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Research Paper

Community structure and phytodiversity of urban green park, Wazir bagh, Anantnag, Kashmir

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ABSTRACT

The study investigates the Community Structure and Phytodiversity of Urban Green Park, Wazir bagh, Anantnag, Kashmir" during the Year 2022. The Phytosociology and floristic diversity survey was conducted throughout the year. In the first instance efforts were made to identify various species present in the study area. During the study all species including trees, shrubs, herbs, and ornamental plants were taken into consideration. Specimens were collected during growing season from study site and identified from Division of Environmental science, SKUAST-Kashmir and centre for Biodiversity and Taxonomy, Department of Botany, University of Kashmir. The data on vegetation was evaluated in terms of Density, Basal area, Frequency, Important Value Index (IVI) separately for three different life forms tree, shrub and herb species. Investigations conducted revealed that the study area is having rich floristic diversity. A total of 65species were recorded in the study area in which 25 were trees, 16 shrubs and 24 herb species. These species belong to 36 families. Among all the families, Rosaceae is the dominant family represented by nine species, followed by Asteraceae, Amaranthaceae and Magnoliaceae with six, four and four species, respectively. The IVI of the tree species shows *Platanus orientalis, Morus alba* and *Salix babylonica* were dominant with IVI value of 29.3,25.3 and 23.2 followed by *Juglans regia* (22.2) and *Cupressus torulosa*(19.1). Among the shrubs *Thuja compacta, Ligustrum ovalifolium* and *Nerium oleander* dominated the site with highest IVI of 25.58,23.61 and 23.53 respectively. The lowest IVI of 13.20 was recorded for *Chaenomeles japonica*. Similarly, in case of herb population the highest density was recorded in *Cynadondactylon* with a density of 6.76 tillers/m^{2}followed by *Trifolium pratense* and *Trifolium repens* with a density 5.76 and 4.59 tillers/m^2 respectively. These findings contribute valuable insights into the ecological resilience and species composition of Wazir Bagh, underscoring the need for conservation strategies that preserve its unique biodiversity amidst ongoing environmental changes.

Key words: Biodiversity, Community structure, IVI, Phytosociology.

The term "biodiversity" was first coined in late 1987 (Wilson 1988) as contraction of the phrase "biological diversity" proposed about 15 years earlier, though some components of the concept have been known since very early times in the history of science. Biodiversity refers to the variety and variability of living organisms and of the ecological complexes in which they occur (Dar *et al*., 2002). One of its early and simple definitions is that of Wilcox (1984), according to which biological diversity is "the variety of life forms in a given region, the ecological roles they perform and the genetic diversity they contain." A more detailed and wider definition is that adopted in the United Nations Conference on Environment and Development at Rio de Janeiro in 1992 and given in Article 2 of the Convention on Biological Diversity (CBD) in 1993, which reads as "'Biological Diversity' means the variability among living organisms from all sources including, inter alia, terrestrial, marine

and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems."

The community structure serves as a fundamental cornerstone of an ecosystem, embodying the cohesive display of hierarchy, roles, and evolutionary trajectories of diverse species coexisting and interacting within a given habitat (Zhang *et al*., 2007). Consequently, the configuration of the community structure stands under the direct sway of species diversity, serving as the biological bedrock upholding the progression of ecosystem processes (Tilman & Downing, 1994; Zhang *et al*., 2004). The assemblage of species and the arrangement of communities find their origins and governance in a patchwork of ecological and human-induced elements. Human activities such as logging, excessive grazing, diminished fertility, and encroachments into forests emerge as pivotal influencers dictating the distribution of species (Nayak *et al*., 2016). The botanical composition of a given region, along with its community makeup, is intricately molded by temporal factors, elevation, geographical latitude, as well as the interplay of aspect and incline.

Forest ecosystems play a pivotal role in offering recreational and tourism opportunities, drawing in countless visitors each day, particularly in regions characterized by moderate latitudes. The evolving global environmental landscape will inevitably cast its influence upon these forest ecosystems, primarily driven by alterations in land utilization, shifts in temperature and precipitation patterns, escalating concentrations of CO2, and the deposition of nitrogen (Sala *et al*., 2000). In the foreseeable future, these changes could potentially reverberate and impact the realms of tourism and recreation. In this context, parks emerge as tangible manifestations reflecting the overall quality of life within a community. They not only establish a sense of identity for residents but also stand as a prominent determinant in shaping perceptions of the overall living standards within a specific locality. The presence and quality of parks and recreational services consistently rank among the paramount considerations when evaluating the desirability and livability of communities, often taking a forefront position in community satisfaction surveys.

The captivating allure of natural landscapes lures visitors to forests, fostering outdoor pursuits and nature-centered tourism. Furthermore, the intrinsic aesthetic charm of these settings plays a pivotal role in engendering restorative experiences and promoting holistic well-being, encompassing sensations of rejuvenation, serenity, tranquility, and mood elevation (Ulrich *et al*., 1991; Karjalainen, 2006). There exists a prevailing belief that enhancing the visual splendor of forests holds substantial potential in positively impacting both the mental and physical health of individuals, fostering enriching aesthetic encounters, and contributing to their overall sense of wellness (Kaplan *et al*., 1989; Ode *et al*., 2002). In a broader context, it is discernible that the scenic beauty exhibited by forests establishes a nearly linear correlation with individual's willingness to invest in it, as evidenced by studies indicating a direct link between aesthetic appreciation and the inclination to allocate resources for its preservation (Daniel *et al*., 1989).

Keeping in view the importance of species diversity this study aims to explore the intricate community structure and phytosociological attributes of the plant communities in Wazir Bagh, Anantnag, Kashmir. By examining the diversity, composition and distribution of plant species, our study seeks to provide a comprehensive understanding of the ecological dynamics at play. This study is pivotal in assessing the ecological health and sustainability of urban green areas, offering valuable insights for conservation and management practices in urban environments.

MATERIALS AND METHODS

The Anantnag Forest Division covers an area of 798.64 Km^2. The forests of Anantnag Forest Division spread over a vast tract and are situated between 33°21' 56.63" N to 33°50' 92" North Latitude and 75°40'4.60" E to 75°32' 6.59" East Longitude. The entire area exists covered by G.T. Sheet Nos., 430/1, 0/2, 0/3, 0/5, 0/6, 0/7, 0/10. Occupying the south-eastern portion of Kashmir Valley, the tract chiefly lies in Anantnag District of Kashmir Province. It is bounded on the east and the south by the lofty Pir Panjal Mountain Range, separating it from Ramban and Kishtwar Forest Divisions. The Mattan Range of Lidder Forest Division marks the boundary of the division on the western side.

The study was carried out in Urban Park Wazir Bagh in Anantnag district situated at 2.3 kms away from Khanabal. Geographically the area is located within 33.733 N latitude and 75.144 E longitude at an elevation of 1600m above the sea level. The park is well maintained exhibiting the lustrous natural beauty of this place along with its varied flora scattered in them. The park has the vast diversity of trees, shrubs and herbs. The district has brown forest soil in most of its parts. It contains texture of silt clay loam and sandy clay loam with granular structure. The study area has temperate climate experiencing four distinct seasons: a severe winter (December to February), a cold spring (March to May), a mild summer, June to August and a pleasant autumn, September to November (Balaji, B. 2015).

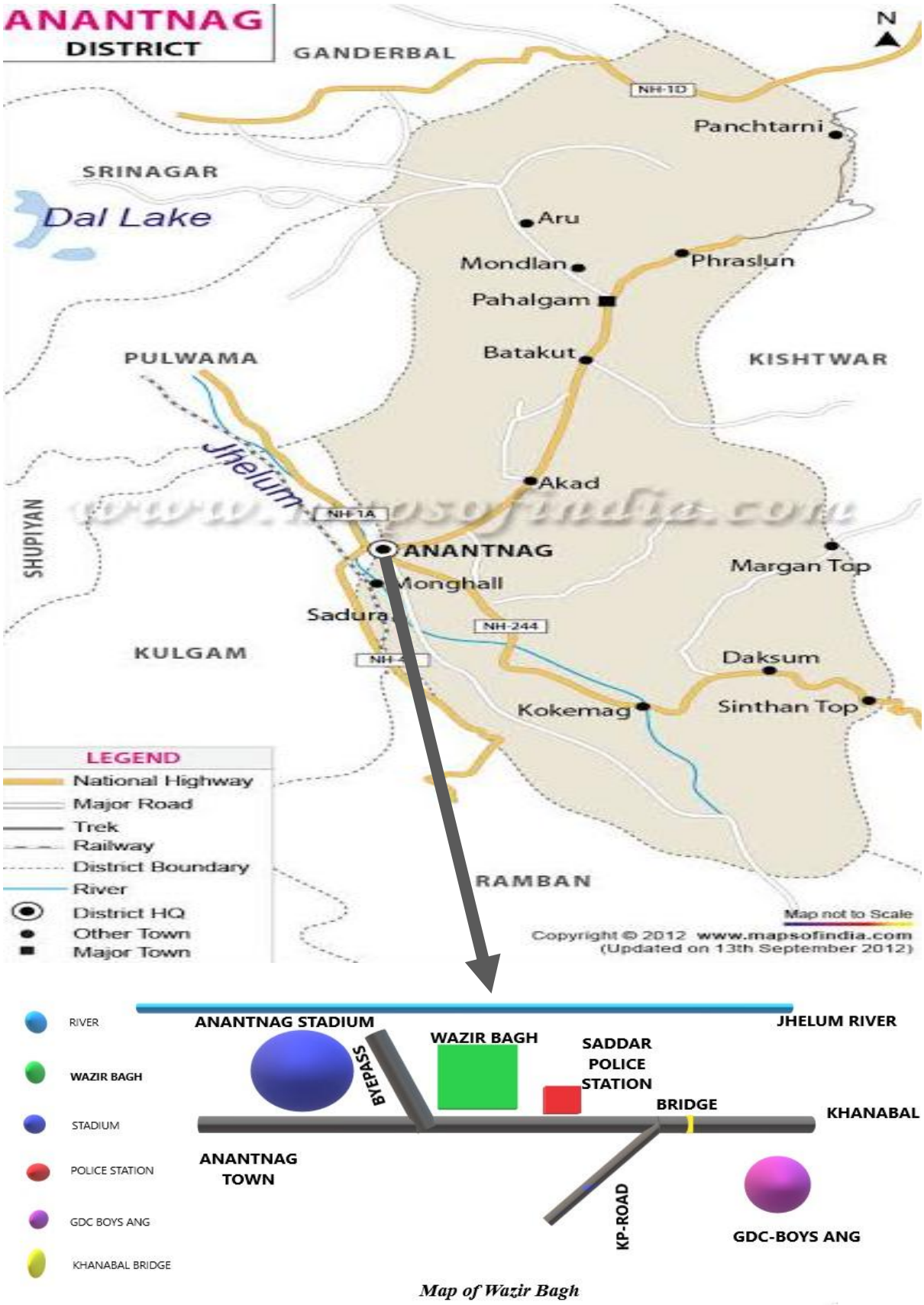

Fig 1: Map and sketch of study (Google Earth)

Table 1: Floristic composition of plant community at Urban Green Park Wazir bagh, Anantnag

S. No	Species	Family	Common name	Local name
Trees				
1.	*Aesculus indica*	Sapindaceae	Indian horse chestnut	Handoon
2.	*Cedrus deodara*	Pinaceae	Himalayan cedar	Deodar
3.	*Cupressus torulosa*	Cupressaceae	Himalayan cypress	Yari kul
4.	*Cupressus sempervirens*	Cupressaceae	Mediterranean cypress	Sarva kul
5.	*Eriobotrya japonica*	Rosaceae	Loquat	Loquat
6.	*Juglans regia*	Juglandaceae	Walnut	Duon
7.	*Lagerstroemia indica*	Lythraceae	Commoncrape myrtle	
8.	*Ligustrum lucidum*	Oleaceae	Chinese privet	
9.	*Livistonia chinensis*	Arecaceae	Chinese fan palm	
10.	*Magnolia grandiflora*	Magnoliaceae	Southern magnolia	
11.	*Magnolia liliiflora*	Magnoliaceae	Lily magnolia	
12.	*Magnolia x soulangeana*	Magnoliaceae	Chinese magnolia	
13.	*Magnolia stellata*	Magnoliaceae	Star magnolia	
14.	*Malus prunifolia*	Rosaceae	Plumleaf crab aplle	
15.	*Morus alba*	Moraceae	White mulberry	Tull kul
16.	*Pinus wallichiana*	Pinaceae	Kail	Kayur
17.	*Platanus orientalis*	Platanaceae	Chinar	Boen
18.	*Prunus cerasifera*	Rosaceae	Cherry plum	
19.	*Prunus laurocerasus*	Rosaceae	Cherry laurel	
20.	*Prunus persica*	Rosaceae	Peach	
21.	*Pyracantha crenulate*	Rosaceae	Himalayan firethorn	
22.	*Salix babylonica*	Salicaceae	Weeping willow	Veer
23.	*Sapium sebiferum*	Euphorbiaceae	Chinese tallow tree	
24.	*Styphnolobium japonicum*	Fabaceae	Japanese pagoda tree	Chhatri kul
25	*Tamarix parviflora*	Tamaricaceae	Smallflower tamarisk	
Shrubs				
1.	*Abelia x grandiflora*	Caprifoliaceae	Glossy abelia	
2.	*Bassia scorparia*	Amaranthaceae	Ragweed	
3.	*Berberis thunbergia*	Berberidaceae	Japanese barberry	kawdach
4.	*Boxus sempervirens*	Buxaceae	Common box	Shamshad
5.	*Chaenomeles japonica*	Rosaceae	Maule's quince	
6.	*Clematis fusca*	Ranunculaceae	Virgin's bower	

Continued table 1

S. No	Species	Family	Common name	Local name
7.	*Dysphania ambrosioides*	Amaranthaceae	Mexican tea	
8.	*Euonymus japonicus*	Celastraceae	Evergreen spindle	
9.	*Lavendulan latifolia*	Lamiaceae	Spike lavender	
10.	*Ligustrum ovalifolium*	Oleaceae	Korean privet	
11.	*Nerium oleander*	Apocynaceae	Oleander	Gandula
12.	*Pyracantha crenulata*	Rosaceae	Nepalese firethorn	
13.	*Thuja compacta*	Cupressaceae		
14.	*Solanum nigrum*	Solanaceae	Common nightshade	
15.	*Spiraea x vanhoutte*	Rosaceae	Bridalwreath	
16.	*Viburnum opulus*	Adoxaceae	Water elder	Kulmauch
Herbs				
1.	*Arctium lappa*	Asteraceae	Greater burdock	Jungle kuth
2.	*Amaranthus retroflexus*	Amaranthaceae	Red-root amaranth	
3.	*Calendula officinalis*	Asteraceae	Pot marigold	
4.	*Cannabis sativa*	Cannabaceae	Hemp	Bhang
5.	*Cardamine impateins*	Brassicaceae	Narrowleaf bittercress	
6.	*Celosia cristata*	Amaranthaceae	Cockscomb	
7.	*Cerastium sp.*	Caryophyllaceae	Mouse-ears	
8.	*Cirsium arvense*	Asteraceae	Creeping thistle	
9.	*Conium maculatum*	Apiaceae	Hemlock	
10.	*Conyza canadensis*	Asteraceae	Horseweed	
11.	*Cynadon dactylon*	Poaceae	Couch grass	Dramun
12.	*Datura stramonium*	Solanaceae	Jimsonweed	Datur
13.	*Malva parviflora*	Malvaceae	Cheeseweed	
14.	*Plantago major*	Plantaginaceae	Common plantain	Boud gull
15.	*Rorippa sylvestris*	Brassicaceae	Creeping yellow	
16.	*Rumex acetosella*	Polygonaceae	Red sorrel	
17.	*Rumex crispus*	Polygonaceae	Curly dock	
18.	*Salvia moorcroftiana*	Lamiaceae	Kashmir salvia	Shobri
19.	*Taraxacum officinale*	Asteraceae	Common dandelion	Hand
20.	*Trifolium pratense*	Fabaceae	Red clover	Batakh leunt
21.	*Trifolium repens*	Fabaceae	White clover	Safed batakh leunt
22.	*Urtica dioica*	Urticaceae	Stinging nettle	Soi
23.	*Verbascum thapsus*	Scrophulariaceae	Great mullein	
24.	*Xanthium strumarium*	Asteraceae	Rough cocklebur	

Methodology: Stratified random sampling technique was used and quadrats were laid down in park and were spatially distributed so as to minimize the autocorrelation in the vegetation. Species area curve was used to determine minimal sample area which is based on quantitative variation of the vegetation in terms of species numberThe community composition and other phytosociological characteristics of the vegetation were studied. The vegetation analysis was carried out by stratified random sampling. Quadrats of 10 × 10m, 5 × 5m and 1 × 1m for trees, shrubs and herbs were laid down.. Plant species present in the park were listed and vegetation was quantitatively analyzed for Floristic composition, density, frequency and abundance using suitable procedures. Important value index (IVI) was also computed for all types of vegetations.

The floristic data was computed for frequency, density and abundance (Curtis and McIntosh, 1950). The relative values of frequency, density and dominance were determined as per Philips (1959). These values were summed to represent IVI (Important Value Index) of individual species in order to express the dominance and ecological success of the species (Curtis, 1959). The important quantitative analysis such as density, frequency and abundance of tree species, shrubs and herbs were determined as per Curtis and McIntosh (1950).

RESULTS AND DISCUSSION

Floristic Composition: The study revealed a total of 65 plant species belonging to 36 families in Wazir Bagh. The five dominant families were Rosaceae (9 species), Asteraceae (6), Amaranthaceae (4), Magnoliaceae (4), and Polygonaceae (2). Within the plant community, various species coexist symbiotically, each assuming distinct roles and showcasing unique structural and functional characteristics. These traits reflect the prevailing biotic conditions of the location, continually influencing the vegetation's functional attributes and steering it towards a climax community over time. Other notable families include Cupressaceae and Fabaceae (3 species each), and Brassicaceae, Lamiaceae, Oleaceae, Pinaceae, Polygonaceae, and Solanaceae (2 species each). Twelve families were represented by only one species each. These findings align with Sarah *et al.* (2015), who reported 59 species from 54 genera and 34 families in the Hytem reserve forest, Malaysia.

The decrease in the understory vegetation can be linked to disparities within the upper canopy trees, encompassing variations in tree species composition and their density. These discrepancies subsequently instigate modifications in the microclimate, as documented by Anderson *et al*. (1969), Alaback and Herman (1988), and Thomas *etal*. (1999), as well as alterations in microhabitat conditions due to shifts in environmental factors, as highlighted by Berg and Staaf (1981).

These alterations unfold along altitudinal gradients and correspond to the extent of litter deposition on the soil surface, a balance primarily determined by the interplay between litter production and the rate of litter decomposition (Staelens *et al*., 2003). This intricate interplay can be influenced by factors such as tree density, site characteristics, as explored by Facelli and Pickett (1991), and climatic attributes, as discussed by Bray and Gorham (1964). Seeds that find themselves beneath layers of litter encounter light deprivation, impeding their capacity to establish roots with ease (Facelli and Picket, 1991; Ellsworth *et al*., 2004). This challenge arises due to differences in their ability to penetrate through the litter layer, thereby leading to frequent failed attempts at germination (Sydes and Grimes, 1981). Moreover, the decomposition process releases plant exudates into the soil in the form of allelochemicals, playing a pivotal role in shaping vegetation patterns, regulating plant distribution within the community, and influencing the growth and development of coexisting species (Saxena and Sharma, 1996). These allelochemicals also act as inhibitors of seed germination, as underscored by Gupta *et al*. (2007). Numerous instances of allelochemical production have been documented across a range of woody species, spanning from boreal conifer forests (Mallik, 2003) to tropical forests (McKey *et al*., 1978), temperate forests (Williamson *et al*., 1992), and sub-desert ecosystems (Van Rooyen *et al*., 2004).

The result of the present study is much less than that of 113 species from temperate forest between 1800-2200m altitude of Subansiri district of Arunachal Pradesh and 122 species from temperate forest of Rhododendrons of western Arunachal Pradesh reported by Behera and Kushawa (2007) and Paul (2008) respectively. The results were also in line with the reports of Sarah *et al.* (2015) who revealed that 59 species belonging to 54 genera and 34 families in the form of herbs, shrubs, understorey trees in Hytem reserve forest Malaysia. The species richness of the vegetation in the present study follows the trend as tree layer>herb layer> shrub layer i.e., 25 tree species, 16 shrub species and 24 herb species which is similar to that reported by Sharma *et al.* (2014) as 48 herb species, 19 shrub species and 57 tree species along the Sangla valley in North west Himalaya.Paul (2008) reported the identical trend from temperate broad leaved *Rhododendron* Forest of western Arunachal Pradesh with higher representation of trees (26), shrubs (20), herbs/grasses (26).

Table 2: Total plant species in different families at Urban Green Park Wazir bagh, Anantnag

S. No	Family	No. of Tree species	No. of shrub species	No. of herb species	Total No. of species
1.	Adoxaceae	-	01	-	01
2.	Amaranthaceae	-	02	02	04
3.	Apiaceae	-	-	01	01
4.	Apocynaceae	-	01	-	01
5.	Arecaceae	01	-	-	01
6.	Asteraceae	-	-	06	06
7.	Berberidaceae	-	01	-	01
8.	Brassicaceae	-	-	02	02
9.	Buxaceae	-	01	-	01
10.	Cannabaceae	-	-	01	01
11.	Caprifoliaceae	-	01	-	01
12.	Caryophyllaceae	-	-	01	01
13.	Celastraceae	-	01	-	01
14.	Cupressaceae	02	01	-	03
15.	Euphorbiaceae	01	-	-	01
16.	Fabaceae	01	-	02	03
17.	Juglandaceae	01	-	-	01
18.	Lamiaceae	-	01	01	02
19.	Lythraceae	01	-	-	01
20.	Magnoliaceae	04	-	-	04
21.	Malvaceae	-	-	01	01
22.	Moraceae	01	-	-	01
23.	Oleaceae	01	01	-	02
24.	Pinaceae	02	-	-	02
25.	Plantaginaceae	-	-	01	01
26.	Platanaceae	01	-	-	01
27.	Poaceae	-	-	01	01
28.	Polygonaceae	-	-	02	02
29.	Ranunculaceae	-	01	-	01
30.	Rosaceae	06	03	-	09
31.	Salicaceae	01	-	-	01
32.	Sapindaceae	01	-	-	01
33.	Scrophulariaceae	-	-	01	01
34.	Solanaceae	-	01	01	02
35.	Tamaricaceae	01	-	-	01
36.	Urticaceae	-	-	01	01
	Total	**25**	**16**	**24**	**65**

Phytosociological attributes of plant community: The density of trees ranged from minimum of 143 individualsha^{-1} for *Sapium sebiferum* to a maximum of 920 individuals ha^{-1} for *Cupressus torulosa* (Table 3). Among the trees species *Prunus cerasifera, Ligustrum lucidum* and*Cupressus sempervirens* had the highest density of 512, 493 and 456 individuals ha^{-1} respectively. The tree density in the present study ranged between 143 to 920 individualsha^{-1} which is lower than reported by Singh *et al.* (2014) i.e., 501 to 1250 treesha^{-1} at Nanital Forest division of Uttarakhand. Among the trees *Platanus orientalis* recorded maximum basal area (974.47 cm^2). The basal area is ranged between 6.02 to 974.47 cm^2 which is within the range value of 3.98 cm^2 to1105 cm^2 reported by Singh *et al.* (2014) in pine dominated forest of Nanital Forest division.

Table 3: Phytosociological attributes of tree species at Urban Green Park Wazir bagh, Anantnag

Name of Species	Avg. D (N ha^{-1})	Avg. BA (cm^2)	F (%)	RD	RBA	RF	IVI
Aesculus indica	232	67.60	30	2.6	1.6	3.5	7.7
Cedrus deodara	276	36.09	50	3.1	0.8	5.8	9.8
Cupressus torulosa	920	21.55	70	10.4	0.5	8.1	19.1
Cupressus sempervirens	456	24.27	60	5.2	0.6	7	12.7
Eriobotrya japonica	211	16.32	20	2.4	0.4	2.3	5.1
Juglans regia	376	674.19	20	4.3	15.6	2.3	22.2
Lagerstroemia indica	344	43.45	40	3.9	1	4.7	9.6
Ligustrum lucidum	493	32.66	60	5.6	0.8	7	13.3
Livistonia chinensis	367	19.39	20	4.2	0.4	2.3	6.9
Magnolia grandiflora	274	158.29	40	3.1	3.7	4.7	11.4
Magnolia liliiflora	258	42.29	20	2.9	1	2.3	6.2
Magnolia x soulangeana	289	62.32	30	3.3	1.4	3.5	8.2
Magnolia stellata	325	53.30	20	3.7	1.2	2.3	7.2
Malus prunifolia	264	49.99	20	3	1.2	2.3	6.5
Morus alba	298	895.33	10	3.4	20.7	1.2	25.3
Pinus wallichiana	442	38.25	60	5	0.9	7	12.9
Platanus orientalis	388	974.47	20	4.4	22.6	2.3	29.3
Prunus cerasifera	512	36.09	60	5.8	0.8	7	13.6
Prunus laurocerasus	309	33.68	30	3.5	0.8	3.5	7.8
Prunus persica	321	39.68	50	3.6	0.9	5.8	10.4
Pyracantha crenulate	256	27.23	20	2.9	0.6	2.3	5.9
Salix babylonica	440	583.25	40	5	13.5	4.7	23.2
Sapium sebiferum	143	361.18	10	1.6	8.4	1.2	11.2
Styphnolobium japonicum	334	19.47	30	3.8	0.5	3.5	7.7
Tamarix parviflora	287	6.02	30	3.3	0.1	3.5	6.9
Total	**8815**	**4316.36**	**860.00**	**100**	**100**	**100**	**300**

The IVI of the tree species shows *Platanus orientalis, Morus alba* and *Salix babylonica* were dominant at with IVI value of 29.3,25.3 and 23.2 followed by*Juglans regia* (22.2) and *Cupressus torulosa* with an IVI value of (19.1). Kawosa (2001) reported that in Jammu and Kashmir Himalaya, *Picea smithiana* together with *Abies pindrow* showed dominance above 2300m-3500m, *Cedrus deodara* and *Pinus wallichiana* at 1600-2800m, while *Pinus roxibhurghii* is dominant in the Shiwaliks. These results are supported by studies conducted by Lone and Pandit (2012) who stated similar results in Langate Forest.

Among the shrubs (Table 4) *Thuja compacta, Ligustrum ovalifolium* and *Nerium oleander* dominated the site with highest IVI of 25.58, 23.61 and 23.53 respectively. The lowest IVI of 13.20 was recorded for *Chaenomeles japonica*. The IVI values are in the range with the similar study by Mehta *et al.* (1997) in Garhwal Himalaya.

Table 4: Phytosociological attributes of shrub species at Urban Green Park Wazir bagh, Anantnag

Name of Species	Avg. D (N ha^{-1})	Avg. BA (cm^2)	F (%)	RD	RBA	RF	IVI
Abelia x grandiflora	231	1.23	20	4.50	7.18	3.17	14.85
Bassia scorparia	275	1.28	30	5.36	7.47	4.76	17.59
Berberis thunbergia	324	0.85	50	6.31	4.96	7.94	19.21
Boxus sempervirens	311	1.38	40	6.06	8.06	6.35	20.46
Chaenomeles japonica	278	0.79	20	5.41	4.61	3.17	13.20
Clematis fusca	325	0.92	30	6.33	5.37	4.76	16.46
Dysphania ambrosioides	234	1.45	30	4.56	8.46	4.76	17.78
Euonymus japonicus	232	0.82	40	4.52	4.79	6.35	15.66
Lavendulan latifolia	375	0.75	40	7.30	4.38	6.35	18.03
Ligustrum ovalifolium	321	1.07	70	6.25	6.25	11.11	23.61
Nerium oleander	498	1.01	50	9.70	5.90	7.94	23.53
Pyracantha crenulata	316	1.02	30	6.16	5.95	4.76	16.87
Thuja compacta	485	0.86	70	9.45	5.02	11.11	25.58
Solanum nigrum	318	1.04	30	6.19	6.07	4.76	17.03
Spiraea x vanhoutte	362	1.36	40	7.05	7.94	6.35	21.34
Viburnum opulus	249	1.3	40	4.85	7.59	6.35	18.79
Total	**5134**	**17.13**	**630**	**100**	**100**	**100**	**300**

Similarly, in case of herb population (Table 5) the highest density was recorded in 6.76 tillers/m^2 for *Cynadon dactylon* followed by *Trifolium pratense, Trifolium repens* with a density 5.76 and 4.59 tillers/m^2. The herb species also show the same pattern as the shrub population and their density ranged from 0.36 to 6.76 tillers/m^2 which is lower compared to the reported values by Ismail *et al.* (2015) i.e., 36 to 110 tillers/m^2 in Rasshad and Alabassia localities of Sudan.So, this study depicts that at herbaceous level the anthropogenic interference decreases species richness or species diversity or dominance index, similar observation was made by (Kukshal *et al.*, 2009; Skornik *et al.*, 2010; Aijaz *et al.,* 2022 and Mushtaq and Pandit, 2010).

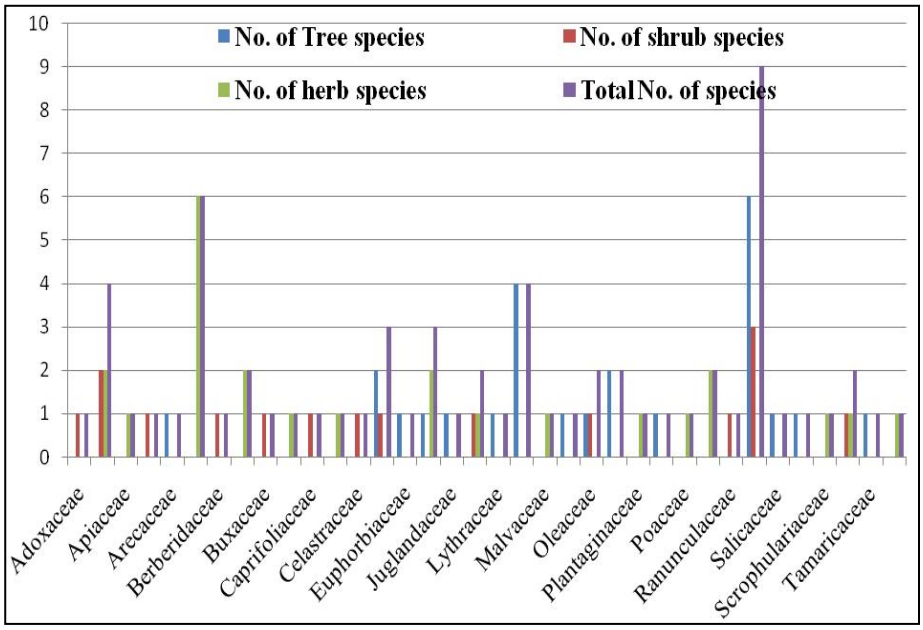

Fig. 2: Different plant families at Urban Green Park Wazir bagh, Anantnag

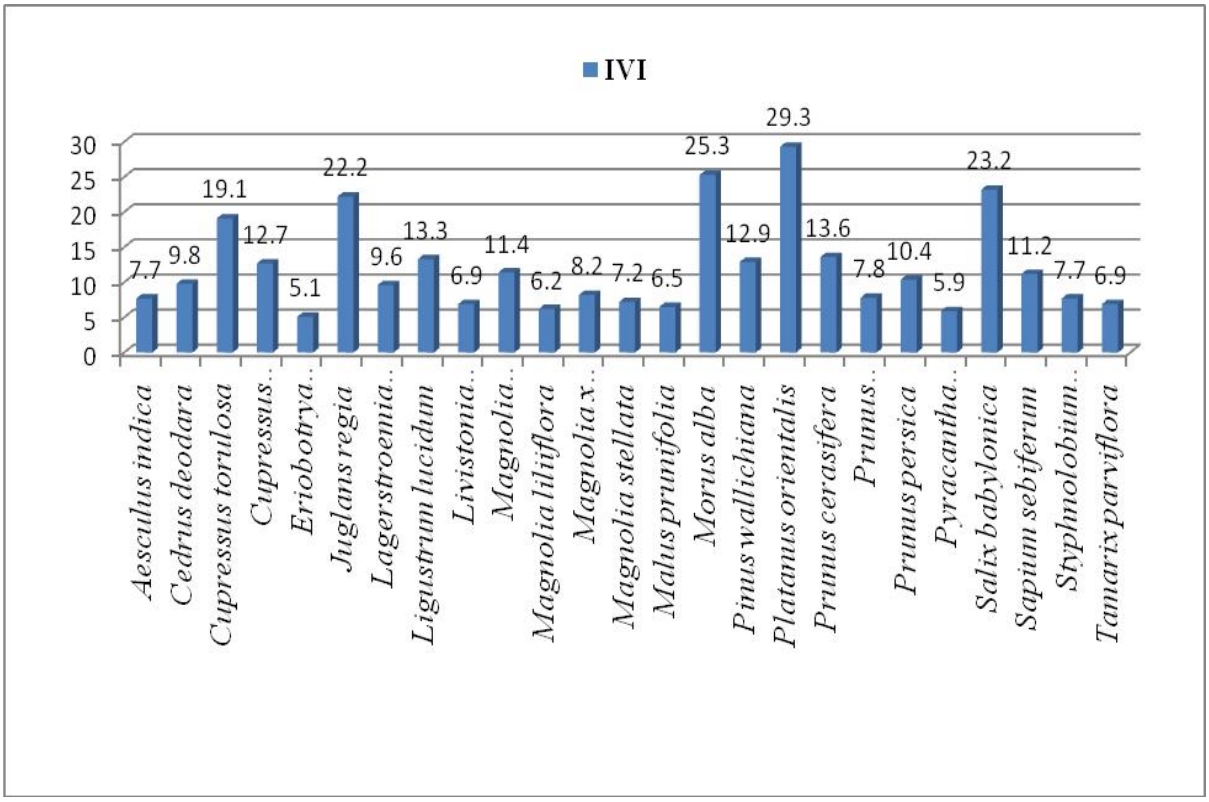

Fig. 3: IVI of different tree species at Urban Green Park Wazir bagh, Anantnag

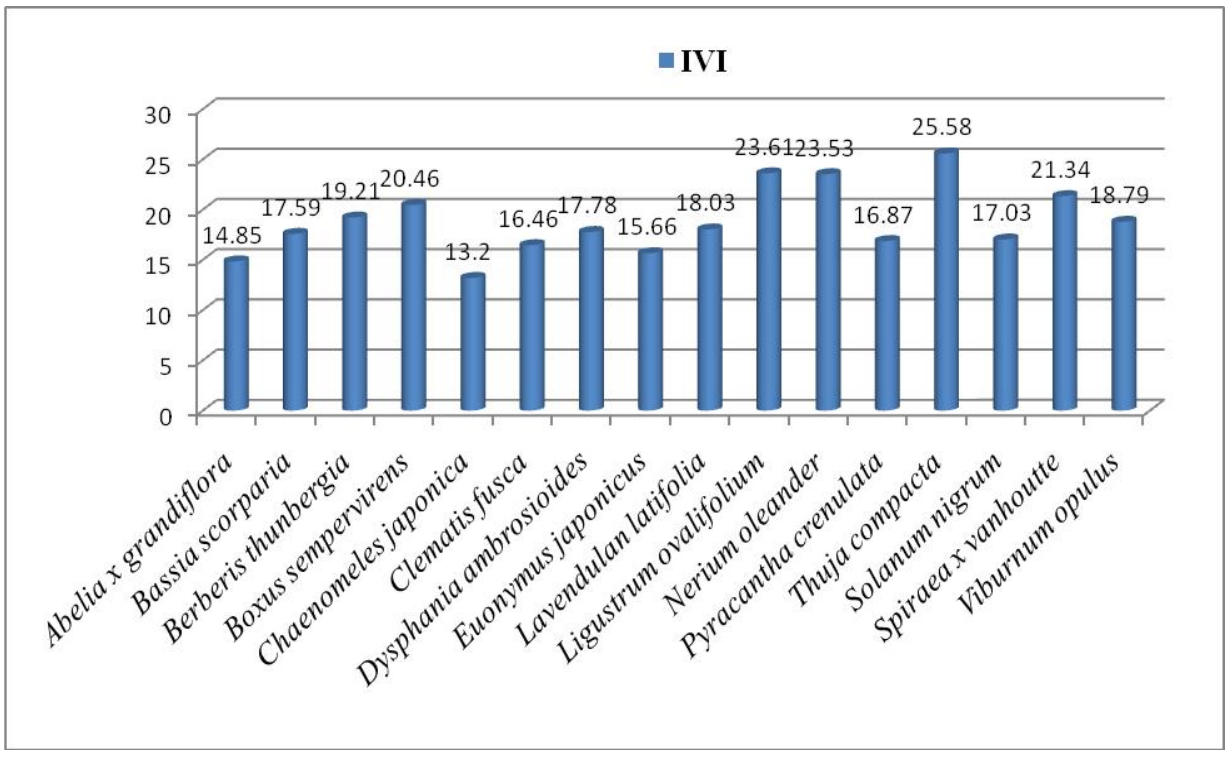

Fig. 4: IVI of different shrub species at Urban Green Park Wazir bagh Anantnag

Table 5: Phytosociological attributes of herbs at Urban Green Park Wazir bagh, Anantnag

Name of Species	Avg. D (m^{-2})	Avg. BA (cm^2)	F (%)	RD	RBA	RF	IVI
Arctium lappa	0.36	1.24	20	0.55	2.92	1.96	5.43
Amaranthus retroflexus	2.95	2.16	40	4.48	5.09	3.92	13.49
Calendula officinalis	2.45	1.56	40	3.72	3.68	3.92	11.32
Cannabis sativa	3.67	2.19	50	5.57	5.16	4.90	15.63
Cardamine impateins	2.85	1.11	30	4.33	2.62	2.94	9.88
Celosia cristata	2.61	1.29	20	3.96	3.04	1.96	8.96
Cerastium sp.	1.21	1.37	20	1.84	3.23	1.96	7.03
Cirsium arvense	1.03	1.22	30	1.56	2.87	2.94	7.38
Conium maculatum	0.62	1.09	30	0.94	2.57	2.94	6.45
Conyza canadensis	2.79	1.86	50	4.23	4.38	4.90	13.52
Cynadon dactylon	6.76	4.78	90	10.26	11.26	8.82	30.35
Datura stramonium	3.24	2.56	30	4.92	6.03	2.94	13.89
Malva parviflora	2.78	1.63	40	4.22	3.84	3.92	11.98
Plantago major	2.36	2.01	60	3.58	4.74	5.88	14.20
Rorippa sylvestris	2.95	1.12	30	4.48	2.64	2.94	10.06
Rumex acetosella	2.57	1.27	50	3.90	2.99	4.90	11.80
Rumex crispus	2.99	1.31	40	4.54	3.09	3.92	11.55
Salvia moorcroftiana	2.78	2.21	60	4.22	5.21	5.88	15.31
Taraxacum officinale	2.34	1.42	50	3.55	3.35	4.90	11.80
Trifolium pratense	5.76	2.67	60	8.74	6.29	5.88	20.92
Trifolium repens	4.59	2.77	80	6.97	6.53	7.84	21.34
Urtica dioica	1.23	0.94	20	1.87	2.21	1.96	6.04
Verbascum thapsus	3.96	1.02	40	6.01	2.40	3.92	12.34
Xanthium strumarium	1.03	1.64	40	1.56	3.86	3.92	9.35
Total	**65.88**	**42.44**	**1020**	**100**	**100**	**100**	**300**

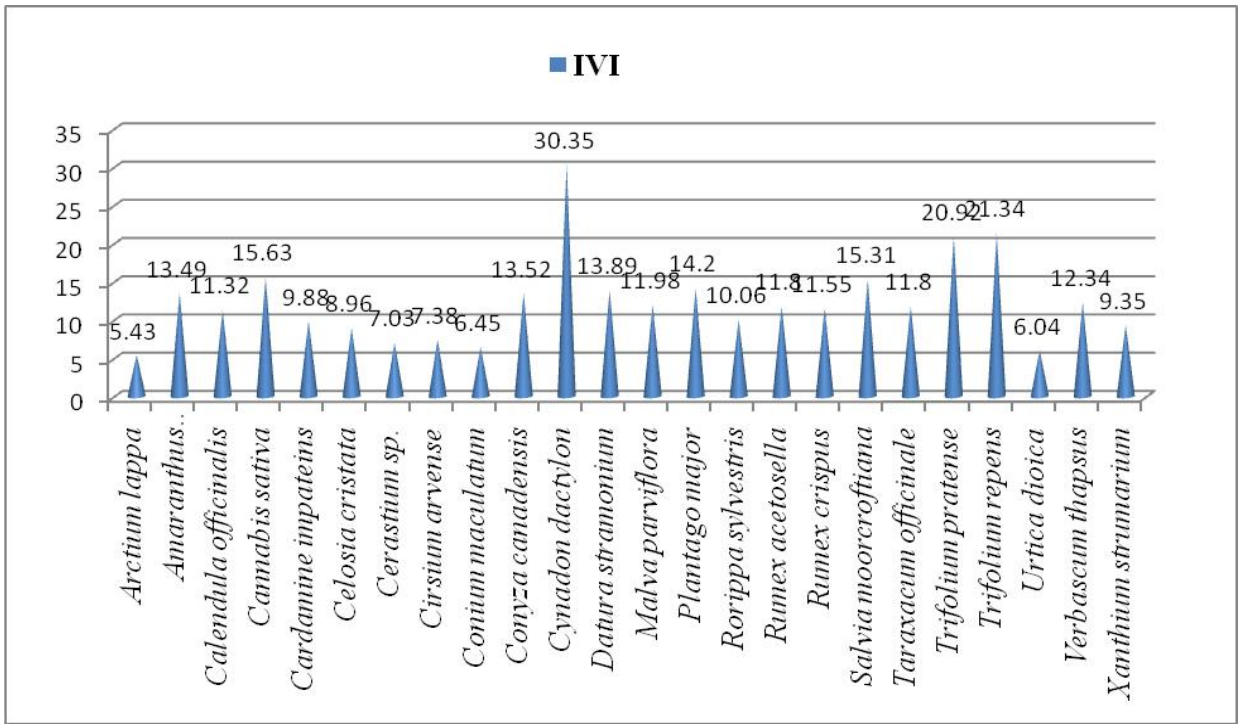

Fig. 5: IVI of different Herbs at Urban Green Park Wazir bagh, Anantnag

CONCLUSION

This research provides a comprehensive assessment of the plant diversity within Wazir Bagh, identifying 65 species distributed across 36 families. The dominance of families such as Rosaceae, Asteraceae and Amaranthaceae highlights their ecological significance in this ecosystem. The symbiotic coexistence of these species underscores their adaptation to local biotic conditions, influencing the community's structural and functional dynamics towards a potential climax state. Among species,*Platanus orientalis* and *Thuja compacta* exhibit high importance values, indicating their pivotal roles within their respective layers of the vegetation. These findings contribute valuable insights into the ecological resilience and species composition of Wazir Bagh, underscoring the need for conservation strategies that preserve its unique biodiversity amidst ongoing environmental changes. Future research could further explore interactions between these species and their ecosystem dynamics to better inform sustainable management practices.

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