

Original Research Article

TAXONOMIC COMPENDIUM OF PLANT COMMUNITY ON SHANKARACHARYA RESERVE FOREST

Abstract

The present investigation was carried out to study the taxonomic compendium of plant community on Shankaracharya reserve forest. Locally also known as Sulaiman Teng, the study site is situated between an altitude of 1575 to 1967 m amsl and a latitude of 34°04'35.56" N and 74°51'08.63" E longitude. The hillock over looks famous Dal lake and presents a beautiful look of Srinagar city on the eastern side of Jammu and Kashmir. The survey was conducted and plant samples were collected for identification. The taxonomic compendium of the plant community identified in Shankaracharya Reserve forest includes 72 **Genera** (69 Angiosperms and 3 Gymnosperms) and 84 species (78 Angiosperms and 6 Gymnosperms) out of which 54 were herbs and grasses, 12 were shrubs and 18 were trees. Monocots and dicots contributed nearly 91.2% of the total angiosperm population indicating that the forest grove is rich in pioneer and mid successional species composition. The study area hosts a remarkable floristic richness with majority of taxa belonging to family Fabaceae followed by Rosaceae, Poaceae and Pinaceae.

Key words: taxonomic, compendium community, Shankaracharya

Introduction

The knowledge of patterns of variation in forest structure over time and space have always served as the basis of formulating forest management strategies that seek to sustain a broad array of forest goods and services [1]. The concept of sacred groves is prevalent in most parts of the world and **Hughes and [2] have presented a detailed overview of their distribution around the globe mainly in Asia, Africa, Australia, Europe and America. A report of [3] has described sacred groves in Ghana, Senegal and Sumatra.** In India, they occur in Western Ghats, Madhya Pradesh, Maharashtra, Meghalaya, Karnataka, etc., and found in variety of habitats ranging from scrub forests of Thar Desert, to rain forests in Western Ghats and temperate forests of Himachal Pradesh and Jammu and Kashmir in the North to deciduous forests of Kerala in the South. Estimates suggest that there might be between 1,00,000 to 1,50,000 sacred groves around the country [4]. Further, all forms of vegetation in the sacred groves are supposed to be under the protection of the reigning deity of that grove, and the removal of even a small twig is taboo [5]. **SHANKARACHARYA RESERVE FOREST** hillock also known as **SULIMAN TENG** or **TAKHT-I- SULIMAN** in Kashmir is one of such groves famous for religious tourism all over the country. This sacred groves is one of the first instances of traditional conservation in Kashmir; however, due to increasing loss in earlier times and biodiversity loss these habitats demand new conservation approaches

39 which will enable fair share of the wider values of conservation to the local communities and
40 positive inherited attitudes towards conservation goals. Nature worship has been a key force
41 of shaping the human attitudes towards conservation and sustainable utilization of natural
42 resources. Such traditional practices have been invariably operating in different parts of India
43 and Shankaracharya is one of the living examples of least studied plantation forest which can
44 now be regarded as the remnant primary forest left untouched by the local inhabitants for
45 conservation of biodiversity.

46 The vegetation of Kashmir forests has been occasionally explored in the past by few
47 botanists. The prominent among them are [6 and 7]. The early twentieth century saw the
48 work of [8 and 9] and who published their work in the form of manuals and floras. Their
49 work was followed by that of [10 and 11]. [12] from Botanical Survey of India, surveyed
50 many places in the valley with a view to document a comprehensive list of flora of this
51 region. In all these studies, the vegetation characteristic of Shankaracharya hillock; which is
52 largely characterized by a typical topographic physiognomy, is poorly cited. This hillock has
53 a long history of degradation due to exploitative deforestation for timber and other NTFP's 
54 However, following its massive re-vegetation programme in 1940 and 1970 with many
55 species including exotic tropical pines viz., *Pinus helpensis*, *Pinus roxburghii* and *Pinus*
56 *canarensis*, the hillock has been designated as a reserve forest. Despite a recorded history of
57 more than seventy years since reforestation of this hillock was taken up, only one or two
58 comprehensive attempts have been made to conduct a systematic study of the vegetation
59 composition and its structure. The present study was; therefore, undertaken to study the
60 floristic and successional status of this unique man made reserved forest grove's which now
61 comprises many plant species of both tropical and temperate origin. The information
62 generated from this study helped to classify this reserved forest hillock on the basis of
63 floristic composition.

64 **Materials and methods**

65 **Study site**

66 The present investigations were carried out on Shankaracharya hillock which stands
67 declared as a reserve forest under Section 11 of the Forest Act of 1987 and a Game Sanctuary
68 under Section 5 of the Game Prevention Act of 1998 [13]. The hillock is maintained by the
69 Forest Department, Government of Jammu and Kashmir for religious, aesthetic and

70 recreational purposes. The study site is located between 34°04' 35.56" to 34°05' 25.08" N
 71 latitude and 74°50' 03.16" to 74°51' 08.63" E longitude (Table 1). Spread over an area of
 72 141.93 ha, this forest grove lies in South-Eastern side of Srinagar and presents a marvelous
 73 view of world famous Dal Lake and other adjoining environs. The altitude of the study site
 74 varies from 1575 to 1967 m asl (Table 1) with entire hillock serving as a catchment area to
 75 Dal Lake.

76 **Table 1: Geographical attributes and Lithology of Shankaracharya Reserve Forest**

Altitude	Aspect	Longitude	Latitude	Lithology	Slope
1575-1705 m asl	North West	34° 04' 35.36" N	74°50'03.132"E	Deep loam	Steep
	North East	34°05'25.38" N	74°50'03.145"E	Fine loam	Steep
	South East	34°05' 25.396" N	74°50'03.148"E	Silty loam	Very steep
1705-1835 m asl	North West	34 °04' 35.44" N	74°50'03.160"E	Deep loam	Steep
	North East	34°05'25.46" N	74°50'03.155"E	Fine loam	Very steep
	South East	34° 05' 25.490"N	74°50'03.158"E	Silty loam	Steep
1835-1967 m asl	North West	34°04'35.508" N	74°50'03.16"E	Deep loam	Very steep
	North East	34°04'35.563"N	74°50'03.16"	Fine loam	Very steep
	South East	34°05'25.083"	74°51' 08.63"E	Silty loam	Very steep

77 **Plant sample collection and Identification**

78 Significant taxonomic reservoirs [14] were used for plant identification in this study.
79 Specimens of some of the species particularly difficult to identify at the species level were
80 got identified by expert taxonomists in Division of Environmental Science, SKUAST of
81 Kashmir, Shalimar, Srinagar and Department of Botany, University of Kashmir. For this
82 purpose herbarium specimens with some distinguishing characteristics of general appearance
83 of vegetative or reproductive material were prepared and these served as a crude basis for
84 their classification.

85 **Results and discussion**

86 The vegetation survey conducted indicated that the selected reserve forest on
87 Shankaracharya hill is rich in plant composition, supporting many plant species, of diverse
88 taxonomic and ecological significance. Floristic composition and successional status of
89 Shankaracharya groove sacred groves are small patches of man-modified conserved
90 landscapes or lingering samples of natural vegetation with the highest levels of biological
91 diversity. Besides centre of high species richness [15] these areas act as a gene pool and
92 provide refuge to a large number of endemic, endangered and threatened species [16] and
93 render many ecological services such as regulation of perennial water, maintaining local
94 micro-environment and sustenance of biogeochemical cycles [17]. Among the 13,720 sacred
95 groves in India, Shankaracharya is a reserve forest being maintained for aesthetic and
96 recreational purposes [17]. The grove is very rich in species richness as depicted by plant
97 community organizational analysis; of the study area, which revealed presence of 84 plant
98 species belonging to 72 genera and 40 families. The data presented in Table 2 reveals that
99 this reserve forest hosts 40 families (38 Angiosperms and 2 Gymnosperms), 72 Genera (69
100 Angiosperms and 3 Gymnosperms) and 84 species (78 Angiosperms and 6 Gymnosperms)
101 out of which 56 were herbs, 12 were shrubs, and 18 were trees (Fig. 1). **Dicotyledons**
102 **contributed nearly 91.2% of the total angiosperms recovered in the area.** Fabaceae was the
103 dominant family with (ten) 10 species followed by Rosaceae (8) Poaceae (7), Pinaceae (5),
104 Asteraceae (5) Malvaceae (4) Lamiaceae (3), Convolvulaceae (3), Salicaceae (3),
105 Cannabaceae (2), Caryophyllaceae (2), Polygonaceae (2), Apiaceae (2) and Plantaginaceae
106 (2). Families with representation of only one species included Moraceae, Juglandaceae,
107 Sapindaceae, Chenopodiaceae, Cupressaceae, Rhamnaceae, Berberidaceae, Oleaceae,
108 Thymelaeaceae, **Scrophulariaceae**, Zygophyllaceae, Iridaceae, Caprifoliaceae,
109 Ophioglossaceae, Violaceae, Urticeae, Labiatae, Boraginaceae, Campanulaceae,

Apocynaceae, Scrophulariaceae, Cupuliferae, Amaranthaceae and Hypericaceae. The survey of Shankaracharya forest hillock conducted by [18] reveals the presence of 49 families with dominance of dicotyledenous (85%). Out of the 86 plant species recorded in the study area, 18 were trees, 12 were shrubs and 56 were herbaceous (Table 2). This species representation pattern of herbs > shrubs > trees has also been reported by [19 and 20] in undisturbed patches of Branwar temperate coniferous forests of Kashmir and temperate broadleaved Rhododendron forest of Western Arunachal Pradesh respectively. The tree plantations thus established on Shankaracharya hillock (long devoid of native plant cover) have acted as successional catalysts, facilitating re-colonisation of many woody and non woody native flora. [21 and 22] have reported that planting of trees encouraged the invasion of local species and thereby resulting in enhanced richness of shrubs and herbaceous species. [23] reported that reforestation by diverse type of plant communities along the environmental gradient facilitated improvement in local habitat. The re-vegetation effort thus profoundly determine the patterns of community structure and its distribution.

The classification of the flora; recorded on Shankaracharya hillock, in [24] biological spectrum reveals that this forest groove is mainly shaped as annual seed bearing therophytic vegetation (65%) which complete their life cycle in one year and pass on unfavourable season by overwintering. The second dominant category of flora was that of phanerophytes (34.5%) which includes shrub and tree species whose perennating buds are borne on aerial shoot reaching a height of at least 25 cm or more above the ground surface. These results show that the flora at Shankaracharya Forest Reserve is predominantly therophytic to climate. [25] have reported almost similar pattern of biological spectrum for Kandi forest range in Kashmir respectively. [26] stated that while higher number of therophytes indicates the shortage of moisture, the less number of phanerophytes specifies that the selected forest is the best representative site for open physiognomy where the latter lifeform spectrum decreases with increasing altitude. The phanerophytes viz., *Cupressus torulosa*, *Cedrus deodara* and *Pinus wallichiana* form a dominant community with prominent association of *Tribulus terrestris*, *Cannabis sativus*, *Linaria dalmatica*, *Taraxacum officinale*, *Medicago sativa*, *Cuscuta europaea*, *Artemisia absinthium*, *Iris nepalensis*, *Lonicera quinquelocularis*, *Rumex acetos*, *Rumex orientalis*, *Lespedeza cuneata*, *Ophioglossum vulgatum*, *Cichorium intybus*, *Viola odorata*, *Panicum crusgalli*, *Foeniculum vulgare*, *Cynodon dactylon*, *Pegasus hermala*, *Chenopodium album*, *Cumimum cyminum*, *Utricadioca*, *Salvia moorcraftian*, *Trifolium repens*, *Nepeta cataria*, *Organum vulgare* and

143 *Rosa webbiana*, *Zizyphus vulgaris*, *Rubus fruticosus*, *Indigofera gerardiana*, *Rosa*
144 *moschata*, *Berberis lycium*, *Jasminum humile* and *Daphne oleoides* through out the
145 altitudinal range.

146 **Conclusion**

147 Measuring the success of ecological restoration is not as straightforward and simple as
148 it appears. The overall results of this study can be concluded as the vegetation analysis
149 conducted indicates presence of 40 families, 38 angiosperms and 2 gymnosperms represented
150 by 54 grasses and herbs, 12 shrubs and 18 tree species. The extent of shrubs and grasses and
151 herbs has greatly expanded due to improvement in site conditions over a period of induced
152 secondary succession. Thus the reforestation of Shankaracharya forest has influenced the
153 microclimate of the area as depicted by invasion of new species of shrubs and herbs on the
154 hillock from the adjoining areas.

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219 **Table 2: Floristic list and plant life form spectra along an altitudinal gradient in Shankaracharya Reserve Forest**

S. No.	Family	Species	Common name/Local name	Life form	Altitude (m)		
					1575-1705	1705-1835	1835-1967
1.	Rosaceae	<i>Pyrus cumminis</i>	Pear/Tang	T	+	+	-
		<i>Prunus cerasifera</i>	Plum/Gurdhoal	T	+	-	-
		<i>Prunus armenica</i>	Apricort/Cheer	T	+	-	-
		<i>Crataegus oxycantha</i>	Hawthorn/Ring	S	+	-	-
		<i>Rosa webbiana</i>	Wild rose/Arwal	S	+	-	+
		<i>Rubus fruticosus</i>	Black berry/Daen Chanch	S	+	+	-
		<i>Rubus pungens</i>	Rubus oldhamii/Rang ratch	S	-	+	-
		<i>Rosa moschata</i>	Rose hip	S	+	-	+
2.	Salicaceae	<i>Populus alba</i>	Silver poplar (Dodhi fras)	T	+	-	-
		<i>Populus nigra</i>	Black poplar (Bati fras)	T	+	-	-
		<i>Salix fragilis</i>	Brittle willow	T	+	-	-
3.	Moraceae	<i>Morus alba</i>	White mulberry/Toot	T	+	+	-
4.	Juglandaceae	<i>Juglans regia</i>	Walnut/Doon	T	+	-	-
5.	Cannabaceae	<i>Celtis australis</i>	Nettle tree/Brimji	T	+	-	+
		<i>Cannabis sativa</i>	Hemp/Bhang	H	+	+	+
6.	Sapindaceae	<i>Aesculus indica</i>	Indian horse chestnut/Handoon	T	+	+	-

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S. No.	Family	Species	Common name/Local name	Life form	Altitude (m)		
					1575-1705	1705-1835	1835-1967
7.	Fabaceae	<i>Robinia pseudoacacia</i>	Black locust/Kikar	T	+	+	-
		<i>Quercus ilex</i>	Holm oak	T	-	+	+
		<i>Indigo gerardiana</i>	Himalayan indigo/Neel	S	+	+	-
		<i>Lespedeza cuneata</i>	Chinese bush clover	H	+	-	+
		<i>Medicago sativa</i>	Lucerne/Poshi gassi	H	+	+	-
		<i>Trifolium repens</i>	White Clover/Batak nur	H	+	-	-
		<i>Trifolium fragiferum</i>	Clover/Batak laut	H	+	+	+
		<i>Melilotus alba</i>	Sweet clover	H	-	+	-
		<i>Trigonella emodi</i>	Himalayan Fenugreek	H	-	-	+
		<i>Cytisus scoparius</i>	Common broom	S	+	+	-
8.	Pinaceae	<i>Pinus helpensis</i>	Aleppo Pine	T	-	+	-
		<i>Cedrus deodara</i>	Himalayan cedar/Deodar	T	-	+	+
		<i>Pinus roxburghii</i>	Chir pine/Chir	T	-	+	-
		<i>Pinus canariensis</i>	Canary Island Pine	T	-	+	-
		<i>Pinus wallichiana</i>	Blue pine/Kail	T	-	-	+
9.	Cupressaceae	<i>Cupressus torulosa</i>	Bhutan cypress/Sarvikul	T	+	+	-

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S. No.	Family	Species	Common name/Local name	Life form	Altitude (m)		
					1575-1705	1705-1835	1835-1967
10.	Rhamnaceae	<i>Ziziphus vulgaris</i>	Zizyphus/Bre	S	-	-	+
11.	Berberidaceae	<i>Berberis lycium</i>	Indian barberry/Kawdach	S	+	+	-
12.	Oleaceae	<i>Jasminium humile</i>	Yellow Jasmine	S	+	+	+
13.	Polypodiaceae	<i>Adiantum capillusveneris</i>	Adiantum/Gew theer	H	-	-	+
14.	Thymelaeaceae	<i>Daphne oleoides</i>	Dafne spatolata	S	-	+	+
15.	Zygophyllaceae	<i>Tribulus terretris</i>	Puncture Vine/Mister kund	H	+	+	+
16.	Caryophyllaceae	<i>Dianthus angulatus</i>	Himalayan Pinks	H	+	+	-
		<i>Phytolacca acinosa</i>	Indian Poke	H	-	-	+
17.	Convolvulaceae	<i>Cuscuta europaea</i>	Devil's hair/Wozul kukli poot	H	+	+	-
		<i>Cuscuta cuspidata</i>	Golden thread/Kokil pot	H	-	+	-
		<i>Convolus arvensis</i>	Bindweed/Soi posh	H	-	+	-
18.	Iridaceae	<i>Iris nepalensis</i>	Graceful himalayan iris/Mazar mond	H	+	+	+
19.	Caprifoliaceae	<i>Lonicera quinquelocularis</i>	Translucent Honey suckle/Pakhur	H	+	+	+
20.	Polygonaceae	<i>Rumex acetosa</i>	Sheep's sorrel/Choki chen	H	+	+	+

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S. No.	Family	Species	Common name/Local name	Life form	Altitude (m)		
					1575-1705	1705-1835	1835-1967
21.	Ophioglossaceae	<i>Rumex orientalis</i>	Spinach dock/Jungli abuj	H	+	-	+
22.	Asteraceae	<i>Ophioglossum vulgatum</i>	Adder's Tongue/Chonchur	H	+	+	+
		<i>Cichorium intybus</i>	Chicory/Handi posh	H	+	+	-
		<i>Taraxacum officinale</i>	Dandelion/Hand	H	+	+	+
		<i>Artemisia absinthium</i>	Worm wood/Tethwan	H	+	+	+
		<i>Tragopogon pratensis</i>	Meadow Salsify	H	-	+	+
23.	Violaceae	<i>Cardus nutans</i>	Musk thistle	H	-	+	+
24.	Apiaceae	<i>Viola odorata</i>	Wood violet/Bunafshah	H	+	+	+
		<i>Foeniculum vulgare</i>	Common fennel/Baidanii	H	+	+	-
		<i>Cuminum cyminum</i>	Cumin/Zur	H	+	+	-
25.	Poaceae	<i>Cynodon dactylon</i>	Dūrvā grass/Dramun	H	+	+	+
		<i>Panicum crusgalli</i> 	Cockspur/Hama	H	+	+	-
		<i>Stipa sibirica</i>	Stipa sibirica	H	+	-	-
		<i>Eragrostis nigra</i>	love grass	H	-	-	+
		<i>Hordeum murinum</i>	False barley/Pingi	H	-	-	+

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S. No.	Family	Species	Common name/Local name	Life form	Altitude (m)		
					1575-1705	1705-1835	1835-1967
26.	Chenopodiaceae	<i>Sorghum halepense</i>	Aleppo grass	H	-	+	+
		<i>Poa angustifolia</i>	Meadow-grass	H	-	+	+
		<i>Chenopodium album</i>	Lamb's quarters/Lachij	H	+	+	-
27.	Urticeae	<i>Urtica dioca</i>	Nettle/Soi	H	+	+	-
28.	Labiatae	<i>Salvia moorcroftiana</i>	Kashmir Salvia/Sholer	H	+	+	+
29	Lamiaceae	<i>Thymus serpyllum</i>	Breckland thyme	H	+	+	+
		<i>Origanum vulgare</i>	Oregano	H	+	-	-
		<i>Nepeta cataria</i>	Cat mint/Gandi soi	H	+	+	-
30.	Boraginaceae	<i>Lycopsis arvensis</i>	Small bugloss/Handi gaasi	H	-	+	-
31.	Campanulaceae	<i>Campanula colorata</i>	Bell flower/Chari hakh	H	-	+	-
32.	Malvaceae	<i>Malva sylvestris</i>	Blue Mallow	H	-	+	-
		<i>Malva album</i>	Purple Mallow	H	-	+	+
		<i>Malva rotundifolia</i>	Dwarf mallow/Sochal	H	-	-	+
		<i>Peganum harmala</i>	Syrian Rue/Isband	H	+	-	-

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S. No.	Family	Species	Common name/Local name	Life form	Altitude (m)		
					1575-1705	1705-1835	1835-1967
33.	Apocynaceae	<i>Vinca major</i>	Bigleaf periwinkle	H	-	+	+
34.	Scrophulariaceae	<i>Linaria dalmatica</i>	Balkan toadflax	H	+	+	-
35.	Plantaginaceae	<i>Kickxia subsessilis</i>	Branched Cancerwort	H	-	+	+
		<i>Plantago lanceolata</i>	Ribwort Plantain/Veuth gulla	H	-	-	+
36.	Oxalidaceae	<i>Oxalis corniculata</i>	Creeping wood sorrel (Khati buti)	H	-	-	+
		<i>Oxalis</i> spp		H	-	-	+
37.	Hypericaceae	<i>Hypericum perforatum</i>	Amber	H	-	-	+
38.	Hamamelidaceae	<i>Parrotiopsis jacquemontiana</i>	Parrotia/Hatab	S	+	-	-
39.	Cupuliferae	<i>Quercus ilex</i>	Holm oak	T	-	+	+
40.	Amaranthaceae	<i>Amaranthus</i> spp	Pigweed	H	-	+	-

235 T = Tree, S = Shrub, H = Grasses and Herbs, + = Present, - = Absent

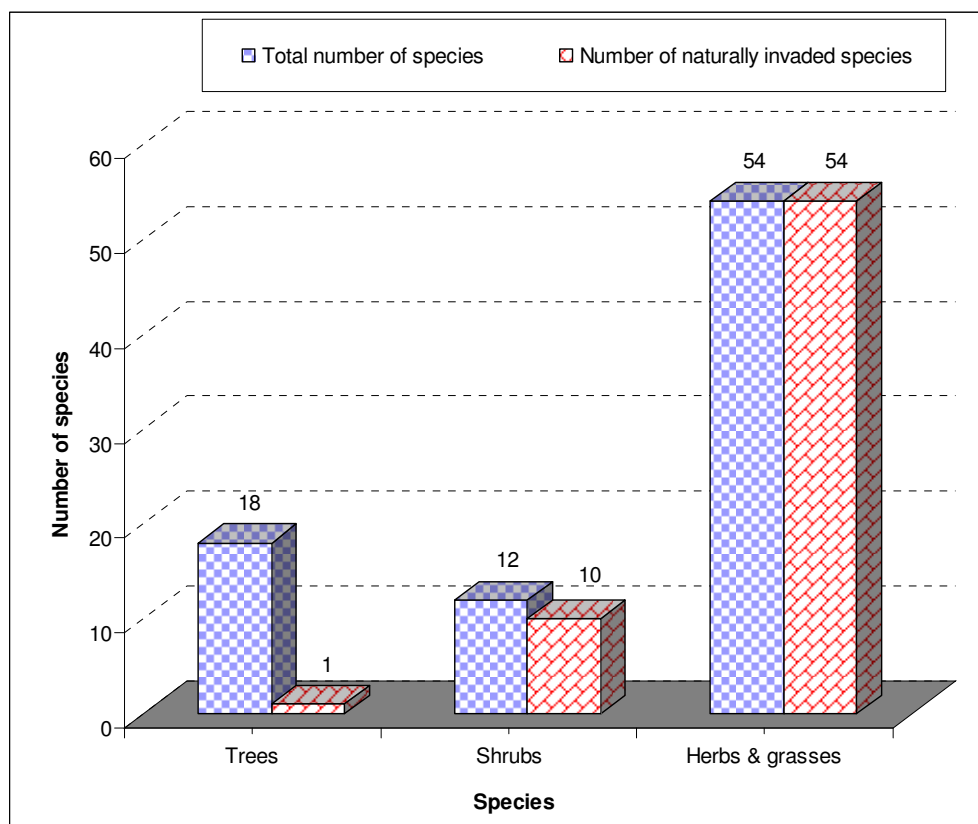


Fig. 1: Community structure of Shankaracharya Reserve Forest