12.61	7.45	430	2.16	0.0017	2.06	4.97	68.15	27.10	13.90	26
3.	July	35.96	15.09	13.11	7.48	360	3.20	0.0012	2.56	4.69	73.13	30.20	17.50	29
4.	Aug.	33.64	14.30	14.63	7.50	330	4.02	0.0052	2.94	5.11	78.37	28.10	16.90	29
5.	Sept.	34.10	14.11	15.10	7.52	290	4.23	0.0071	3.09	4.62	81.89	25.10	12.50	23
6.	Oct.	35.00	13.92	16.28	7.55	260	4.82	0.0102	3.15	4.69	83.20	20.00	5.90	15
Average		36.48	14.75	13.80	7.48	375	3.41	0.0044	2.50	4.80	74.97	25.80	12.76	24.80

Table - 2. Physico - Chemical Parameters of soil of Main University Campus

S. No.	Month	Field Capacity (%)	Moisture Content (%)	Loss on ignition (%)	PH	Conductivity (μ siemens/ Cm)	Ca (mg/g)	Mg (mg/g)	Org. Carbon (mg/g)	Total Nitrogen (mg/g)	Total Phosphorus (mg/g)	Aim. Temp (°C)		Soil Temp. (°C)
												Max.	Min	
1.	May	42.75	13.44	9.17	6.89	577	3.10	0.0017	1.37	4.06	62.11	26.50	11.90	27
2.	June	40.21	13.06	10.86	6.94	460	3.26	0.0025	1.92	4.27	64.19	29.70	15.10	30
3.	July	37.08	12.78	11.32	7.08	410	3.66	0.0063	1.98	4.97	66.39	33.90	19.90	31
4.	Aug.	35.16	13.31	12.96	7.15	400	4.64	0.0085	2.17	4.13	69.09	31.90	17.90	32
5.	Sept.	36.76	13.38	13.66	7.23	360	5.02	0.0098	2.25	3.99	73.18	27.20	13.15	25
6.	Oct.	37.81	13.42	14.01	7.30	350	5.10	0.0112	2.36	4.34	75.10	21.20	7.20	18
Average		38.29	13.23	12.00	7.09	429.50	4.13	0.0066	2.00	4.29	68.34	28.40	14.19	27.10

slow within an ecosystem, and recycling within a tree is nearly nonexistent. The pattern of magnesium was found to be similar to that of calcium. Uptake greatly exceeded annual requirement for both the deciduous and coniferous species, indicating that magnesium accumulates in the older tissues of trees. Calcium and magnesium are known to serve as essential nutrients for plants and they are used agronomically to ameliorate the pH of acidic soils.

Temperature is an important ecological factor both for the physiology and ecology of plants and animals. Soil of NBC lies under the shade of chinars and comparatively MUC being an open landscape so soil temperature is higher in MUC than NBC. Temperature of soil greatly affects the physical, biological and chemical processes occurring in that soil. In cold soils, chemical and biological rates are slow. Biological decomposition can come to a near stand still, thereby limiting the rates at which nutrients such as nitrogen, phosphorus, sulphur and calcium are made available. Also, absorption and transport of water and nutrient loss by higher plants are adversely affected by low temperature. Soils of MUC are dry and water retention capacity is high during rainfall. As NBC is under the canopy of tall chinar trees and soils are already saturated, here water holding capacity is less than MUC. William (1968) observed that soil moisture content was related to its percent loss on ignition. The soil of NBC retain higher moisture content than MUC soil.

Apparently the dominant plant species of MUC is *Cynodon dactylon*. Similarly in NBC *Platanus orientalis* is the dominant species followed by ground cover of *Plantago major*, *Poa pratensis*, *Poa annua*, *Trifolium sp.* and *Rumex acetosa*. The list of cultivated and non-cultivated plant species recorded during study months are given in Table 3. About 76 species appeared to form the plant community of the two campuses. Of these 49 represented self growing or wild and 27 the cultivated ones. NBC flora was found to be comprised of 24 wild species and 5 cultivated species while MUC was inhabited by about 29 wild and 24 cultivated species.

During the blockwise census (Table 4) it was found that most of the *Platanus orientalis* were damaged because of lack of proper care and maintenance. The branches are often broken due to winds and heavy snowfall; moreover, its dried leaves are usually being collected during autumn and burned close to the trunk of the tree to produce charcoal and during this process trees are damaged. The hollow tree trunks provide shelter to birds and other animals. The girth of the maximum chinar trees was in the range of 8-15 ft (Table 5).

Table - 3. Plant Species of the Main University Campus (MUC) and Naseem Bagh Campus (NBC)
 (This list excludes the variety of plants of Botanic Garden, medicinal plants of Herbal Garden and nursery of landscape section).

S.No.	MUC		NBC	
	Wild	Cultivated	Wild	Cultivated
1.	<i>Anthemis cotula</i>	<i>Aesculus indicus</i>	<i>Cannabis sativa</i>	<i>Brassica oleracea</i>
2.	<i>Bothriocloa pertusa</i>	<i>Abizzia sp.</i>	<i>Cardamine hirsuta</i>	<i>Platanus orientalis</i>
3.	<i>Chrysanthemum leucanthemum</i>	<i>Buxus sp.</i>	<i>Carex sp.</i>	<i>Populus alba</i>
4.	<i>Capsella bursa pastoris</i>	<i>Castaenia sativa</i>	<i>Chenopodium album</i>	<i>Solanum tuberosum</i>
5.	<i>Crepis sancta</i>	<i>Cedrus deodara</i>	<i>Cynodon dactylon</i>	<i>Viola tricolor</i>
6.	<i>Cynodon dactylon</i>	<i>Cyperus spp.</i>	<i>Datura stramonium</i>	
7.	<i>Digitaria sanguinale</i>	<i>Dahlia sp.</i>	<i>Geranium rotundifolia</i>	
8.	<i>Erodium cicutarium</i>	<i>Daucus carota</i>	<i>G. Wallichiana</i>	
9.	<i>Eryngium billardii</i>	<i>Euonymus sp.</i>	<i>Lolium perenne</i>	
10.	<i>Euphorbia helioscopia</i>	<i>Cercis sp.</i>	<i>Merus alba</i>	
11.	<i>Ficus sp.</i>	<i>Juglans regia</i>	<i>Plantago major</i>	
12.	<i>Fragaria vesca</i>	<i>Narcissus pseudonarcissus</i>	<i>Prunella vulgaris</i>	
13.	<i>Gaium tricornis</i>	<i>Papaver sp.</i>	<i>Poa pratensis</i>	
14.	<i>Hypericum perforatum</i>	<i>Petunia alba</i>	<i>Poa annua</i>	
15.	<i>Ins ereata</i>	<i>Pinus spp.</i>	<i>Rubia cordifolia</i>	
16.	<i>Lotus corniculatus</i>	<i>Platanus orientalis</i>	<i>Rumex acetosa</i>	
17.	<i>Lespedeza variegata</i>	<i>Populus alba</i>	<i>Rubus fruticosus</i>	
18.	<i>Medicago denticulata</i>	<i>Portulaca sp.</i>	<i>Senecio vulgaris</i>	
19.	<i>Malva neglecta</i>	<i>Prunus persica</i>	<i>Solanum nigrum</i>	
20.	<i>Potentilla sp.</i>	<i>Pyrus communis</i>	<i>Sisgesbeckia orientalis</i>	
21.	<i>Plantago lanceolata</i>	<i>Pyrus malus</i>	<i>Taraxacum officinale</i>	
22.	<i>Poa pratensis</i>	<i>Robinia pseudoacacia</i>	<i>Tritolium sp.</i>	
23.	<i>Rumex acetosa</i>	<i>Rosa indica</i>	<i>Urtica dioeca</i>	
24.	<i>Sorghum halepense</i>	<i>Tagetes minuta</i>	<i>Veronica persica</i>	
25.	<i>Tritolium sp.</i>	<i>Viola tricolor</i>	<i>Viola indica</i>	
26.	<i>Tulipa stellata</i>			
27.	<i>Urtica dioeca</i>			
28.	<i>Viscia sp.</i>			
29.	<i>Xanthium spinosum</i>			

Table - 4. Blockwise Census and Status of *Platanus orientalis* in Naseem Bagh Campus of the Kashmir University

S. No.	Block	Damaged	Solid	Branches Broken	Hollow Stem	Upper Part Damaged	Partially Dried	Total
1.	Nursery Area	4	2	3	—	3	—	12
2.	University Landscape	1	1	2	—	1	1	6
3.	Backyard of Distance Education + Teacher's club	5	16	3	2	1	3	30
4.	Teacher's Association Office	12	44	4	2	1	2	65
5.	Flight side of M.A. Hostel Road	9	25	—	1	—	1	36
6.	Flight side of M.A. Hostel Road	9	17	1	—	—	—	27
7.	Front side of Distance Education	—	11	—	—	—	—	11
8.	AVRC Building	6	4	—	2	—	—	12
9.	MERC + Office of Chief Proctor + Physical Education Office	6	53	—	—	—	14	90
10.	C O R D	20	59	4	—	—	7	98
11.	Flight side of M.A. Hostel Road	20	69	4	—	—	5	98
12.	Barracks + Kashmir Union Association	11	54	6	01	—	—	72
13.	Department of Home Science + Islamic Studies	5	3	—	—	—	—	8
14.	New building of Distance Education + Canteen Area	27	11	5	—	—	—	43
15.	Barracks + Deptt. Of Environmental Science + Uhami Hospital	25	45	4	—	—	—	74
16.	Model School	13	4	1	—	—	7	25
17.	Geography Department	1	—	—	—	—	1	2
18.	M.A. Hostel Campus	6	2	—	—	—	3	11
19.	Phytochemistry Lab. + Store + Barracks.	13	76	6	1	—	1	97
	TOTAL	193	448	46	9	6	31	733

Table - 5. Approximate Girth (in feet) of *Platanus orientalis* at Breast Height

S. No.	Block	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22	25
1.	Nursery Area	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	5	—	4	—	—	—
2.	University Landscape	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	2	1	—	—
3.	Backyard of Distance Education + Teacher's club	—	—	—	1	1	3	—	—	2	4	2	4	—	1	6	4	1	—	1	—	—
4.	Teacher's Association Office	—	—	1	3	15	11	11	3	4	1	1	—	—	5	—	8	1	—	—	—	—
5.	Right side of M.A. Hostel Road	—	—	—	—	2	2	5	1	10	3	4	—	—	3	4	1	1	—	—	—	—
6.	Right side of M.A. Hostel Road	—	—	—	—	1	—	3	4	6	—	4	—	—	3	4	—	1	—	1	—	—
7.	Front side of Distance Education	—	—	—	—	5	2	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8.	AVR.C. Building	1	1	—	—	—	—	—	—	1	—	2	—	1	—	—	3	—	3	—	—	—
9.	MERC + Office of Chief Proctor + Physical Education Office	1	—	—	—	—	—	—	—	1	—	6	1	1	—	1	—	1	—	1	—	1
10.	C.O.R.D	—	—	—	6	13	25	10	8	4	1	—	5	1	3	4	5	—	—	—	—	—
11.	Right side of M.A. Hostel Road	—	1	—	2	4	11	17	7	25	3	9	1	1	7	9	1	—	—	—	—	—
12.	Barracks + Kashmir Union Association	—	—	—	1	3	20	22	4	4	—	3	—	4	4	3	—	3	—	1	—	—
13.	Department of Home Science + Islamic Studies	—	—	—	—	—	—	—	—	1	—	2	—	—	2	—	—	2	—	1	—	—
14.	New building of Distance Education + Canteen Area	—	—	—	1	1	3	1	—	3	—	—	—	2	6	3	7	7	4	—	2	3
15.	Barracks + Deptt. Of Environmental Science + Ushni Hospital	—	2	1	3	2	5	6	10 ¹	15	2	1	1	4	10	1	1	8	—	—	—	—
16.	Model School	—	—	—	—	1	—	1	—	1	—	—	—	—	12	5	—	5	—	—	—	—
17.	Geography Department	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—
18.	M.A. Hostel Campus	—	—	—	—	—	—	—	—	—	—	—	1	1	2	—	1	2	—	1	3	—
19.	Phytochemistry Lab. + Store + Barracks	1	—	3	4	4	16	33	9	6	—	4	1	4	3	—	6	1	—	2	—	—
	TOTAL	3	4	5	21	52	98	115	46	84	14	36	18	16	66	47	34	45	6	12	6	3

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